THE ACCURACY OF CHARTED PORT POSITIONS IN THE PACIFIC AS DEFINED BY SATELLITE DETERMINED POSITIONS USING MULTIPLE OBSERVATIONS

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ABSTRACT

As a by-product of the marine scientific program on the oceanographic cruises of the University of Hawaii's research vessels, positions for 34 dock or anchorage sites in and around the Pacific basin were determined using the Magnavox 702 CA (MX 702/hp) Satellite Navigator as a fixed point positioning device. While it is apparent that not all positions were determined to the same accuracy, a significant number represent improvements of 15 seconds or more in the charted positions of islands, ports and harbors in the Pacific basin. Thus this work may prove to be of considerable benefit by establishing a network of well known and well surveyed Doppler determined positions in the Pacific which may serve as geodetic position references. More fundamentally, this study will contribute to the safety of navigation in making land approaches by providing more modern and accurate positional information than can be obtained from charts.

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INTRODUCTION

The Navy Navigation Satellite System (NNSS), often referred to as the TRANSIT system, has been used as a primary navigation system aboard the oceanographic research vessels of the Hawaii Institute of Geophysics (HIG) since 1970. The first satellite navigation system used was a Magnavox 702 CA (MX/702/hp) Satellite Navigator, which was furnished HIG in 1969 by the Office of Naval Research of the United States Navy. The system first saw sea duty aboard the Institute's oceanographic research ship R/V Mahi from April to December 1970. In December 1970 when the R/V Mahi was retired, the system was transferred to the newly acquired R/V Kana Keoki and remained aboard that vessel through July 1976, when it was temporarily replaced with a Magnavox 702 system. The material reported in this thesis was all taken with the Magnavox 702 system and the study has its foundation in the test program conducted prior to the first voyage of the navigator aboard the R/V Mahi. In this test program the MX/702/hp system was used to make continuous observations at dock side in Honolulu over a period of 16 days and Daugherty (1972) performed an analysis of the 79 satellite position determinations taken during this period. Daugherty determined that despite occasional erratic values, a remarkably precise mean position (standard deviation of 1.63 seconds of arc, standard deviation of the mean of 0.185 second of arc) could be determined by simple arithmetical averaging without editing of the data or

a posteriori updating of the satellite orbital parameters. On the basis of this initial testing of the satellite navigation system at Honolulu Daugherty proposed the idea of using the system as a point positioning device for various ports visited by the institute's research vessels about the Pacific as a means to improve charted positions. That there is considerable need for such information was brought out in World War II when isolated islands in the South Pacific were reported as having charted positions as much as 20 miles in error. The results from an initial evaluation of data taken at 9 port docking sites in the Pacific basin were presented by Daugherty at the December 1972 meeting of the American Geophysical Union and later published as Part I of Technical Report HIG-74-1 (Daugherty, 1974).

The present study represents a continuation of the work referred to above, and incorporates an improvement in that the data are edited as suggested by Daugherty (1974). Also the coverage is expanded to include 22 different ports. Some of these ports were occupied at the same locations several times and also at different docking sites. Also presented in this paper in Appendix A are charts for each docking site based on the latest and best maps available. The data were reduced using the same arithmetic averaging procedure used by Daugherty (1972, 1974) in order to permit comparisons with his unedited results. As some of the data used are the same as used by Daugherty there is some overlap between the results presented in this paper and the previous ones given by Daugherty and referred to above.

That there are other more precise methods of handling the data than arithmetic averaging is recognized. For example, Woollard and Thompson (1974) used a graphical approach for refining positions obtained with a Magnavox 706 satellite receiver system at land based sites in South America. Berg (1975, 1976) has shown that the double pass method of Anderle (1971) with antenna height corrections based on Stansell (1970) can yield highly refined positions (approximately 8 meters or better in position coordinates). However, the improvement in positions using these more sophisticated time consuming and extensive methods is not sufficient to significantly affect the basic conclusions reached regarding errors in charted positions. For example, if a comparison is made of coordinates for Pier 18 in Honolulu Harbor as determined in this study with those determined by Woollard and Thompson (1974) and Berg (1975, 1976) the same site and using the same data sets, the greatest discrepancy is 0.07 seconds (approximately 2 meters), and on average only 0.05 seconds. As these differences are within the scaling error on the best charts, which seldom are on a scale of better than 1:10,000, it is clear that the considerable extra expense involved in these other methods was not justified for the purposes of this study.

DATA ACQUISITION

Satellite Navigation positioning data were collected at 22 different ports in the Pacific from October 5, 1970 to July 14, 1974. Due to changes in moored position and return visits to the

same port there are a total of 34 positions where the research vessel was either moored or at anchor and data were taken. In all there are a total of 45 data sets ranging in size from 4 fixes for one of the occupations at Guayaquil, Ecuador to 377 at Honolulu, Hawaii.

SYSTEM DESCRIPTION

During the time of collection of the data contained in this paper there were a maximum of six operational Doppler satellites in the Navy Navigation Satellite System (NNSS). Each satellite of the NNSS is in a circular polar orbit approximately 600 nautical miles above the surface of the earth. Each satellite makes a complete circle of the earth in approximately 105 minutes thus providing intermittent position fix updates rather than continuous navigation information as is provided by such systems as Omega. During a satellite pass the user receives line-of-sight UHF signals from each satellite both day and night and in all weather conditions. For the most accurate and consistent results the maximum elevation angle of the satellite above the horizon should lie between 15 and 75 degrees (Newton, 1967).

The satellites of the NNSS transmit two stable frequencies (about 150 and 400 MHz). By scaling and comparing Doppler frequency shifts of both signals, the first order effects of ionospheric refraction may be measured and eliminated in the computer program.

The satellite's memory system contains the navigation message which is transmitted on the 400 MHz signal in phase modulation. This navigation message is transmitted continuously and is timed to last exactly 2 minutes, beginning and ending at the instant of each even minute. The message readout is precisely controlled so that the beginning and end of each two minute message serves as an accurate time mark. The navigation message is based on a predicted ephemeris which is updated every 12 hours with parameters suitable for the following 16 hours. The broadcast message consists of a fixed part which defines a smooth, precessing elliptical orbit and a variable part consisting of a set of corrections to the elliptical orbit defining the predicted position of the satellite at eight two-minute time points. This variable part of the navigation message is changed every two minutes with the deletion of the oldest time point and the addition of orbital corrections at a new time point.

The ground based receiver records the transmitted fixed frequency signal. Due to the motion of the satellite in its orbit the fixed frequencies transmitted by each satellite appear to change as a function of time, this is the Doppler effect. The Doppler shift is proportional to the time rate of change of the slant range to the satellite (range rate). Given an assumed initial position of the receiver and a calculated range rate for a time instant t_i the so called frequency affect can be determined. The calculated and measured quantities are compared and residuals formed, the assumed initial quantities are then varied until a best fit is achieved (Newton, 1967).

The Magnavox 702/CA (Mx/702/hp) Satellite Navigation System consists of the following basic elements:

a 43 pound antenna-preamplifier unit

200 feet of coaxial cable

a Doppler receiver

a Hewlett-Packard 2114 computer

an ASR-33 teleprinter for input-output.

The input/output system aboard the R/V Kana Keoki allows dialogue between the HP 2114 Satellite Navigation computer and the central Data Logging system using a Nova mini-computer. Thus positions fixes may be merged with other data in near real time to allow the scientific party to monitor the geophysical environment while underway. A non-trivial side benefit of this computer to computer connection is the ability to reload the navigation program in a matter of seconds from magnetic tape rather than the 45 minutes required to reload the program using punched paper tape.

REMARKS ON DATA UTILIZED

Only the information contained in the standard satellite fix output of the HP 2114 computer was used in this study. Two programs were used during the period over which the data were accumulated, the MAPS-70065 program aboard the R/V Mahi in 1970 and the MAPS-70356 program aboard the R/V Kana Keoki subsequently. The satellite navigation program output was changed by deleting those parameters

relating to the movement of the receiver. The parameters retained and used in the present analysis are as follows:

INPUT DATA

1. DATE: (DATE) The Julian Day Number representing the consecutive numbering of days of the year, i.e. DATE 59 is 28 February.
2. TIME: (GMT) The Greenwich Mean Time of the position fix in hours and minutes.
3. SATELLITE: (SAT) Six near-polar orbit navigation satellites were used to measure these data samples. A two digit numbering code for the satellites, related to the semi-major axis in kilometers, was adopted. The correspondence to the Satellite Number is listed below:

SATELLITE	SEMI-MAJOR AXIS	SATELLITE #
42	7442	30120
54	7455	30140
63	7463	30180
64	7464	30130
65	7465	30190
67	7399	30200

4. ELEVATION ANGLE: (ELEV) Vertical angle of the satellite above the horizon at closest approach to the observing station measured in degrees.

5. ANTENNA HEIGHT: Geoid height, as taken from the geoidal map in the Magnavox manual, added algebraically to the ship's antenna height above sea level.
6. IITERATIONS: (IT) Number of iterations required for the program to converge on a fix.
7. DOPPLER COUNTS: (CTS) Number of counts received and used in the computation of the individual fix.
8. DOPPLER COUNT SEQUENCE: (CTSQ) Number of balanced (symmetric) 24 second counts about the point of closest approach.

DERIVED QUANTITIES:

1. LATITUDE: (LATITUDE) Latitude of observed points measured from the equator to the station in degrees, minutes and seconds of arc.
2. LONGITUDE: (LONGITUDE) Longitude of observation points measured from the Greenwich Meridian to the station in degrees, minutes and seconds of arc.

In Table 1 the dates, description of sites and number of fixes utilized at each site are listed. Figure 1 shows the geographic distribution of the sites.

SOURCES OF ERROR IN THE MEASUREMENTS AND SELECTION CRITERIA USED:

Each individual satellite fix may be influenced by several factors: the elevation angle, the antenna height assumed, the number of Doppler counts and the symmetry of the Doppler count sequence. These latter two indicate the quantity and quality of the Doppler

TABLE 1

DATES AND LOCATION OF SATELLITE FIXES

TABLE NUMBER	DATES	PORT AND LOCATION	NUMBER OF FIXES	# OF FIXES USED
1A-1	4-6 to 4-20-70	Honolulu, Hawaii Pier 18	87	66
1A-2	11-1 to 11-4-72 11-7 to 11-8-72	Honolulu, Hawaii Pier 18	68	44
1A-3	11-4 to 11-6-72	Honolulu, Hawaii Pier 18	37	29
1A-4	11-6 to 11-7-72	Honolulu, Hawaii Pier 10	8	5
1A-5	7-23 to 7-26-73	Honolulu, Hawaii Port side to Pier 18	36	30
1A-6	9-8 to 9-10-73	Honolulu, Hawaii Port side to Pier 18	45	31
1A-7	10-17 to 10-24-73	Honolulu, Hawaii Port side to Pier 18	139	102
1A-8	12-19 to 12-31-73 1-1 to 1-7-74	Honolulu, Hawaii Port side to Pier 18	377	252
1A-9	1-9-74	Honolulu, Hawaii Pier 40	17	11
2A-1	6-3 to 6-5-70	Pago Pago, Samoa, Oil Dock	25	21
3A-1	6-24-70	Suva, Fiji, King's Wharf	9	7
3A-2	6-25-70	Suva, Fiji, Dolphins	10	8
3A-3	6-26-70	Suva, Fiji, In Dry Dock	9	8
3A-4	7-20 to 7-21-71	Suva, Fiji, NW end of King's Wharf	19	10
3A-5	7-21 to 7-26-71	Suva, Fiji, Dolphins, NE of King's Wharf	77	56
3A-6	7-29 to 8-2-71	Suva, Fiji, Dolphins, NE of King's Wharf	117	81
3A-7	12-24 to 12-25-72	Suva, Fiji, 500 foot mark of King's Wharf	25	15

TABLE 1 (continued)

TABLE NUMBER	DATES	PORT AND LOCATION	NUMBER OF FIXES	# OF FIXES USED
3A-8	11-25 to 11-27-72	Suva, Fiji, Dolphins at Government Slipway	40	28
4A-1	8-4-70	Rabaul, New Britain, moored at dock	7	5
5A-1	9-18, 9-23-70	Guam, Dillingham Pier	7	13
5A-2	10-31 to 11-6-70	Guam, Dillingham Pier	21	6
6A-1	10-5 to 10-6-70	Majuro, Marshall Is., "T" Wharf	6	4
7A-1	5-26 to 5-29-71	Ponape, Caroline Is., Main Dock	40	24
8A-1	6-16 to 6-19-71	Palau, Caroline Is., Main Dock at Malakal Is.	56	37
9A-1	8-29 to 9-1-71	Wellington, New Zealand, Moored to East side of "Glascow" Wharf	58	43
10A-1	1-15 to 1-22-72	Callao, Peru, Berth 9-D, (Callao A)	106	70
10A-2	2-23 to 2-27-72	Callao, Peru, Berth 4-A, (Callao B)	84	54
11A-1	2-29-72	Ancon, Peru, swinging at anchor, not dragging	11	8
12A-1	3-14 to 3-15-72	Talara, Peru, Swinging at anchor, not dragging	25	11
13A-1	4-13 to 4-20-72	Guayaquil, Ecuador, Berth #2, Puerto Maritimo	111	73
13A-2	2-15 to 2-19-73	Guayaquil, Ecuador, Port side to Berth #2	63	45
13A-3	2-19 to 2-20-73	Guayaquil, Ecuador, Port side to Caribbean Tiuna	22	12

TABLE 1 (continued)

TABLE NUMBER	DATES	PORT AND LOCATION	NUMBER OF FIXES	# OF FIXES USED
13A-4	3-6-73	Guayaquil, Ecuador, Port side to Berth #6	4	3
14A-1	5-1 to 5-2-72	Puntarenas, Costa Rica, at anchor	19	11
15A-1	5-11 to 5-12-72	Acapulco, Mexico, Moored at dock	20	12
15A-2	5-12 to 5-18-72	Acapulco, Mexico, 6 meters West of above position	47	26
15A-3	7-14-74	Acapulco, Mexico, Moored to Pier	6	5
16A-1	7-21-72	Sand Island, Midway, main pier	18	13
17A-1	1-21-73	Papeete, Tahiti, Port side to North end of main wharf	7	7
17A-2	5-31 to 6-1-73	Papeete, Tahiti, Fuel Dock	15	11
18A-1	4-3-73	Antofagasta, Chile, Port side to Sitio #2	52	36
19A-1	4-29 to 4-30-73	Easter Is., swinging at anchor in Cook Bay	14	12
20A-1	5-23-73	Pitcairn Is., swinging at anchor in Bounty Bay	6	6
21A-1	5-22 to 5-26-74	Valparaiso, Chile, Berth #4	38	25
22A-1	6-16 to 6-21-74	Balboa, Panama, Rodman Naval Base, Pier #2	82	55

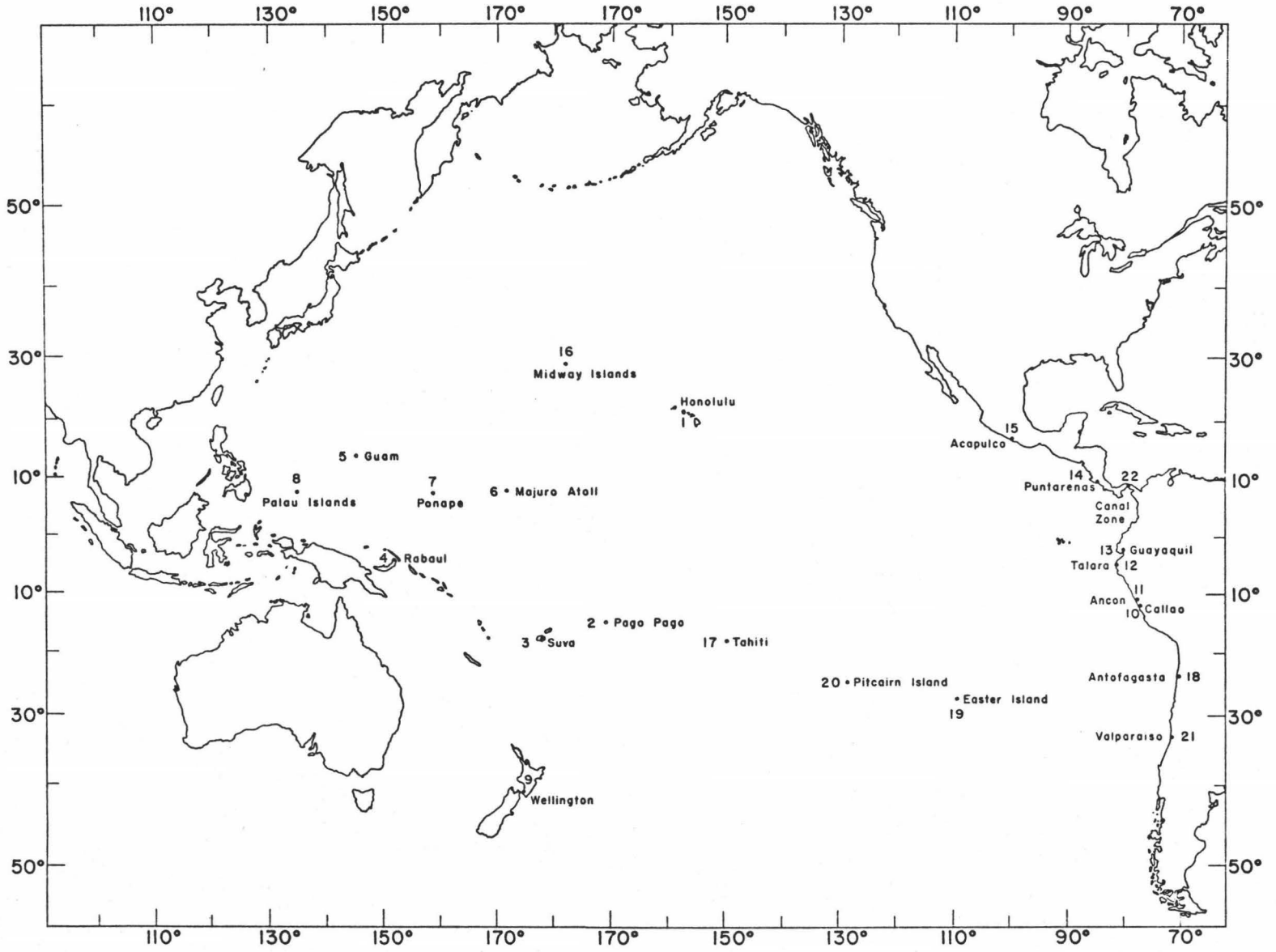


Figure 1. Chart of the Pacific showing harbor sites.

data received. The quantity of information is indicated by the number of Doppler counts while the quality of the information is shown by the number of balanced (symmetric) Doppler counts about the point of closest approach.

Newton (1967) indicated that the elevation angle affects the positional accuracy of satellite fixes in several ways. A significant cross-track effect may be created by the increasing effects of refraction which can be quite serious for low elevation passes. The high elevation passes, which do not suffer from data loss, have increasing sensitivity to errors in the cross-track direction since the elevation angle usually enters these error factors as the tangent of the angle, thus approaching infinity at an elevation angle of 90^{o}. For this reason Newton advocates deleting all passes below 15^{o} and above 75^{o} elevation angles. Similarly Stansell (1970) has pointed out the importance of the antenna height used and the effect on the tangent of the satellite elevation angle and tropospheric effect particularly in defining longitude positions for East and West passing satellites. Berg (1975, 1976), even after applying these corrections found that certain data sets were of such variance from the rest, that the values should be rejected in deriving a final solution.

For the purposes of defining the arithmetic mean position of each site in the writer's investigation the following editing or rejection criteria were adopted. First, data for elevation angles less than 15^{o} and greater than 75^{o} were not used in the computations for reasons states above.

A second rejection criteria was that there be no more than 5 program iterations (IT) required for convergence on a solution. This was chosen as a quick means of eliminating data lacking in quality or quantity or both from computation of the mean. As will be seen from an inspection of the tables in Appendix B the number of iterations is closely correlated with the information content and distribution.

The final automatic rejection criteria was based on first making a trial arithmetic solution and then inspecting all data for deviation against the trial mean. All passes having deviations of greater than 10 seconds of arc in either latitude or longitude were flagged and not included in the final computation of the arithmetic mean. Again inspection of the tables will show that passes with large deviations are generally those with low or high elevation angles, a low number of Doppler counts or a poor count sequence, or a combination of these. Although it can be argued that this is not a valid procedure since it represents in some cases an "overkill" and in other cases the incorporation of data that would have been rejected on the basis of probability theory, it does put all the data on a uniform numerical standard defined statistically for acceptance or rejection.

SATELLITE RESULTS OBTAINED

Even though excluded from the computation of the mean and the statistics of the position fix, the data eliminated in the described editing procedures are included in the tables but are flagged appropriately for easy identification. In Appendix B, tables 1A-1 to 22A-1, are listed the satellite fix information for the data used in this paper. In the following section the various statistical techniques used to test the data samples for reliability are discussed. Also in Appendix B are tables 1B-a to 22B-1 which show the satellite determined mean latitude and longitude as well as the standard deviation and the standard deviation of the mean, and tables 1C-1 to 22C-1 showing similar information but with the data sorted to give a solution for each satellite by satellite number.

STATISTICAL TESTS OF RELIABILITY ADOPTED

The initial statistic that was calculated on all samples was the most obvious one, the arithmetic mean. This is shown in Appendix B, tables 1B-1 to 22B-1, where NP is the number of fixes, N is the number of fixes eliminated from the sample and NSD is the number of fixes used to calculate the mean. The statistical parameters used as a measure of precision of the positional data were the standard deviation of a single observation

$$s_x = \pm \sum_{i=1}^{n} \sqrt{\frac{(x_i - \bar{x})^2}{(n - 1)}}$$

and the standard deviation of the mean

$$s_{\bar{x}} = \pm \sum_{i=1}^{n} \sqrt{\frac{(x_i - \bar{x})^2}{n(n-1)}}$$

where n in the number of observations and $\bar{x}$ is the mean.

Tables 1B-1 to 22B-1 also give the derived average latitude and longitude values and the standard deviation and the standard deviation of the mean in seconds of arc for each station. Tables 1C-1 to 22C-1 presents similar information with the data sorted to give a solution for each satellite by satellite number. As seen from an inspection of the above tables, recognized earlier by Berg (1975, 1976), all satellites are not of equal reliability at any given time. Satellite 54, for example, gave significantly different results from the other satellites much of the time.

DISCUSSION OF SATELLITE RESULTS

Table 2 is a summary of the data given in Tables 1B through 22B-1 in the appendix and site and the number of observations accepted in each case after editing for computation of the arithmetic mean values of latitude and longitude. Also shown in this table is the spread in maximum and minimum values of latitude and longitude recorded for each series of measurements, and where the ship was at the same site more than once, the weighted mean average of the mean latitude and longitude values are given for the site as well as the

arithmetic average. As seen, it is only at Honolulu that there is any significant difference (approximately 0.3 seconds of arc) between the weighted mean average values and a straight average of average values for each series of observations. That this weighting of values on the basis of the number of observations in each series may be less preferable than straight averaging of series values is evident from the following tabulation showing how the standard deviation varies with number of observations in a series. The data are for Pier 18 Honolulu.

N	Latitude Std. Dev.	Longitude Std. Dev.
27	1.3	1.4
29	1.3	1.3
31	1.2	1.4
44	1.4	1.9
101	1.5	1.9
252	1.4	1.2
Avg.	1.35	1.51

As seen from the above there is no apparent systematic relationship between the standard deviation values and the number of observations indicating that some factor having greater weight than size of sample is involved in determining the reliability of a fix. That the above is a general situation is brought out in Table 3 showing the spread between minimum and maximum deviations from the mean for latitude and longitude along with the average

TABLE 2

MAXIMUM AND MINIMUM VALUES FOR LATITUDE AND LONGITUDE

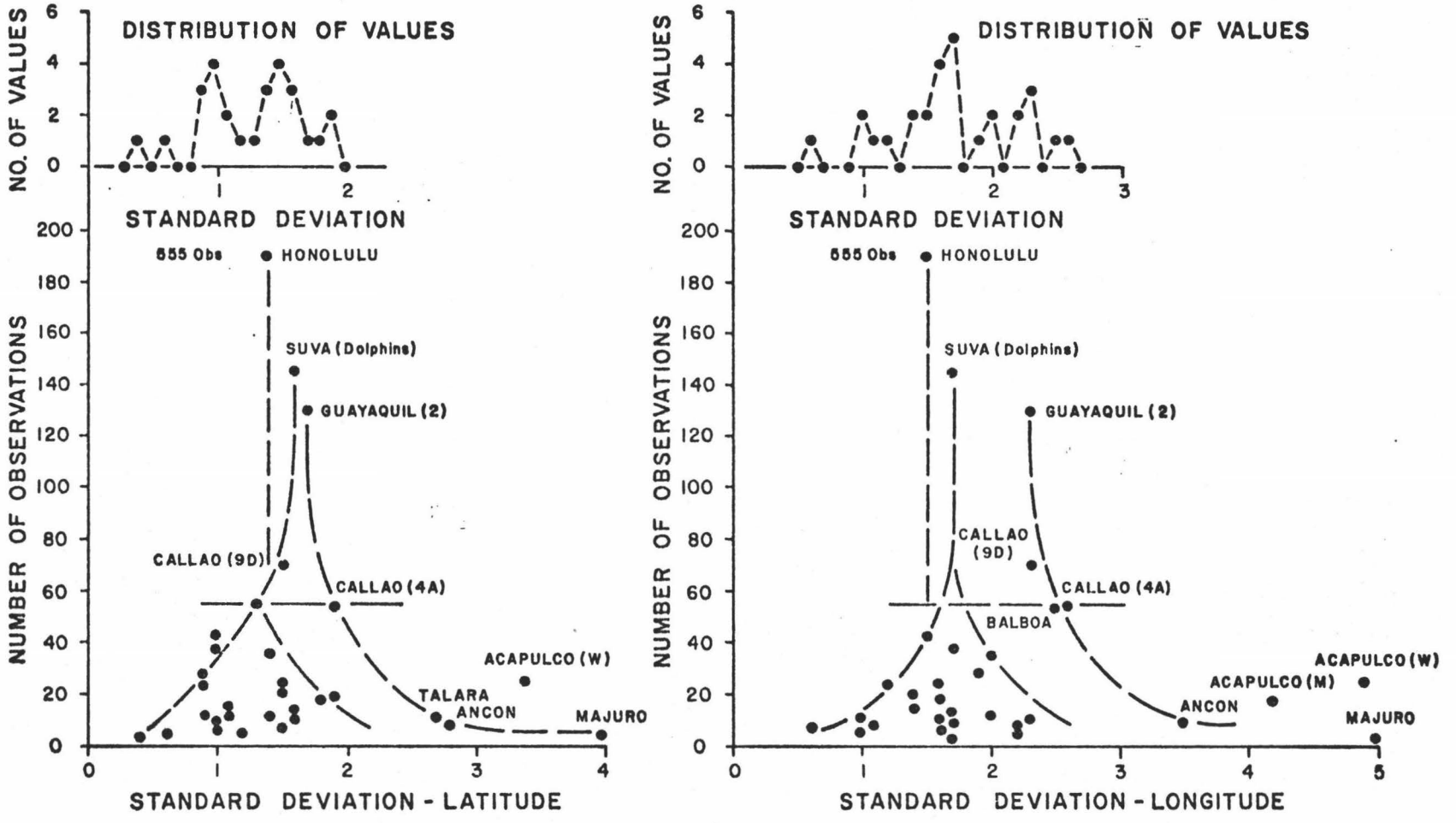
PORT AND LOCATION	# Obs	# Obs Used	Minimum ° ' "	Maximum ' "	Arithmetic Mean ' "	Minimum ° ' "	Maximum ' "	Arithmetic Mean ' "
Honolulu, Pier 18	86	66	21 18 44.22	19 00.84	18 48.21	157 45 39.66	52 05.34	52 01.53
	68	44	42.30	18 55.22	48.42	51 59.76	04.26	01.30
	37	29	32.28	53.10	49.92	55.14	07.14	00.90
	36	30	46.28	53.16	48.34	58.56	07.20	01.48
	45	31	33.24	19 09.12	48.70	52.26	11.94	01.70
	139	102	24.72	33 06.96	48.17	48 04.32	53 31.38	01.56
	377	252	17 54.60	23 38.16	48.19	51 42.18	55 22.92	01.48
		Average:	18 30.81	21 10.08	18 48.56	50 27.41	52 47.17	52 01.56
		Weighted Mean:			18 48.28			52 01.52
Honolulu, Pier 10	8	5	21 18 13.98	18 28.26	18 27.82	157 51 54.36	52 02.82	51 58.99
Honolulu, Pier 40	17	11	21 18 56.58	19 06.60	19 04.31	157 52 37.20	53 34.02	52 54.09
Pago Pago, Oil Dock	25	21	14 16 32.10	16 44.34	16 34.91	170 40 51.78	40 58.38	40 55.32
Suva, King's Wharf	9	7	18 07 41.76	07 48.48	07 47.36	178 25 30.90	25 35.94	25 34.10
Suva, Dolphins	10	8	18 07 46.20*	07 51.42*	07 49.00*	178 25 35.10*	25 42.36*	25 37.55*
	77	56	44.46	54.72	46.79	24.96	36.18	32.27
*Values with wrong antenna height. Not used in averages.	114	81	40.62	08 13.68	46.76	24 01.14	45.30	32.20
		Average:	07 42.59	08 04.25	07 46.77	24 42.55	25 40.74	25 32.24
		Weighted Mean:			07 46.76			25 32.23
Suva, Dry Dock	9	8	18 07 45.98	07 54.90	07 49.60	178 25 34.08	25 40.92	25 37.40
Suva, NW of King's Wharf	19	10	18 07 41.22	08 06.36	07 56.27	178 25 12.66	25 36.42	25 26.68
Suva, 500' mark	25	15	18 07 54.60	08 01.62	07 59.91	178 25 00.90	25 48.06	25 25.28
Suva, Gov't Slipway	40	28	18 07 25.38	07 51.06	07 46.65	178 25 26.64	26 12.00	25 32.45

TABLE 2 (continued)

PORT AND LOCATION	#Obs	# Obs Used	Minimum ° ' "	Maximum ' "	Arithmetic Mean ' "	Minimum ° ' "	Maximum ' "	Arithmetic Mean ' "
Rabaul, Main Dock	7	5	4 11 58.14	12 03.24	12 01.43	152 10 14.52	10 20.16	10 17.98
Guam, Dillingham Pier	21	13	13 27 19.62	27 56.10	27 42.63	144 39 08.76	39 59.52	39 52.61
	7	6	27 39.96	27 44.46	42.20	51.78	55.62	53.22
		Average:	27 29.79	27 50.28	27 42.42	39 30.27	39 57.57	39 52.92
		Weighted Mean:			27 42.49			39 52.80
Majuro, "T" Wharf	6	4	7 06 13.02	06 25.20	06 18.99	171 22 09.18	22 23.16	22 16.59
Ponape, Main Dock	39	24	6 58 40.02	59 15.18	58 44.74	158 11 54.66	13 19.14	12 01.97
Palau, Main Dock	55	37	7 19 34.20	20 12.96	19 49.34	134 27 05.94	27 51.78	27 23.49
Wellington, Glascow Wharf	58	43	41 16 35.10	18 03.60	16 54.19	174 45 37.44	47 23.34	46 57.55
Callao, Berth 9-D	104	70	12 02 55.86	03 33.18	03 19.62	77 07 00.30	09 30.72	08 58.97
Callao, Berth 4-A	84	54	12 01 40.80	08 05.88	02 50.43	77 08 12.24	15 22.68	08 44.97
Ancon, Anchored	11	8	11 44 25.62	45 14.76	44 31.51	77 10 17.40	19 35.46	10 24.73
Talara, Anchored	25	11	04 33 30.96	34 03.78	33 44.51	81 17 14.76	17 34.26	17 20.44
Guayaquil, Berth #2	110	73	2 16 43.98	20 12.18	16 59.84	79 51 43.02	54 38.10	54 20.35
	64	45	16 47.28	25.32	59.76	53.16	38.10	20.46
*Omitted in averages.	22	12	37.50*	17 17.76*	58.11*	54 09.48*	33.18*	23.65*
		Average:	16 45.63	19 18.75	16 59.80	52 48.09	54 38.10	54 20.41
		Weighted Mean			16 59.81			54 20.39
Guayaquil, Berth #6	4	3	2 16 43.62	16 46.38	16 43.86	79 54 43.44	54 46.50	54 44.60
Puntarenas, Anchored	19	11	9 57 47.40	57 54.90	57 51.33	84 49 19.32	49 29.28	49 26.30

TABLE 2 (continued)

PORT AND LOCATION	# Obs	# Obs Used	Minimum	Maximum	Arithmetic Mean	Minimum	Maximum	Arithmetic Mean
			o ' "	' "	' "	o ' "	' "	' "
Acapulco, Main Dock	20	12	16 50 41.76	51 05.76	50 53.76	99 54 04.74	54 39.84	54 15.86
	6	5	30.78	50 54.66	53.84	51 11.88	20.22	17.23
		Average:	50 36.27	51 00.21	50 53.80	52 38.31	54 30.03	54 16.55
		Weighted Mean:			50 53.78			54 16.47
Acapulco, W of Main Dock	47	26	16 50 44.28	51 15.48	50 54.65	99 53 19.38	59 11.76	54 19.16
Midway, Main Pier	18	13	28 12 47.52	13 01.98	12 50.37	177 21 43.08	21 53.76	21 48.40
Papeete, Main Wharf	7	7	17 31 59.58	32 03.90	32 01.50	149 34 20.70	34 22.74	34 21.80
Papeete, Fuel Dock	15	11	17 31 57.30	32 20.16	32 14.22	149 34 09.06	35 30.66	34 10.69
Antofagasta, Sitio #2	52	36	23 39 09.96	39 42.12	39 13.70	70 24 00.78	24 35.64	24 20.40
Easter Is., Anchored	14	12	27 08 20.70	08 33.18	08 30.42	109 26 16.26	26 28.86	26 18.43
Pitcairn Is., Anchored	6	6	25 03 51.24	03 53.88	03 52.02	130 05 33.72	05 38.58	05 36.17
Valparaiso, Berth #4	38	25	33 01 45.12	02 07.32	02 00.48	71 37 30.24	38 37.68	37 36.72
Balboa, Pier #2	81	55	8 52 04.80	57 17.10	57 06.86	79 30 22.02	35 06.90	34 22.90



RELATIONSHIP OF STANDARD DEVIATION TO NUMBER OF OBSERVATIONS

Figure 2

TABLE 3

DIFFERENCE FROM THE MEAN IN LATITUDE AND LONGITUDE

PORT AND LOCATION	# OBS USED	SERIES	DIFFERENCE FROM THE MEAN MINIMUM ' "	DIFFERENCE FROM THE MEAN MAXIMUM ' "	STD DEV	DIFFERENCE FROM THE MEAN MINIMUM ' "	DIFFERENCE FROM THE MEAN MAXIMUM ' "	STD DEV
Honolulu, Pier 18	555	6	- 17.47	+ 2 21.80	1.4	- 1 34.11	+ 45.65	1.5
Honolulu, Pier 10	5	1	- 13.84	+ 0.44	0.6	- 4.63	+ 3.83	1.0
Honolulu, Pier 40	11	1	- 7.73	+ 2.29	1.4	- 16.89	+ 20.07	1.7
Pago Pago, Oil Dock	21	1	- 2.81	+ 9.43	1.5	- 3.54	+ 3.06	1.4
Suva, King's Wharf	7	1	- 5.60	+ 1.12	1.0	- 3.20	+ 1.84	1.1
Suva, Dolphins	137	2	- 4.17	+ 17.49	1.6	- 49.68	+ 8.51	1.7
Suva, Dry Dock	8	1	- 3.62	+ 5.30	2.8	- 3.32	+ 3.52	2.2
Suva, NW of King's Wharf	10	1	- 15.05	+ 10.09	1.0	- 14.02	+ 9.74	1.7
Suva, 500' mark	15	1	- 5.31	+ 1.71	1.1	- 24.38	+ 22.78	1.4
Suva, Gov't Slipway	28	1	- 21.27	+ 4.41	0.9	- 5.81	+ 39.55	1.9
Rabaul, Main Dock	5	1	- 3.29	+ 1.81	1.2	- 3.46	+ 2.18	2.2
Guam, Dillingham Pier	19	2	- 12.70	+ 7.79	1.9	- 22.65	+ 4.65	1.6
Majuro, "T" Wharf	4	1	- 5.97	+ 6.21	4.0	- 7.33	+ 6.65	5.0
Ponape, Main Dock	24	1	- 4.72	+ 30.44	0.9	- 7.31	+ 1 17.17	1.2
Palau, Main Dock	37	1	- 15.14	+ 23.62	1.0	- 17.55	+ 28.29	1.7

TABLE 3 (continued)

PORT AND LOCATION	# OBS USED	SERIES	DIFFERENCE FROM THE MEAN MINIMUM ' "	DIFFERENCE FROM THE MEAN MAXIMUM ' "	STD DEV	DIFFERENCE FROM THE MEAN MINIMUM ' "	DIFFERENCE FROM THE MEAN MAXIMUM ' "	STD DEV
Wellington, Glascow Wharf	43	1	- 19.09	+ 1 09.41	1.0	- 1 20.11	+ 25.79	1.5
Callao, Berth 9-D	70	1	- 23.76	+ 13.56	1.5	- 1 58.67	+ 31.75	2.3
Callao, Berth 4-A	54	1	- 1 09.63	+ 5 15.45	1.9	- 32.73	+ 37.71	2.5
Ancon, Anchores	8	1	- 5.89	+ 43.25	2.8	- 7.33	+ 9 10.73	3.5
Talara, Anchored	11	1	- 13.55	+ 19.27	2.7	- 5.68	+ 13.82	2.3
Guayaquil, Berth #2	130	2	- 16.32	+ 2 19.18	1.7	- 1 46.27	+ 14.97	2.3
Guayaquil, Berth #6	3	1	- 0.24	+ 2.52	0.4	- 1.16	+ 1.90	1.7
Puntarenas, Anchored	11	1	- 3.93	+ 3.57	1.1	- 6.98	+ 2.98	1.6
Acapulco, Main Dock	17	2	- 17.53	+ 6.41	1.8	- 1 38.24	+ 13.48	4.2
Acapulco, W of Main Dock	26	1	- 10.37	+ 20.83	3.4	- 59.78	+ 4 52.60	4.9
Midway, Main Pier	13	1	- 2.85	+ 11.61	1.6	- 5.32	+ 5.36	2.0
Papeete, Main Wharf	7	1	- 1.92	+ 2.40	1.5	- 1.10	+ 0.94	0.6
Papeete, Fuel Dock	11	1	- 16.92	+ 5.94	0.9	- 1.63	+ 1 29.97	1.0
Antofagasta, Sitio #2	36	1	- 3.74	+ 28.42	1.4	- 19.62	+ 15.24	2.0
Easter Is., Anchored	12	1	- 9.72	+ 2.76	1.6	- 2.17	+ 10.43	1.7

TABLE 3 (continued)

PORT AND LOCATION	# OBS USED	SERIES	DIFFERENCE FROM THE MEAN MINIMUM ' "	DIFFERENCE FROM THE MEAN MAXIMUM ' "	STD DEV	DIFFERENCE FROM THE MEAN MINIMUM ' "	DIFFERENCE FROM THE MEAN MAXIMUM ' "	STD DEV
Pitcairn Is., Anchored	6	1	- 0.78	+ 1.86	1.0	- 2.45	+ 2.41	1.6
Valparaiso, Berth #4	25	1	- 15.36	+ 6.84	1.5	- 6.48	+ 1 00.96	1.6
Balboa, Pier #2	55	1	- 4 49.76	+ 10.24	1.3	- 4 00.88	+ 44.00	1.6

standard deviation values for each site. A possible statistical explanation is brought out in Figure 2. In the figure the distribution of standard deviation values is plotted to see if they have a normal distribution, and a plot presented to show on an overall basis they are related to the number of observations.

As seen from Figure 2, the standard deviation values: (1) do not define a bimodal rather than a Gaussian (normal) distribution; (2) they are only partially related to the number of observations taken, and (3) certain sites are consistently subject to significant probable error in both latitude and longitude. This last is indicated by the values for these sites lying outside the envelope defining a convergence in values towards the most probable standard deviation to be expected. It is also to be noted that the standard deviation values are not significantly improved by taking more than 55 observations at a given site, and because of the bimodal distribution in values found, one should not expect better, on the average, than a standard deviation of 1.3 seconds of arc for latitude and 1.7 seconds of arc for longitude. The values which fall outside the envelope enclosing most of the data points at first glance appear to be a function of geographic location, and for the most part are restricted to the West Coast of Central and South America. However, this is not consistently true, and it can only be concluded that the large standard deviations noted for these observations as well as the bimodal distribution pattern shown is a function of the satellites involved. The most probable explanation

appears to be errors in the ephemeris values since the data considered were edited to eliminate all values apt to be suspect because of elevation angle values, number of iterations needed, etc., as well as those values whose standard deviation values departed significantly (> 10 seconds of arc) from the mean.

RESULTS ON CHARTED POSITIONS VERSUS SATELLITE DEFINED POSITIONS

All of the charts used for defining position were the most recent available, and except for the one for Ancon, Peru issued in 1923 and the one for Rabaul issued in 1966, all of the charts represent post 1972 editions. As seen from Table 4, the scales for these charts varies from 1:5,000 to 1:36,481, and for the most part they have a scale of 1:10,000 and 1:12,500 (11 charts) or 1:25,000 and 1:35,000 (8 charts). If an average reliability of 1 mm is assumed for the ship's plotted positions at a dock or anchorage, on a chart of 1:10,000 scale there would be an uncertainty of about 10 meters or 0.3 seconds in position. For charts on a scale of 1:25,000 and 1:35,000, the uncertainty is proportionally greater. The uncertainty in scaling coordinates for these charted position, on the other hand, is based on the spread in values obtained for the positions which were scaled twice by two different observers. This was of the order of ± .02 mm.

Table 5 lists the chart measured coordinates and the satellite derived coordinates. Table 6 lists the comparison of the chart and

TABLE 4

CHARTS USED FOR POSITION COMPARISONS WITH SATELLITE DATA

LOCATION	CHART #	YEAR	SCALE	AUTHORITY
Acapulco	21401	1974	1:25,000	Defense Mapping Agency, Hydrographic Center
Ancon	22171	1923	1:36,481	United States Navy, Hydrographic Office
Antofagasta	22221	1976	1:12,500	DMA-HC
Callao	22172	1972	1:10,000	DMA-HC
Easter Is	22451	1975	1:23,173	USN-HO
Guam	81048	1975	1:10,000	National Oceanic and Atmospheric Administration
Guayaquil	22113	1973	1:10,000	DMA-HC
Honolulu	19367	1974	1:5,000	NOAA
Majuro	81782	1974	1:35,000	DMA-HC
Midway	19481	1973	1:32,500	NOAA
Pago Pago	83484	1975	1:15,000	NOAA
Palau	81155	1972	1:10,000	DMA-HC
Papeete	83385	1975	1:6,000	DMA-HC
Panama	21604	1976	1:12,500	DMA-HC
Pitcairn Is	83225	1972	1:24,079	DMA-HC
Ponape	81435	1975	1:36,115	DMA-HC
Puntarenas	21546	1976	1:12,500	DMA-HC
Rabaul	82192	1966	1:25,000	USN-HO

TABLE 4 (continued)

LOCATION	CHART #	YEAR	SCALE	AUTHORITY
Suva	83605	1975	1:12,150	Defense Mapping Agency, Hydrographic Center
Talara	22121	1976	1:10,000	DMA-HC
Valparaiso	22259	1976	1:8,000	DMA-HC
Wellington	76071	1975	1:12,000	DMA-HC

TABLE 5

CHART EVALUATIONS AND SATELLITE COORDINATES

TABLE NUMBER	LOCATION	CHART EVALUATION OF DOCKING SITE	SATELLITE COORDINATES	DIFFERENCE
1A-1	Honolulu, Pier 18	21° 19' 00"	21° 18' 48.2" N	+ 11.8
		157° 52' 10.6"	157° 52' 01.53" W	+ 9.1
1A-2	Honolulu, Pier 18	21° 19' 00"	21° 18' 48.41" N	+ 11.6
		157° 52' 10.6"	157° 52' 01.30" W	+ 9.3
1A-3	Honolulu, Pier 18	21° 19' 00"	21° 18' 49.92" N	+ 11.1
		157° 52' 10.5"	157° 52' 00.90" W	+ 9.6
1A-4	Honolulu, Pier 10	21° 18' 38.5"	21° 18' 27.81" N	+ 10.7
		157° 52' 08.8"	157° 51' 58.99" W	+ 9.8
1A-5	Honolulu, Pier 18	21° 19' 00"	21° 18' 48.34" N	+ 11.7
		157° 52' 10.6"	157° 52' 01.48" W	+ 9.1
1A-6	Honolulu, Pier 18	21° 19' 00"	21° 18' 48.70" N	+ 11.3
		157° 52' 10.6"	157° 52' 01.70" W	+ 8.9
1A-7	Honolulu, Pier 18	21° 19' 00"	21° 18' 48.48" N	+ 11.5
		157° 52' 10.6"	157° 52' 01.14" W	+ 9.5
1A-8	Honolulu, Pier 18	21° 19' 00"	21° 18' 48.19" N	+ 11.8
		157° 52' 10.6"	157° 52' 01.47" W	+ 9.1
1A-9	Honolulu, Pier 40	21° 19' 14.3"	21° 19' 04.31" N	+ 10.0
		157° 53' 03.3"	157° 52' 54.09" W	+ 9.2
2A-1	Pago Pago, Oil Dock	14° 16' 45.0"	14° 16' 34.91" S	+ 10.1
		170° 41' 09.5"	170° 40' 55.32" W	+ 14.2

TABLE 5 (continued)

TABLE NUMBER	LOCATION	CHART EVALUATION OF DOCKING SITE	SATELLITE COORDINATES	DIFFERENCE
3A-1	Suva, King's Wharf	18° 08' 00.5"	18° 07' 47.36" S	+ 13.1
		178° 25' 42.5"	178° 25' 34.10" E	+ 8.4
3A-2	Suva, Dolphins	18° 07' 53.5"	18° 07' 49.00" S	+ 4.5
		178° 25' 45.0"	178° 25' 37.55" E	+ 7.5
3A-3	Suva, Dry Dock	18° 07' 55.8"	18° 07' 49.60" S	+ 6.2
		178° 25' 47.0"	178° 25' 37.40" E	+ 9.6
3A-4	Suva, NW of Kings Wharf	18° 08' 00"	18° 07' 56.27" S	+ 4.2
		178° 25' 39.5"	178° 25' 26.68" E	+ 12.8
3A-5	Suva, Dolphins	18° 07' 53.5"	18° 07' 46.79" S	+ 7.6
		178° 25' 45.0"	178° 25' 32.27" E	+ 12.7
3A-6	Suva, Dolphins	18° 07' 53.5"	18° 07' 46.74" S	+ 6.8
		178° 25' 45.0"	178° 25' 32.20" E	+ 12.8
3A-7	Suva, 500' King's Wharf	18° 08' 05.0"	18° 07' 59.91" S	+ 5.1
		178° 25' 38.5"	178° 25' 25.28" E	+ 13.2
3A-8	Suva, Gov't Slipway	18° 07' 52.5"	18° 07' 46.65" S	+ 5.6
		178° 25' 46.4"	178° 25' 32.45" E	+ 13.9
4A-1	Rabaul, Main Dock	4° 12' 10.0"	4° 12' 01.43" S	+ 8.6
		152° 10' 08.0"	152° 10' 17.98" E	- 10.0
5A-1	Guam, Dillingham Pier	13° 27' 35.3"	13° 27' 42.20" N	- 6.7
		144° 39' 43.0"	144° 39' 53.22" E	- 10.2
5A-2	Guam, Dillingham Pier	13° 27' 35.5"	13° 27' 42.63" N	- 7.1
		144° 39' 43.0"	144° 39' 52.61" E	- 9.6

TABLE 5 (continued)

TABLE NUMBER	LOCATION	CHART EVALUATION OF DOCKING SITE	SATELLITE COORDINATES	DIFFERENCE
6A-1	Majuro, "T" Wharf	7° 06' 24.0"	7° 06' 18.99" N	+ 5.0
		171° 22' 18.0"	171° 22' 16.59" E	+ 1.4
7A-1	Ponape, Main Dock	6° 59' 12.0"	6° 58' 44.74" N	+ 27.3
		158° 12' 59.0"	158° 12' 01.97" E	+ 57.0
8A-1	Palau, Main Dock	7° 19' 39.0"	7° 19' 49.34" N	+ 10.3
		134° 27' 50.0"	134° 27' 23.49" E	+ 26.5
9A-1	Wellington, Glascow Dock	41° 17' 00.0"	41° 16' 54.19" S	+ 5.8
		174° 46' 58.0"	174° 46' 57.54" E	+ 0.5
10A-1	Callao, 9-D	12° 03' 29.0"	12° 03' 19.62" S	+ 9.4
		77° 09' 44.5"	77° 08' 58.97" W	+ 45.5
10A-2	Callao, 4-A	12° 03' 24.0"	12° 02' 50.43" S	+ 33.6
		77° 09' 38.0"	77° 08' 44.97" W	+ 53.0
11A-1	Ancon, Anchored	11° 44' 30.0"	11° 44' 31.51" S	- 1.5
		77° 10' 30.0"	77° 10' 24.73" W	+ 5.3
12A-1	Talara, Anchored	4° 34' 00.0"	4° 33' 44.51" S	- 15.5
		81° 18' 00.0"	81° 17' 20.44" W	- 39.6
13A-1	Guayaquil, #2	2° 16' 47.0"	2° 16' 59.84" S	- 12.8
		79° 54' 13.5"	79° 54' 20.35" W	- 6.9
13A-2	Guayaquil, #2	2° 16' 47.0"	2° 16' 59.76" S	- 12.8
		79° 54' 13.5"	79° 54' 20.46" W	- 7.0
13A-3	Guayaquil, #2	2° 16' 47.0"	2° 16' 58.11" S	- 11.1
		79° 54' 13.5"	79° 54' 23.65" W	- 10.2
13A-4	Guayaquil, #6	2° 16' 33.5"	2° 16' 43.86" S	- 10.4
		79° 54' 33.5"	79° 54' 44.60" W	- 11.1

TABLE 5 (continued)

TABLE NUMBER	LOCATION	CHART EVALUATION OF DOCKING SITE	SATELLITE COORDINATES	DIFFERENCE
14A-1	Puntarenas, Anchored	9° 57' 54.0"	9° 57' 51.33"	+ 2.7
		84° 49' 28.5"	84° 49' 26.39"	+ 2.1
15A-1	Acapulco, Main Dock	16° 50' 47.0"	16° 50' 53.76" N	- 6.8
		99° 54' 10.0"	99° 54' 15.86" N	- 5.9
15A-2	Acapulco, Main Dock	16° 50' 47.0"	16° 50' 54.65" N	- 7.7
		99° 54' 12.0"	99° 54' 19.16" W	- 7.2
15A-3	Acapulco, W of Main Dock	16° 50' 47.0"	16° 50' 53.84" N	- 6.8
		99° 54' 10.0"	99° 54' 17.23" W	- 7.2
16A-1	Midway, Main Pier	28° 12' 36.0"	28° 12' 50.37" N	- 14.4
		177° 21' 46.0"	177° 21' 48.40" W	- 2.4
17A-1	Papeete, Main Wharf	17° 32' 19.5"	17° 32' 01.50" S	+ 18.0
		149° 34' 08.5"	49° 34' 21.80" W	- 13.3
17A-2	Papeete, Fuel Dock	17° 32' 17.8"	17° 32' 14.22" S	+ 3.6
		149° 34' 08.3"	149° 34' 10.68" W	- 2.4
18A-1	Antofagasta, Sitio #2	23° 39' 11.0"	23° 39' 13.70" S	- 2.7
		70° 25' 19.0"	70° 24' 20.40" W	+ 58.6
19A-1	Easter Island, Anchored	27° 08' 00.0"	27° 08' 30.42" S	- 30.4
		109° 26' 30.0"	109° 26' 18.43" W	+ 11.6
20A-1	Pitcairn Island, Anchored	25° 03' 41.0"	25° 03' 52.02" S	- 11.0
		130° 05' 35.0"	130° 05' 36.17" W	- 1.2
21A-1	Valparaiso, Berth #4	33° 01' 55.0"	33° 02' 00.48" S	- 5.5
		71° 37' 54.0"	71° 37' 36.72" W	+ 17.3
22A-1	Balboa, Berth #2	8° 57' 12.0"	8° 57' 06.86" N	+ 5.1
		79° 34' 32.5"	79° 34' 22.90" W	+ 9.6

satellite defined positions. It will be noted that seven series of observations were taken over a 4 year period for Pier 18 in Honolulu Harbor and that the latitude error indicated is + 11.54 ± .21 seconds and for longitude + 9.23 ± .20 seconds.

As Berg (1976) has reported what he regards as a "best" solution position for Pier 18 in Honolulu Harbor, it is of interest to compare this writer's coordinates for Pier 18 with those obtained by Berg using the double pass method and the additional rejection criteria he adopted in arriving at his "best" solution. In regard to this solution, Berg (1976), after using normal rejection criteria as to satellite elevation angles, iterations required, symmetry in Doppler counts and number of Doppler counts greater than 5, used the computed geoidal height from trial solutions as an additional criterion for rejection. Starting with what would normally be regarded as acceptable data for a double pass solution, Berg determined the geoidal height for each pair of consecutive passes of the same satellite. These pairs of values whose standard deviation in geoidal height exceeded 2 σ from the mean were then rejected for determining position location. In his solution for the position of Pier 18, Honolulu his first trial solution using the double pass method gave the following coordinates: Lat 21° 18.4042'; Long 157° 52.0146', antenna height 34.35 m. The second solution after rejecting one series of data whose antenna (geoidal) height exceeded the 2 σ limit, gave the following results: Lat 21° 18.8054'; Long 157° 52.0166',

antenna height 32.26 m. The third solution after rejecting another series of observations whose antenna height exceeded the 2 σ limit for this set of data gave the following results: Lat 21° 18.8062'; Long 157° 52.0151'; antenna height 31.09 m. This sample of data was the one used to get a final 'best' position by repeating the process outlined above but with respect to the standard deviation for position coordinates not exceeding the 2 σ rejection criterion. In this process four more series of double passes were eliminated.

The final position determined by Berg (1976) for Pier 18, his "best" solution, gives the following coordinates: Lat 21° 18.8140 (18' 48.48"); Long 157° 52.0230' (52' 01.38"). The position derived by the writer is Lat 21° 18' 48.28" (average) or 21° 18' 48.28" (weighted mean) and Long 157° 52' 01.56" (average) or 157° 52' 01.52" (weighted mean). As seen the difference in latitude is between 0.08" and 0.20" (2.5 to 7.5 meters), and the difference in longitude is between 0.15" and 0.18" (4.3 to 4.5 meters). Although this degree of agreement is undoubtedly fortuitous, it does support the initial assumption made in this study, namely that the method of analysis adopted is adequate for evaluating the reliability of published chart positions.

From an inspection of Table 6 and Figures 3 and 4 which are a graphical representation of the difference in chart position and satellite defined positions, it is seen that the apparent degree in error in chart position varies significantly and that there are errors in excess of 50 seconds in latitude and longitude for several

TABLE 6

DIFFERENCE BETWEEN CHART MEASURED AND SATELLITE DERIVED COORDINATES

+ values of latitude are north of satellite position, + values of longitude are west of satellite position.

LOCATION	# OBS USED	TABLE NO.	DIFFERENCE LATITUDE	DIFFERENCE LONGITUDE	CHART SCALE	YEAR
Honolulu, Pier 18	66	1A-1	+ 11.8" (364m)	+ 9.1" (262m)	1:5,000	1974
Honolulu, Pier 18	44	1A-2	+ 11.6" (358m)	+ 9.3" (268m)		
Honolulu, Pier 18	29	1A-3	+ 11.1" (343m)	+ 9.6" (276m)		
Honolulu, Pier 18	30	1A-5	+ 11.7" (361m)	+ 9.1" (262m)		
Honolulu, Pier 18	31	1A-6	+ 11.3" (349m)	+ 8.9" (256m)		
Honolulu, Pier 18	102	1A-7	+ 11.5" (355m)	+ 9.5" (273m)		
Honolulu, Pier 18	252	1A-8	+ 11.8" (364m)	+ 9.1" (262m)		
Honolulu, Pier 10	5	1A-4	+ 10.7" (331m)	+ 9.8" (282m)		
Honolulu, Pier 40	11	1A-9	+ 10.0" (309m)	+ 9.2" (265m)		
Pago Pago, Oil Dock	21	2A-1	+ 10.1" (312m)	+ 14.2" (425m)	1:15,000	1973
Suva, King's Wharf	7	3A-1	+ 13.1" (405m)	+ 8.4" (247m)	1:12,150	1975
Suva, Dolphins	8	3A-2	+ 4.5" (139m)	+ 7.5" (220m)		
Suva, Dry Dock	8	3A-3	+ 6.2" (192m)	+ 9.6" (282m)		
Suva, NW King's Wharf	10	3A-4	+ 4.2" (130m)	+ 12.8" (376m)		
Suva, Dolphins	56	3A-5	+ 7.6" (235m)	+ 12.7" (373m)		
Suva, Dolphins	81	3A-6	+ 6.8" (210m)	+ 12.8" (376m)		

TABLE 6 (continued)

LOCATION	# OBS USED	TABLE NO.	DIFFERENCE LATITUDE	DIFFERENCE LONGITUDE	CHART SCALE	YEAR
Suva, 500' King's Wharf	15	3A-7	+ 5.1" (158m)	+ 13.2" (387m)		
Suva, Gov't Slipway	28	3A-8	+ 5.6" (173m)	+ 13.9" (408m)		
Rabaul, Main Dock	5	4A-1	+ 8.6" (266m)	- 10.0" (308m)	1:25,000	1966
Guam, Dillingham Pier	13	5A-1	- 6.7" (207m)	- 10.2" (306m)	1:10,000	1975
Guam, Dillingham Pier	6	5A-2	- 7.1" (219m)	- 9.6" (288m)		
Majuro, "T" Wharf	4	6A-1	+ 5.0" (154m)	+ 1.4" (43m)	1:35,000	1974
Ponape, Main Dock	24	7A-1	+ 27.3" (843m)	+ 57.0" (1748m)	1:25,000	1973
Palau, Main Dock	37	8A-1	- 10.3" (318m)	+ 26.5" (812m)	1:10,000	1972
Wellington, Glascow Wharf	43	9A-1	+ 5.8" (179m)	+ 0.5" (12m)	1:12,000	1975
Callao, 9-D	70	10A-1	+ 9.4" (290m)	+ 45.5" (1375m)	1:10,000	1972
Callao, 4-A	54	10A-2	+ 33.6" (1038m)	+ 53.0" (1601m)		
Ancon, Anchored	8	11A-1	- 1.5" (46m)	+ 5.3" (160m)	1:36,481	1923
Talara, Anchored	11	12A-1	- 15.5" (479m)	- 39.6" (1219m)	1:10,000	1976
Guayaquil, #2	73	13A-1	- 12.8" (395m)	- 6.9" (211m)	1:10,000	1973
Guayaquil, #2	45	13A-2	- 12.8" (395m)	- 7.0" (215m)		
Guayaquil, Tiuna	12	13A-3	- 11.1" (343m)	- 10.2" (313m)		
Guayaquil, #6	3	13A-4	- 10.4" (321m)	- 11.1" (340m)		

TABLE 6 (continued)

LOCATION	# USED	TABLE NO.	DIFFERENCE LATITUDE	DIFFERENCE LONGITUDE	CHART SCALE	YEAR
Puntarenas, Anchored	11	14A-1	+ 2.7" (83m)	+ 2.1" (64m)	1:12,500	1976
Acapulco, Main Dock	12	15A-1	- 6.8" (210m)	- 5.9" (174m)	1:25,000	1974
Acapulco, Main Dock	5	15A-3	- 6.8" (210m)	- 7.2" (213m)		
Acapulco, W of Main Dock	26	15A-2	- 7.7" (238m)	- 7.2" (213m)		
Midway, Main Pier	13	16A-1	- 14.4" (445m)	- 2.4" (65m)	1:32,500	1973
Papeete, Main Wharf	7	17A-1	+ 18.0" (556m)	- 13.3" (392m)	1:5,000	1975
Papeete, Fuel Dock	11	17A-2	+ 3.6" (111m)	- 2.4" (71m)		
Antofagasta, Sitio #2	36	18A-1	- 2.7" (83m)	+ 58.6" (1658m)	1:12,500	1976
Easter Island, Anchored	12	19A-1	- 30.4" (939m)	+ 11.6" (319m)	1:23,173	1975
Pitcairn Island, Anchored	6	20A-1	- 11.0" (340m)	- 1.2" (34m)	1:24,079	1972
Valparaiso, Berth #4	25	21A-1	- 5.5" (170m)	+ 17.3" (448m)	1:8,000	1976
Balboa, Pier #2	55	22A-1	+ 5.1" (158m)	+ 9.6" (293m)	1:12,500	1976

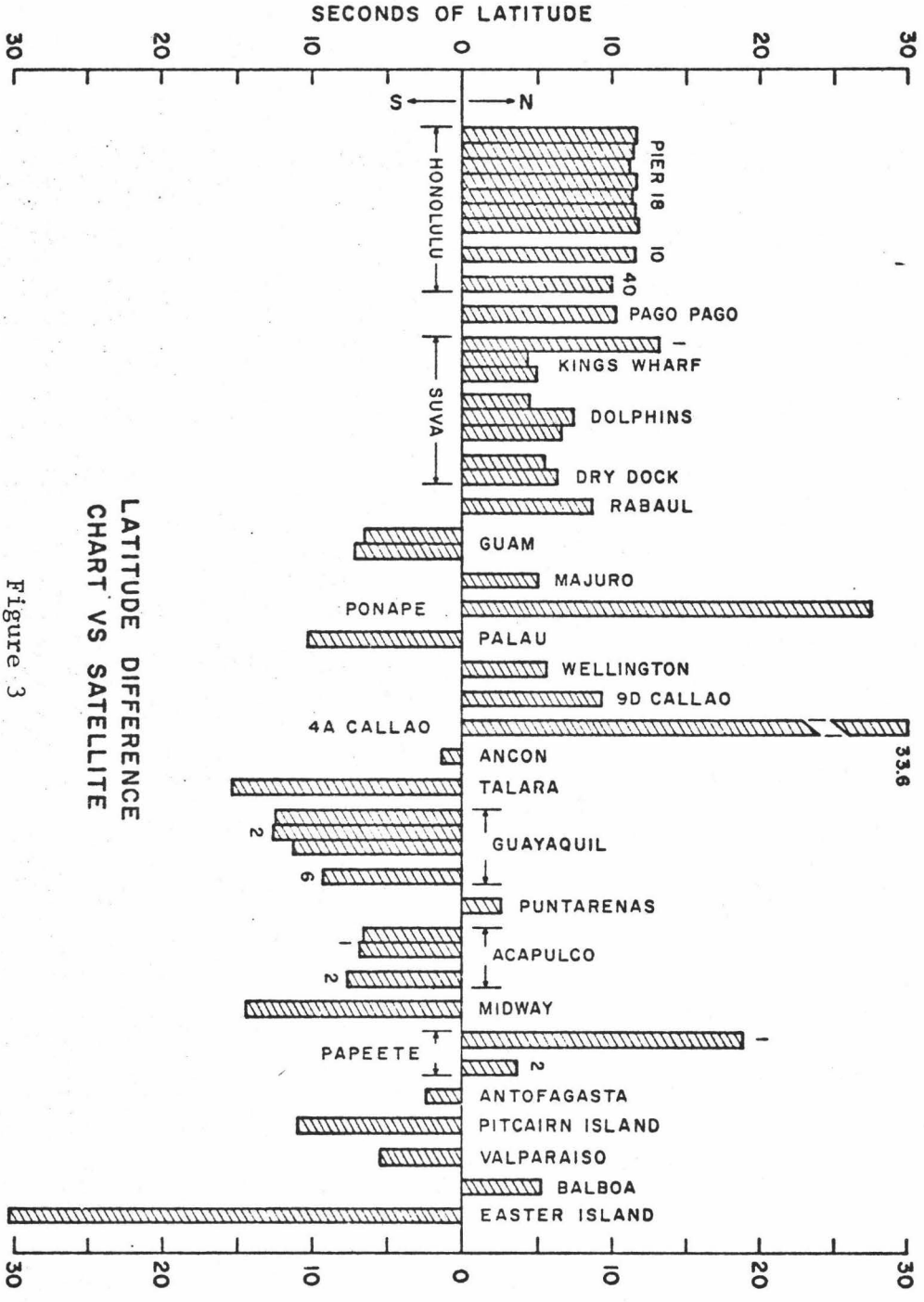
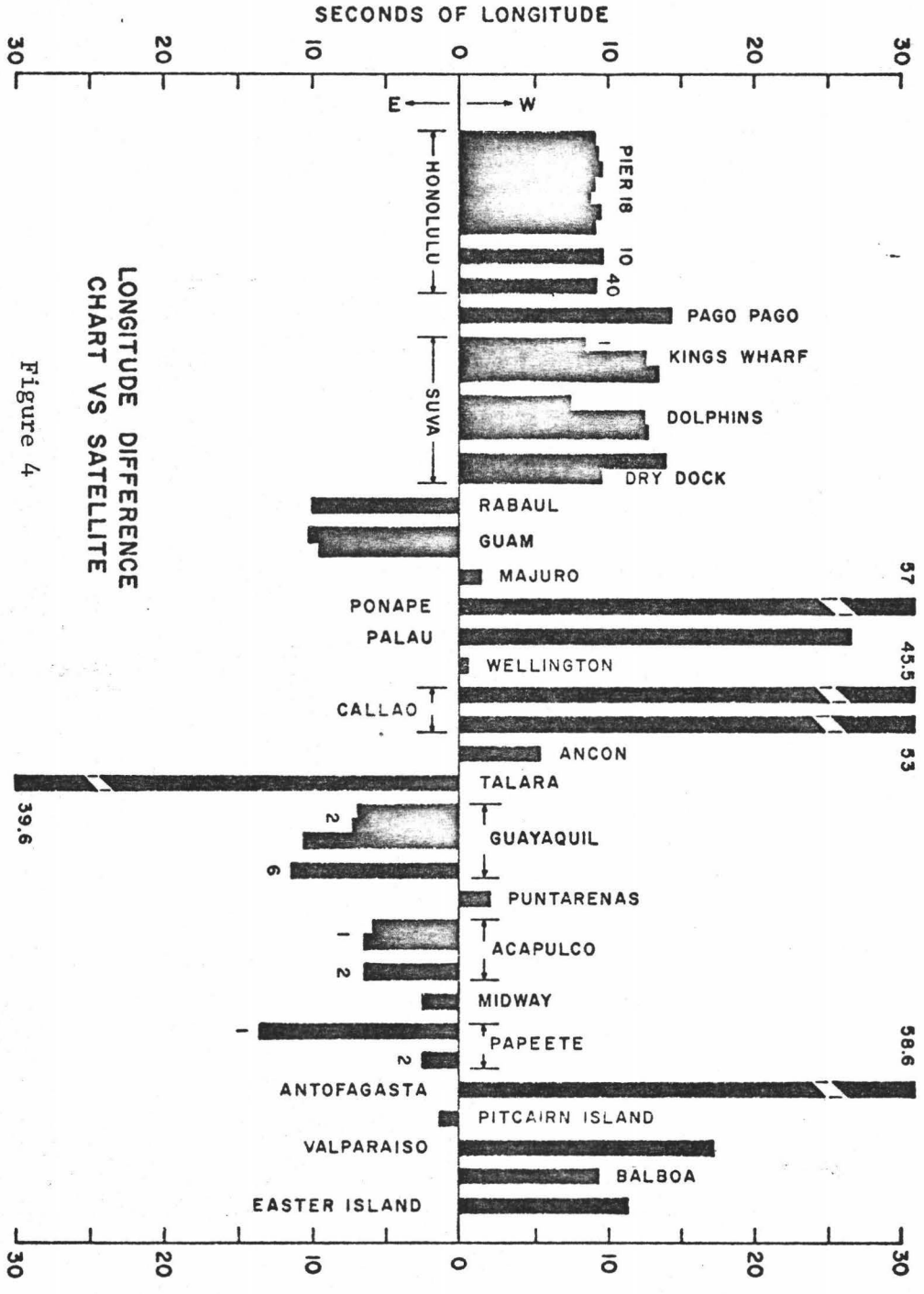

SECONDS OF LATITUDE
30
20
10
0
10
20
30
S
N
HONOLULU
SUVA
PIER 18
10
40
PAGO PAGO
KINGS WHARF
DOLPHINS
DRY DOCK
RABAUL
GUAM
MAJURO
PONAPE
PALAU
WELLINGTON
9D CALLAO
4A CALLAO
33.6
ANCON
TALARA
2
GUAYAQUIL
6
PUNTARENAS
ACAPULCO
2
MIDWAY
PAPEETE
2
ANTOFAGASTA
PITCAIRN ISLAND
VALPARAISO
BALBOA
EASTER ISLAND
LATITUDE DIFFERENCE
CHART VS SATELLITE

Figure 3



LONGITUDE DIFFERENCE
CHART VS SATELLITE

Figure 4

places. As these errors are not related to either the date of issue of the charts or chart scales, they are either real, or represent abnormalities in the satellite data. This last is postulated on the basis of poor agreement indicated for nearby locations in a harbor using the same chart. See for example, Suva and Callao. Whereas in Suva there is probably an error related to the use of a wrong initialized antenna height for one set of data there is a different kind of problem at Callao. This was noted by Berg (1976) in using the double pass method to establish a position for Callao. Berg could not resolve this discrepancy which he attributes to "causes unknown". However, it could be related to local electrical field interference as noted by Woollard and Thompson (1974) at Bogota in connection with television broadcasts. As Berg (1976) does not comment on problems in using the double pass method at sites other than Callao, his position determinations for Ponape, Palau, Talara, Antofagasta and Easter Island, the sites indicating large errors in position as at Callao as well as Papeete (site 1), were examined as to degree of agreement with the writer's determinations of position. These determinations by Berg however, are not all on the same standard of quality control as that for his values for Honolulu since the rejection limit was 3 σ for most sites rather than 2 σ for the standard deviation values. For purposes of comparison with the writer's determinations of position, Berg's solution with Doppler counts greater than 5 were used where available and where the count was less than 5 the site is marked with an asterisk.

		BERG (1976)		THIS STUDY	DIFFERENCE RELATIVE TO BERG
Palau	Lat	7°19.8248'	(19'49.50")	7°19'49.34"	- 0.16"
	Long	134°27.3982'	(27'23.88")	134°27'23.49"	- 0.39"
Ponape*	Lat	6°38.7471'	(58'44.82")	6°58'44.74"	- 0.08"
	Long	158°12.030	(12'01.80")	158°12'01.97"	+ 0.17"
Talara*	Lat	4°33.7412'	(33'44.46")	4°33'44.51"	+ 0.06"
	Long	81°17.3455'	(17'20.73")	81°17'20.44"	- 0.29"
Antofagasta	Lat	23°39.2241'	(39'13.44")	23°39'13.70"	+ 0.26"
	Long	70°24.3384'	(24'20.30")	70°24'20.40"	+ 0.10"
Papeete*	Lat	17°32.0200'	(32'01.20")	17°32'01.50"	+ 0.30"
	Long	149°34.3618'	(34'21.68")	149°34'21.80"	+ 0.18"

Note: Easter Island was not determined by Berg.

As seen from the above comparisons the difference in values is random in sign, and nowhere exceeds 0.39" and on average is 0.21" which is insignificant in comparison with the observed difference between the writer's determination of satellite position and the chart positions for the sites in question. The indicated difference in chart positions can therefore be regarded as real, at least in terms of the reliability of the data to approximately 0.20" in latitude and longitude. In the case of Suva the discrepancy noted for King's Whart site 1 relative to the other two determinations at the same location is undoubtedly related to the use of the wrong initialized antenna height for this series of observations. A value of 75 meters was used for the first observations rather than the more correct height of 54 meters which was used for the later

determinations. This explanation, however, does not explain the apparent discrepancy noted between sites 1 and 2 at Papeete. The most logical explanation for these discrepancies brought out by Berg (1976) is that the ephemeris for certain satellites at times are in error. That the ship's position was located in error on the chart, or else there are discrepancies on the charts for the locations shown for some of the port facilities, is not regarded as being as an important source of error.

As none of the discrepancies between chart positions and satellites positions exceed 1 minute of arc in either latitude or longitude, it would appear that all the charts used have at least this degree of reliability, and most a reliability of better than 20 seconds in both latitude and longitude.

CONCLUSIONS

In this study of the reliability of charted positions for port locations in the Pacific area using the Navy Navigation Satellite System as a standard for evaluating position location, several points were brought into focus concerning the reliability of satellite defined positions that had not been anticipated in advance of undertaking this study. Although outside the primary objective of the study, the general importance of these auxiliary findings appears to make them worthy of inclusion as one of the principal results obtained from this study since for the most part

they are not alluded to in previously published papers on the reliability of satellite defined positions so far as the writer is aware. These can be summarized briefly as follows. (1) The standard deviation in satellite defined values of position of latitude and longitude using all satellite passes are not improved by having multiple observation samples in excess of 55 observations. (2) The distribution of values of standard deviation for a series of multiple passes converges as the number of passes increases towards an intermediate value between a minimum and maximum value which is not the same for both latitude and longitude. (3) The distribution of values of standard deviation for multiple observations does not define a Gaussian (normal) distribution, but portrays a bimodal distribution that is most pronounced in the latitude observations. (4) In the case of both latitude and longitude position there are certain series of values whose standard deviation depart significantly from the other values taken as a whole. In most cases both the latitude and longitude standard deviations for the sites involved appear to be anomalous although this is not always the case. Although most of these sites having an anomalous high standard deviation value occur along the Pacific coasts of Central and South America where there is a steep gravity and geoidal gradient, an error in initialized antenna height does not appear to be the explanation for the anomalous values as other sets of values at the same sites are not anomalous. As all data were subject to the same selection and editing criteria, there is, therefore, no obvious

explanation other than certain sets of satellite data incorporated errors in ephemeris values at times.

In terms of primary objectives of this study it was found that charted positions agreed well with satellite positions for some locations in a given port but appeared to be less good at an adjacent nearby location. In each such case it was found the standard deviation for the satellite position was anomalously high where there were local discrepancies of the order of 5 seconds or more. Although in part such discrepancies could be related to the use of a wrong initialized antenna height in defining the satellite position, this point could only be demonstrated for one site, Suva. No relation was noted between the date of issue of a chart (all were post 1923 editions with most post 1974), or the scale of the charts, which varied from 1:5,000 to 1:36,460, and indicated errors in position. In general, agreement was within ± 15 seconds in latitude and longitude, but certain sites (Ponape, Palau, Talara, Antofagasta and Easter Island) appeared to have either one or both sets of coordinates in error be 30 seconds or more. Although a similar degree of error is indicated for Callao, this may only be an apparent error as the satellite data cannot be regarded as reliable.

REFERENCES

Anderle, R. J., 1971, Refined Geodetic Results Based on Doppler Satellite Observations, Tech. Rep. 2889, U. S. Naval Weapons Lab. Dahlgren, Va, 14 pp.

Berg, Eduard, 1975, The Double Pass Method for More Precise Determinations of Longitude and Geoidal Height Using the Transit System of Navigational Satellites, Hawaii Inst. Geophys. Report HIG-75-11.

Berg, Eduard, 1976, Geoid Heights and Geodetic Positions of Pacific Harbors and Deep Sea Drilling Sites, Hawaii Inst. of Geophys., Final Report, ONR N00014-75-C-0209.

Daugherty, Kenneth I., 1972, On the Application of the Transit Satellite Navigation System to Geodetic Surveying, Hawaii Inst. of Geophys. Contribution No. 494.

Daugherty, Kenneth I., 1974 (Part 1), Reliability of Satellite Determined Positions of Latitude and Longitude; Geodetic (?) Positioning of some Islands in the Pacific using the Transit Shipboard Navigation System; Hawaii Inst. Geophys. Report HIG-74-1, Honolulu.

Newton, R. R., 1967, The Navy Navigation Satellite System, pp. 735-763, in R. L. Smith-Rose (Ed.), Space Research V11, Vol. 2, North-Holland Pub. Amsterdam.

Stansell, T. A. Jr., 1970, Using the Navy Navigation Satellite System, Navigation, Vol. 17, No. 2.

Woollard, G. P. and Noel J. Thompson, 1974, Part II, Reliability of Satellite Determined Positions of Latitude and Longitude: Problems in the Use of a Magnavox 706 Marine-type Satellite Navigator for Land Station Position Control, Hawaii Inst. Geophysics Report HIG-74-1, Honolulu.

APPENDIX A

ALPHABETICAL LISTING OF HARBOR CHARTS

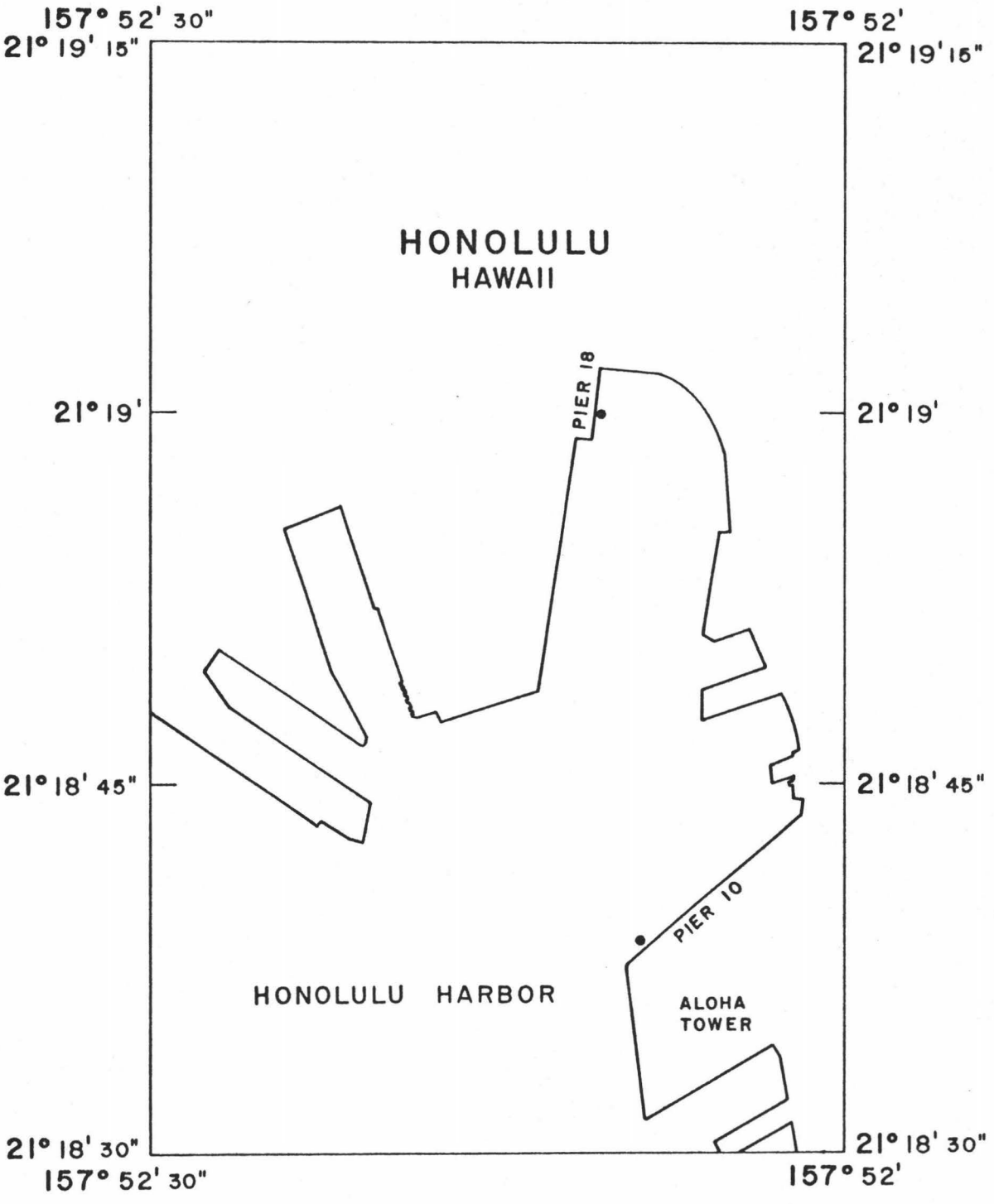

157° 52' 30"
21° 19' 15"
157° 52'
21° 19' 15"
HONOLULU
HAWAII
PIER 18
21° 19'
21° 19'
21° 18' 45"
21° 18' 45"
PIER 10
HONOLULU HARBOR
ALOHA
TOWER
21° 18' 30"
21° 18' 30"
157° 52' 30"
157° 52'

Figure 5

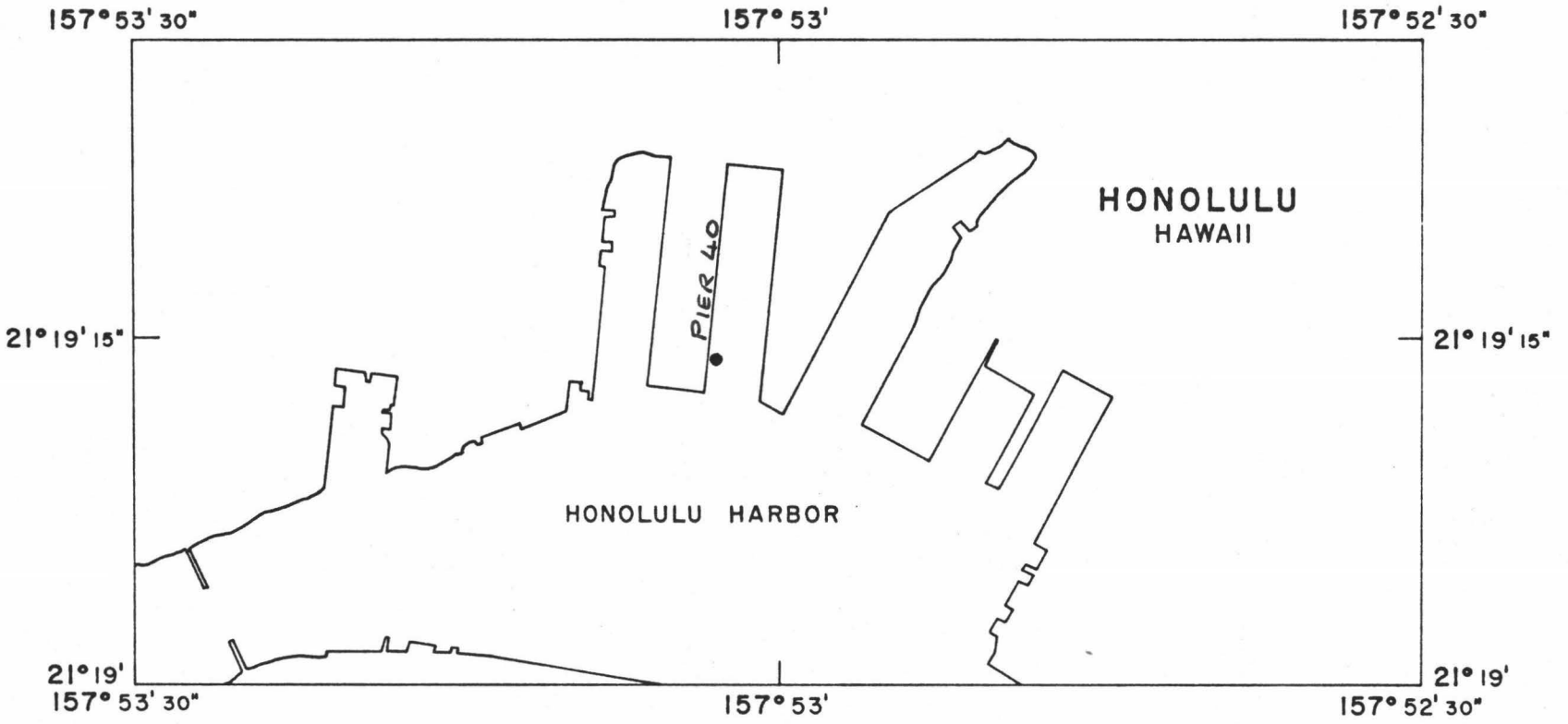

157° 53' 30"
157° 53'
157° 52' 30"
HONOLULU
HAWAII
PIER 40
21° 19' 15"
21° 19' 15"
HONOLULU HARBOR
21° 19'
21° 19'
157° 53' 30"
157° 53'
157° 52' 30"

Figure 6

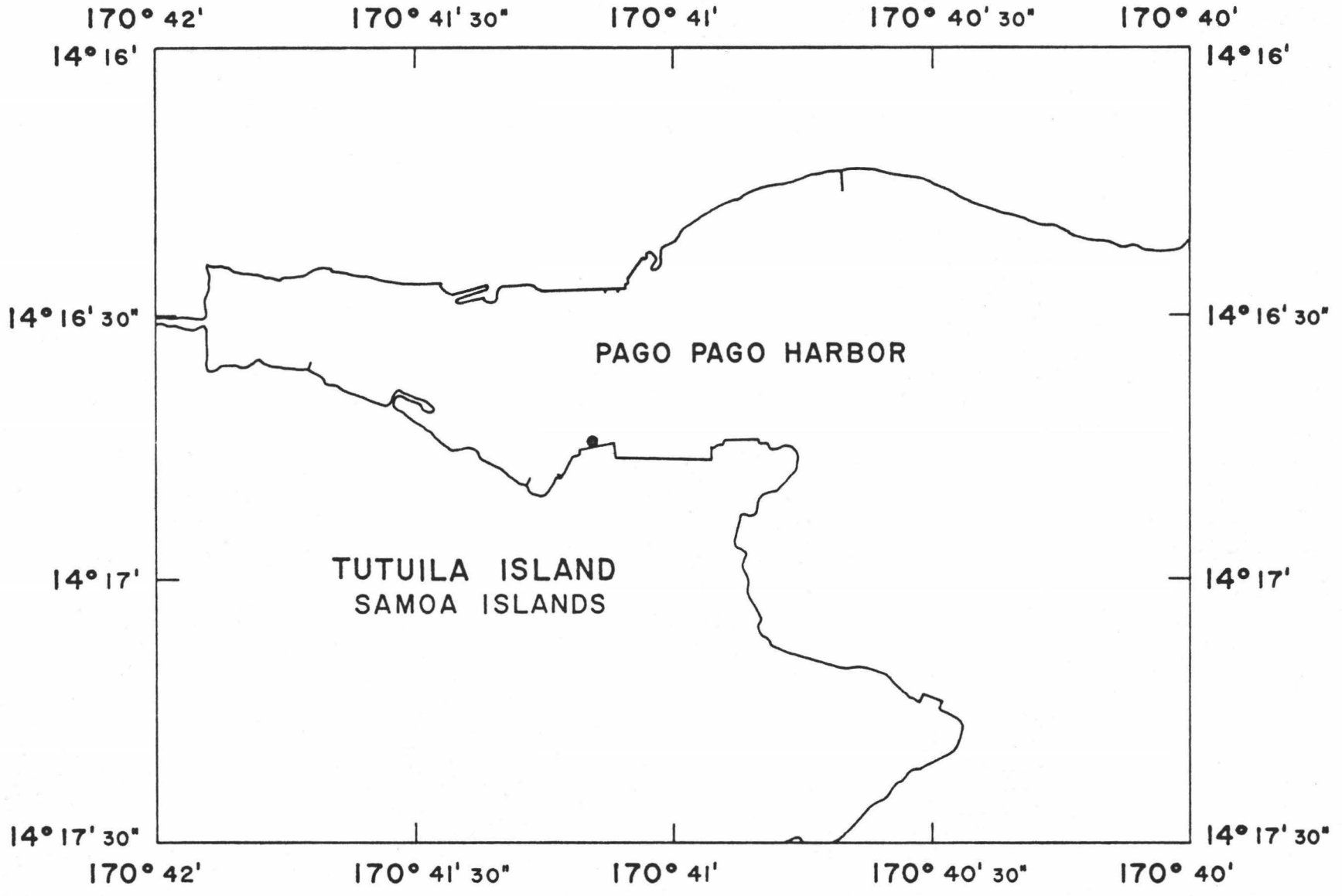

170° 42'
170° 41' 30"
170° 41'
170° 40' 30"
170° 40'
14° 16'
14° 16' 30"
14° 17'
14° 17' 30"
PAGO PAGO HARBOR
TUTUILA ISLAND
SAMOA ISLANDS

Figure 7

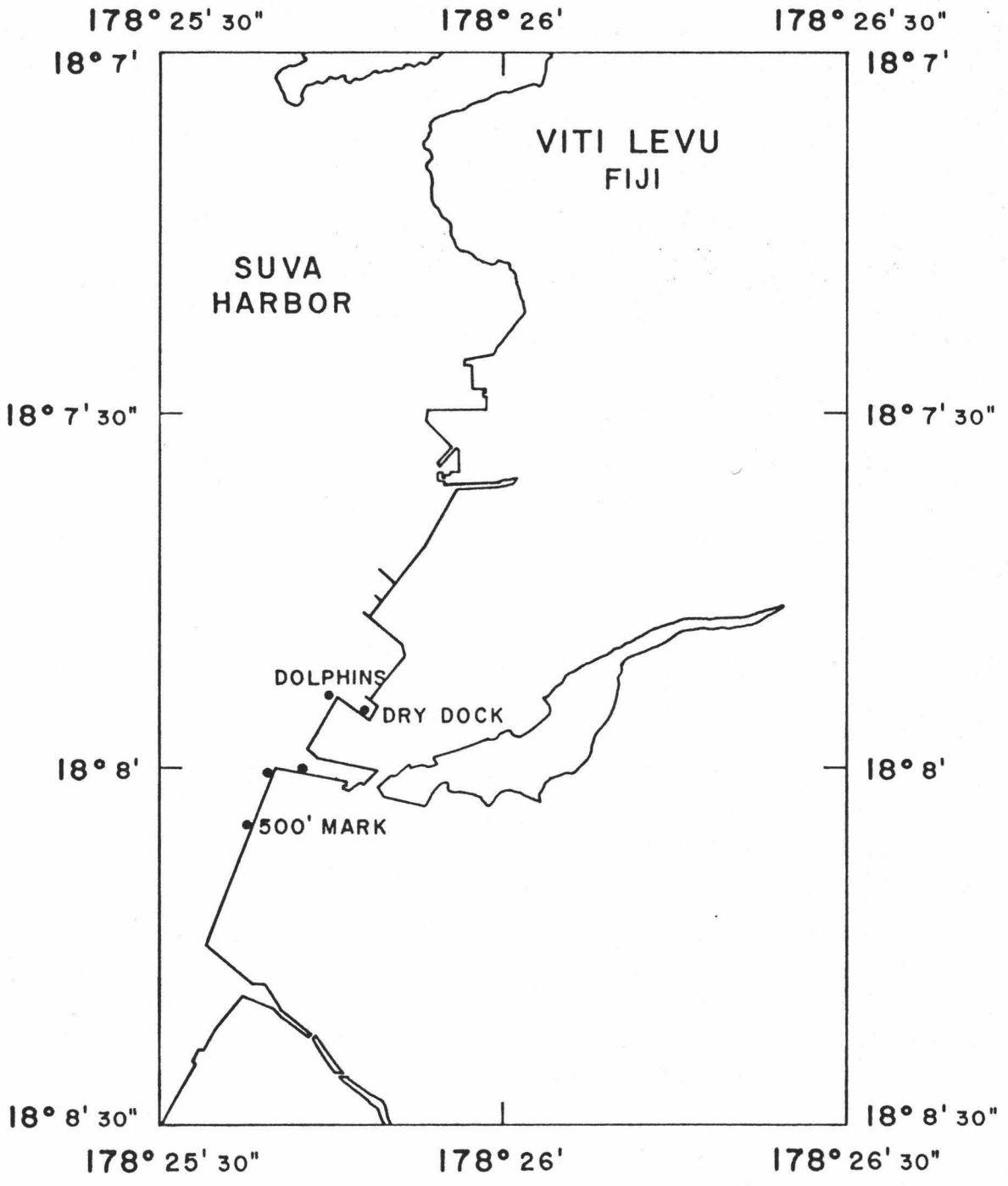

178° 25' 30"
178° 26'
178° 26' 30"
18° 7'
18° 7' 30"
18° 8'
18° 8' 30"
VITI LEVU
FIJI
SUVA
HARBOR
DOLPHINS
DRY DOCK
500' MARK

Figure 8

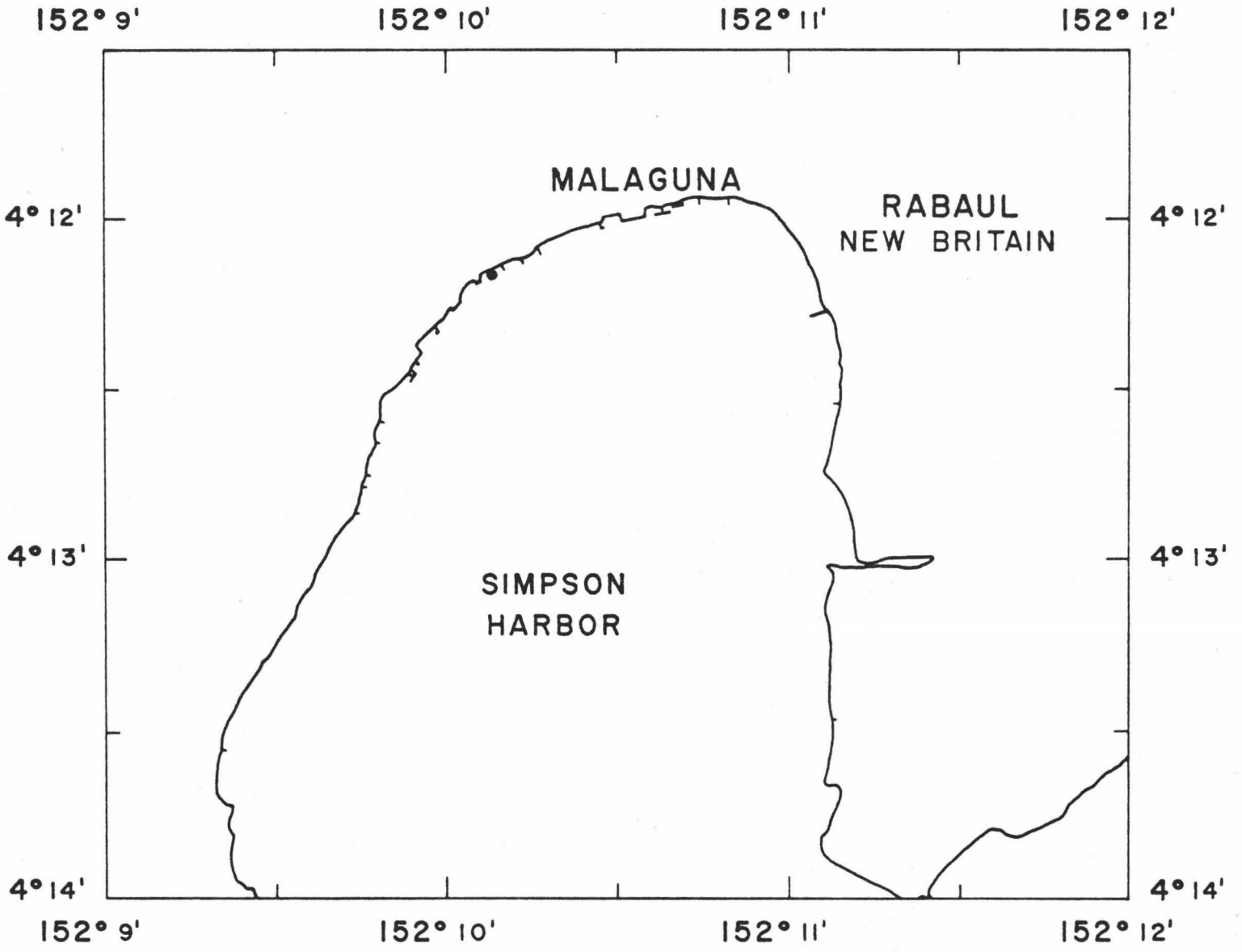

152° 9'
152° 10'
152° 11'
152° 12'
4° 12'
4° 13'
4° 14'
MALAGUNA
RABAUL
NEW BRITAIN
SIMPSON
HARBOR

Figure 9

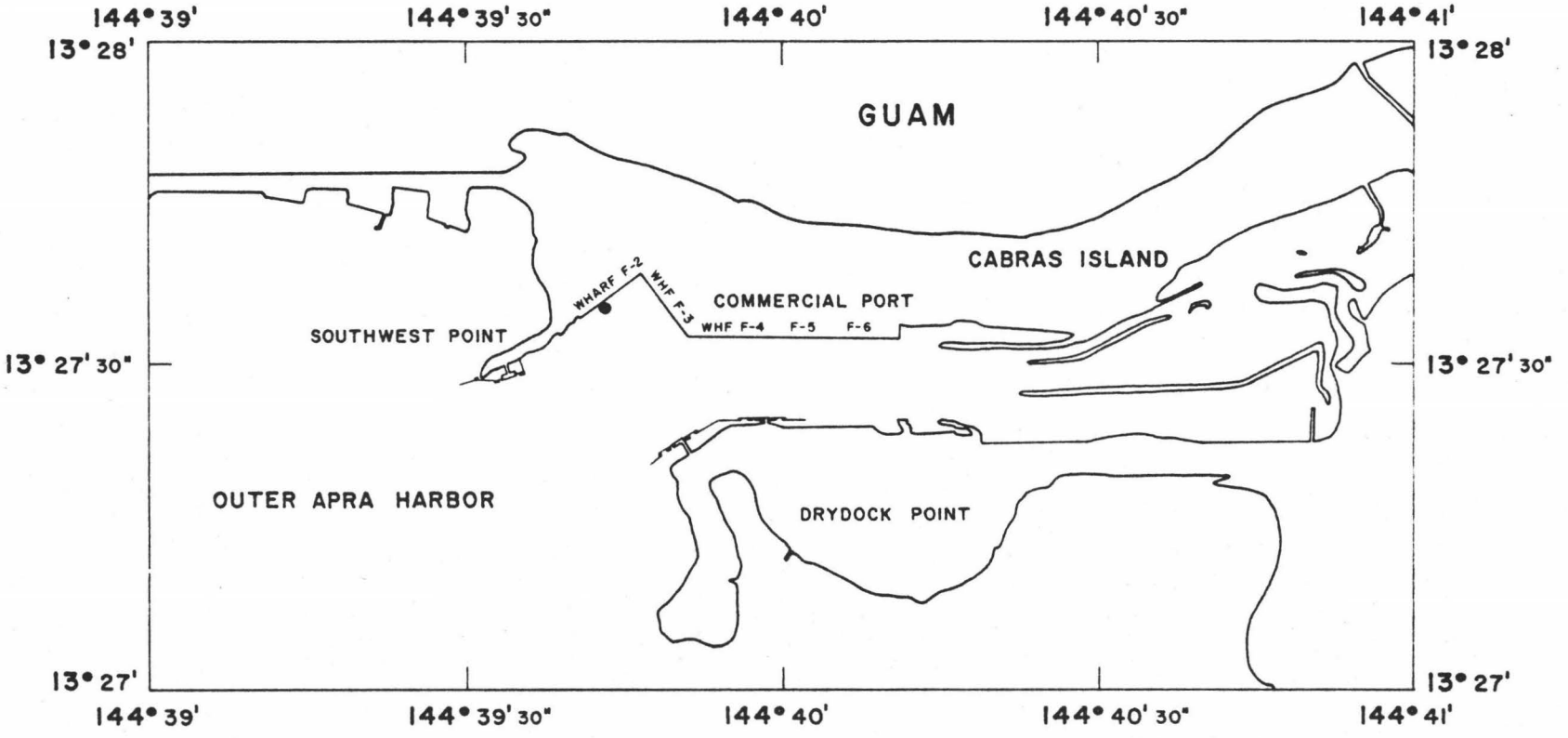

144° 39'
144° 39' 30"
144° 40'
144° 40' 30"
144° 41'
13° 28'
13° 27' 30"
13° 27'
GUAM
CABRAS ISLAND
WHARF F-2
WHF F-3
COMMERCIAL PORT
WHF F-4 F-5 F-6
SOUTHWEST POINT
OUTER APRA HARBOR
DRYDOCK POINT

Figure 10

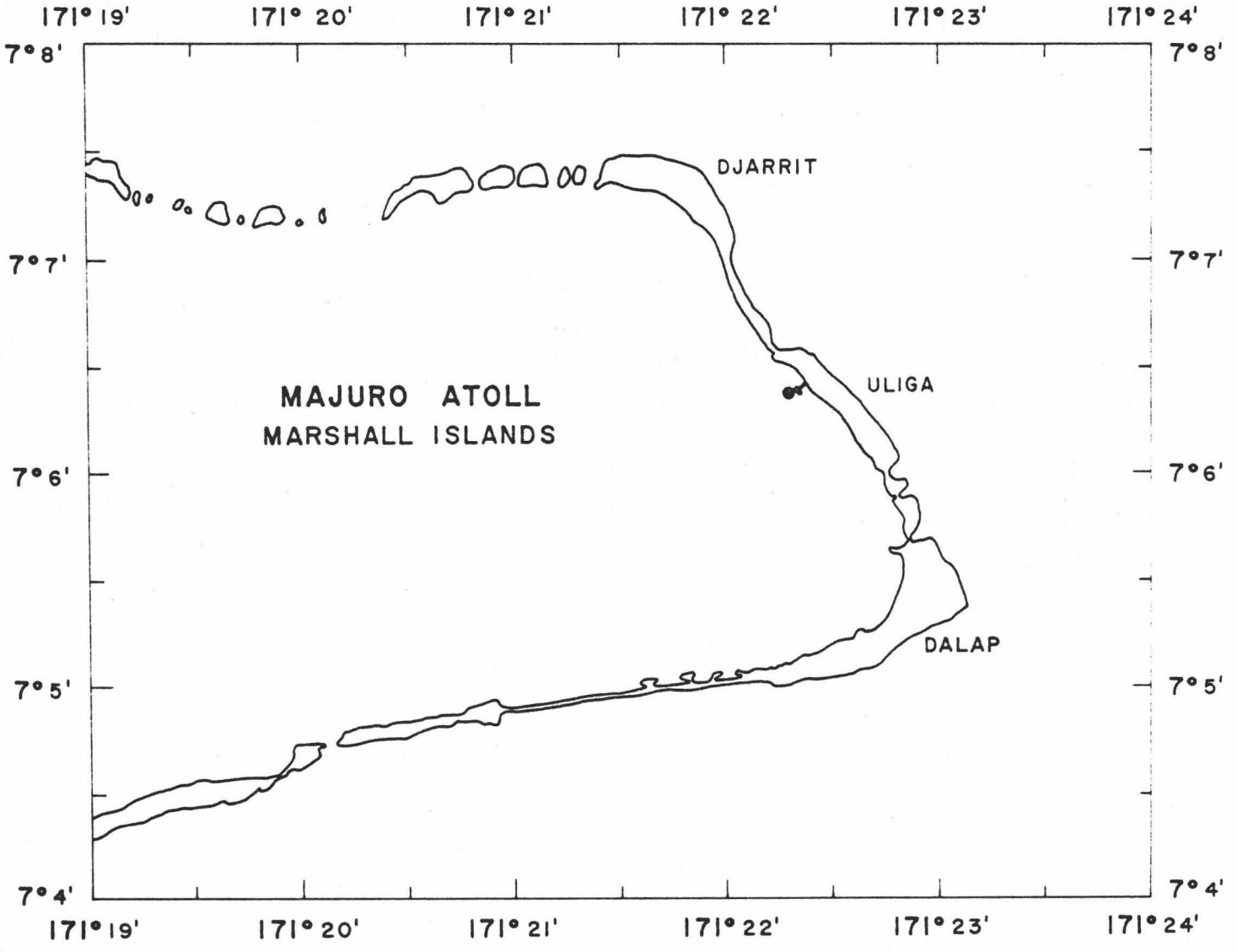

171° 19'
171° 20'
171° 21'
171° 22'
171° 23'
171° 24'
7° 8'
7° 7'
7° 6'
7° 5'
7° 4'
DJARRIT
ULIGA
DALAP
MAJURO ATOLL
MARSHALL ISLANDS

Figure 11

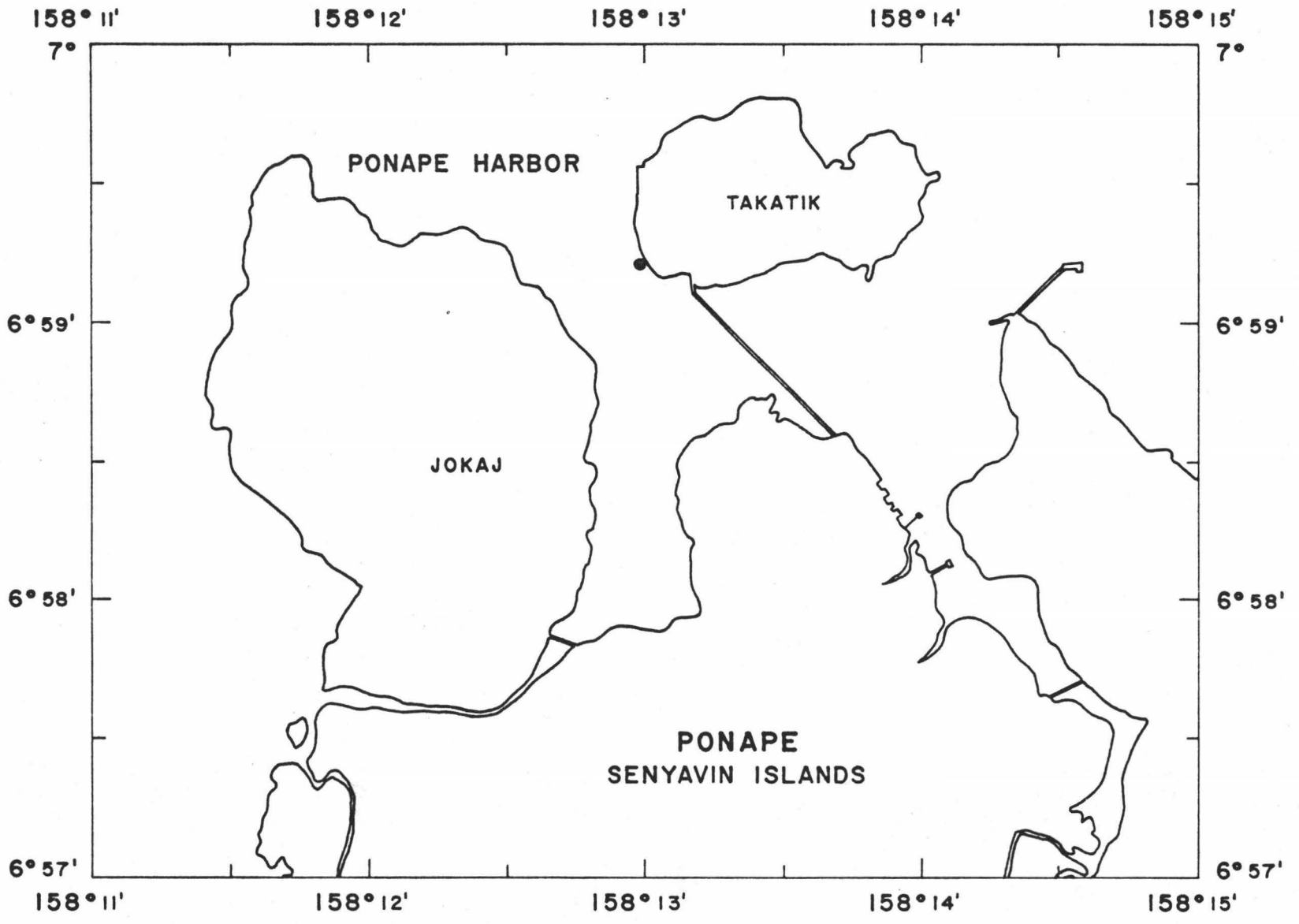

158° 11'
158° 12'
158° 13'
158° 14'
158° 15'
7°
6° 59'
6° 58'
6° 57'
PONAPE HARBOR
TAKATIK
JOKAJ
PONAPE
SENYAVIN ISLANDS

Figure 12

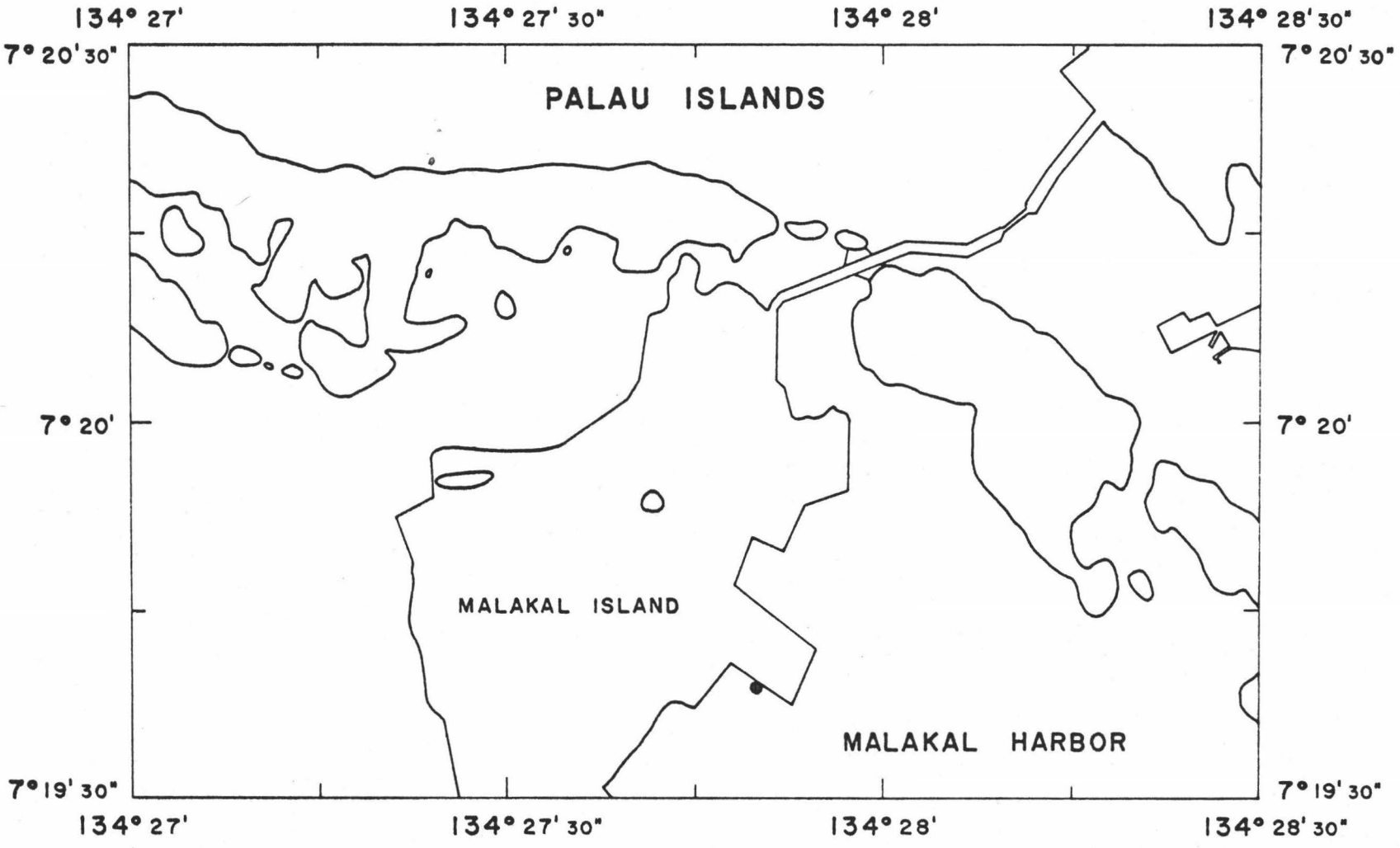

134° 27'
134° 27' 30"
134° 28'
134° 28' 30"
7° 20' 30"
7° 20'
7° 19' 30"
PALAU ISLANDS
MALAKAL ISLAND
MALAKAL HARBOR

Figure 13

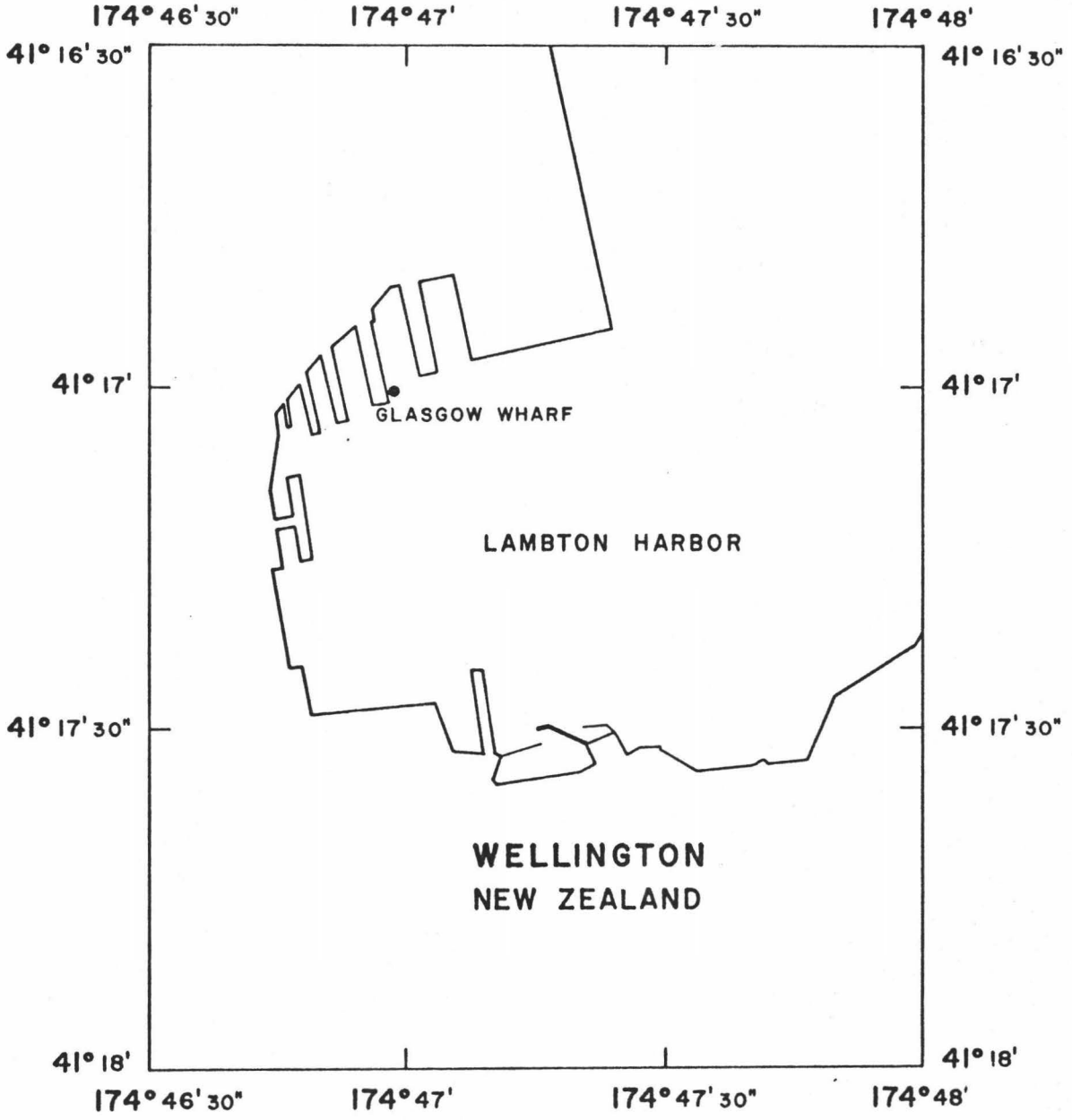

174° 46' 30"
174° 47'
174° 47' 30"
174° 48'
41° 16' 30"
41° 17'
41° 17' 30"
41° 18'
GLASGOW WHARF
LAMBTON HARBOR
WELLINGTON
NEW ZEALAND

Figure 14

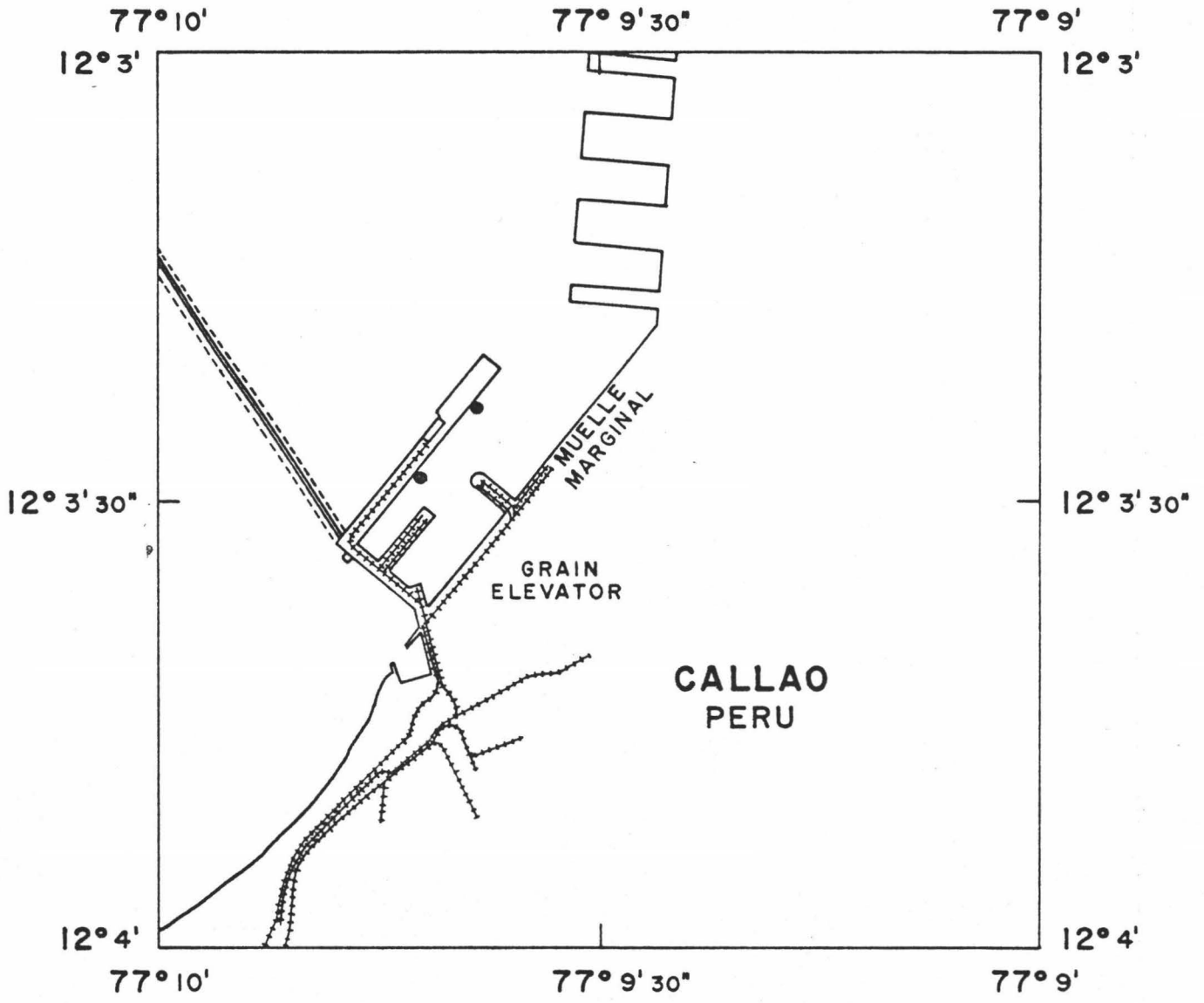

77° 10'
77° 9' 30"
77° 9'
12° 3'
12° 3' 30"
12° 4'
MUELLE MARGINAL
GRAIN ELEVATOR
CALLAO
PERU

Figure 15

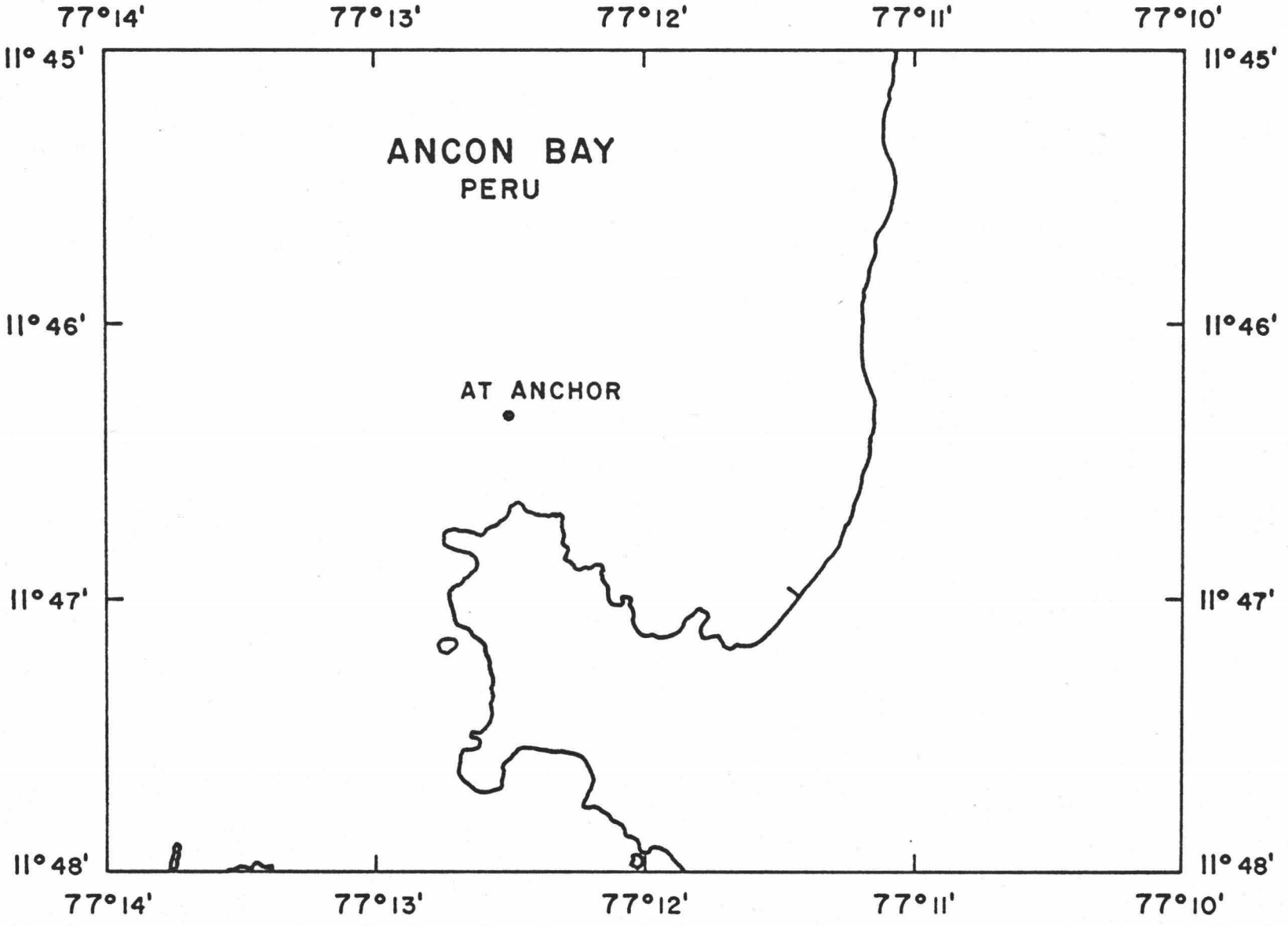

77°14'
77°13'
77°12'
77°11'
77°10'
11°45'
11°46'
11°47'
11°48'
ANCON BAY
PERU
AT ANCHOR

Figure 16

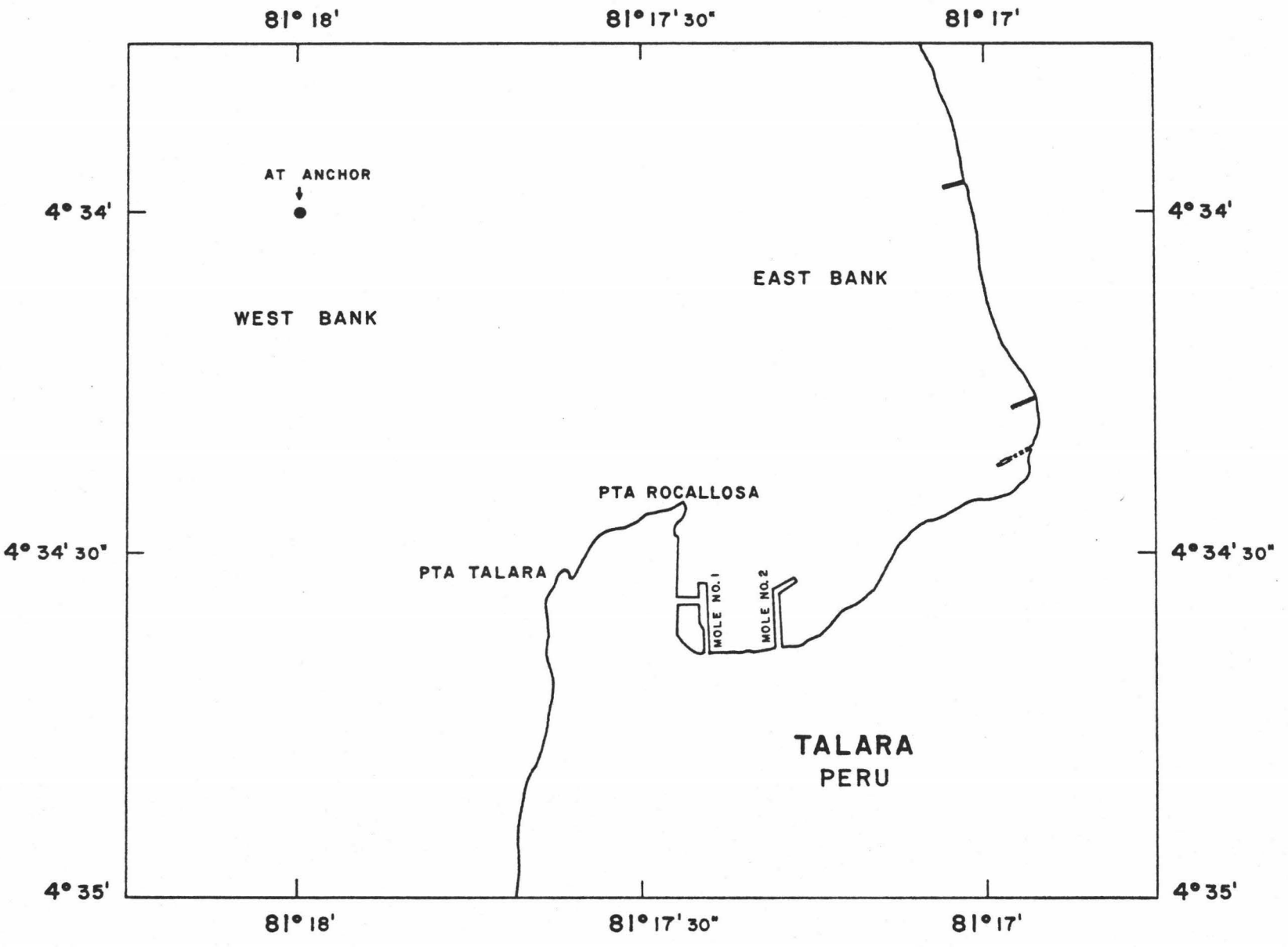

81° 18'
81° 17' 30"
81° 17'
AT ANCHOR
4° 34'
WEST BANK
EAST BANK
PTA ROCALLOSA
4° 34' 30"
PTA TALARA
MOLE NO. 1
MOLE NO. 2
TALARA
PERU
4° 35'

Figure 17

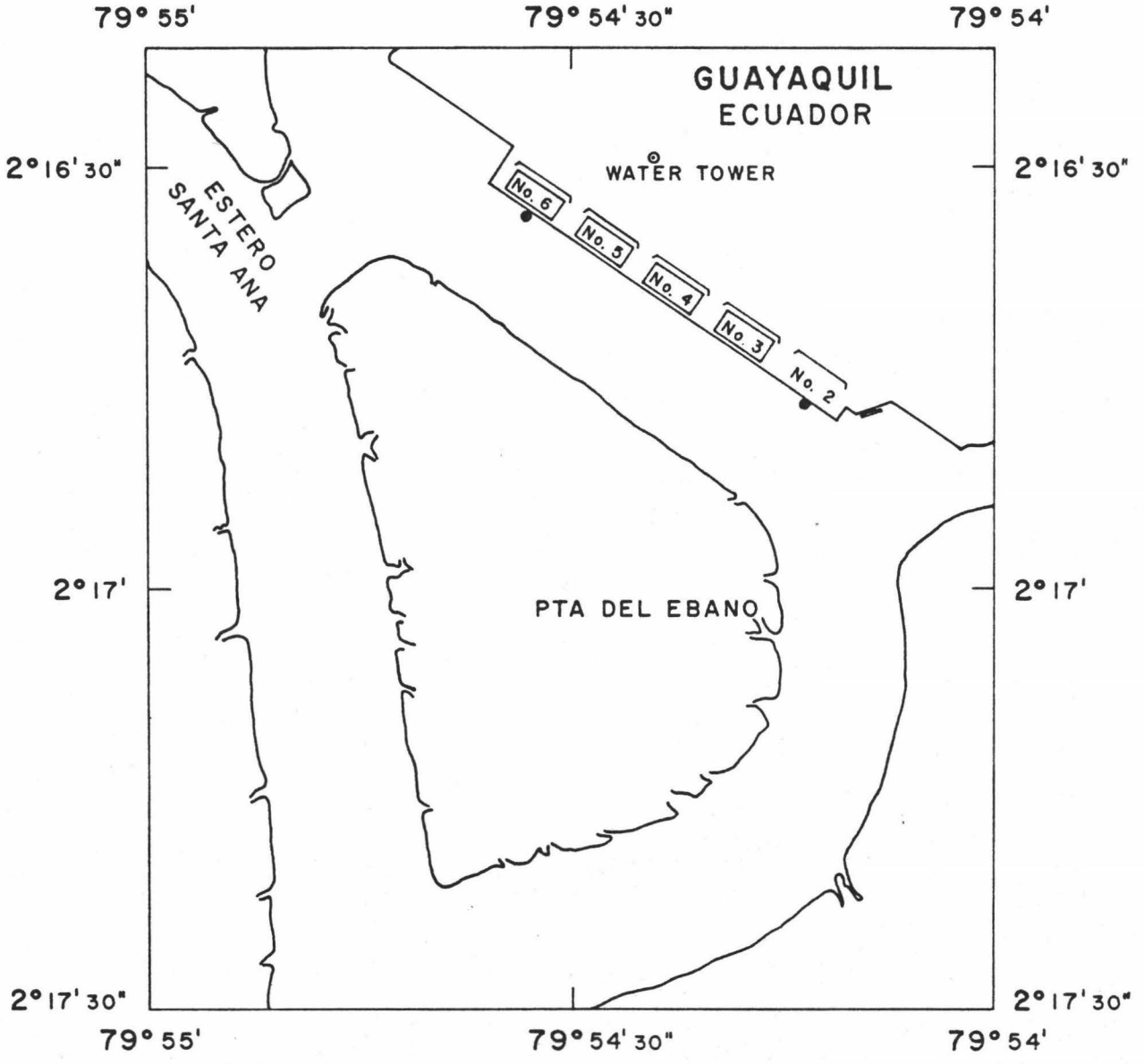

79° 55'
79° 54' 30"
79° 54'
GUAYAQUIL
ECUADOR
2° 16' 30"
WATER TOWER
ESTERO
SANTA ANA
No. 6
No. 5
No. 4
No. 3
No. 2
2° 17'
PTA DEL EBANO
2° 17' 30"

Figure 18

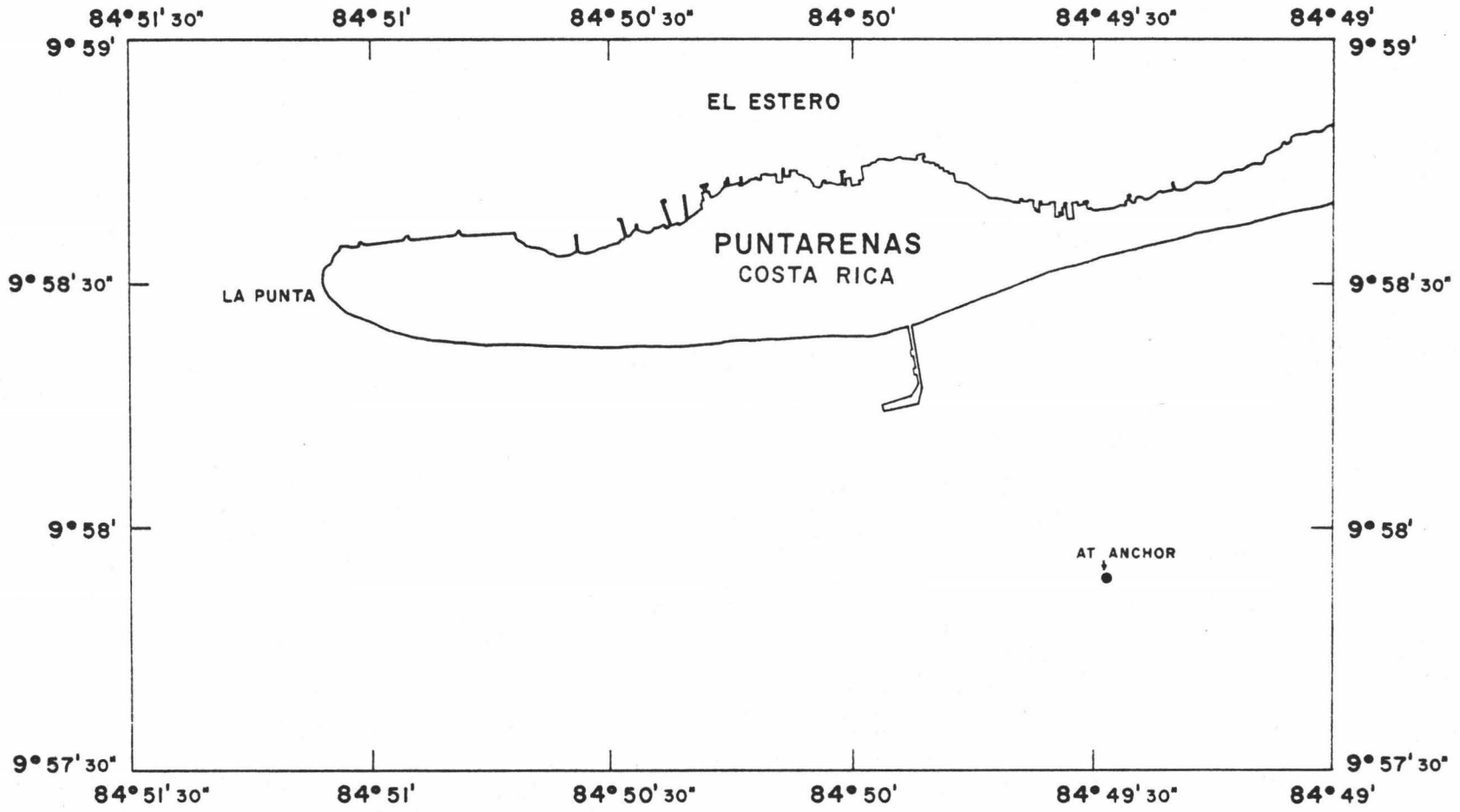

84°51'30"
84°51'
84°50'30"
84°50'
84°49'30"
84°49'
9°59'
9°58'30"
9°58'
9°57'30"
EL ESTERO
PUNTARENAS
COSTA RICA
LA PUNTA
AT ANCHOR

Figure 19

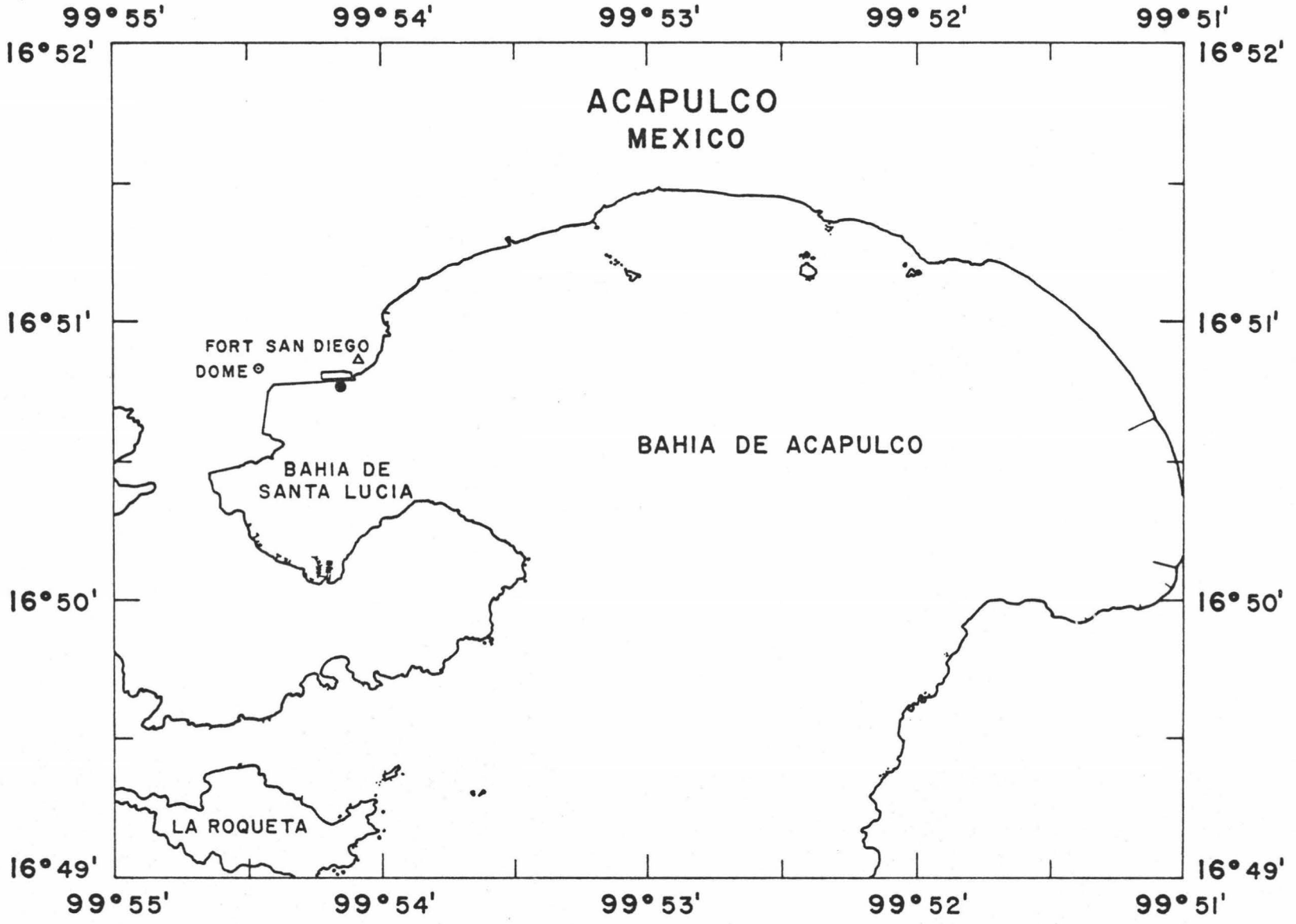

99°55'
99°54'
99°53'
99°52'
99°51'
16°52'
16°51'
16°50'
16°49'
ACAPULCO
MEXICO
FORT SAN DIEGO
DOME
BAHIA DE ACAPULCO
BAHIA DE
SANTA LUCIA
LA ROQUETA

Figure 20

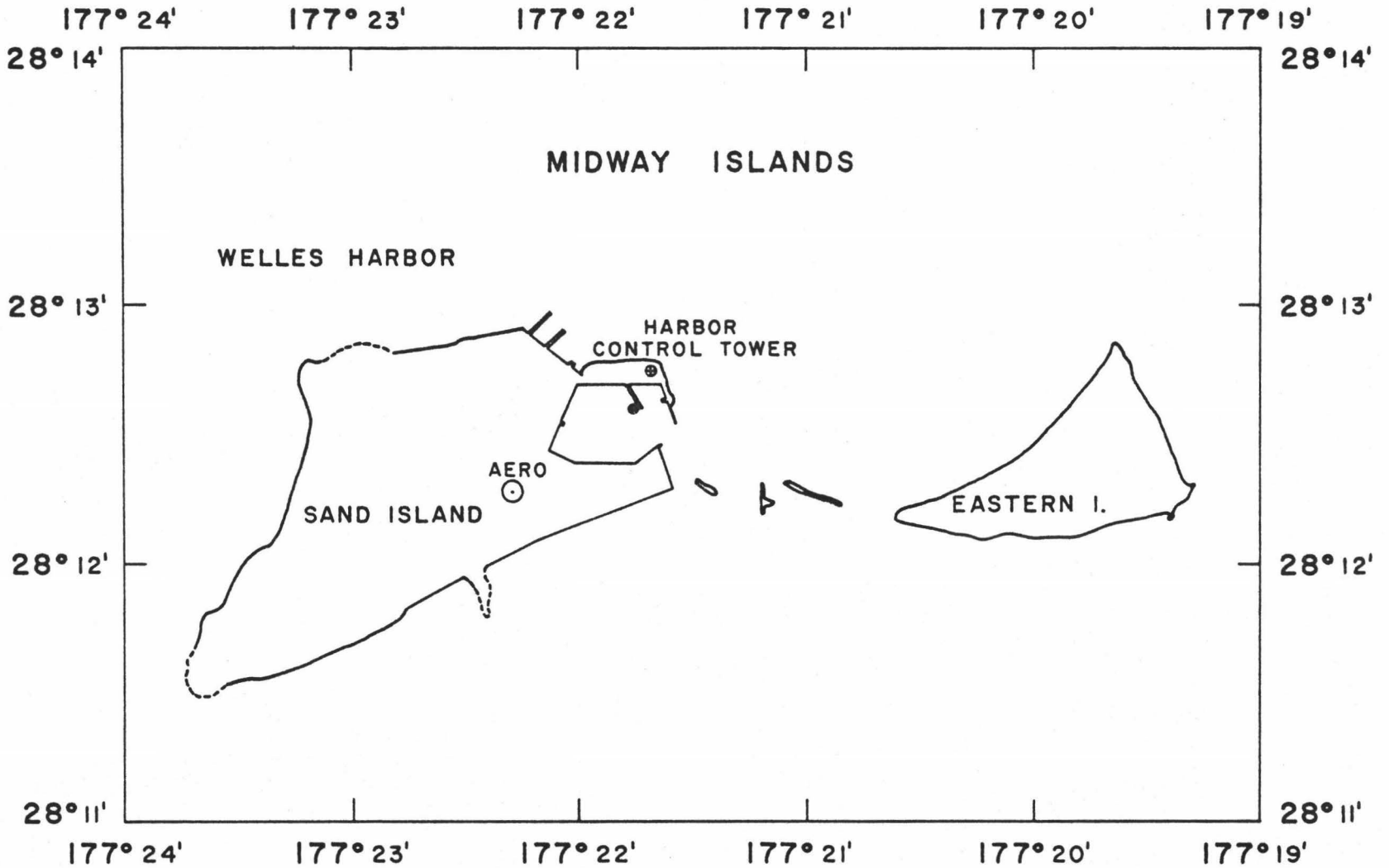

177° 24'
177° 23'
177° 22'
177° 21'
177° 20'
177° 19'
28° 14'
28° 13'
28° 12'
28° 11'
MIDWAY ISLANDS
WELLES HARBOR
HARBOR
CONTROL TOWER
AERO
SAND ISLAND
EASTERN I.

Figure 21

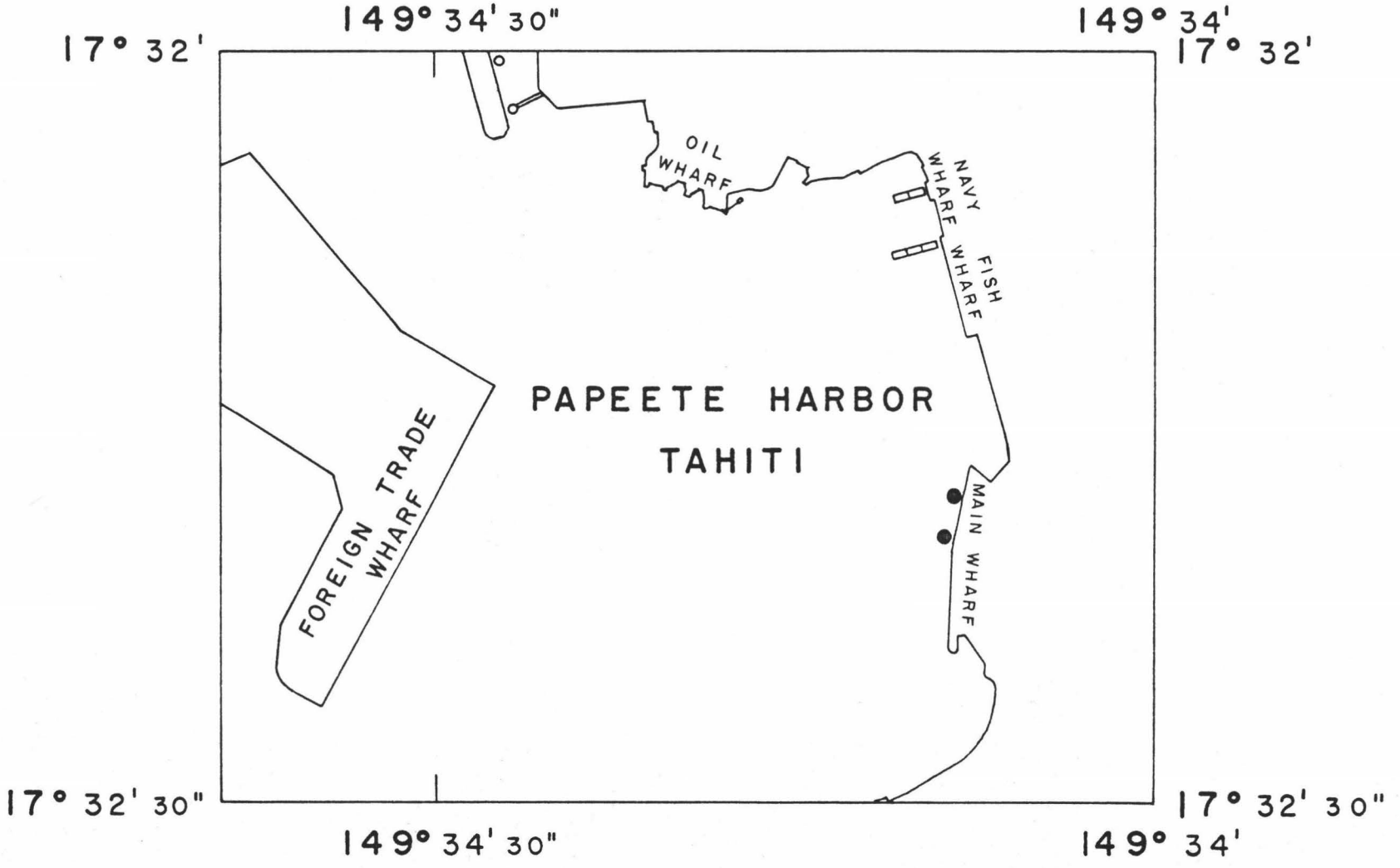

149° 34' 30"
149° 34'
17° 32'
17° 32'
OIL WHARF
NAVY WHARF
FISH WHARF
PAPEETE HARBOR
TAHITI
FOREIGN TRADE WHARF
MAIN WHARF
17° 32' 30"
17° 32' 30"
149° 34' 30"
149° 34'

Figure 22

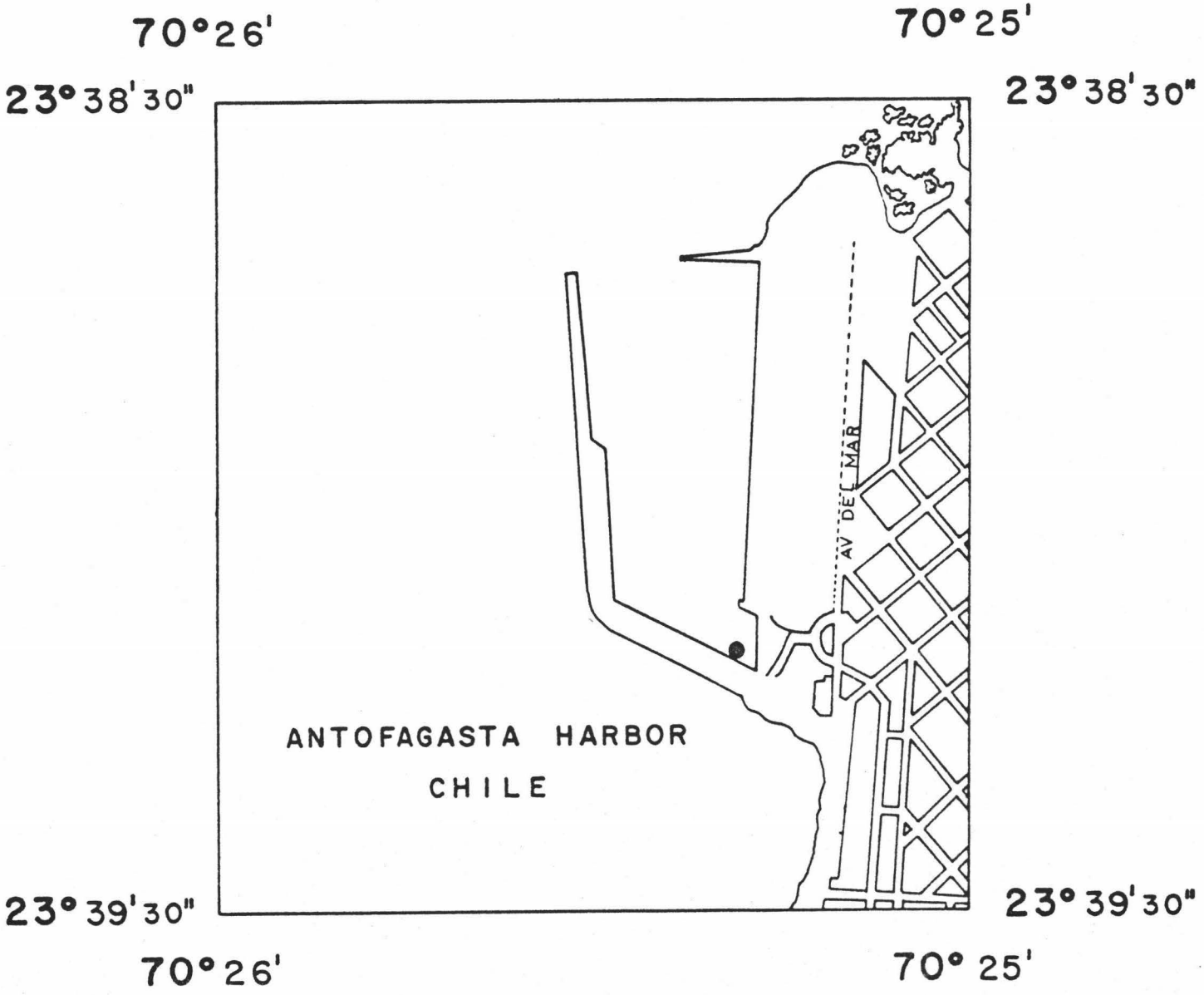

70°26'
70°25'
23°38'30"
23°38'30"
AV DEL MAR
ANTOFAGASTA HARBOR
CHILE
23°39'30"
23°39'30"
70°26'
70°25'

Figure 23

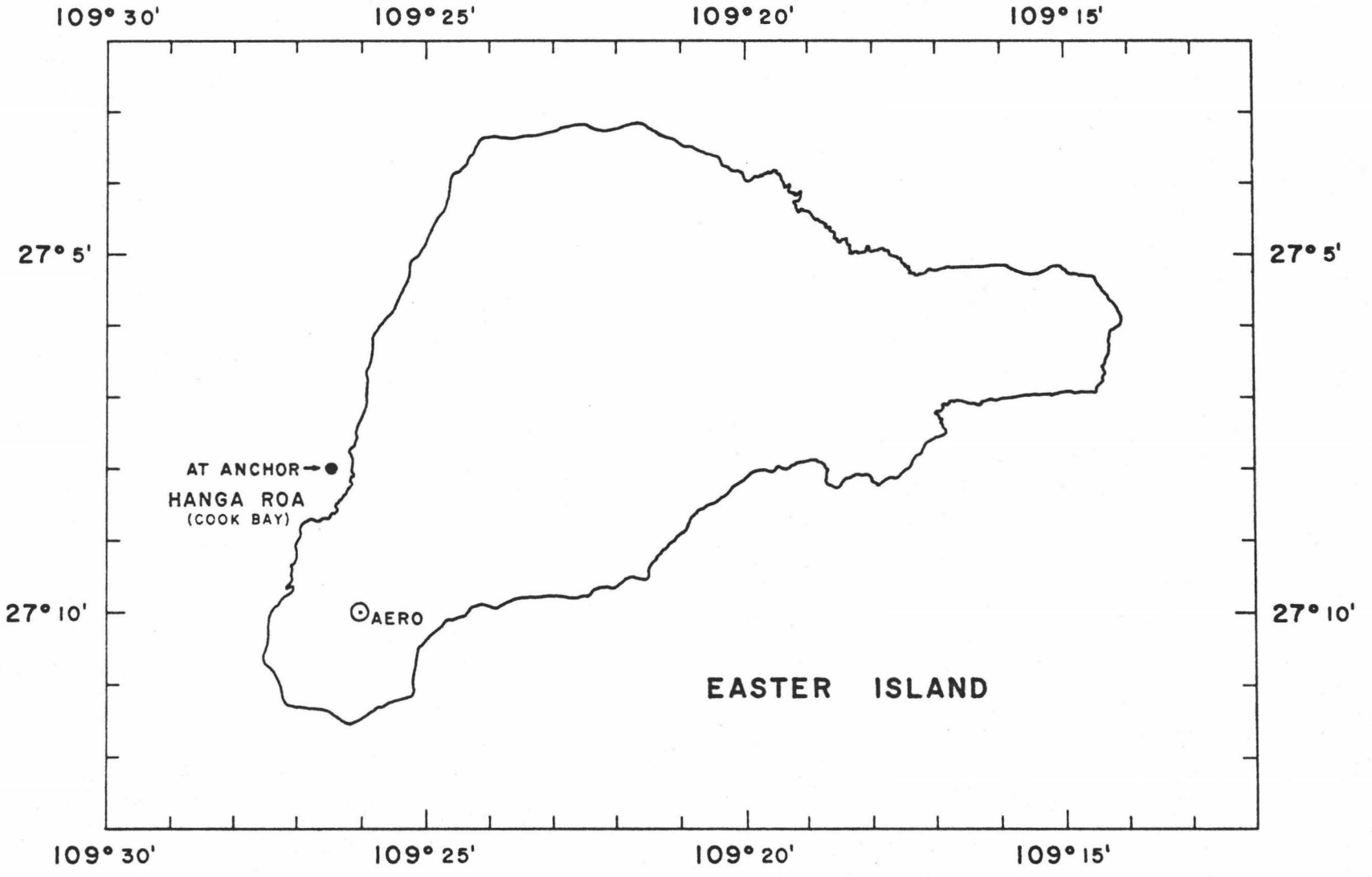

109° 30'
109° 25'
109° 20'
109° 15'
27° 5'
27° 10'
AT ANCHOR
HANGA ROA
(COOK BAY)
AERO
EASTER ISLAND

Figure 24

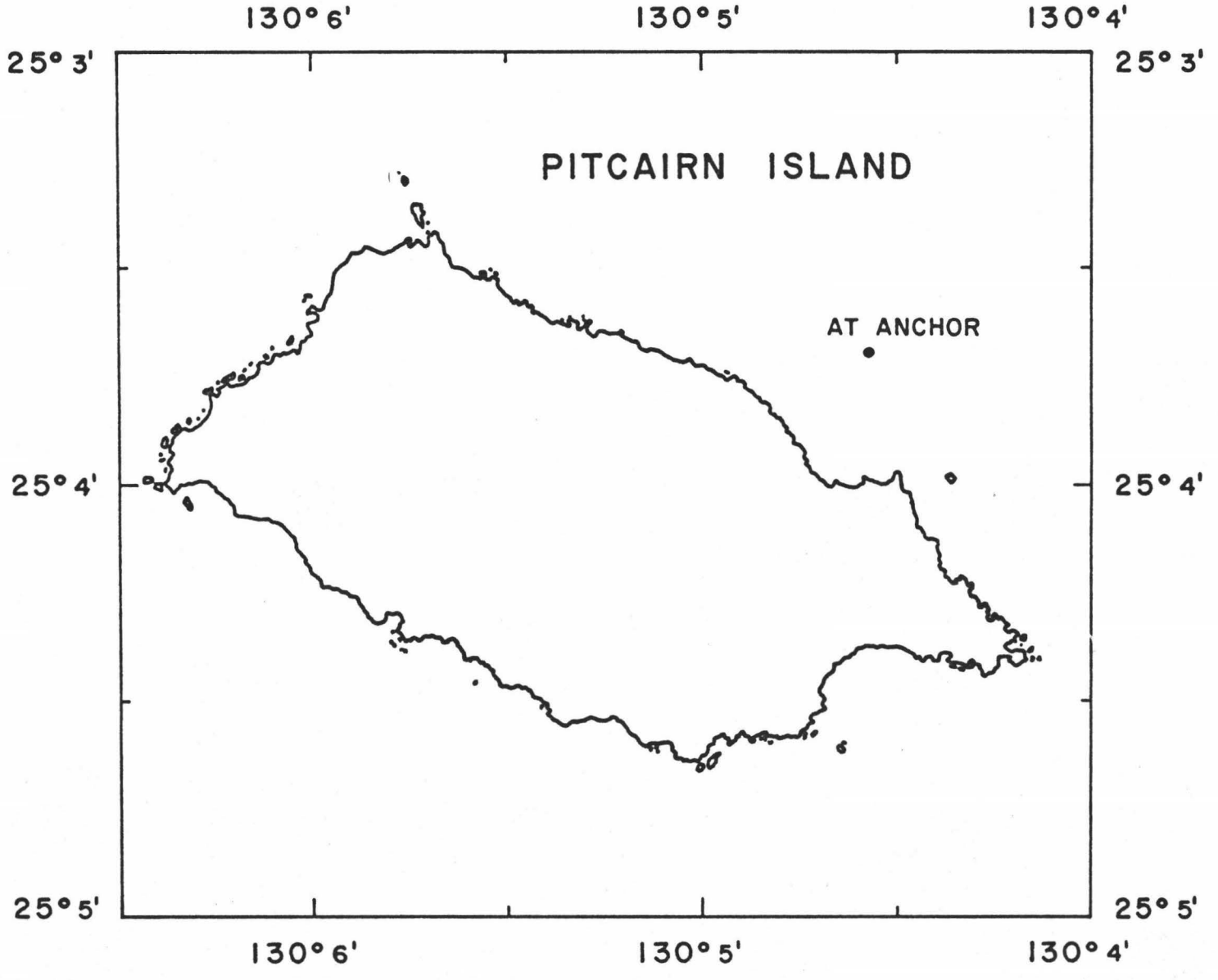


Figure 25

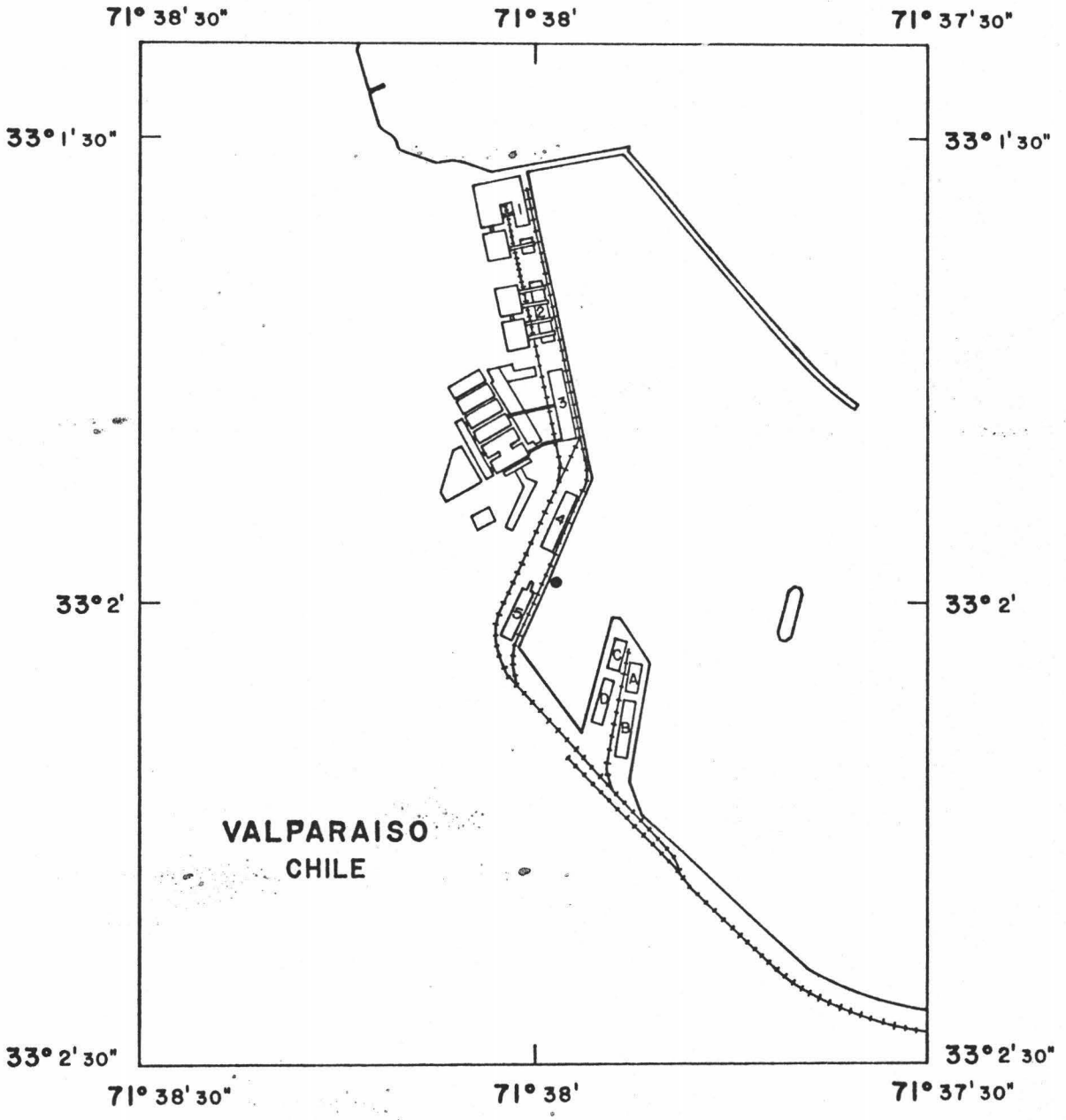


Figure 26

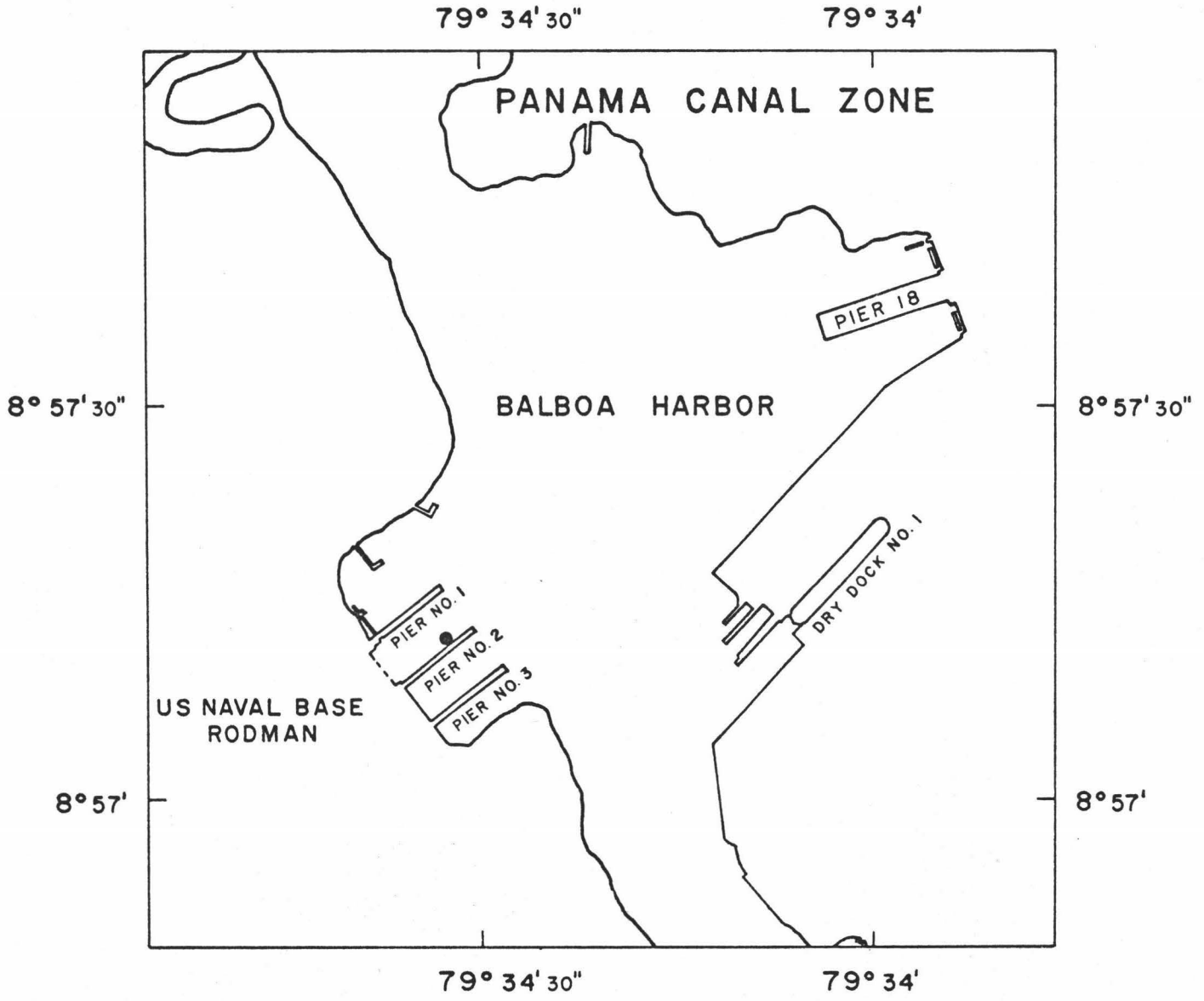

79° 34' 30"
79° 34'
PANAMA CANAL ZONE
PIER 18
8° 57' 30"
BALBOA HARBOR
8° 57' 30"
DRY DOCK NO. 1
PIER NO. 1
PIER NO. 2
PIER NO. 3
US NAVAL BASE
RODMAN
8° 57'
8° 57'
79° 34' 30"
79° 34'

Figure 27

APPENDIX B

ALPHABETICAL LISTING OF DATA TABLES

TABLE 1A-1

F/V MAHI 1970 POSITIONAL DATA, HONOLULU, HAWAII
AT PIER 18, STARBOARD SIDE TO DOCK

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
96	1038	64	28		21 18 47.76N	157 52 1.96W	3	30	15	-0.5	0.3
96	1224	64	30		21 18 48.84N	157 52 2.64W	2	29	12	0.6	1.4
96	1520	63	35		21 18 50.46N	157 52 1.32W	2	31	6	2.2	-0.2
96	1646	54	25		21 18 48.66N	157 52 1.32W	2	29	14	1.4	-0.2
96	1708	63	26		21 18 48.08N	157 52 2.16W	2	30	14	0.8	0.6
96	1832	54	34		21 18 50.58N	157 52 3.36W	2	32	16	2.4	1.8
96	2024	42	61		21 18 47.40N	157 52 2.52W	2	29	0	-0.8	1.3
96	2226	64	32		21 18 48.18N	157 51 59.52W	2	25	8	0.9	-2.0
97	12	64	37		21 18 47.76N	157 52 2.04W	2	31	12	-0.5	0.5
* 97	248	63	14		21 18 47.88N	157 51 59.64W	2	19	9	-0.3	-1.9
97	618	54	44		21 18 48.54N	157 52 2.16W	4	29	7	0.3	0.6
* 97	932	42	13		21 18 44.46N	157 52 4.34W	3	15	4	-3.8	2.8
97	1134	64	73		21 18 46.98N	157 52 4.26W	2	34	0	-1.2	2.7
* 97	1436	63	13		21 18 45.42N	157 52 0.66W	3	20	9	-2.8	-0.9
97	1620	63	66		21 18 48.06N	157 52 1.26W	2	31	0	-0.2	-0.3
* 97	1740	54	72		21 18 48.52N	157 51 53.28W	6	30	0	-1.6	-8.3
97	1930	42	46		21 18 47.88N	157 52 1.32W	2	28	7	-0.3	-0.2
97	2116	42	18		21 18 48.24N	157 52 2.40W	2	25	12	0.0	0.9
* 97	2322	64	67		21 19 0.24N	157 48 39.66W	2	19	0	12.6	-381.9
98	344	63	59		21 18 45.48N	157 52 0.66W	4	24	1	-2.7	-0.9
98	652	42	19		21 18 47.34N	157 52 1.50W	2	22	5	-0.9	-0.0
* 98	716	54	10		21 18 52.08N	157 52 1.20W	6	14	6	3.9	-0.3
98	836	42	42		21 18 48.36N	157 52 2.04W	2	30	12	0.1	0.5
98	1046	64	42		21 18 47.22N	157 52 1.74W	2	34	16	-1.0	0.2
98	1234	64	20		21 18 48.48N	157 52 1.74W	2	25	10	0.3	0.2
98	1530	63	50		21 18 49.50N	157 52 2.04W	2	34	1	1.3	0.5
98	1650	54	33		21 18 47.76N	157 52 1.32W	2	32	15	-0.5	-0.2
98	1720	63	18		21 18 47.16N	157 52 2.82W	2	25	12	-1.1	1.3
98	2022	42	55		21 18 48.72N	157 52 1.62W	2	32	15	0.5	0.1
98	2216	64	33		21 18 48.80N	157 52 0.66W	2	28	8	1.6	-0.9
99	22	64	25		21 18 48.60N	157 52 2.28W	2	29	14	0.4	0.7
99	256	63	22		21 18 46.22N	157 52 1.32W	2	15	0	-4.0	-0.2
99	438	54	24		21 18 48.48N	157 52 0.18W	2	26	10	0.3	-1.4
99	622	54	33		21 18 48.96N	157 52 3.36W	2	28	5	0.7	1.8
99	742	42	66		21 18 46.32N	157 51 57.90W	2	27	8	-1.8	-3.6
* 99	928	42	11		21 18 45.60N	157 52 0.00W	2	13	3	-2.6	4.5
99	1000	64	15		21 18 50.04N	157 51 59.64W	2	24	11	1.8	-1.9
99	1144	64	53		21 18 47.64N	157 52 2.52W	2	35	17	-0.5	1.0
99	1444	63	19		21 18 48.78N	157 52 0.18W	2	27	12	0.6	-1.4
99	1628	63	47		21 18 47.34N	157 52 2.16W	2	35	3	-0.9	0.6
*100	356	63	84		21 18 45.00N	157 51 29.46W	5	13	0	-3.2	-32.1
100	648	42	21		21 18 47.82N	157 52 0.18W	2	23	4	-0.4	-1.4
100	832	42	38		21 18 46.08N	157 52 4.50W	2	27	5	-2.1	3.0
100	1056	64	62		21 18 45.48N	157 52 1.08W	2	33	16	-2.7	-0.5

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 1A-1 (CONT.)

R/V MAHI 1970 POSITIONAL DATA, HONOLULU, HAWAII
AT PIER 18, STARBOARD SIDE TO DOCK

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
*100	1244	64	13		21 18 49.52N	157 52 2.16W	2	20	9	1.4	0.6
100	1538	63	69		21 18 49.56N	157 52 0.66W	3	35	0	1.3	-0.9
100	1654	54	43		21 18 49.38N	157 52 0.54W	2	34	17	1.2	-1.0
100	1834	42	17		21 18 46.38N	157 52 2.52W	2	18	5	-1.8	1.0
100	2018	42	50		21 18 47.58N	157 52 1.86W	2	34	16	-0.6	0.3
101	1922	42	56		21 18 49.26N	157 52 0.42W	2	30	1	1.0	-1.1
*101	2110	42	14		21 18 45.66N	157 52 2.04W	2	20	2	-2.6	0.5
101	2158	64	18		21 18 48.42N	157 51 58.56W	2	24	9	0.2	-3.0
101	2342	64	44		21 18 47.46N	157 52 2.28W	2	31	13	-0.8	0.7
102	404	63	66		21 18 46.80N	157 52 3.30W	2	19	1	-1.4	1.9
102	534	54	71		21 18 49.26N	157 52 3.60W	2	33	1	1.0	2.1
102	644	42	24		21 18 45.30N	157 51 58.68W	2	22	2	-2.9	-2.0
102	830	42	34		21 18 48.00N	157 52 1.74W	2	31	7	-0.2	0.2
*102	1106	64	87		21 18 45.84N	157 51 38.64W	5	34	16	-2.4	-22.9
*102	1406	63	9		21 18 49.38N	157 52 2.04W	7	12	6	1.2	0.5
*102	1548	63	80		21 18 48.84N	157 52 2.28W	3	33	1	0.6	0.7
102	1658	54	57		21 18 48.78N	157 52 1.74W	2	34	17	0.6	0.2
102	1830	42	18		21 18 48.36N	157 52 0.54W	2	23	9	0.1	-1.0
*102	1848	54	14		21 18 50.88N	157 52 2.82W	3	17	7	2.7	1.3
102	2014	42	45		21 18 47.16N	157 52 2.40W	2	34	17	-1.1	0.9
102	2254	64	70		21 18 48.36N	157 52 1.38W	2	32	0	0.1	-0.2
*103	44	64	10		21 18 51.72N	157 52 0.84W	6	12	2	3.5	-0.7
103	312	63	46		21 18 47.94N	157 52 1.86W	2	26	5	-0.3	0.3
103	444	54	41		21 18 48.42N	157 52 0.66W	2	32	16	0.2	-0.9
103	632	54	19		21 18 49.86N	157 52 2.40W	2	25	12	1.6	0.9
*103	734	42	76		21 18 45.66N	157 51 59.34W	2	34	0	-2.6	-2.2
103	1018	64	34		21 18 47.40N	157 52 0.72W	2	31	0	-0.9	-0.8
103	1922	42	62		21 18 48.18N	157 52 0.66W	2	25	9	-0.0	-0.9
*103	2108	42	12		21 18 44.34N	157 52 4.02W	3	18	2	-3.9	2.5
*111	1908	42	56		21 18 45.48N	157 52 38.76W	2	23	0	-2.7	37.2
111	2244	64	59		21 18 49.54N	157 52 1.38W	2	16	0	0.3	-0.2
112	300	63	54		21 18 51.54N	157 51 56.82W	2	17	0	3.3	-4.7
112	410	54	45		21 18 48.60N	157 52 2.28W	2	23	2	0.4	0.7
*112	448	63	8		21 18 46.80N	157 52 2.28W	2	9	4	-1.4	0.7
112	628	42	39		21 18 45.62N	157 52 1.08W	2	30	3	-1.6	-0.5
112	814	42	20		21 18 47.10N	157 52 6.24W	2	12	1	-1.1	4.7
112	1008	64	63		21 18 50.22N	157 52 0.0 W	2	28	7	2.0	-1.5
*112	1156	64	13		21 18 41.52N	157 51 56.58W	6	13	3	-6.7	-5.0
112	1446	63	54		21 18 49.42N	157 52 0.96W	2	31	0	0.2	-0.6
112	1534	54	23		21 18 50.34N	157 52 0.54W	2	24	11	2.1	-0.6
112	1718	54	38		21 18 50.04N	157 52 3.36W	2	31	14	1.8	1.8
112	1816	42	31		21 18 48.96N	157 52 1.38W	2	23	9	0.7	-0.2

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 18-1

ARITHMETIC MEAN SOLUTION AT HONOLULU, PIER 18

NP	N	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
86	20	66	21 18 48.21N 157 52 1.53W	1.4 1.5	0.2 0.2

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
97	248	X			
97	932	X			
97	1436	X			
97	1740			X	
97	2322				X
98	716	X		X	
99	928	X			
100	356		X	X	X
100	1244	X			
101	2110	X			
102	1106		X	X	X
102	1406	X		X	
102	1548		X		
102	1948	X			
103	44	X		X	
103	734		X		
103	2108	X			
111	1908				X
112	448	X			
112	1156	X		X	

TABLE 1C-1

BY SATELLITE ----- ARITHMETIC MEAN SOLUTION AT HONOLULU, PIER 19

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	20	21 18 47.53N 157 52 1.59W	1.0 1.8	0.2 0.4
54	14	21 18 47.48N 157 52 1.39W	1.1 1.7	0.3 0.4
63	14	21 18 47.48N 157 52 1.33W	1.1 1.7	0.3 0.4
64	18	21 18 47.50N 157 52 1.34W	1.0 1.5	0.2 0.4

TABLE 1A-2

R/V KANA KEOKI 1972 POSITIONAL DATA, HONOLULU, HAWAII
MOORED PORT SIDE TO PIER 19 - SOUTH.

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
306	52	63	11	N-E	21 18 28.44N	157 51 34.68W	3	10	1	-20.0	-26.6
306	114	65	15	N-W	21 18 47.58N	157 52 4.38W	2	20	2	-0.8	3.1
306	234	63	45	N-W	21 18 43.18N	157 52 0.66W	2	24	1	-0.2	-0.6
*306	2140	64	10	S-E	21 19 4.38N	157 52 25.68W	2	14	5	16.0	24.4
306	2244	65	21	N-E	21 18 46.08N	157 52 0.78W	3	16	3	-2.3	0.5
306	2324	64	33	S-W	21 18 49.32N	157 52 0.84W	2	20	0	0.9	-0.5
307	146	63	46	N-E	21 18 46.62N	157 52 1.20W	2	22	2	-1.8	-0.1
307	328	67	18	N-E	21 18 47.52N	157 52 1.38W	2	17	7	-2.0	0.1
307	508	67	31	N-W	21 18 47.88N	157 52 1.92W	2	26	14	-0.5	0.7
*307	544	64	8	N-E	21 18 45.54N	157 51 56.22W	3	6	1	-2.9	-5.1
*307	726	64	80	N-W	21 18 48.12N	157 51 54.36W	5	32	1	-0.3	-5.9
*307	918	64	7	N-W	21 18 57.30N	157 51 56.20W	4	0	0	8.9	-3.1
*307	1148	65	77	S-W	21 18 51.06N	157 52 20.64W	5	24	1	2.6	19.6
*307	1336	65	7	S-W	21 18 42.90N	157 52 7.02W	2	0	0	-5.5	5.7
307	1454	63	30	S-W	21 18 50.94N	157 52 0.84W	2	34	16	2.5	-0.5
307	1852	42	38	S-E	21 19 49.14N	157 52 1.08W	2	28	11	0.7	0.7
307	2038	64	17	S-W	21 18 48.06N	157 52 1.32W	2	17	6	-0.4	0.9
307	2234	64	44	S-E	21 18 48.78N	157 52 1.38W	2	30	15	0.4	0.1
308	22	64	18	S-W	21 18 50.64N	157 52 2.40W	2	21	5	2.2	1.1
308	58	63	16	N-E	21 18 45.78N	157 51 57.36W	2	12	0	-1.7	-3.9
*308	124	65	9	N-W	21 18 48.36N	157 52 2.16W	2	11	1	-0.1	0.9
308	244	63	46	N-W	21 18 46.92N	157 52 1.20W	2	31	15	-1.5	-0.1
*308	830	42	26	N-W	21 18 50.82N	157 51 50.64W	4	12	1	2.4	-10.7
308	1020	64	34	N-E	21 18 47.76N	157 52 0.54W	2	31	2	-0.7	-0.9
308	1100	65	34	S-E	21 18 48.62N	157 52 0.72W	2	29	14	1.2	-0.6
308	1206	64	26	N-W	21 18 46.44N	157 52 1.50W	2	25	3	-2.0	0.2
308	1246	65	21	S-W	21 18 50.70N	157 52 1.86W	2	25	12	2.3	0.5
308	1406	63	74	S-E	21 18 48.42N	157 52 2.64W	2	30	1	0.0	1.3
*308	1554	63	9	S-W	21 18 48.30N	157 52 3.06W	3	12	5	-0.1	1.9
308	1804	64	17	S-E	21 18 49.02N	157 51 59.64W	2	20	2	0.6	-1.7
*308	1946	42	66	S-W	21 18 50.28N	157 51 36.00W	2	32	10	1.8	-24.4
308	2144	64	15	S-E	21 18 49.62N	157 52 1.08W	2	19	5	1.2	-0.2
308	2248	65	30	N-E	21 18 48.54N	157 52 0.30W	2	30	5	0.1	-1.0
308	2328	64	52	S-W	21 18 49.26N	157 52 1.38W	2	34	15	0.8	0.1
309	36	65	29	N-W	21 18 47.70N	157 52 1.08W	2	28	14	-0.7	0.7
309	156	63	64	N-E	21 18 47.34N	157 52 0.72W	2	21	1	-0.5	-0.5
*309	342	63	10	N-W	21 18 46.68N	157 52 3.30W	4	15	7	-1.7	2.3
*309	548	42	7	N-E	21 18 36.36N	157 51 52.86W	3	6	2	-12.1	-8.4
309	730	42	68	N-W	21 18 47.58N	157 51 54.48W	2	31	0	-0.8	-6.9
*309	922	42	7	N-W	21 19 7.02N	157 51 54.24W	4	0	0	18.7	-7.1
*309	936	64	11	N-E	21 18 50.52N	157 52 2.16W	3	9	1	2.1	0.9
*309	1014	65	11	S-E	21 18 42.78N	157 52 1.32W	4	15	7	0.4	0.0
309	1114	64	71	N-W	21 18 46.80N	157 52 1.50W	3	36	17	-1.6	0.2
309	1156	65	59	S-W	21 18 49.50N	157 52 1.62W	2	32	15	1.1	0.3
*309	1306	64	7	N-W	21 18 55.20N	157 52 7.86W	9	0	0	6.8	6.6

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 1A-2 (CONT.)

R/V KANA KEOKI 1972 POSITIONAL DATA, HONOLULU, HAWAII
MOORED PORT SIDE TO PIER 19 - SOUTH.

DAY	GMT	SAT	ELEV	QUAD	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
309	1320	63	32	S-E	21 18 49.30N	157 52 1.20W	2	24	0	1.4	-0.1
309	1504	63	28	S-W	21 18 50.34N	157 52 0.72W	2	27	0	1.9	-0.6
312	302	63	22	N-W	21 18 45.56N	157 52 1.98W	2	26	12	-1.9	0.7
312	634	42	35	N-E	21 18 47.76N	157 52 0.66W	2	27	12	-0.7	-1.2
*312	656	64	77	N-E	21 18 48.18N	157 52 0.84W	3	34	1	-0.2	2.5
312	818	42	23	N-W	21 18 46.68N	157 52 1.32W	2	28	13	-1.7	0.0
*312	845	64	6	N-W	21 18 53.22N	157 52 1.74W	3	12	5	4.8	0.4
312	1026	54	57	N-E	21 18 47.64N	157 52 1.74W	2	35	17	-0.2	0.4
*312	1118	65	76	S-E	21 18 48.90N	157 51 59.76W	2	34	16	0.5	-1.5
312	1214	54	15	N-W	21 18 46.56N	157 52 2.16W	2	23	11	-1.9	0.9
312	1238	63	17	S-E	21 18 48.32N	157 52 0.96W	2	24	3	0.9	-0.3
*312	1306	65	8	S-W	21 18 42.30N	157 52 4.26W	2	6	2	-5.1	3.0
312	1422	63	51	S-W	21 18 48.38N	157 52 1.08W	2	36	17	1.0	-0.2
*312	1754	42	14	S-E	21 18 48.06N	157 51 59.88W	2	19	5	-0.4	-1.4
312	1824	64	38	S-E	21 18 48.50N	157 52 1.32W	2	24	7	1.1	0.0
312	1940	42	55	S-W	21 18 50.10N	157 52 1.50W	2	30	14	1.7	0.2
312	2008	64	22	S-W	21 18 50.16N	157 52 1.08W	2	23	6	1.7	-0.2
312	2150	54	26	S-E	21 18 48.09N	157 52 1.62W	2	25	3	0.7	0.3
312	2306	65	58	N-E	21 18 48.18N	157 52 1.08W	2	26	1	-0.2	-0.2
312	2336	54	30	S-W	21 18 49.62N	157 52 1.50W	2	29	4	1.2	0.2
*313	30	63	12	N-E	21 18 47.34N	157 51 59.76W	4	11	4	-0.5	-1.5
*313	56	65	11	N-W	21 18 51.48N	157 52 1.38W	2	13	0	3.1	0.1
313	212	63	57	N-W	21 18 46.32N	157 52 1.20W	2	26	0	-2.1	-0.1

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 18-2

ARITHMETIC MEAN SOLUTION AT HONOLULU, PIER 19 SOUTH

NP	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
68	24	44	21 18 49.42N	1.4	0.2
			157 52 1.30W	1.9	0.3

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
306	52	X			X
306	2140	X			X
307	544	X			
307	726		X	X	
307	918	X			
307	1148		X	X	X
307	1336	X			
308	124	X			
308	830				X
308	1554	X			
308	1746				X
309	342	X			
309	548	X			X
309	922	X			X
309	936	X			
309	1014	X			
309	1306	X		X	
312	656		X		
312	846	X			
312	1119		X		
312	1306	X			
312	1754	X			
313	30	X			
313	56	X			

TABLE 1C-2

BY SATELLITE SET ---- ARITHMETIC MEAN SOLUTION AT HONOLULU, PIER 18 SOUTH

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	5	21 18 49.25N 157 51 59.87W	1.4 3.1	0.6 1.4
54	12	21 18 49.59N 157 52 0.70W	1.3 2.1	0.4 0.6
63	13	21 18 48.45N 157 52 0.77W	1.4 2.0	0.4 0.5
64	4	21 18 47.78N 157 51 59.46W	1.0 3.4	0.5 1.7
65	8	21 18 48.75N 157 52 0.43W	1.3 2.5	0.5 0.9
67	2	21 18 48.36N 157 51 58.23W	1.1 5.3	0.8 3.8

TABLE 1A-3

R/V KANA KEOKI 1972 POSITIONAL DATA, HONOLULU, HAWAII
MOORED PORT SIDE TO BUR 18, 38.4 METERS NORTH OF DAY 306 LOCATION.

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
309	1650	42	42	S-E	21 18 50.16N	157 52 2.40W	2	30	14	0.2	1.5
309	2038	42	20	S-W	21 18 51.00N	157 52 1.32W	2	24	5	1.1	0.4
*309	2206	65	10	N-E	21 18 47.10N	157 51 55.14W	4	9	3	-2.8	-5.8
309	2236	54	57	S-E	21 18 49.80N	157 52 2.40W	2	31	1	-0.1	1.5
309	2344	65	72	N-W	21 18 48.72N	157 52 1.20W	2	33	0	-1.2	0.3
*310	24	54	13	S-W	21 18 50.04N	157 52 2.82W	2	20	9	1.0	1.9
310	108	63	24	N-E	21 18 48.96N	157 52 0.54W	2	22	5	-1.0	-0.4
310	252	63	32	N-W	21 18 50.04N	157 52 0.96W	2	27	1	0.1	-0.1
310	636	42	32	N-E	21 18 48.96N	157 52 0.54W	2	31	14	-1.0	-0.4
310	656	64	54	N-E	21 18 46.68N	157 51 57.78W	2	16	1	-0.2	-3.1
310	822	42	25	N-W	21 18 48.54N	157 52 1.20W	2	29	13	-1.4	0.3
310	842	64	15	N-W	21 18 51.96N	157 51 59.88W	2	12	2	2.0	-1.0
310	1022	54	44	N-E	21 18 48.30N	157 52 1.62W	2	34	17	-1.6	0.7
310	1108	65	51	S-E	21 18 50.40N	157 52 0.96W	2	32	15	0.5	0.1
*310	1234	63	11	S-E	21 18 32.28N	157 52 16.98W	8	8	1	-17.6	16.1
*310	1256	65	14	S-W	21 18 52.38N	157 52 1.74W	2	19	8	2.5	0.9
310	1414	63	69	S-W	21 18 49.08N	157 52 1.50W	2	30	0	-0.8	0.6
*310	1758	42	13	S-E	21 18 51.00N	157 52 2.70W	2	17	5	1.1	1.8
310	1814	64	26	S-E	21 18 51.48N	157 52 2.40W	2	25	4	1.6	1.5
310	1942	42	60	S-W	21 18 50.52N	157 52 0.84W	2	33	11	0.5	-0.1
310	2002	64	32	S-W	21 18 51.12N	157 52 1.32W	2	23	0	1.2	0.4
310	2148	54	20	S-E	21 18 50.82N	157 52 0.06W	2	16	3	0.9	-0.8
310	2256	65	44	N-E	21 18 50.58N	157 52 0.30W	2	31	7	0.7	-0.6
310	2332	54	40	S-W	21 18 51.48N	157 52 0.96W	2	30	15	1.6	0.1
311	44	65	19	N-W	21 18 48.12N	157 52 0.96W	2	26	12	-1.8	0.1
311	202	63	45	N-E	21 18 44.30N	157 51 56.16W	4	24	0	-1.5	-4.7
*311	544	42	6	N-E	21 18 51.12N	157 51 59.88W	4	7	0	1.2	-1.0
311	600	64	21	N-E	21 18 50.40N	157 52 1.20W	2	22	1	0.5	0.3
*311	726	42	77	N-W	21 18 46.56N	157 51 57.00W	2	30	1	-0.4	-3.9
311	746	64	41	N-W	21 18 48.12N	157 52 1.32W	2	32	4	-1.8	0.4
*311	918	42	7	N-W	21 18 53.10N	157 52 7.14W	15	0	0	3.2	5.2
311	934	54	16	N-E	21 18 48.84N	157 52 2.16W	2	14	1	-1.1	1.3
311	1022	65	18	S-E	21 18 52.08N	157 52 0.42W	2	22	9	2.2	-0.5
311	1118	54	54	N-W	21 18 47.28N	157 52 1.20W	2	35	16	-2.6	0.3
311	1206	65	39	S-W	21 18 52.20N	157 52 1.74W	2	28	10	2.3	0.8
311	1326	63	46	S-E	21 18 49.98N	157 52 1.50W	2	30	4	0.1	0.6
311	1512	63	20	S-W	21 18 50.82N	157 52 1.38W	2	27	12	0.9	0.5

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 18-3

ARITHMETIC MEAN SOLUTION, HONOLULU, PIER 18, 38.4 METERS NORTH.

NP	N	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
37	8	29	21 18 49.92N 157 52 0.90W	1.3 1.3	0.2 0.2

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
309	2206	X			
310	24	X			
310	1234	X		X	X
310	1256	X			
310	1758	X			
311	544	X			
311	726		X		
311	918	X		X	

TABLE 1C-3

BY SATELLITE, MEAN SOLUTION, HONOLULU, PIER 19, 38.4 METERS NORTH.

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	5	21 18 49.84N 157 52 1.26W	1.0 0.7	0.5 0.3
54	6	21 18 49.83N 157 52 1.45W	0.9 0.8	0.4 0.3
63	6	21 18 49.83N 157 52 1.45W	0.9 0.8	0.4 0.3
64	6	21 18 49.83N 157 52 1.45W	0.9 0.8	0.4 0.3
65	6	21 18 49.83N 157 52 1.45W	0.9 0.8	0.4 0.3

TABLE 1A-4

R/V KANA KEOKI 1972 POSITIONAL DATA, HONOLULU, HAWAII
MOORED FOR REPAIRS AT PIER 10.

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
311	1946	42	46	S-E	21 18 27.66N	157 51 58.56W	2	28	3	-0.2	-0.4
*311	1910	64	81	S-W	21 18 28.08N	157 51 54.36W	4	28	0	0.3	-4.6
311	2036	42	18	S-W	21 18 29.62N	157 51 56.88W	3	16	0	0.8	-0.0
*311	2058	64	7	S-W	21 18 13.98N	157 52 2.82W	5	0	0	-13.9	3.9
311	2210	65	16	N-E	21 18 27.60N	157 51 57.90W	2	23	11	-0.2	-1.1
311	2240	64	66	S-E	21 18 28.26N	157 52 0.66W	2	27	0	0.4	1.7
311	2354	65	48	N-W	21 18 26.94N	157 51 58.86W	2	32	0	-0.9	-0.1
*312	28	54	9	S-W	21 18 27.06N	157 51 58.68W	2	10	0	-0.8	-0.3

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 18-4

ARITHMETIC MEAN SOLUTION AT HONOLULU, PIER 10.

NP	N	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
8	3	5	21 18 27.82N 157 51 58.99W	0.6 1.0	0.3 0.5

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
311	1910		X		
311	2058	X		X	X
312	28	X			

TABLE 1C-4

BY SATELLITE -- ARITHMETIC MEAN SOLUTION AT HONOLULU, PIER 10.

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	2	21 18 28.14N 157 51 58.77W	0.7 0.3	0.5 0.2
54	1	21 18 27.66N 157 51 58.56W		
65	2	21 18 28.14N 157 51 58.77W	0.7 0.3	0.5 0.2

TABLE 1A-5

R/V KANA KECKI 1973 POSITIONAL DATA, HONOLULU, HAWAII
SECURED WITH PORT SIDE TO PIER 18.

DAY	GMT	SAT	ELEV	CEON	LATITUDE	LONGITUDE	IT	CTS	CTSO	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
204	2018	65	P	S-W	21 19 51.19N	157 52 7.20W	3	8	3	2.8	5.7
204	2210	63	19	S-W	21 18 49.38N	157 52 1.32W	2	24	5	1.6	-0.2
205	14	64	18	S-E	21 18 48.72N	157 51 58.68W	2	13	0	0.4	-2.8
205	158	64	46	S-W	21 18 49.86N	157 52 1.32W	2	32	8	1.5	-0.2
205	356	42	17	S-W	21 18 50.04N	157 52 0.66W	2	23	3	1.7	-0.8
205	414	54	63	S-E	21 18 48.42N	157 52 1.32W	2	17	1	0.1	-0.2
*205	558	54	12	S-W	21 18 47.94N	157 52 2.52W	2	18	8	-0.4	1.0
205	618	65	65	N-E	21 19 48.36N	157 52 2.70W	2	33	16	0.0	1.2
*205	810	65	10	N-W	21 19 48.66N	157 52 3.06W	2	14	6	0.3	1.6
205	1000	63	21	N-W	21 18 47.46N	157 52 1.74W	2	26	12	-0.9	0.3
*205	1202	64	14	N-E	21 18 50.58N	157 52 0.54W	3	11	1	2.2	-0.9
205	1344	64	58	N-W	21 18 47.64N	157 52 0.66W	2	34	3	-0.7	-0.8
205	1540	42	22	N-W	21 18 47.70N	157 52 1.38W	2	27	13	-0.6	-0.1
205	1600	54	48	N-E	21 18 47.52N	157 52 0.84W	2	25	7	-0.8	-0.6
205	1742	65	30	S-E	21 18 47.52N	157 51 58.56W	2	24	5	-0.8	-2.9
205	1928	65	27	S-W	21 18 49.80N	157 52 2.70W	2	29	14	1.5	1.2
205	2122	63	49	S-W	21 18 51.06N	157 52 1.50W	2	30	2	2.7	0.0
206	110	64	69	S-E	21 18 48.26N	157 52 4.38W	3	33	16	0.9	2.0
*206	258	64	11	S-W	21 18 53.16N	157 52 4.02W	2	17	8	4.8	2.5
206	320	54	22	S-E	21 18 49.68N	157 52 1.32W	2	25	11	1.3	-0.2
206	506	54	36	S-W	21 18 49.74N	157 52 0.96W	2	29	8	1.4	-0.5
206	532	65	24	N-E	21 18 49.50N	157 52 2.64W	2	28	13	1.2	1.2
206	720	65	31	N-W	21 18 47.64N	157 52 1.38W	2	24	10	-0.7	-0.1
206	909	63	58	N-W	21 18 46.74N	157 52 0.30W	2	31	12	-1.6	-1.2
206	1256	64	54	N-E	21 18 48.06N	157 52 2.52W	2	31	1	-0.3	1.0
206	1444	42	63	N-W	21 18 48.00N	157 51 59.52W	2	16	0	-0.3	-2.0
206	1508	54	17	N-E	21 18 47.34N	157 52 0.30W	2	24	11	-1.0	-1.2
206	1652	54	49	N-W	21 18 46.50N	157 52 1.20W	2	35	17	-1.8	-0.3
206	1840	65	61	S-W	21 18 45.90N	157 52 5.04W	2	26	0	-2.4	3.6
206	2032	63	66	S-E	21 18 47.04N	157 52 2.28W	2	19	0	-1.3	0.8
*206	2220	63	12	S-W	21 18 44.28N	157 52 1.20W	4	19	8	-4.1	-0.3
207	22	64	26	S-E	21 18 47.52N	157 52 2.70W	2	26	4	-0.8	1.2
207	206	42	53	S-E	21 18 48.30N	157 52 1.98W	2	19	1	-0.0	0.5

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 18-5

ARITHMETIC MEAN SOLUTION, HONOLULU, PIER 19.

NP	N	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
33	6	27	21 18 48.34N 157 52 1.48W	1.3 1.4	0.2 0.3

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
204	2018	X			
205	558	X			
205	810	X			
205	1202	X			
206	258	X			
206	2220	X			

TABLE 1C-5

BY SATELLITE, MEAN SOLUTION, HONOLULU, PIER 18.

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	4	21 19 48.51N 157 52 0.84W	1.0 1.1	0.5 0.5
54	6	21 19 48.33N 157 52 0.95W	0.9 0.8	0.4 0.3
63	5	21 18 48.49N 157 52 0.97W	0.9 0.9	0.4 0.4
64	6	21 18 48.33N 157 52 0.95W	0.9 0.8	0.4 0.3
65	7	21 18 48.52N 157 52 1.00W	1.0 0.8	0.4 0.3

TABLE 1A-6

R/V KANA KEOKI 1973 POSITIONAL DATA, HONOLULU, HAWAII
PORT SIDE TO PIER 18, ANTENNA 20.7 METERS NORTH OF S. END OF PIER.

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
251	1046	42	28	N-E	21 18 46.68N	157 51 57.90W	2	25	8	-1.7	-3.8
*251	1202	64	8	N-W	21 18 54.90N	157 51 57.90W	3	10	4	6.2	-3.8
251	1230	42	29	N-W	21 18 47.40N	157 52 2.04W	2	28	14	-1.3	0.3
251	1350	54	40	N-W	21 18 47.58N	157 52 1.32W	2	32	15	-1.1	-0.4
251	1422	65	22	S-E	21 18 50.34N	157 52 2.52W	2	31	14	1.6	-0.8
251	1609	65	44	S-W	21 18 49.92N	157 52 1.20W	2	37	18	1.2	-0.5
251	1730	63	60	S-E	21 18 48.36N	157 52 3.72W	2	27	0	-0.3	2.0
*251	1918	63	12	S-W	21 18 49.14N	157 52 1.74W	2	13	3	0.4	0.0
251	2136	64	39	S-E	21 18 48.54N	157 52 1.62W	2	30	3	-0.2	-0.1
*251	2204	42	10	S-E	21 18 50.76N	157 51 57.78W	3	9	3	2.1	-3.9
251	2322	64	21	S-W	21 18 48.96N	157 52 1.38W	2	25	10	0.3	-0.3
251	2350	42	65	S-W	21 18 48.24N	157 52 0.84W	2	30	0	-0.5	-0.9
*252	112	54	69	S-W	21 18 47.88N	157 52 1.38W	12	0	0	-0.8	-0.3
*252	302	54	7	S-W	21 18 23.24N	157 52 4.02W	3	0	0	-15.5	2.3
252	356	65	61	N-W	21 18 47.34N	157 52 2.82W	2	28	1	-1.4	1.1
252	518	63	50	N-E	21 18 48.48N	157 52 1.50W	2	33	2	-0.2	-0.2
252	706	63	18	N-W	21 18 47.40N	157 52 1.50W	2	21	1	-1.3	-0.2
252	924	64	31	N-E	21 18 48.38N	157 52 1.62W	2	26	1	0.7	-0.1
*252	954	42	7	N-E	21 18 54.24N	157 52 4.02W	6	4	1	5.5	2.3
252	1112	64	27	N-W	21 18 48.24N	157 52 2.64W	2	29	14	-0.5	0.9
*252	1139	42	75	N-W	21 18 46.08N	157 52 24.48W	2	24	1	-2.6	22.8
252	1258	54	59	N-E	21 18 48.72N	157 52 3.30W	2	33	0	0.0	1.6
*252	1326	42	7	N-W	21 19 9.12N	157 51 52.26W	2	0	0	20.4	-9.4
*252	1448	54	9	N-W	21 18 50.82N	157 52 1.50W	2	11	0	2.1	-0.2
252	1520	65	71	S-E	21 18 48.72N	157 52 3.84W	2	35	1	0.0	2.1
252	1642	63	22	S-E	21 18 48.48N	157 52 1.86W	2	27	12	0.7	0.2
*252	1708	65	11	S-W	21 18 47.58N	157 52 2.16W	2	18	8	-1.1	0.5
252	1828	63	36	S-W	21 18 48.26N	157 52 1.74W	2	31	15	0.5	0.0
*252	2048	64	14	S-E	21 18 46.00N	157 52 1.20W	2	13	0	-3.7	-0.6
253	20	54	35	S-E	21 18 48.60N	157 52 2.40W	2	28	3	-0.1	0.7
253	42	42	20	S-W	21 18 52.02N	157 52 1.38W	2	18	5	3.3	-0.3
253	208	54	24	S-W	21 18 51.42N	157 52 4.92W	2	27	0	2.7	3.2
253	308	65	62	N-E	21 18 48.18N	157 52 0.66W	2	34	17	-0.5	-1.0
253	430	63	19	N-E	21 18 48.72N	157 52 2.52W	2	24	6	0.0	0.8
*253	456	65	12	N-W	21 18 45.36N	157 52 2.16W	2	16	2	-3.3	0.5
253	616	63	47	N-W	21 18 47.28N	157 52 1.86W	2	34	16	-1.4	0.2
*253	838	64	10	N-E	21 18 51.60N	157 52 1.08W	5	12	4	2.9	-0.6
253	1020	64	69	N-W	21 18 47.94N	157 52 0.06W	2	33	0	-0.8	-1.5
253	1040	42	31	N-E	21 18 47.88N	157 52 0.30W	2	31	14	-0.8	-1.4
253	1208	54	23	N-E	21 18 48.00N	157 51 58.74W	2	13	0	0.2	-3.0
253	1228	42	27	N-W	21 18 47.64N	157 52 2.16W	2	29	14	-1.1	0.5
253	1354	54	31	N-W	21 18 47.64N	157 52 1.32W	2	30	14	-1.1	-0.4
253	1432	65	32	S-E	21 18 50.16N	157 52 2.64W	2	33	15	1.5	0.9
253	1618	65	31	S-W	21 18 49.98N	157 52 0.54W	2	34	16	1.3	-1.2
*253	1739	63	68	S-E	21 18 48.96N	157 52 11.94W	2	29	0	0.3	10.2

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 1F-6

ARITHMETIC MEAN SOLUTION, HONOLULU, PIER 19, ANT. 20.7 METERS NORTH.

NP	N	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
45	14	31	21 18 48.70N 157 52 1.70W	1.2 1.4	0.2 0.3

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
251	1202	X			
251	1918	X			
251	2206	X			
252	112			X	
252	302	X			X
252	954	X		X	
252	1138				X
252	1326	X			X
252	1448	X			
252	1708	X			
252	2048	X			
253	456	X			
253	838	X		X	
253	1738				X

TABLE 1C-6

BY SATELLITE. MEAN SOLUTION. HONOLULU. PIER 18. ANT. 20.7 METERS NORTH.

SATELLITE NUMBER	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	6	21 18 48.36N	1.8	0.8
		157 52 0.77W	1.6	0.6
54	6	21 18 48.36N	1.8	0.8
		157 52 0.77W	1.6	0.6
63	7	21 18 48.25N	1.7	0.6
		157 52 0.85W	1.5	0.5
64	5	21 18 48.50N	2.0	0.9
		157 52 0.49W	1.6	0.7
65	7	21 18 48.25N	1.7	0.6
		157 52 0.85W	1.5	0.5

TABLE 1A-7

R/V KANA KEOKI 1973 POSITIONAL DATA. HONOLULU, HAWAII
PORT SIDE TO PIER 18, ANTENNA 14.6 METERS NORTH OF S. END OF PIER.

DAY	GMT	SAT	ELEV	QUAD	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
290	144	65	40	N-W	21 18 46.68N	157 52 0.30W	3	36	17	-1.5	-1.3
290	244	63	39	N-E	21 18 48.72N	157 52 0.18W	2	14	1	0.6	-1.4
290	426	63	20	N-W	21 18 46.08N	157 52 0.18W	2	19	2	0.9	-1.4
290	700	64	39	N-E	21 18 48.60N	157 52 2.04W	2	31	1	0.4	0.5
290	840	42	49	N-E	21 18 47.52N	157 52 1.74W	2	34	16	-0.6	0.2
290	1026	42	16	N-W	21 18 47.82N	157 52 2.16W	2	23	10	-0.3	0.6
290	1308	65	75	S-W	21 18 47.28N	157 51 58.20W	2	32	1	-0.9	-3.4
290	1404	63	18	S-E	21 18 47.04N	157 52 0.30W	2	18	1	-1.1	-1.3
290	1548	63	44	S-W	21 18 49.74N	157 51 59.10W	2	28	4	1.6	-2.5
290	1824	64	19	S-E	21 18 49.38N	157 52 2.04W	2	25	9	1.2	0.5
290	2002	42	21	S-E	21 18 49.50N	157 52 2.40W	2	22	5	1.3	0.8
290	2146	42	38	S-W	21 18 48.90N	157 51 54.72W	3	16	0	0.7	-6.9
*290	2314	65	0	N-E	21 18 51.72N	157 51 58.44W	6	9	2	3.6	-3.1
290	2346	54	16	S-W	21 18 50.16N	157 52 1.20W	2	23	11	2.0	-0.4
*291	54	65	71	N-E	21 18 53.46N	157 49 55.08W	3	31	0	11.3	-126.5
*291	244	65	0	N-W	21 18 48.54N	157 52 0.06W	8	0	0	0.4	-1.5
291	340	63	54	N-W	21 18 46.62N	157 52 4.26W	2	26	8	-1.5	2.7
*291	612	64	14	N-E	21 18 45.72N	157 52 1.20W	2	21	10	-2.4	-0.4
291	748	42	15	N-E	21 18 47.40N	157 51 58.74W	2	22	10	-0.8	-2.9
291	804	64	56	N-W	21 18 46.74N	157 52 2.16W	2	17	0	-1.4	0.6
291	930	42	50	N-W	21 18 47.64N	157 52 0.54W	2	32	12	-0.5	-1.0
291	950	54	39	N-E	21 18 48.24N	157 52 0.54W	2	22	6	0.1	-1.0
291	1132	54	21	N-W	21 18 46.44N	157 52 2.04W	2	27	12	-1.7	0.5
291	1220	65	33	S-E	21 18 49.06N	157 52 2.70W	2	31	14	-0.1	1.1
291	1406	65	18	S-W	21 18 48.18N	157 52 1.32W	2	23	10	0.0	-0.2
291	1502	63	69	S-E	21 18 48.60N	157 52 1.74W	3	26	0	0.4	0.2
*291	154	63	14	N-E	21 18 24.72N	157 52 0.18W	2	10	0	-23.4	-1.4
291	1920	64	71	S-E	21 18 48.78N	157 52 3.18W	2	31	0	0.6	1.6
291	2052	42	67	S-E	21 19 46.14N	157 52 5.58W	2	23	0	1.0	4.0
*291	1648	63	10	S-W	21 18 31.68N	157 51 52.92W	4	5	1	-16.5	-9.6
*291	2240	42	17	S-W	21 18 50.04N	157 52 1.50W	6	15	7	2.8	-0.1
291	2256	54	45	S-W	21 18 49.38N	157 52 1.74W	2	26	11	1.2	0.2
292	6	65	37	N-E	21 18 47.16N	157 52 1.56W	2	30	3	-1.0	0.3
292	154	65	27	N-W	21 18 47.64N	157 52 0.96W	2	32	5	-0.5	-0.6
292	248	63	57	N-E	21 18 46.42N	157 52 3.18W	3	17	1	0.3	1.6
*292	436	63	13	N-W	21 18 40.08N	157 53 9.30W	3	11	1	-8.1	7.7
292	708	64	56	N-E	21 18 47.82N	157 52 2.52W	2	29	0	-0.3	1.0
292	836	42	54	N-E	21 19 47.46N	157 52 1.86W	2	33	15	-0.7	0.3
*292	1024	42	14	N-W	21 18 47.16N	157 52 2.16W	2	21	9	-1.0	0.6
292	1042	54	59	N-W	21 18 46.98N	157 52 1.62W	2	30	14	-1.2	0.1
*292	1134	65	13	S-E	21 18 49.02N	157 52 2.70W	2	19	8	0.0	1.1
292	1318	65	50	S-W	21 18 48.36N	157 52 0.06W	2	32	15	0.2	-1.5
292	1414	63	26	S-E	21 19 47.46N	157 52 0.84W	2	14	0	-0.7	-0.7
292	1558	63	31	S-W	21 18 50.34N	157 52 1.98W	2	25	2	2.2	0.4
292	1832	64	28	S-E	21 18 49.14N	157 52 2.64W	2	26	5	1.0	1.1
292	1958	42	23	S-E	21 18 48.36N	157 52 2.28W	2	19	0	0.2	0.7

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 1A-7 (CONT.)

R/V KANA KEOKI 1973 POSITIONAL DATA, HONOLULU, HAWAII
PORT SIDE TO PIER 16, ANTENNA 14.6 METERS NORTH OF S. END OF PIER.

DAY	GMT	SAT	ELEV	QFCM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
292	2018	64	31	S-W	21 18 49.92N	157 52 1.32W	2	19	2	1.8	-0.2
292	2142	42	36	S-W	21 18 49.62N	157 52 0.84W	2	32	15	1.5	-0.7
292	2202	54	65	S-E	21 18 49.14N	157 52 1.92W	3	24	0	1.0	0.4
*292	2350	54	11	S-W	21 18 46.62N	157 52 6.36W	4	15	1	-1.5	4.9
*293	202	63	21	N-E	21 18 56.16N	157 53 31.38W	2	24	10	8.0	89.8
293	346	63	38	N-W	21 18 45.66N	157 52 1.86W	2	19	1	-2.5	0.3
*293	620	64	22	N-E	21 19 1.92N	157 51 54.60W	2	27	13	13.8	-7.0
293	744	42	17	N-E	21 18 48.60N	157 52 0.42W	2	20	1	0.4	-1.1
293	806	64	39	N-W	21 18 46.20N	157 52 0.96W	2	32	13	-2.0	-0.5
293	930	42	46	N-W	21 18 46.62N	157 52 1.74W	2	26	11	-1.5	0.2
293	948	54	51	N-E	21 18 47.52N	157 52 2.28W	2	35	17	-0.6	0.7
293	1136	54	16	N-W	21 18 46.38N	157 52 2.16W	2	23	11	-1.8	0.6
293	1230	65	59	S-E	21 18 49.02N	157 52 4.02W	2	31	14	0.9	2.5
*293	1324	63	8	S-E	21 18 48.72N	157 52 3.48W	4	6	1	0.5	7.3
*293	1418	65	11	S-W	21 18 50.46N	157 52 1.86W	3	15	7	2.3	0.3
*293	1508	63	82	S-W	21 18 48.18N	157 52 5.04W	6	30	2	0.0	3.5
*293	1930	64	79	S-W	21 18 48.90N	157 52 0.30W	2	33	1	0.7	-1.3
293	2048	42	64	S-E	21 18 49.26N	157 52 1.98W	2	26	0	1.1	0.4
293	2112	54	25	S-E	21 18 49.86N	157 52 3.84W	2	18	3	1.7	2.3
*293	2234	42	9	S-W	21 18 43.26N	157 52 3.30W	7	12	5	-4.9	1.7
293	2258	54	34	S-W	21 18 50.34N	157 52 1.50W	2	30	1	2.2	-0.1
294	16	65	53	N-E	21 18 48.24N	157 52 3.30W	2	34	13	0.1	1.7
294	206	65	19	N-W	21 18 45.42N	157 52 2.04W	2	28	13	-2.7	0.5
*294	256	63	79	N-E	21 18 48.90N	157 52 1.20W	5	27	6	0.7	-0.4
*294	448	63	8	N-W	21 33 6.96N	157 48 4.32W	8	6	0	858.8	-237.2
294	718	64	73	N-E	21 18 47.64N	157 52 6.54W	4	32	1	-0.5	5.0
294	832	42	59	N-E	21 18 47.52N	157 52 1.86W	2	32	15	-0.6	0.3
294	856	54	18	N-E	21 18 46.56N	157 51 59.40W	2	25	11	-1.6	-2.2
294	1020	42	15	N-W	21 18 45.00N	157 52 2.70W	2	18	6	-3.2	1.1
294	1044	54	45	N-W	21 18 45.74N	157 52 1.98W	2	32	0	-1.4	0.3
294	1142	65	21	S-E	21 18 49.02N	157 52 1.62W	2	25	11	0.3	0.1
294	1328	65	33	S-W	21 18 49.62N	157 52 0.0 W	2	29	13	1.5	-1.5
294	1420	63	38	S-E	21 18 47.16N	157 52 1.32W	2	14	0	-1.0	-0.2
294	1606	63	22	S-W	21 18 51.00N	157 51 54.60W	2	24	7	2.8	-7.0
294	1842	64	40	S-E	21 18 49.08N	157 52 1.38W	2	30	7	0.9	-0.2
294	1952	42	26	S-E	21 18 49.32N	157 52 0.54W	2	27	3	1.2	-1.0
*294	2022	54	7	S-E	21 18 31.38N	157 51 50.94W	14	0	0	-16.8	-10.6
294	2138	42	33	S-W	21 18 50.10N	157 52 1.62W	2	31	15	1.9	0.1
*294	2206	54	73	S-E	21 18 49.14N	157 52 15.48W	8	30	0	1.0	13.9
294	2330	65	21	N-E	21 18 45.54N	157 52 2.04W	2	28	11	-2.6	0.5
*294	2354	54	7	S-W	21 18 45.24N	157 52 4.26W	2	7	3	-2.9	2.7
295	114	65	47	N-W	21 18 46.50N	157 52 0.0 W	2	36	17	-1.7	-1.6
295	208	63	30	N-E	21 18 47.28N	157 52 1.98W	2	19	3	-0.9	0.4
295	358	63	26	N-W	21 18 52.92N	157 52 1.62W	2	13	1	4.8	0.1
295	630	64	32	N-E	21 18 47.58N	157 52 1.32W	2	30	14	-0.6	-0.2
295	738	42	19	N-E	21 18 46.92N	157 52 0.84W	2	24	4	-1.2	-0.7

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 1A-7 (CONT.)

R/V KANA KEOKI 1973 POSITIONAL DATA. HONOLULU, HAWAII
PORT SIDE TO PIER 18, ANTENNA 14.6 METERS NORTH OF S. END OF PIER.

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
295	816	64	26	N-W	21 18 46.80N	157 52 1.32W	2	28	14	-1.4	-0.2
295	922	42	42	N-W	21 18 46.74N	157 52 0.96W	2	33	16	-1.4	-0.6
295	952	54	66	N-E	21 18 48.24N	157 52 0.18W	2	34	0	0.1	-1.4
*295	1140	54	11	N-W	21 18 46.44N	157 52 3.18W	3	17	7	-1.7	1.6
*295	1240	65	79	S-E	21 19 49.98N	157 52 22.80W	3	30	1	1.8	21.2
*295	1334	63	13	S-E	21 18 57.60N	157 52 13.50W	2	16	2	9.4	11.9
*295	1428	65	7	S-W	21 18 37.50N	157 52 6.78W	2	0	0	-10.7	5.2
295	1518	53	58	S-W	21 18 49.62N	157 52 3.48W	2	22	4	1.5	1.9
295	1754	64	15	S-E	21 18 51.36N	157 52 2.04W	2	18	4	3.2	0.5
295	1938	64	56	S-W	21 18 48.90N	157 52 0.84W	2	33	0	0.7	-0.7
295	2044	42	67	S-E	21 18 49.14N	157 52 5.28W	3	29	0	1.0	3.7
*296	544	64	11	N-E	21 18 51.48N	157 52 1.38W	3	16	7	3.3	-0.2
296	728	64	64	N-W	21 18 47.40N	157 52 1.38W	2	27	1	-0.8	0.4
296	828	42	61	N-E	21 18 47.46N	157 52 1.32W	2	27	0	-0.7	-0.2
296	904	54	24	N-E	21 18 47.10N	157 52 0.18W	2	24	1	-1.1	-1.4
*296	1016	42	11	N-W	21 18 48.06N	157 52 1.38W	6	17	8	0.8	-0.2
296	1048	54	35	N-W	21 18 46.68N	157 52 2.16W	2	33	16	-1.5	0.6
296	1152	65	31	S-E	21 18 48.06N	157 52 2.64W	2	29	13	0.8	1.1
296	1338	65	22	S-W	21 18 49.02N	157 52 1.38W	2	25	11	0.5	-0.5
296	1428	63	40	S-E	21 18 48.66N	157 52 3.72W	2	19	0	0.5	2.2
296	1850	64	59	S-E	21 18 48.26N	157 52 2.64W	3	27	0	1.1	1.1
296	1950	42	29	S-E	21 18 46.50N	157 52 5.28W	2	14	3	-1.7	3.2
*296	2026	54	10	S-E	21 18 45.00N	157 51 57.54W	3	13	2	-3.2	-4.0
*296	2042	64	14	S-W	21 18 47.04N	157 52 0.0 W	3	14	4	-1.1	-1.6
296	2136	42	30	S-W	21 18 48.32N	157 52 0.54W	2	29	14	1.2	-1.0
296	2210	54	53	S-W	21 18 47.76N	157 51 56.46W	2	20	0	-0.4	-5.1
296	2340	65	31	N-E	21 18 46.44N	157 52 0.96W	2	27	2	-1.7	-0.6
*296	2400	54	7	S-W	21 18 21.54N	157 52 6.48W	6	0	0	-26.6	4.9
297	126	65	33	N-W	21 18 46.38N	157 52 0.18W	2	30	0	-1.8	-1.4
297	220	63	43	N-E	21 18 48.90N	157 52 2.28W	2	18	2	0.7	0.7
297	404	63	18	N-W	21 18 46.92N	157 52 1.38W	2	24	11	-1.2	-0.2
297	638	64	46	N-E	21 18 47.10N	157 52 1.20W	2	29	2	-1.1	-0.4
297	736	42	21	N-E	21 18 47.16N	157 52 0.96W	2	26	12	-1.0	-0.6
*297	814	54	7	N-E	21 18 52.38N	157 51 58.98W	2	0	0	3.9	-2.6
297	826	64	18	N-W	21 18 46.44N	157 52 2.04W	2	21	4	-1.7	0.5
297	920	42	39	N-W	21 18 46.68N	157 52 2.04W	2	33	16	-1.2	0.5
*297	956	54	78	N-E	21 18 47.28N	157 52 2.70W	2	34	1	-0.9	1.1
*297	1106	65	10	S-E	21 18 47.10N	157 52 1.86W	2	13	5	-1.1	0.3
*297	1146	54	7	N-W	21 18 51.60N	157 51 59.34W	6	6	3	3.4	-2.2
297	1250	65	62	S-W	21 18 48.48N	157 51 59.10W	2	31	15	0.3	-2.5
297	1340	63	20	S-E	21 18 51.84N	157 52 4.02W	4	20	5	3.7	2.5
297	1526	63	41	S-W	21 18 50.52N	157 52 1.32W	2	23	1	2.4	-0.2
297	1802	64	22	S-E	21 18 49.38N	157 52 2.16W	2	26	7	1.2	0.6
297	1948	64	38	S-W	21 18 49.62N	157 52 1.50W	2	31	10	1.5	-0.1
*297	2040	42	79	S-E	21 18 47.94N	157 52 2.82W	9	0	0	-0.2	1.3
297	2118	54	42	S-E	21 18 47.64N	157 52 2.04W	2	32	15	-0.5	0.5

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 16-7

ARITHMETIC MEAN SOLUTION, HONOLULU, PIER 18, ANT. 14.6 METERS NORTH.

NP	N	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
138	37	101	21 18 48.17N	1.5	0.1
			157 52 1.56W	1.9	0.2

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
290	2314	X		X	
291	54				X
291	244	X		X	
291	612	X			
291	154	X			X
291	1648	X			X
291	2240			X	
292	436	X			
292	1024	X			
292	1134	X			
292	2350	X			
293	202				X
293	620				X
293	1324	X			
293	1418	X			
293	1508		X	X	
293	1930		X		
293	2234	X		X	
294	256		X	X	
294	448	X		X	X
294	2022	X		X	X
294	2206			X	
294	2354	X			
295	1140	X			
295	1240		X		
295	1334	X			X
295	1428	X			X
296	544	X			
296	1016	X		X	
296	2026	X			
296	2042	X			
296	2400	X		X	X
297	814	X			
297	936		X		
297	1106	X			
297	1146	X		X	
297	2040		X	X	

TABLE 1C-7

BY SATELLITE, MEAN SOLUTION, HONOLULU, PIER 18, ANT. 14.6 METERS NORTH.

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	25	21 18 48.00N	1.2	0.2
		157 52 1.74W	2.6	0.5
54	17	21 18 48.22N	1.3	0.3
		157 52 1.28W	2.2	0.5
63	20	21 18 48.13N	1.3	0.3
		157 52 1.44W	2.2	0.5
64	20	21 18 48.13N	1.3	0.3
		157 52 1.44W	2.2	0.5
65	19	21 18 48.08N	1.3	0.3
		157 52 1.24W	2.1	0.5

TABLE 1A-8

R/V KANA KEOKI 1973 POSITIONAL DATA, HONOLULU, HAWAII
SECURED WITH PORT SIDE TO PIER 18, "ANTENNA HEIGHT" +19.0 METERS.

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
353	350	64	50	N-W	21 18 46.80N	157 52 1.50W	3	35	16	-1.4	0.1
353	410	42	25	N-E	21 18 47.76N	157 52 1.62W	2	20	7	-0.4	0.1
*353	436	64	13	N-E	21 18 46.68N	157 52 1.08W	3	16	4	-1.5	-0.4
353	552	42	34	N-W	21 18 46.62N	157 52 2.04W	2	32	15	-1.6	0.6
353	620	64	61	N-W	21 18 46.98N	157 52 1.32W	2	34	0	-1.2	-0.2
*353	812	64	7	N-W	21 18 36.42N	157 52 14.28W	4	0	0	-11.8	12.8
353	832	65	58	S-E	21 18 48.90N	157 52 2.64W	2	33	15	0.7	1.2
353	1018	65	16	S-W	21 18 49.32N	157 52 1.38W	2	26	12	1.1	-0.1
*353	1038	63	38	S-E	21 18 49.92N	157 52 14.28W	5	14	1	1.7	12.8
353	1116	99	43	N-E	21 18 45.78N	157 52 2.16W	2	35	16	-2.4	0.7
353	1216	63	21	S-W	21 18 49.92N	157 52 1.08W	2	27	12	1.7	-0.4
353	1302	99	21	N-W	21 18 44.16N	157 52 1.62W	2	29	13	-4.0	0.1
*353	1514	64	80	S-E	21 18 48.54N	157 52 2.04W	3	29	0	0.3	0.6
*353	1702	64	8	S-W	21 18 46.06N	157 52 4.68W	3	5	0	-3.1	3.2
*353	1718	42	77	S-W	21 18 48.24N	157 51 58.68W	3	0	0	0.0	-2.9
353	1742	54	50	S-S	21 19 49.44N	157 52 1.98W	2	24	0	1.2	0.5
*353	1900	42	7	S-W	21 18 35.40N	157 52 9.00W	3	0	0	-12.8	7.5
*353	1930	54	11	S-W	21 18 51.12N	157 52 2.28W	3	15	3	2.9	0.8
353	2020	65	42	N-E	21 18 47.10N	157 52 1.50W	2	28	2	-1.1	0.0
353	2208	65	15	N-W	21 18 44.52N	157 52 1.62W	2	21	10	-3.7	0.1
*353	2234	99	12	S-E	21 18 46.38N	157 52 0.18W	2	14	5	-1.9	-1.3
354	6	63	26	N-W	21 18 47.64N	157 52 2.94W	2	28	3	-0.6	1.5
354	302	64	65	N-E	21 18 47.52N	157 52 1.38W	2	33	4	-0.7	-0.1
*354	450	64	12	N-W	21 18 48.90N	157 52 0.72W	2	19	9	0.7	-0.8
354	528	54	49	N-E	21 18 47.10N	157 52 2.16W	2	32	6	-1.1	0.7
*354	644	42	8	N-W	21 18 45.48N	157 52 1.98W	6	9	3	-2.7	0.5
354	716	54	16	N-W	21 18 46.14N	157 52 2.16W	2	24	11	-2.1	0.7
354	744	65	23	S-E	21 18 49.74N	157 52 1.86W	2	30	15	1.5	0.4
354	928	65	42	S-W	21 18 49.92N	157 52 1.50W	2	36	18	1.7	0.0
*354	1012	99	10	N-E	21 18 50.82N	157 52 0.30W	2	12	0	2.6	-1.2
354	1126	63	55	S-W	21 18 49.38N	157 52 2.04W	2	35	17	1.2	0.6
*354	1154	99	77	N-W	21 18 46.62N	157 51 58.44W	2	35	1	-1.6	-3.0
*354	1344	99	7	N-W	21 19 55.62N	157 52 0.30W	7	0	0	7.4	-1.2
354	1426	64	31	S-E	21 18 48.96N	157 52 1.20W	2	29	14	0.8	-0.3
354	1612	64	27	S-W	21 18 48.90N	157 52 1.62W	2	30	13	0.7	0.1
354	1652	54	23	S-E	21 18 49.92N	157 52 1.32W	2	26	11	1.7	-0.2
354	1804	42	23	S-W	21 18 49.50N	157 52 1.98W	2	27	13	1.3	0.5
354	1838	54	35	S-W	21 18 50.28N	157 52 1.50W	2	30	15	2.1	0.0
354	1936	65	15	N-E	21 18 49.32N	157 52 0.96W	2	14	2	1.1	-0.8
354	2118	65	45	N-W	21 18 45.78N	157 52 0.42W	2	31	14	-2.4	-1.1
354	2310	99	35	S-E	21 18 49.02N	157 52 2.52W	2	29	13	0.8	1.0
355	56	99	18	S-W	21 18 49.26N	157 52 1.38W	2	21	9	1.1	-0.1
355	214	64	25	N-E	21 18 47.04N	157 52 1.20W	2	23	4	-1.2	-0.3
355	400	64	34	N-W	21 18 46.86N	157 52 1.62W	2	31	5	-1.3	0.1
355	438	54	17	N-E	21 18 47.40N	157 52 1.62W	2	24	11	-0.8	0.1
355	548	42	31	N-W	21 18 46.62N	157 52 1.32W	2	28	3	-1.6	-0.2

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 1A-B (CONT.)

R/V KANA KEOKI 1973 POSITIONAL DATA, HONOLULU, HAWAII
SECURED WITH PORT SIDE TO PIER 18, 'ANTENNA HEIGHT' +19.0 METERS.

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
355	622	54	47	N-W	21 18 45.92N	157 52 0.96W	2	33	16	-1.3	-0.5
*355	840	65	71	S-E	21 18 43.20N	157 52 4.50W	5	33	0	1.0	3.0
*355	1028	65	10	S-W	21 18 45.06N	157 52 2.16W	6	16	7	-3.1	0.7
*355	1048	63	36	S-E	21 18 56.28N	157 52 23.82W	16	0	0	8.1	22.3
*355	1226	63	14	S-W	21 18 49.74N	157 52 1.32W	2	21	9	1.5	-0.2
*355	1338	64	10	S-E	21 18 50.04N	157 52 0.42W	2	14	4	1.9	-1.1
355	1522	64	70	S-W	21 18 48.54N	157 52 1.62W	2	24	0	0.3	0.1
355	1708	42	72	S-W	21 18 48.72N	157 51 59.22W	2	32	1	0.5	-2.3
355	1746	54	68	S-E	21 18 48.84N	157 51 58.74W	4	21	0	0.5	-2.7
*355	1856	42	7	S-W	21 18 33.66N	157 52 7.86W	3	0	0	-8.5	6.4
*355	1934	54	7	S-W	21 18 43.02N	157 52 4.02W	3	6	2	-5.2	2.5
355	2030	65	64	N-E	21 18 47.52N	157 52 0.66W	2	29	1	-0.7	-0.8
*355	2218	65	9	N-W	21 18 52.44N	157 51 59.34W	3	11	5	4.2	-2.1
*355	2348	99	77	S-W	21 18 47.52N	157 51 54.36W	3	30	0	-0.7	-7.1
356	16	63	18	N-W	21 18 47.88N	157 52 2.16W	2	23	11	-0.3	0.7
*356	310	64	73	N-W	21 18 48.60N	157 51 50.76W	2	30	0	0.4	-10.7
356	452	42	70	N-E	21 18 46.92N	157 52 11.82W	3	31	0	-1.3	10.3
356	532	54	64	N-E	21 18 47.52N	157 52 2.16W	2	32	1	-0.7	0.7
*356	642	42	7	N-W	21 18 53.82N	157 52 0.96W	8	0	0	5.6	-0.5
*356	720	54	12	N-W	21 18 46.86N	157 52 1.08W	2	18	8	1.7	-0.4
356	752	65	34	S-E	21 18 48.42N	157 52 2.04W	2	34	11	0.2	0.6
356	938	65	30	S-W	21 18 48.24N	157 52 1.20W	2	33	16	0.0	-0.1
356	1128	99	68	N-E	21 18 46.86N	157 52 1.32W	2	33	16	-1.3	-0.2
*356	1314	99	12	N-W	21 18 43.08N	157 52 0.72W	3	20	9	-5.1	-0.8
356	1434	64	46	S-E	21 18 48.30N	157 52 1.50W	2	33	3	0.1	0.0
356	1614	42	38	S-E	21 18 48.12N	157 52 1.68W	2	30	15	1.1	0.5
356	1654	54	30	S-E	21 18 50.40N	157 52 1.62W	2	30	3	2.2	0.1
356	1800	42	21	S-W	21 18 48.26N	157 52 1.32W	2	27	12	1.1	-0.2
356	1842	54	27	S-W	21 18 50.76N	157 52 1.50W	2	28	14	2.6	0.0
356	1942	65	23	N-E	21 18 46.92N	157 52 1.20W	2	25	12	-1.3	-0.3
356	2130	65	30	N-W	21 18 47.16N	157 52 1.62W	2	27	13	-1.0	0.1
356	2244	99	21	S-E	21 18 48.02N	157 52 1.38W	2	21	4	0.8	-0.1
*356	2332	63	42	N-W	21 18 43.26N	157 51 42.18W	2	14	1	-4.0	-19.3
357	28	99	29	S-W	21 18 48.24N	157 52 1.20W	2	26	12	1.1	-0.3
357	224	64	36	N-E	21 18 48.00N	157 52 0.54W	2	29	14	-0.2	-0.9
357	358	42	29	N-E	21 18 47.94N	157 52 0.54W	2	28	5	-0.3	-0.9
357	442	54	23	N-E	21 18 46.44N	157 52 0.84W	2	28	13	-1.8	-0.6
357	544	42	28	N-W	21 18 46.44N	157 52 2.16W	2	31	15	-1.8	0.7
357	628	54	36	N-W	21 18 46.26N	157 52 1.50W	2	32	15	-1.9	0.0
*357	706	65	12	S-E	21 18 48.84N	157 52 1.20W	4	21	10	0.6	-0.3
357	850	65	71	S-W	21 18 48.72N	157 51 59.40W	2	37	5	0.5	-2.1
357	1022	99	18	N-E	21 18 45.24N	157 51 59.88W	2	25	11	-3.0	-1.6
*357	1046	63	73	S-E	21 18 48.84N	157 51 58.74W	5	31	0	0.5	-2.7
357	1204	99	50	N-W	21 18 45.54N	157 52 0.30W	2	33	6	-2.7	-1.2
*357	1236	63	9	S-W	21 18 47.34N	157 52 4.62W	3	10	4	-0.9	3.1
357	1346	64	16	S-E	21 18 48.54N	157 52 1.32W	2	22	0	0.3	-0.2
*357	1520	42	11	S-E	21 18 50.76N	157 52 2.82W	2	16	7	2.6	1.3

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 1A-8 (CONT.)

R/V KANA KEOKI 1973 POSITIONAL DATA, HONOLULU, HAWAII
SECURED WITH PORT SIDE TO PIER 18, "ANTENNA HEIGHT" +19.0 METERS.

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CISQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
357	1536	64	49	S-W	21 18 49.56N	157 52 1.86W	2	24	8	1.4	0.4
*357	1606	54	9	S-E	21 18 45.72N	157 52 0.18W	2	10	3	-2.5	-1.3
357	1704	42	66	S-W	21 18 49.14N	157 52 0.18W	2	34	16	0.9	-1.3
357	1750	54	75	S-W	21 18 48.02N	157 52 2.28W	2	33	16	0.8	0.8
*357	1854	42	7	S-W	21 18 15.42N	157 52 20.10W	6	0	0	-32.8	18.6
*357	2040	65	85	N-W	21 18 48.78N	157 52 2.40W	2	32	15	0.6	0.9
357	2234	63	67	N-E	21 18 47.76N	157 52 0.30W	2	28	1	-0.4	-1.2
357	2322	99	61	S-E	21 18 48.36N	157 52 3.06W	2	27	13	0.2	1.6
*358	28	63	12	N-W	21 18 51.18N	157 51 59.88W	2	11	2	3.0	-1.6
*358	106	99	9	S-W	21 18 43.02N	157 52 2.16W	2	11	4	-5.2	0.7
*358	136	64	13	N-E	21 18 45.24N	157 51 58.44W	2	18	6	-3.0	-3.0
*358	306	42	9	N-E	21 18 56.76N	157 52 7.32W	8	7	2	8.6	5.8
358	322	64	62	N-W	21 18 46.62N	157 52 2.04W	2	27	7	-1.6	0.6
*358	354	54	7	N-E	21 18 49.36N	157 51 57.00W	2	0	0	0.2	-4.5
*358	448	42	78	N-W	21 18 48.60N	157 51 57.78W	8	0	0	0.4	-3.7
*358	536	54	60	N-E	21 18 47.40N	157 52 1.20W	8	0	0	-0.8	-0.3
*358	640	42	7	N-W	21 18 58.74N	157 51 59.76W	4	0	0	10.5	-1.7
*358	726	54	8	N-W	21 18 47.46N	157 52 2.94W	6	7	3	-0.7	1.5
358	802	65	48	S-E	21 18 48.60N	157 52 2.16W	2	38	19	0.4	0.7
358	948	65	21	S-W	21 18 47.94N	157 52 1.32W	2	23	14	-0.3	-0.2
358	1058	99	45	N-E	21 18 45.72N	157 52 2.52W	2	35	17	-2.5	1.0
358	1144	63	27	S-W	21 18 49.20N	157 52 1.32W	2	30	14	1.0	-0.2
358	1244	99	20	N-W	21 18 44.94N	157 52 1.20W	2	27	12	-3.3	-0.3
358	1442	64	64	S-E	21 18 48.66N	157 52 1.32W	2	35	17	0.5	-0.2
358	1610	42	41	S-E	21 18 48.90N	157 52 2.04W	2	31	15	0.7	0.6
*358	1630	64	12	S-W	21 18 49.92N	157 52 2.70W	3	17	8	1.7	1.2
358	1658	54	39	S-E	21 18 48.96N	157 52 1.98W	2	33	15	0.8	0.5
358	1756	42	19	S-W	21 18 49.80N	157 52 1.50W	2	24	5	0.4	0.0
358	1952	65	34	N-E	21 18 46.98N	157 52 0.72W	2	25	9	-1.2	-0.8
358	2138	65	20	N-W	21 18 47.40N	157 52 1.74W	2	24	11	-0.8	0.3
*358	2216	99	12	S-E	21 18 49.84N	157 52 1.98W	3	16	6	0.6	0.5
358	2400	99	47	S-W	21 18 49.62N	157 52 0.84W	2	28	14	1.4	-0.5
359	230	64	52	N-E	21 18 47.34N	157 52 1.38W	2	30	1	-0.9	-0.1
359	356	42	32	N-E	21 18 47.70N	157 52 0.30W	2	23	14	-0.5	-1.2
359	418	64	15	N-W	21 18 47.76N	157 52 1.98W	2	23	11	-0.4	0.5
359	446	54	30	N-E	21 18 46.98N	157 52 0.18W	2	28	3	-1.2	-1.3
359	544	42	26	N-W	21 18 47.76N	157 52 2.16W	2	23	9	-0.4	0.7
359	634	54	27	N-W	21 18 46.56N	157 52 2.52W	2	26	12	-1.5	1.0
359	716	65	19	S-E	21 18 50.10N	157 52 1.98W	2	25	5	1.9	0.5
359	900	65	51	S-W	21 18 49.44N	157 52 0.30W	3	37	18	1.2	-1.2
*359	954	99	10	N-E	21 18 47.34N	157 52 1.50W	5	15	7	-0.9	0.0
359	1056	63	71	S-W	21 18 48.42N	157 52 1.38W	2	33	16	0.2	-0.1
*359	1136	99	77	N-W	21 18 46.56N	157 51 58.74W	2	36	18	-1.5	-2.7
*359	1246	63	7	S-W	21 18 32.34N	157 52 10.20W	12	0	0	-15.9	8.7
*359	1326	99	7	N-W	21 18 57.84N	157 52 2.16W	3	0	0	9.5	0.7
359	1356	64	25	S-S	21 18 49.68N	157 52 2.16W	2	27	13	1.5	0.7
*359	1518	42	12	S-E	21 18 46.80N	157 52 0.30W	2	16	8	-1.4	-1.2

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 1A-8 (CONT.)

R/V KANA KEOKI 1973 POSITIONAL DATA, HONOLULU, HAWAII
SECURED WITH PORT SIDE TO PIER 18. "ANTENNA HEIGHT" +19.0 METERS.

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
359	1542	64	33	S-W	21 18 46.86N	157 52 1.74W	2	27	8	1.7	0.3
*359	1610	54	13	S-E	21 18 51.30N	157 52 1.32W	2	16	0	3.1	-0.2
359	1700	42	60	S-W	21 18 48.72N	157 52 0.30W	2	34	16	0.5	-1.2
359	1752	54	58	S-W	21 18 49.14N	157 52 1.32W	2	34	17	0.9	-0.2
*359	1906	65	11	N-E	21 18 49.56N	157 52 0.0 W	2	15	7	1.4	-1.5
359	2050	65	56	N-W	21 18 46.62N	157 52 0.84W	2	32	15	-1.6	-0.6
*359	2248	63	71	N-W	21 18 46.44N	157 52 30.06W	6	18	1	-1.8	29.6
*360	34	63	7	N-W	21 18 43.02N	157 52 31.26W	6	0	0	-5.2	29.8
360	144	64	20	N-E	21 18 47.34N	157 51 59.76W	2	25	7	-0.9	-1.7
*360	304	42	9	N-E	21 18 43.20N	157 51 59.14W	3	12	5	-5.0	-6.3
360	328	64	42	N-W	21 18 46.62N	157 52 1.38W	2	34	17	-1.6	-0.1
*360	358	54	9	N-E	21 18 49.74N	157 52 0.18W	2	9	4	1.5	-1.3
360	444	42	63	N-W	21 18 47.34N	157 52 0.30W	2	30	0	-0.9	-1.2
*360	540	54	76	N-W	21 18 47.40N	157 52 0.66W	2	35	16	-0.8	-0.8
*360	636	42	7	N-W	21 18 57.48N	157 52 4.02W	2	0	0	9.3	2.5
*360	732	54	7	N-W	21 18 48.18N	157 52 4.80W	3	0	0	-0.0	3.3
360	812	65	68	S-E	21 18 48.66N	157 52 3.36W	2	36	2	0.5	1.9
*360	1000	65	14	S-W	21 18 49.38N	157 52 0.54W	3	22	10	1.2	-0.9
360	1032	99	29	N-E	21 18 46.26N	157 52 1.32W	2	31	14	-1.9	-0.2
360	1152	63	19	S-W	21 18 49.42N	157 52 1.50W	2	25	11	0.2	0.0
360	1216	99	31	N-W	21 18 45.36N	157 52 1.38W	2	32	14	-2.2	-0.1
*360	1452	64	84	S-W	21 18 48.60N	157 51 59.88W	2	36	17	0.4	-1.6
360	1606	42	45	S-E	21 18 48.90N	157 52 1.98W	2	32	15	0.7	0.5
*360	1642	64	7	S-W	21 18 44.22N	157 52 4.38W	3	0	0	-4.0	2.9
360	1702	54	51	S-E	21 18 48.90N	157 52 1.98W	2	33	16	0.7	0.5
360	1752	42	18	S-W	21 18 48.72N	157 52 1.74W	2	24	11	0.5	0.3
360	1848	54	15	S-W	21 18 49.68N	157 52 2.04W	2	22	10	1.5	0.6
360	2000	65	51	N-E	21 18 47.40N	157 52 2.28W	2	28	10	-0.9	0.8
*360	2150	99	7	S-E	21 19 10.50N	157 52 1.98W	11	0	0	22.3	0.5
*360	2202	63	35	N-E	21 18 49.38N	157 52 7.56W	7	13	1	0.2	6.1
360	2332	99	72	S-W	21 18 47.88N	157 52 0.0 W	2	26	0	-0.3	-1.5
*361	240	64	72	N-E	21 18 47.88N	157 51 58.74W	6	0	0	-0.3	-2.7
361	352	42	35	N-E	21 18 47.76N	157 52 0.66W	2	28	5	-0.4	-0.8
*361	430	64	9	N-W	21 18 49.50N	157 52 1.62W	4	13	5	1.3	0.1
361	448	54	39	N-E	21 18 47.10N	157 52 1.20W	2	31	2	-1.1	-0.3
361	536	42	24	N-W	21 18 47.64N	157 52 1.08W	2	29	14	-0.6	-0.4
361	636	54	21	N-W	21 18 46.80N	157 52 1.98W	2	27	12	-1.4	0.5
361	724	65	28	S-E	21 18 49.92N	157 52 2.82W	2	33	15	1.7	1.3
361	910	65	36	S-W	21 18 49.68N	157 52 0.06W	2	35	16	1.5	-1.4
361	1104	63	50	S-W	21 18 49.68N	157 52 1.50W	2	34	15	1.5	0.0
*361	1256	99	11	N-W	21 18 47.04N	157 52 0.96W	3	17	7	-1.2	-0.5
361	1404	64	36	S-E	21 18 49.14N	157 52 1.74W	2	32	15	0.9	0.3
*361	1514	42	14	S-E	21 18 49.62N	157 52 0.30W	2	16	6	1.4	-1.2
361	1550	64	23	S-W	21 18 48.96N	157 52 2.04W	2	27	1	0.8	0.5
361	1612	54	18	S-E	21 18 50.28N	157 52 1.32W	2	24	11	2.1	-0.2
361	1656	42	55	S-W	21 18 49.62N	157 52 0.30W	2	32	3	1.4	-1.2
361	1916	65	18	N-E	21 18 48.06N	157 52 0.66W	2	21	10	-0.1	-0.8

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 1A-8 (CONT.)

R/V KANA KEOKI 1973 POSITIONAL DATA, HONOLULU, HAWAII
SECURED WITH PORT SIDE TO PIER 18, "ANTENNA HEIGHT" +19.0 METERS.

DAY	GMT	SAT	ELEV	QUAD	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
*361	2058	65	37	N-W	21 18 41.70N	157 52 31.20W	2	22	6	-6.5	29.7
*361	2226	99	22	S-E	21 18 43.14N	157 52 31.86W	2	23	2	-5.1	30.4
*361	2250	63	63	N-W	21 18 45.20N	157 53 27.78W	2	25	1	-2.0	96.3
362	12	99	28	S-W	21 18 49.38N	157 52 1.32W	2	23	10	1.2	-0.2
362	154	64	29	N-E	21 18 48.42N	157 52 0.84W	2	22	0	0.2	-0.6
*362	300	42	10	N-E	21 18 47.28N	157 51 57.66W	2	9	0	-0.6	-3.8
362	340	64	23	N-W	21 18 47.22N	157 52 1.98W	2	30	15	-1.0	0.5
*362	400	54	12	N-E	21 18 47.04N	157 52 1.20W	2	16	5	-1.2	-0.3
362	440	42	72	N-W	21 18 48.06N	157 51 59.34W	2	35	17	-0.1	-2.1
362	542	54	59	N-W	21 18 47.46N	157 52 0.66W	2	33	7	-0.7	-0.8
*362	822	65	82	S-W	21 18 47.16N	157 51 45.90W	3	36	1	-1.0	-15.6
362	1004	99	18	N-E	21 18 47.40N	157 52 1.38W	2	24	6	-0.8	-0.1
362	1022	63	63	S-E	21 18 48.02N	157 52 6.84W	2	13	0	0.8	5.1
362	1148	99	48	N-W	21 18 46.20N	157 52 0.66W	2	35	16	-2.0	-0.9
*362	1318	64	13	S-E	21 18 48.90N	157 52 0.54W	2	19	9	0.7	-0.9
362	1502	64	60	S-W	21 18 48.26N	157 52 1.32W	2	32	11	1.1	-0.2
362	1602	42	49	S-E	21 18 48.26N	157 52 2.28W	2	33	15	1.1	0.8
362	1706	54	67	S-E	21 18 48.62N	157 52 1.32W	2	31	8	1.4	-0.2
362	1748	42	16	S-W	21 18 48.38N	157 52 1.38W	2	22	10	1.8	-0.1
*362	1854	54	11	S-W	21 18 48.62N	157 52 2.16W	5	16	7	1.4	0.7
362	2010	65	68	N-E	21 18 47.34N	157 52 4.02W	3	25	0	-0.8	2.5
362	2202	63	52	N-E	21 18 48.30N	157 52 1.08W	2	21	3	0.1	-0.4
362	2304	99	64	S-E	21 18 48.60N	157 52 1.98W	2	28	14	0.4	0.5
362	2350	63	17	N-W	21 18 46.08N	157 52 1.74W	2	20	0	-2.1	0.3
*363	50	99	8	S-W	21 18 47.04N	157 52 3.48W	2	9	3	-1.2	2.0
*363	108	64	9	N-E	21 18 54.60N	157 52 5.78W	3	10	1	6.4	5.3
*363	248	64	76	N-W	21 18 48.54N	157 52 15.66W	2	29	0	0.3	14.2
363	348	42	38	N-E	21 18 47.58N	157 52 0.18W	2	29	8	-0.6	-1.3
*363	442	64	7	N-W	21 18 59.56N	157 52 3.30W	4	0	0	10.4	1.8
363	454	54	50	N-E	21 18 47.04N	157 52 1.38W	2	30	14	-1.2	-0.1
363	534	42	22	N-W	21 18 49.62N	157 52 1.32W	2	25	10	-1.6	-0.2
363	640	54	15	N-W	21 18 45.96N	157 52 2.28W	2	22	10	-2.2	0.8
363	734	65	40	S-E	21 18 49.08N	157 52 2.94W	2	35	17	0.0	1.5
363	920	65	25	S-W	21 18 48.90N	157 52 0.72W	2	30	3	0.7	-0.8
363	1040	99	46	N-E	21 18 46.26N	157 52 2.70W	2	33	1	-1.9	1.2
363	1112	63	35	S-W	21 18 49.50N	157 52 1.08W	2	32	12	1.3	-0.4
363	1228	99	19	N-W	21 18 45.60N	157 52 2.70W	2	25	12	-2.5	1.2
363	1414	64	53	S-E	21 18 49.02N	157 52 1.50W	2	32	15	0.8	0.0
363	1508	42	15	S-E	21 18 49.98N	157 52 1.62W	2	23	10	1.8	0.1
363	1600	64	15	S-W	21 18 49.08N	157 52 1.74W	2	22	10	0.9	0.3
363	1620	54	24	S-E	21 18 49.38N	157 52 3.18W	2	16	2	1.2	1.7
363	1654	42	50	S-W	21 18 50.04N	157 52 2.16W	2	31	15	1.8	0.7
363	1800	54	34	S-W	21 18 50.46N	157 52 1.98W	2	31	14	2.3	0.5
363	1924	65	28	N-E	21 18 48.06N	157 52 0.66W	2	27	13	-0.1	-0.8
363	2110	65	25	N-W	21 18 47.58N	157 52 2.40W	2	26	2	-0.5	0.9
*363	2158	99	13	S-E	21 18 51.36N	157 52 5.94W	2	13	0	3.9	4.5
363	2300	63	45	N-W	21 18 46.80N	157 52 2.16W	2	35	17	-1.4	0.7

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 1A-8 (CONT.)

P/V KANA KEOKI 1973 POSITIONAL DATA, HONOLULU, HAWAII
SECURED WITH PORT SIDE TO PIER 18, "ANTENNA HEIGHT" +19.0 METERS.

DAY	GMT	SAT	ELEV	QUAD	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
363	2342	99	45	S-W	21 18 50.70N	157 52 0.72W	2	29	13	2.5	-0.8
364	200	64	42	N-E	21 18 47.58N	157 52 1.32W	2	28	10	-0.6	-0.2
*364	256	42	12	N-E	21 18 47.64N	157 51 59.40W	2	15	5	-0.3	-2.1
364	348	64	20	N-W	21 18 46.32N	157 52 1.08W	2	27	12	-1.9	0.5
364	436	42	66	N-W	21 18 47.52N	157 52 1.32W	2	32	9	-0.7	-0.2
364	546	54	45	N-W	21 18 46.98N	157 52 1.08W	2	34	17	-1.2	-0.4
364	646	65	16	S-E	21 18 49.50N	157 52 2.28W	2	24	7	1.3	0.8
364	832	65	61	S-W	21 18 49.32N	157 51 59.76W	3	37	18	1.1	-1.7
*364	1212	63	7	S-W	21 18 43.02N	157 52 5.04W	4	3	1	-5.2	3.6
*364	1310	99	7	N-W	21 19 10.02N	157 52 5.16W	8	0	0	22.7	3.7
*364	938	99	11	N-E	21 18 46.08N	157 51 58.68W	2	16	7	-2.1	-2.4
*364	1022	63	75	S-E	21 18 48.18N	157 51 59.64W	11	0	0	-0.0	-1.8
364	1118	99	73	N-W	21 18 46.62N	157 51 59.34W	3	34	16	-1.5	-2.1
364	1326	64	20	S-E	21 18 49.98N	157 52 1.08W	2	26	12	1.8	-0.4
364	1510	64	41	S-W	21 18 49.62N	157 52 1.32W	2	33	15	1.4	-0.2
364	1558	42	54	S-E	21 18 49.14N	157 52 2.16W	2	34	16	0.9	0.7
*364	1708	54	76	S-E	21 18 49.02N	157 52 2.64W	7	0	0	0.8	1.2
*364	1746	42	14	S-W	21 18 50.58N	157 52 1.38W	2	21	10	2.4	-0.1
*364	1838	65	9	N-E	21 18 43.20N	157 51 58.98W	2	10	4	1.0	-2.5
*364	1958	54	7	S-W	21 18 38.34N	157 52 2.64W	4	4	1	-3.9	1.2
364	2020	65	71	N-W	21 18 47.16N	157 52 1.08W	2	31	1	-1.0	-0.4
*364	2210	63	71	N-E	21 18 55.02N	157 52 42.84W	3	30	7	6.8	41.4
364	2236	99	39	S-E	21 18 48.96N	157 52 1.98W	2	28	14	0.8	0.5
*364	2400	63	11	N-W	21 18 47.40N	157 52 2.52W	3	16	1	-0.8	1.0
365	20	99	16	S-W	21 18 48.84N	157 52 0.96W	2	21	10	0.6	-0.5
365	114	64	16	N-E	21 18 48.66N	157 51 59.40W	2	21	7	0.5	-2.1
365	258	54	52	N-W	21 18 47.22N	157 52 1.20W	2	34	16	-1.0	-0.3
365	342	42	42	N-E	21 18 47.34N	157 52 1.08W	2	33	16	-0.9	-0.4
365	456	54	66	N-E	21 18 47.40N	157 52 1.50W	2	32	2	-0.8	0.0
365	530	42	20	N-W	21 18 46.50N	157 52 2.16W	2	25	8	-1.7	0.7
*365	644	54	11	N-W	21 18 45.42N	157 52 1.32W	5	17	7	-2.8	-0.2
365	744	65	58	S-E	21 18 49.26N	157 52 3.72W	2	33	4	1.1	2.2
365	830	65	17	S-W	21 18 49.62N	157 52 0.18W	2	26	12	1.4	-1.3
365	1014	99	30	N-E	21 18 46.26N	157 52 1.20W	2	31	14	-1.9	-0.3
365	1120	63	25	S-W	21 18 48.18N	157 52 2.04W	2	29	13	1.2	0.5
365	1158	99	29	N-W	21 18 46.02N	157 52 1.62W	2	30	9	-2.2	0.1
*365	1422	64	76	S-E	21 18 48.60N	157 52 1.86W	2	25	1	0.4	0.4
365	1504	42	17	S-E	21 18 49.74N	157 52 1.38W	2	22	0	1.5	-0.1
*365	1610	64	9	S-W	21 18 44.46N	157 52 3.96W	3	11	1	-3.7	2.5
365	1650	42	46	S-W	21 18 50.16N	157 52 1.20W	2	32	15	2.0	-0.3
365	1804	54	26	S-W	21 18 50.58N	157 52 2.16W	2	29	13	2.4	-0.7
365	1932	65	42	N-E	21 18 47.88N	157 52 1.20W	2	29	13	-0.3	-0.3
365	2120	65	16	N-W	21 18 45.66N	157 52 2.28W	2	23	10	-2.5	1.7
365	2308	63	32	N-W	21 18 47.58N	157 52 1.50W	2	29	12	-0.6	0.0
1	210	64	61	N-E	21 18 48.00N	157 52 0.30W	2	33	14	-0.2	-1.2
* 1	250	42	13	N-E	21 18 43.44N	157 51 58.02W	2	19	9	-4.8	-3.5

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 1A-8 (CONT.)

R/V KANA KEOKI 1973 POSITIONAL DATA, HONOLULU, HAWAII
SECURED WITH PORT SIDE TO PIER 18, 'ANTENNA HEIGHT' 419.0 METERS.

	DAY	GMT	SAT	ELEV	RECM	LATITUDE	LONGITUDE	IT	CTS	CTSO	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
*	1	358	64	12	N-W	21 18 43.44N	157 52 1.32W	5	20	9	-4.8	-0.2
	1	434	42	61	N-W	21 18 47.04N	157 52 1.38W	2	33	1	-1.2	-0.1
	1	550	54	34	N-W	21 18 47.22N	157 52 1.08W	2	31	15	-1.0	-0.4
*	1	626	42	7	N-W	21 18 34.74N	157 52 5.84W	12	0	0	46.5	4.4
	1	656	65	23	S-E	21 18 50.40N	157 52 2.16W	2	29	10	2.2	0.7
	1	842	65	43	S-W	21 18 50.70N	157 51 59.76W	2	36	19	2.5	-1.7
	1	1032	63	65	S-W	21 18 49.78N	157 52 0.84W	2	33	7	0.6	-0.6
	1	1054	99	74	N-E	21 18 47.94N	157 52 0.84W	2	31	15	-0.3	-0.6
*	1	1224	63	7	S-W	21 17 54.60N	157 52 7.20W	2	0	0	-53.6	5.7
*	1	1240	99	10	N-W	21 18 46.02N	157 52 1.20W	2	15	6	-2.2	-0.3
	1	1334	64	29	S-E	21 18 49.86N	157 52 1.50W	2	31	15	1.7	0.0
	1	1520	64	28	S-W	21 18 49.92N	157 52 1.32W	2	27	2	1.7	-0.2
	1	1554	42	59	S-E	21 18 48.90N	157 52 1.98W	2	33	0	0.7	0.5
	1	1712	54	73	S-W	21 18 48.78N	157 52 2.28W	2	33	6	0.5	0.9
*	1	1742	42	13	S-W	21 18 50.10N	157 52 1.50W	2	19	9	1.9	0.0
	1	1848	65	15	N-E	21 18 49.72N	157 52 0.96W	2	18	9	0.5	-0.5
*	1	1902	54	7	S-W	21 18 24.48N	157 52 10.44W	4	0	0	-23.7	0.0
	1	2030	65	47	N-W	21 18 46.20N	157 52 2.28W	2	29	7	-2.0	0.8
	1	2208	99	23	S-E	21 18 50.34N	157 52 1.38W	2	25	11	2.1	-0.1
*	1	2226	63	77	N-W	21 18 48.78N	157 52 5.16W	5	17	1	0.6	3.7
	1	2354	99	26	S-W	21 18 49.86N	157 52 1.98W	2	24	12	1.7	0.5
*	2	12	63	7	N-W	21 18 58.20N	157 52 2.28W	6	0	0	10.0	0.8
	2	122	64	23	N-E	21 18 48.54N	157 52 1.08W	2	27	11	0.3	-0.4
	2	308	64	35	N-W	21 18 47.52N	157 52 2.04W	2	28	0	-0.7	0.6
	2	340	42	46	N-E	21 18 47.64N	157 52 0.54W	2	28	3	-0.6	-0.9
*	2	458	54	65	N-E	21 18 48.66N	157 52 7.32W	11	0	0	0.5	5.8
	2	526	42	18	N-W	21 18 47.82N	157 52 1.50W	2	20	0	-0.4	0.0
*	2	612	65	7	S-E	21 18 42.00N	157 51 56.64W	2	0	0	-6.2	-4.8
*	2	650	54	7	N-W	21 18 51.42N	157 52 1.32W	7	0	0	3.2	-0.2
*	2	754	65	76	S-E	21 18 50.04N	157 52 6.24W	2	33	1	1.9	4.8
*	2	942	65	11	S-W	21 18 50.16N	157 52 2.52W	6	0	0	2.0	1.0
	2	1130	63	17	S-W	21 18 48.60N	157 52 2.64W	2	21	5	0.4	1.2
*	2	1248	64	9	S-E	21 18 38.34N	157 52 1.86W	2	10	0	-8.8	0.4
	2	1942	65	63	N-E	21 18 48.54N	157 52 0.06W	2	27	1	0.3	-1.4
	2	2130	63	38	N-E	21 18 49.62N	157 51 58.86W	2	11	0	1.4	-2.5
	2	2246	99	66	S-E	21 18 44.18N	157 52 2.40W	2	30	14	-0.0	0.9
	2	2318	63	23	N-W	21 18 47.82N	157 52 2.04W	2	29	14	-0.4	0.6
*	3	32	99	8	S-W	21 18 26.04N	157 52 3.96W	2	8	4	-22.2	2.5
*	3	218	64	84	N-E	21 18 47.16N	157 52 31.92W	2	30	0	-1.0	30.4
*	3	246	42	14	N-E	21 18 47.76N	157 52 1.32W	2	18	8	-0.4	-0.2
	3	410	54	30	N-E	21 18 47.34N	157 52 0.66W	2	24	0	-0.9	-0.8
	3	430	42	56	N-W	21 18 47.16N	157 52 1.20W	2	30	0	-1.0	-0.3
	3	556	54	26	N-W	21 18 47.16N	157 52 2.40W	2	28	3	-1.0	0.9
	3	706	65	34	S-E	21 18 50.40N	157 52 2.82W	2	33	16	2.2	1.3
	3	852	65	30	S-W	21 18 49.32N	157 52 0.30W	2	26	1	1.7	-1.2
	3	1024	99	47	N-E	21 18 49.12N	157 52 2.52W	2	34	16	-0.1	1.0
	3	1044	63	46	S-W	21 18 49.50N	157 52 1.74W	2	24	8	1.3	0.3

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 1A-B (CONT.)

R/V KANA KEOKI 1973 POSITIONAL DATA, HONOLULU, HAWAII
SECURED WITH PORT SIDE TO PIER 18, 'ANTENNA HEIGHT' +19.0 METERS.

	DAY	GMT	SAT	ELEV	QUAD	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
	3	1210	09	17	N-W	21 18 45.56N	157 52 2.04W	2	25	11	-1.6	0.5
	3	1342	64	43	S-E	21 18 48.24N	157 52 1.74W	2	33	15	0.0	0.3
	3	1530	64	13	S-W	21 18 51.14N	157 52 6.00W	2	15	1	3.0	5.4
	3	1550	42	54	S-E	21 18 48.48N	157 52 1.32W	2	34	16	0.3	-0.2
	3	1716	54	55	S-W	21 18 49.14N	157 52 1.08W	2	32	1	0.9	-0.4
*	3	1738	42	11	S-W	21 18 51.12N	157 52 1.38W	2	17	7	2.9	-0.1
	3	1956	65	23	N-E	21 19 47.70N	157 51 59.76W	2	24	7	-0.5	-1.7
	3	2040	65	32	N-W	21 18 45.56N	157 52 2.16W	2	30	15	-1.6	0.7
*	3	2140	09	14	S-E	21 18 41.64N	157 51 54.84W	6	14	0	-6.3	-6.6
	3	2226	63	59	N-W	21 18 49.00N	157 52 0.06W	2	34	0	-0.2	-1.4
	3	2326	09	43	S-W	21 18 50.04N	157 52 2.04W	2	26	12	2.7	0.5
	4	134	64	34	N-E	21 18 47.52N	157 52 0.06W	2	23	11	-0.7	-1.4
	4	318	64	24	N-W	21 18 47.34N	157 52 1.62W	2	19	2	-0.9	0.1
	4	338	42	50	N-E	21 18 47.82N	157 51 59.76W	2	25	0	-0.4	-1.7
	4	502	54	58	N-W	21 18 47.52N	157 52 0.72W	2	30	1	-0.3	-0.9
	4	522	42	16	N-W	21 18 46.92N	157 52 1.32W	2	24	11	-1.3	-0.2
*	4	620	65	12	S-E	21 18 50.58N	157 52 2.04W	3	19	9	2.4	0.5
*	4	654	54	7	N-W	21 19 12.72N	157 52 4.68W	6	0	0	24.5	3.2
	4	802	65	73	S-W	21 18 49.00N	157 51 58.86W	3	38	19	-0.2	-2.6
*	4	920	09	11	N-E	21 18 45.84N	157 51 59.40W	5	16	8	-2.4	-2.1
	4	950	63	67	S-E	21 18 49.32N	157 52 1.32W	2	25	0	0.1	-0.2
	4	1102	09	70	N-W	21 18 46.20N	157 52 1.20W	2	34	13	-2.0	-0.3
*	4	1138	63	11	S-W	21 18 50.22N	157 52 2.70W	2	14	1	2.0	1.2
*	4	1252	09	7	N-W	21 18 58.08N	157 52 11.16W	8	0	0	9.9	8.7
	4	1440	64	51	S-W	21 18 49.32N	157 52 1.32W	2	34	16	1.1	-0.2
	4	1500	42	21	S-E	21 18 49.38N	157 52 0.72W	2	18	2	1.2	-0.8
	4	1624	54	53	S-E	21 18 48.54N	157 52 2.16W	2	35	17	0.3	0.7
	4	1644	42	39	S-W	21 18 49.98N	157 52 1.32W	2	28	13	1.8	-0.2
	4	1812	54	15	S-W	21 18 49.44N	157 52 2.28W	2	22	10	1.2	0.9
*	4	1952	65	87	N-W	21 18 47.76N	157 52 20.22W	2	31	12	-0.4	18.7
	4	2138	63	44	N-E	21 18 49.02N	157 52 0.06W	2	14	0	0.8	-1.4
	5	1904	65	34	N-E	21 19 48.72N	157 52 0.18W	2	27	11	0.5	-1.3
	5	2050	65	21	N-W	21 18 46.32N	157 52 2.16W	2	22	8	-1.9	0.7
	5	2236	63	42	N-W	21 18 47.40N	157 52 1.80W	2	35	17	-0.8	0.4
	5	2256	09	72	S-W	21 18 49.32N	157 52 1.32W	2	29	1	1.1	-0.2
	6	140	64	49	N-E	21 18 47.52N	157 52 0.96W	2	28	0	-0.7	-0.5
*	6	322	54	13	N-E	21 18 51.12N	157 52 1.38W	4	12	0	2.9	-0.1
	6	506	54	56	N-W	21 18 47.70N	157 52 0.42W	2	34	17	-0.5	-1.1
	6	626	65	19	S-E	21 18 50.76N	157 52 1.86W	2	28	13	2.6	0.4
	6	2336	09	26	S-W	21 18 49.98N	157 52 1.86W	2	25	12	1.8	0.4
	7	52	64	19	N-E	21 18 47.22N	157 51 59.22W	2	21	9	-1.0	-2.3
	7	238	64	44	N-W	21 18 46.68N	157 52 1.38W	2	21	2	-1.5	-0.1
	7	416	54	52	N-E	21 18 47.34N	157 52 1.62W	2	33	15	-0.9	0.1
	7	602	54	15	N-W	21 18 46.02N	157 52 1.50W	2	21	10	-2.2	0.0
	7	724	65	67	S-E	21 18 49.56N	157 52 4.02W	2	38	18	0.3	2.5

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 1A-8 (CONT.)

R/V KANA KEOKI 1973 POSITIONAL DATA, HONOLULU, HAWAII
SECURED WITH PORT SIDE TO PIER 18, 'ANTENNA HEIGHT' +19.0 METERS.

	DAY	GMT	SAT	ELEV	QUAD	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
*	7	510	65	14	S-W	21 23 39.16N	157 55 22.92W	4	15	5	290.0	201.4
	7	930	99	19	N-E	21 18 46.92N	157 52 0.66W	3	25	11	-1.3	-0.8
	7	1058	63	22	S-W	21 18 49.68N	157 52 1.50W	2	25	0	1.5	0.0
	7	1118	99	42	N-W	21 18 46.98N	157 52 1.32W	2	24	9	-1.2	-0.2
*	7	1400	64	77	S-E	21 18 48.30N	157 51 55.80W	3	34	1	0.1	-5.7

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 18-8

ARITHMETIC MEAN SOLUTION, HONOLULU, PISP 18, 'ANT. HEIGHT' +19.0 METERS

NP	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
377	125	252	21 18 48.19N	1.4	0.1
			157 52 1.48W	1.2	0.1

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
353	436	X			
353	812	X			X
353	1038			X	X
353	1514		X		
353	1702	X			
353	1718		X		
353	1900	X			X
353	1930	X			
353	2234	X			
354	450	X			
354	644	X		X	
354	1012	X			
354	1154		X		
354	1344	X		X	
355	840			X	
355	1028	X		X	
355	1048			X	X
355	1226	X			
355	1338	X			
355	1856	X			
355	1934	X			
355	2218	X			
355	2348		X		
356	310				X
356	642	X		X	
356	720	X			
356	1314	X			
356	2332				X
357	706	X			
357	1046			X	
357	1236	X			
357	1520	X			
357	1606	X			
357	1854	X		X	X
357	2042		X		
358	28	X			
358	106	X			
358	136	X			

ALL PROBLEM PASSES ARE LISTED BELOW (CONT.)

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
359	306	X		X	
358	354	X			
358	448		X	X	
358	535			X	
358	640	X			X
358	726	X		X	
358	1630	X			
359	2210	X			
359	954	X		X	
359	1136		X		
359	1246	X		X	X
359	1326	X			
359	1518	X			
359	1610	X			
359	1706	X			
359	2218			X	X
360	34	X		X	X
360	304	X			
360	358	X			
360	540		X		
360	636	X			
360	732	X			
360	1000	X			
360	1452		X		
360	1642	X			
360	2150	X		X	X
360	2202			X	
361	240			X	
361	430	X			
361	1256	X			
361	1514	X			
361	2058				X
361	2226				X
361	2250				X
362	300	X			
362	400	X			
362	822		X		X
362	1318	X			
362	1854	X		X	
363	50	X			
363	108	X			
363	248		X		X
363	442	X			X
363	2158	X			
364	256	X			
364	1212	X			
364	1310	X		X	X
364	938	X			
364	1022			X	
364	1708		X	X	
364	1746	X			
364	1838	X			
364	1858	X			

ALL PROBLEM PASSES ARE LISTED BELOW (CONT.)

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
364	2210				x
364	2400	x			
365	644	x		x	
365	1422		x		
365	1610	x			
1	250	x			
1	358	x		x	
1	626	x		x	x
1	1224	x			x
1	1240	x			
1	1742	x			
1	1902	x			x
1	2226		x	x	
2	12	x		x	
2	458			x	
2	612	x			
2	650	x		x	
2	754		x		
2	942	x		x	
2	1248	x			
3	32	x			x
3	218		x		x
3	246	x			
3	1738	x			
3	2140	x		x	
4	520	x			
4	654	x		x	x
4	920	x		x	
4	1138	x			
4	1252	x		x	
4	1952		x		x
6	322	x			
7	910	x			x
7	1400		x		

TABLE 1C-8

BY SATELLITE, MEAN SOLUTION, HONOLULU, PIER 18, 'ANT. HEIGHT' +12.0 METERS

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	45	21 18 48.23N 157 52 1.43W	1.1 1.8	0.2 0.3
54	44	21 18 48.25N 157 52 1.43W	1.1 1.8	0.2 0.3
63	26	21 18 48.26N 157 52 1.53W	1.0 2.3	0.2 0.4
64	45	21 18 48.23N 157 52 1.45W	1.1 1.9	0.2 0.3
65	52	21 18 48.27N 157 52 1.48W	1.2 1.6	0.2 0.2
99	40	21 18 48.26N 157 52 1.52W	1.1 1.8	0.2 0.3

TABLE 1A-9

R/V KANA KEOKI 1974 POSITIONAL DATA, HONOLULU, HAWAII
MOORED TO WEST SIDE OF PIER 40 (A,B).

	DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
	9	100	64	29	N-E	21 19 3.72N	157 52 52.74W	4	22	6	-0.6	-1.3
	9	250	64	30	N-W	21 19 2.22N	157 52 54.00W	2	23	9	-2.1	0.8
	9	418	42	43	N-W	21 19 4.44N	157 52 54.24W	2	17	4	0.1	0.2
*	9	550	65	9	S-E	21 19 3.00N	157 52 54.48W	3	12	6	-1.3	0.4
*	9	628	64	10	N-W	21 19 2.28N	157 52 54.66W	3	15	5	-2.0	0.6
*	9	734	65	67	S-W	21 19 3.48N	157 52 37.20W	9	0	0	-0.8	-16.9
*	9	902	99	11	N-E	21 19 5.82N	157 52 51.96W	2	15	6	1.5	-2.1
*	9	918	63	33	S-E	21 18 56.58N	157 53 34.02W	10	11	0	-7.7	39.9
	9	1044	99	66	N-W	21 19 2.64N	157 52 53.04W	2	34	16	-1.7	-1.0
	9	1106	63	15	S-W	21 19 4.92N	157 52 53.58W	2	20	0	0.6	-0.5
*	9	1226	64	12	S-E	21 19 3.90N	157 52 53.46W	2	18	8	-0.4	-0.6
	9	1410	64	64	S-W	21 19 4.74N	157 52 54.06W	2	35	15	0.4	-0.0
	9	1540	64	13	S-E	21 19 2.70N	157 52 56.86W	2	14	6	-1.5	4.8
	9	1728	64	26	S-W	21 19 6.60N	157 52 53.82W	2	25	5	2.3	-0.3
	9	1922	65	67	N-E	21 19 5.46N	157 52 52.38W	2	25	0	1.1	-1.7
	9	2200	99	43	S-E	21 19 6.00N	157 52 53.40W	2	30	14	1.7	-0.7
	9	2254	63	21	N-W	21 19 4.02N	157 52 53.94W	2	26	0	-0.3	-0.1

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 18-9

ARITHMETIC MEAN SOLUTION, HONOLULU, PIES 40 (A,B).

NP	N	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
17	6	11	21 19 4.31N 157 52 54.09W	1.4 1.7	0.4 0.5

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
9	550	x			
9	608	x			
9	734			x	x
9	902	x			
9	918			x	x
9	1226	x			

TABLE 1C-9

BY SATELLITE, MEAN SOLUTION, HONOLULU, RIEF 40 (A,B).

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	1	21 19 4.44N 157 52 54.24W		
54	2	21 19 3.57N 157 52 56.56W	1.2 3.3	0.9 2.3
63	2	21 19 3.57N 157 52 56.56W	1.2 3.3	0.9 2.3
64	3	21 19 4.58N 157 52 55.64W	2.0 2.8	1.1 1.6
65	1	21 19 4.44N 157 52 54.24W		
95	2	21 19 3.57N 157 52 56.56W	1.2 3.3	0.9 2.3

TABLE 2A-1

R/V MAHI 1970 POSITIONAL DATA, PAGO PAGO, SAMOA ISLANDS
MOORED TO THE 'OIL DOCK'.

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSO	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
154	344	64	20		14 16 38.52S	170 40 55.86W	2	22	11	3.6	0.6
154	536	42	62		14 16 33.96S	170 40 56.76W	2	26	10	-0.9	1.4
*154	624	64	84		14 16 32.10S	170 40 51.78W	3	32	0	-2.8	-3.5
154	1226	63	33		14 16 34.26S	170 40 55.50W	2	28	12	-0.6	0.2
154	1342	64	26		14 16 34.08S	170 40 54.18W	2	23	10	-0.8	-1.1
154	1414	63	22		14 16 35.82S	170 40 55.98W	2	25	11	0.9	0.7
154	1528	64	28		14 16 34.38S	170 40 56.52W	2	25	11	-0.6	1.2
154	1556	42	63		14 16 34.02S	170 40 54.18W	2	32	15	-0.9	-1.1
154	1950	64	43		14 16 35.40S	170 40 55.20W	2	29	14	0.5	-0.1
154	2142	64	17		14 16 36.54S	170 40 58.38W	3	14	3	1.6	3.1
155	14	63	26		14 16 36.78S	170 40 55.62W	2	22	1	1.9	0.3
*155	104	64	12		14 16 33.78S	170 40 54.18W	2	19	9	-1.1	-1.1
155	200	63	33		14 16 35.64S	170 40 55.50W	2	24	9	0.7	0.2
155	250	64	67		14 16 36.16S	170 40 55.74W	2	30	13	0.3	0.4
155	440	42	43		14 16 36.76S	170 40 54.54W	2	29	14	0.9	-0.8
*155	628	42	17		14 16 44.34S	170 40 54.78W	2	16	5	9.4	-0.5
155	738	64	31		14 16 34.20S	170 40 53.46W	2	23	8	-0.7	-1.9
155	926	64	24		14 16 35.34S	170 40 56.28W	2	19	6	0.4	1.0
*155	1140	63	10		14 16 36.60S	170 40 52.32W	2	12	1	1.7	-3.0
155	1324	63	62		14 16 35.28S	170 40 57.06W	2	29	12	0.4	1.7
155	1436	64	75		14 16 33.00S	170 40 55.86W	3	26	1	-1.9	0.5
155	1602	42	19		14 16 32.64S	170 40 51.78W	2	23	10	-2.3	-3.5
155	1750	42	38		14 16 32.10S	170 40 53.88W	2	25	11	-2.8	-1.4
155	1902	64	15		14 16 34.14S	170 40 54.30W	2	22	10	-0.8	-1.0
155	2050	64	48		14 16 36.06S	170 40 55.08W	2	26	11	1.2	-0.2

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 25-1

ARITHMETIC MEAN SOLUTION AT PAGO PAGO OIL DOCK

NP	N	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
25	4	21	14 16 34.91S 170 40 55.32W	1.5 1.4	0.3 0.3

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
154	824		X		
155	104	X			
155	628				X
155	1140	X			

TABLE 2C-1

BY SATELLITE ----- ARITHMETIC MEAN SOLUTION AT PAGO PAGO OIL DOCK

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	5	14 16 33.70S 170 40 54.23W	1.4 1.8	0.6 0.8
54	5	14 16 33.70S 170 40 54.23W	1.4 1.8	0.6 0.8
63	5	14 16 33.70S 170 40 54.23W	1.4 1.8	0.6 0.8
64	6	14 16 34.50S 170 40 54.50W	2.3 1.7	1.0 0.7

TABLE 3A-1

R/V MAHI 1970 POSITIONAL DATA, SUVA, FIJI
RECORD AT THE EAST END OF 'KING'S WHARF'

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
175	638	64	23		18 7 46.56S	178 25 35.94E	2	22	2	-0.9	1.9
175	826	64	34		18 7 47.94S	178 25 33.00E	2	28	13	0.6	-1.1
175	1216	63	61		18 7 46.62S	178 25 33.24E	2	28	1	-0.7	-0.9
175	1240	64	21		18 7 48.06S	178 25 34.56E	2	27	12	0.7	0.5
*175	1404	63	9		18 7 43.08S	178 25 30.90E	6	11	5	-4.3	-3.2
175	1426	64	36		18 7 47.46S	178 25 33.42E	2	32	15	0.1	-0.7
175	1620	42	70		18 7 46.02S	178 25 34.98E	2	33	13	-1.3	0.9
*175	1806	64	10		18 7 41.76S	178 25 35.40E	4	14	4	-5.6	1.3
175	1948	64	70		18 7 48.84S	178 25 33.54S	2	36	18	1.5	-0.6

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 3B-1

ARITHMETIC MEAN SOLUTION AT SUVA

NP	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
9	2	7	18 7 47.36S 178 25 34.10E	1.0 1.1	0.4 0.4

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
175	1404	X		X	
175	1806	X			

TABLE 3C-1

ARITHMETIC MEAN SOLUTION BY SATELLITE AT SUVA

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	1	18 7 46.02S 179 25 34.99E		
54	2	18 7 47.04S 178 25 34.77E	1.4 0.3	1.0 0.2
63	1	18 7 46.02S 179 25 34.98E		
64	3	18 7 47.18S 178 25 34.32E	1.0 0.8	0.6 0.5

TABLE 3A-2

R/V MAHI 1970 POSITIONAL DATA, SUVA, FIJI
AT DOLPHINS, NEAR THE DRYDOCK

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
176	148	54	46		18 7 51.42S	178 25 35.10E	2	25	1	2.4	-2.5
176	404	42	52		18 7 49.56S	178 25 38.58E	2	32	16	0.6	1.0
*176	552	42	14		18 7 50.34S	178 25 35.10E	2	19	9	1.3	-2.5
176	1128	63	26		18 7 48.18S	178 25 40.02E	2	26	1	-0.8	2.5
176	1314	63	29		18 7 46.20S	178 25 36.18E	2	31	14	-2.8	-1.4
*176	1334	54	81		18 7 49.56S	178 25 42.36E	2	34	15	0.6	4.8
176	1526	42	23		18 7 49.08S	178 25 38.28E	2	28	13	0.1	0.7
176	1712	42	34		18 7 50.52S	178 25 36.18E	2	31	14	1.5	-1.4
176	1900	64	45		18 7 50.58S	178 25 37.50E	2	35	17	1.6	-0.1
176	2314	63	21		18 7 46.50S	178 25 38.58E	2	23	1	-2.5	1.0

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 3E-2

ARITHMETIC MEAN SOLUTION AT SUVA

NF	N	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
10	2	8	18 7 49.00S	1.9	0.7
			178 25 37.55E	1.6	0.5

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
176	552	X			
176	1334		X		

TABLE 3C-2

ARITHMETIC MEAN SOLUTION BY SATELLITE AT SUVA

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	3	18 7 49.72S 178 25 37.68E	0.7 1.3	0.4 0.8
54	1	18 7 49.56S 178 25 38.58E		
63	3	18 7 49.72S 178 25 37.68E	0.7 1.3	0.4 0.8

TABLE 3A-3

R/V MAHI 1970 POSITIONAL DATA, SUVA, FIJI
SHIP INSIDE DRYDOCK

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
177	244	54	20		18 7 45.48S	178 25 36.16E	2	26	6	-4.1	0.8
177	312	42	17		18 7 47.34S	178 25 40.92E	2	24	11	-2.3	3.5
177	456	42	47		18 7 49.14S	178 25 34.08E	2	33	13	-0.5	-3.3
177	648	64	34		18 7 48.96S	178 25 35.60E	2	29	10	-0.6	2.2
177	840	64	23		18 7 49.14S	178 25 37.26E	3	17	4	-0.5	-0.1
177	1432	54	18		18 7 54.90S	178 25 37.50E	2	12	1	5.3	0.1
177	1618	42	72		18 7 50.40S	178 25 35.40E	2	26	1	0.8	-2.0
*177	1806	42	8		18 7 45.96S	178 25 35.40E	2	7	1	-3.6	-2.0
177	1958	64	47		18 7 51.48S	178 25 36.30E	2	34	16	1.9	-1.1

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 3E-3

ARITHMETIC MEAN SOLUTION AT SUVA

NP	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
9	1	8	18 7 43.60S	2.8	1.0
			178 25 37.40E	2.2	0.8

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <13	>75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
177	1806	X			

TABLE 3C-3

ARITHMETIC MEAN SOLUTION BY SATELLITE AT SUVA

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	3	18 7 48.96S 178 25 36.80E	1.5 3.6	0.9 2.1
54	2	18 7 48.24S 178 25 37.50E	1.3 4.9	0.9 3.4
64	3	18 7 48.96S 178 25 36.80E	1.5 3.6	0.9 2.1

TABLE 3A-4

R/V KANA KEOKI 1971 POSITIONAL DATA, SUVA, FIJI
MOORED AT THE NORTH WEST END OF KING'S WHARF, ANTENNA HEIGHT 75 METERS

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
201	742	65	52	N-E	18 7 57.00S	178 25 24.78E	2	33	15	0.7	-1.9
*201	912	63	8	N-E	18 7 41.22S	178 25 25.62E	8	7	1	-15.1	-1.1
*201	930	65	13	N-W	18 7 55.50S	179 25 27.18E	2	17	1	-0.8	0.5
201	1000	64	73	S-E	18 7 56.62S	178 25 26.64E	2	30	14	-0.7	-0.0
*201	1056	63	78	N-W	18 7 57.60S	178 25 32.70E	3	32	12	1.3	6.0
*201	1148	54	9	S-W	18 7 56.22S	178 25 24.90E	6	10	4	-0.1	-1.8
201	1438	42	31	N-E	18 7 56.64S	178 25 25.62E	2	23	2	0.4	-1.1
*201	1532	64	11	N-E	18 7 55.98S	178 25 26.76E	2	18	8	-0.3	0.1
201	1624	42	26	N-W	18 7 56.08S	179 25 27.96E	2	29	14	-0.6	1.3
201	1718	64	69	N-W	18 7 57.54S	178 25 29.34E	2	34	13	1.3	3.3
201	1928	65	44	S-E	18 7 54.42S	178 25 25.08E	2	36	4	-1.9	-1.6
201	2114	65	22	S-W	18 7 56.80S	178 25 29.38E	2	24	5	-0.5	1.7
*201	2242	63	74	S-E	18 7 54.18S	178 25 12.66E	2	30	0	-2.1	-14.0
201	2308	54	23	N-W	18 7 55.50S	178 25 24.96E	2	22	6	-0.8	-1.7
*202	32	63	7	S-W	18 8 5.28S	178 25 25.76E	6	5	2	9.0	3.1
202	224	42	22	S-E	18 7 57.12S	178 25 26.82E	2	25	4	0.8	0.1
*202	322	64	7	S-E	18 8 6.36S	178 25 24.42E	7	5	2	10.1	-2.3
202	408	42	35	S-W	18 7 57.42S	178 25 26.64E	2	32	15	1.1	-0.0
*202	506	64	83	S-W	18 7 58.44S	178 25 36.42E	2	31	1	2.2	9.7

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 3E-4

ARITHMETIC MEAN SOLUTION AT SUVA ANT 75 METERS

NP	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
19	9	10	18 7 56.27S	1.0	0.3
			178 25 25.68E	1.7	0.5

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
201	912	X		X	X
201	930	X			
201	1056		X		
201	1148	X		X	
201	1532	X			
201	2242				X
202	32	X		X	
202	322	X		X	
202	506		X		

TABLE 3C-4

BY INDIVIDUAL SATELLITE - ARITHMETIC MEAN SOLUTION AT SUVA ANT 75 METERS

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	4	18 7 56.71S	0.9	0.4
		178 25 26.76E	1.9	0.5
54	2	18 7 56.16S	0.7	0.5
		178 25 26.79E	1.7	1.2
64	1	18 7 56.64S		
		178 25 25.62E		
65	3	18 7 56.48S	0.7	0.4
		178 25 26.80E	1.2	0.7

TABLE 3A-5

R/V KANA KEOKI 1971 POSITIONAL DATA. SUVA, FIJI
MOORED TO DOLPHINS AT N/E KING'S WHARF. ANTENNA HEIGHT 75 METERS.

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
202	2340	63	26	S-W	18 7 45.42S	178 25 33.24E	2	28	12	-1.4	1.0
*203	312	42	77	S-E	18 7 45.36S	178 25 26.82E	2	34	17	-1.4	-5.5
203	416	64	37	S-E	18 7 45.00S	178 25 31.68E	2	33	15	-1.8	-2.6
*203	502	42	9	S-W	18 7 45.54S	178 25 29.28E	4	8	3	-1.3	-3.0
203	604	64	21	S-W	18 7 45.66S	178 25 32.58E	2	27	13	-1.1	0.3
*203	752	65	76	N-E	18 7 47.64S	178 25 24.96E	2	32	0	0.9	-7.3
*203	820	54	7	S-E	18 7 58.50S	178 25 26.22E	3	0	0	11.7	-6.1
*203	920	63	13	N-E	18 7 48.30S	178 25 32.88E	2	20	3	1.5	0.6
*203	940	65	7	N-W	18 7 42.84S	178 25 29.40E	5	0	0	-4.0	-2.9
*203	1002	54	77	S-W	18 7 46.98S	178 25 45.66E	3	32	1	0.2	13.4
203	1104	63	53	N-W	18 7 48.18S	178 25 32.88E	2	34	17	1.4	0.6
203	1434	42	34	N-E	18 7 47.52S	178 25 31.02E	2	32	16	0.7	-1.3
203	1542	64	18	N-E	18 7 48.18S	178 25 32.04E	2	26	12	1.4	-0.2
203	1622	42	23	N-W	18 7 47.10S	178 25 32.76E	2	27	13	0.3	0.5
203	1726	64	46	N-W	18 7 47.58S	178 25 33.24E	2	34	17	0.9	1.0
203	1936	65	64	S-E	18 7 46.38S	178 25 29.28E	2	36	17	-0.4	-3.0
*203	2108	63	10	S-E	18 7 45.42S	178 25 34.86E	2	14	6	-1.4	3.5
203	2124	54	42	N-E	18 7 48.66S	178 25 32.00E	2	16	0	1.8	0.7
203	2252	63	69	S-W	18 7 44.82S	178 25 34.44E	2	32	1	-2.0	2.2
203	2312	54	17	N-W	18 7 47.04S	178 25 32.76E	2	25	11	0.2	0.5
204	220	42	25	S-E	18 7 45.18S	178 25 33.00E	2	29	8	-1.6	0.7
*204	330	64	13	S-E	18 7 46.86S	178 25 33.66E	2	17	1	0.1	1.4
204	406	42	32	S-W	18 7 44.52S	178 25 32.46E	2	30	14	-2.3	0.2
204	514	64	57	S-W	18 7 45.78S	178 25 33.36E	2	35	16	-1.0	1.1
204	704	65	28	N-E	18 7 46.98S	178 25 30.90E	2	28	13	0.2	-1.4
204	850	65	25	N-W	18 7 46.38S	178 25 32.88E	2	27	12	-0.4	0.6
204	912	54	34	S-E	18 7 44.64S	178 25 32.58E	2	31	15	-2.2	0.3
204	1016	63	57	N-E	18 7 48.48S	178 25 30.78E	2	32	13	1.7	-1.5
204	1100	54	23	S-W	18 7 45.96S	178 25 31.38E	2	23	9	-0.8	-0.9
*204	1204	63	13	N-W	18 7 45.00S	178 25 32.10E	2	20	9	-1.8	-0.2
*204	1342	42	9	N-E	18 7 42.96S	178 25 31.56E	3	12	5	-3.8	-0.7
204	1526	42	72	N-W	18 7 48.00S	178 25 37.26E	2	35	17	1.2	5.0
204	1638	64	72	N-E	18 7 47.40S	178 25 28.62E	2	36	17	0.6	-3.7
*204	1826	64	10	N-W	18 7 47.28S	178 25 31.38E	6	14	7	0.5	-0.9
204	1850	65	26	S-E	18 7 45.12S	178 25 30.78E	2	33	15	-1.7	-1.5
204	2036	54	17	N-E	18 7 48.18S	178 25 31.02E	2	20	9	1.4	-1.3
204	2204	63	45	S-E	18 7 45.00S	178 25 31.02E	2	31	16	-1.8	-1.3
204	2224	54	48	N-W	18 7 48.30S	178 25 33.42E	2	28	12	2.1	1.1
204	2350	63	17	S-W	18 7 44.82S	178 25 32.22E	2	22	9	-2.0	-0.1
*205	128	42	7	S-E	18 7 53.34S	178 25 34.56E	2	0	0	6.5	2.3
*205	310	42	76	S-E	18 7 44.40S	178 25 32.58E	3	31	1	-2.4	-0.7
205	424	64	55	S-E	18 7 45.90S	178 25 31.02E	2	34	10	-0.9	-1.3
*205	500	42	7	S-W	18 7 51.18S	178 25 31.02E	6	0	0	4.4	-1.3
*205	614	64	14	S-W	18 7 44.94S	178 25 31.68E	2	21	10	-1.9	-0.6
205	802	65	69	N-W	18 7 46.92S	178 25 37.74E	2	32	15	0.1	5.6

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 34-E (CONT.)

R/V KANA KEOKI 1971 POSITIONAL DATA. SUVA, FIJI
MOORED TO DOLPHINS AT N/E KING'S WHARF. ANTENNA HEIGHT 75 METERS.

DAY	GMT	SAT	ELEV	QUOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
*205	822	54	11	S-E	18 7 47.28S	178 25 34.08E	2	16	7	0.5	1.8
205	928	63	21	N-E	18 7 48.48S	178 25 31.92E	2	26	12	1.7	-0.4
205	1006	54	65	S-W	18 7 45.96S	178 25 33.36E	2	35	16	-0.8	1.1
205	1114	63	37	N-W	18 7 48.00S	178 25 33.76E	2	33	16	1.2	1.1
205	1432	42	37	N-E	18 7 48.24S	178 25 30.48E	2	33	15	1.4	-1.8
205	1550	64	28	N-E	18 7 49.86S	178 25 31.56E	2	31	14	3.1	-0.7
205	1618	42	21	N-W	18 7 47.34S	178 25 33.00E	2	26	12	0.5	0.7
205	1736	64	30	N-W	18 7 47.34S	178 25 33.24E	2	31	15	0.5	1.0
*205	1804	65	6	S-E	18 7 45.78S	178 25 33.12E	6	10	4	-1.0	0.8
*205	1948	65	71	S-W	18 7 54.72S	178 27 29.76E	7	32	3	7.9	117.5
205	2116	63	16	S-E	18 7 46.08S	178 25 33.24E	2	22	9	-0.7	1.0
205	2134	54	64	N-E	18 7 47.52S	178 25 30.24E	2	25	9	1.0	-2.0
205	2300	63	48	S-W	18 7 46.26S	178 25 33.36E	2	32	12	-0.5	1.1
*205	2320	54	12	N-W	18 7 46.08S	178 25 31.26E	2	17	8	-0.7	-1.0
206	216	42	27	S-E	18 7 44.46S	178 25 32.34E	2	30	14	-2.3	0.1
206	338	64	21	S-E	18 7 46.56S	178 25 32.22E	2	24	4	-0.2	-0.1
206	402	42	29	S-W	18 7 44.46S	178 25 33.24E	2	30	14	-2.3	1.0
206	524	64	39	S-W	18 7 45.42S	178 25 34.02E	2	32	16	-0.2	1.7
206	714	65	42	N-E	18 7 46.02S	178 25 30.12E	2	31	14	-0.2	-2.2
206	902	65	16	N-W	18 7 46.38S	178 25 31.92E	2	22	10	-0.4	-0.4
206	918	54	45	S-E	18 7 46.38S	178 25 32.76E	2	27	11	-0.4	0.5
206	1024	63	74	N-E	18 7 48.18S	178 25 24.96E	2	31	0	1.4	-7.2
207	812	65	45	N-W	18 7 47.10S	178 25 33.66E	2	30	11	0.3	1.4
207	936	63	30	N-E	18 7 47.28S	178 25 31.80E	2	27	11	0.5	-0.5
207	1012	54	50	S-W	18 7 47.10S	178 25 32.22E	2	30	14	0.3	-0.1
207	1122	63	26	N-W	18 7 46.50S	178 25 32.22E	2	29	14	-0.3	-0.1
207	1428	42	41	N-E	18 7 47.70S	178 25 30.78E	2	33	15	0.9	-1.5
207	1600	64	41	N-E	18 7 48.18S	178 25 30.60E	2	32	4	1.4	-1.7
207	1620	42	19	N-W	18 7 48.42S	178 25 32.10E	2	16	5	1.6	-0.2
207	1746	64	20	N-W	18 7 47.10S	178 25 33.12E	2	27	12	0.3	0.8
*207	1814	65	14	S-E	18 7 44.76S	178 25 32.22E	2	24	11	-2.0	-0.1
207	1958	65	64	S-W	18 7 46.32S	178 25 36.18E	2	38	17	-0.5	3.9

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 3B-5

ARITHMETIC MEAN SOLUTION AT SUVA ANT 75 METERS

NP	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
77	21	56	18 7 46.795 178 25 32.27E	1.3 1.9	0.2 0.3

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
203	312		x		
203	502	x			
203	752		x		
203	820	x			x
203	920	x			
203	940	x		x	
203	1002		x		x
203	2108	x			
204	330	x			
204	1204	x			
204	1342	x			
204	1826	x		x	
205	128	x			
205	310		x		
205	500	x		x	
205	614	x			
205	822	x			
205	1804	x		x	
205	1948			x	x
205	2320	x			
207	1814	x			

TABLE 3C-5

ARITHMETIC MEAN SOLUTION BY SATELLITE AT SUVA ANT 75 METERS

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	11	18 7 46.63S	1.6	0.5
		178 25 32.59E	1.8	0.5
54	10	18 7 46.45S	1.6	0.5
		178 25 32.63E	1.9	0.6
63	13	18 7 46.82S	1.6	0.4
		178 25 32.63E	1.7	0.5
64	13	18 7 46.82S	1.6	0.4
		178 25 32.63E	1.7	0.5
65	9	18 7 46.31S	1.6	0.5
		178 25 32.84E	1.9	0.6

TABLE 3A-6

R/V KANA KEOKI 1971 POSITIONAL DATA, SUVA, FIJI
MOORED TO DOLPHINS AT N/E KING'S WHARF. ANTENNA HEIGHT 54 METERS.

DAY	GMT	SAT	ELEV	QUAD	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
207	2124	63	24	S-E	18 7 45.78S	178 25 32.34E	2	28	13	-1.0	0.1
207	2310	63	33	S-W	18 7 45.90S	178 25 32.22E	2	29	7	-0.8	0.0
208	212	42	30	S-E	18 7 44.28S	178 25 32.88E	2	29	12	-2.5	0.7
208	348	64	31	S-E	18 7 45.78S	178 25 32.88E	2	28	6	-1.0	0.7
208	534	64	26	S-W	18 7 45.24S	178 25 31.92E	2	29	13	-1.5	-0.3
208	724	65	64	N-E	18 7 47.34S	178 25 29.40E	2	32	15	0.6	-2.8
*208	850	63	9	N-E	18 8 9.04S	178 25 30.36E	7	14	6	21.3	-1.8
*208	914	65	9	N-W	18 7 40.62S	178 25 31.26E	2	12	5	-6.1	-0.9
208	1032	63	70	N-W	18 7 48.66S	178 25 33.24E	2	34	17	1.9	1.0
*208	1108	54	12	S-W	18 7 46.68S	178 25 30.60E	2	18	6	-0.1	-1.6
*208	1336	42	12	N-E	18 7 48.60S	178 25 32.88E	2	19	8	1.9	0.7
208	1512	64	15	N-E	18 7 46.14S	178 25 31.80E	2	22	10	-0.6	-0.4
208	1656	64	53	N-W	18 7 48.06S	178 25 32.22E	2	33	1	1.3	0.0
208	1910	65	54	S-E	18 7 48.60S	178 25 31.02E	2	33	1	-1.1	-1.2
208	2042	54	30	N-E	18 7 47.52S	178 25 31.92E	2	32	15	0.8	-0.3
208	2102	65	17	S-W	18 7 46.56S	178 25 31.44E	2	17	7	-0.2	-0.9
*208	2220	63	12	S-E	18 7 48.02S	178 26 4.20E	17	13	0	2.3	32.0
208	2234	64	28	N-W	18 7 47.22S	178 25 32.10E	2	20	6	0.5	-0.1
*209	10	63	7	S-W	18 7 48.30S	178 25 29.28E	4	0	0	2.2	-2.9
*209	122	42	8	S-E	18 7 53.52S	178 25 30.60E	8	7	4	6.8	-1.6
*209	300	64	10	S-E	18 7 45.42S	178 25 34.20E	6	0	0	-1.3	2.0
209	444	64	70	S-W	18 7 45.60S	178 25 32.34E	3	32	1	-1.1	0.1
209	636	65	22	N-E	18 7 47.52S	178 25 31.68E	2	26	12	0.8	-0.5
209	822	65	30	N-W	18 7 46.50S	178 25 33.24E	2	27	10	-0.2	1.0
209	944	63	44	N-E	18 7 48.18S	178 25 32.10E	2	34	16	1.4	-0.1
209	1014	54	38	S-W	18 7 46.80S	178 25 32.22E	2	33	15	0.1	0.0
209	1132	63	18	N-W	18 7 46.92S	178 25 32.82E	2	24	11	0.2	0.7
209	1424	42	45	N-E	18 7 47.40S	178 25 31.56E	2	33	16	0.7	-0.6
209	1608	63	60	N-E	18 7 48.48S	178 25 30.78E	2	31	1	1.7	-1.4
*209	1756	63	13	N-W	18 7 45.66S	178 25 32.70E	2	19	9	-1.1	0.5
209	1922	65	22	S-E	18 7 45.66S	178 25 32.04E	2	30	14	-1.1	-0.2
*209	1954	54	9	N-E	18 7 44.46S	178 25 33.42E	6	12	5	-2.3	1.2
209	2010	65	45	S-W	18 7 46.08S	178 25 33.12E	2	34	16	-0.7	0.3
209	2132	63	34	S-E	18 7 45.18S	178 25 32.76E	2	32	15	-1.6	0.6
209	2318	63	23	S-W	18 7 45.42S	178 25 33.00E	2	26	7	-1.3	0.9
210	208	42	33	S-E	18 7 45.06S	178 25 32.10E	2	31	15	-1.7	-0.1
210	344	64	19	S-W	18 7 45.96S	178 25 31.26E	4	22	3	-0.8	-0.9
*210	734	65	66	N-W	18 7 46.14S	178 25 45.30E	2	29	0	-0.6	13.1
210	856	63	16	N-E	18 7 48.00S	178 25 33.42E	2	15	1	1.3	1.2
210	924	54	73	S-E	18 7 45.20S	178 25 34.08E	2	27	1	-0.5	2.8
210	1042	63	49	N-W	18 7 48.24S	178 25 31.92E	2	32	14	1.5	-0.3
*210	1112	54	8	S-W	18 7 50.64S	178 25 32.22E	8	0	0	3.9	0.0
*210	1330	42	14	N-E	18 7 45.24S	178 25 33.90E	2	21	10	-1.5	1.7
210	1516	42	54	N-W	18 7 48.36S	178 25 33.66E	2	29	8	1.6	1.5
210	1706	64	36	N-W	18 7 47.58S	178 25 33.12E	2	33	16	0.8	0.9

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 34-6 (CONT.)

F/V KANA KEOKI 1971 POSITIONAL DATA, SUVA, FIJI
MOORED TO DOLPHINS AT N/E KING'S WHARF. ANTENNA HEIGHT 54 METERS.

DAY	GMT	SAT	ELEV	FROM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
210	1920	65	73	S-E	18 7 45.42S	178 25 28.74E	3	35	0	-1.3	-3.5
*210	2046	63	11	S-E	18 7 46.58S	178 25 33.78E	2	18	9	0.2	1.6
*210	2110	65	11	S-W	18 7 44.40S	178 25 31.14E	2	15	7	-2.3	-1.1
*211	116	42	9	S-E	18 7 46.50S	178 25 35.88E	6	11	4	-0.2	3.7
211	300	42	73	S-W	18 7 45.30S	178 25 34.02E	2	33	1	-1.1	1.9
211	454	63	48	S-W	18 7 45.90S	178 25 32.22E	2	35	17	-0.8	0.0
211	646	65	34	N-E	18 7 47.40S	178 25 31.26E	2	29	13	0.7	-0.9
211	832	54	28	S-E	18 7 45.00S	178 25 32.04E	2	19	2	-1.7	-0.2
211	952	63	64	N-E	18 7 48.00S	178 25 31.80E	2	29	12	2.2	-0.4
211	1018	54	29	S-W	18 7 46.26S	178 25 31.92E	2	29	10	-0.5	-0.3
*211	1140	63	11	N-W	18 7 43.26S	178 25 33.24E	5	16	6	-3.5	1.0
211	1420	42	50	N-S	18 7 46.98S	178 25 32.46E	2	33	16	0.2	0.3
211	1608	42	15	N-W	18 7 46.20S	178 25 31.80E	2	23	11	-0.5	-0.4
*211	1628	64	52	N-E	18 7 55.86S	178 24 1.14E	10	0	0	10.2	-91.1
*211	1808	64	7	N-W	18 7 45.24S	178 25 29.58E	6	3	1	-1.5	-2.6
211	1832	65	32	S-E	18 7 44.64S	178 25 32.10E	2	34	16	-2.1	-0.1
*211	1956	54	13	N-E	18 7 47.16S	178 25 33.00E	2	20	3	0.4	0.8
211	2018	65	31	S-W	18 7 45.78S	178 25 34.02E	2	35	17	-1.0	1.8
211	2142	54	59	N-W	18 7 48.30S	178 25 32.24E	2	18	9	2.2	1.0
*212	206	42	37	S-E	18 7 45.24S	178 25 32.40E	6	0	0	-1.5	0.3
212	352	42	21	S-W	18 7 44.76S	178 25 32.10E	2	27	13	-2.0	-0.1
212	412	63	66	S-E	18 7 46.68S	178 25 32.88E	2	19	2	0.2	0.7
*212	554	63	11	S-W	18 7 46.92S	178 25 31.38E	2	17	8	0.2	-0.8
212	804	63	24	N-E	18 7 48.18S	178 25 32.34E	2	29	14	1.4	0.1
212	930	54	71	S-W	18 7 45.18S	178 25 24.12E	2	23	1	-1.6	-8.1
212	1050	63	34	N-W	18 7 46.86S	178 25 30.36E	2	30	14	0.1	-1.8
*212	1118	54	7	S-W	18 8 13.68S	178 25 36.84E	3	0	0	26.0	4.6
212	1328	42	16	N-E	18 7 54.36S	178 25 31.92E	2	23	10	7.6	-0.3
212	1512	42	49	N-W	18 7 48.12S	178 25 32.88E	2	33	15	1.4	0.7
212	1532	64	33	N-E	18 7 47.10S	178 25 32.34E	2	30	15	0.4	0.1
212	1716	64	25	N-W	18 7 46.20S	178 25 32.52E	2	28	11	-0.5	0.4
*212	1746	65	11	S-E	18 7 44.64S	178 25 33.24E	2	19	8	-2.1	1.0
212	1930	65	74	S-W	18 7 45.54S	178 25 35.94E	2	39	19	-1.2	3.7
212	2050	54	35	N-E	18 7 48.12S	178 25 31.80E	2	15	0	1.4	-0.4
*213	112	42	23	S-E	18 7 47.22S	178 25 32.88E	5	14	7	0.5	0.7
213	256	42	67	S-W	18 7 45.84S	178 25 33.42E	2	34	16	-0.9	1.2
213	318	64	25	S-E	18 7 46.38S	178 25 32.70E	2	28	14	-0.4	0.5
213	504	64	32	S-W	18 7 45.26S	178 25 32.22E	2	32	15	-0.5	0.0
213	656	65	52	N-S	18 7 47.70S	178 25 30.66E	2	31	14	1.0	-2.1
*213	818	63	7	N-E	18 7 52.26S	178 25 35.94E	3	0	0	5.5	3.7
213	836	54	37	S-E	18 7 45.18S	178 25 32.70E	2	33	16	-1.6	0.5
*213	1002	63	73	N-E	18 7 48.96S	178 25 34.74E	15	0	0	2.2	2.5
213	1026	54	22	S-W	18 7 47.34S	178 25 31.56E	2	20	9	0.6	-0.5
*213	1150	63	7	N-W	18 7 45.12S	178 25 27.48E	2	0	0	-1.6	-4.7
213	1418	42	55	N-E	18 7 47.52S	178 25 31.56E	2	33	14	0.9	-0.6
*213	1444	64	11	N-E	18 7 49.02S	178 25 32.04E	2	17	7	2.3	-0.2

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 3A-6 (CONT.)

R/V KANA KEOKI 1971 POSITIONAL DATA. SUVA, FIJI
MOORED TO DOLPHINS AT N/S KING'S WHARF. ANTENNA HEIGHT 54 METERS.

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
*213	1606	42	14	N-W	18 7 45.30S	178 25 32.10E	2	20	9	-0.9	-0.1
213	1628	64	65	N-W	18 7 48.24S	178 25 33.36E	2	36	17	1.5	1.2
213	1842	65	46	S-E	18 7 44.64S	178 25 30.90E	2	36	12	-2.1	-1.3
213	2000	54	19	N-E	18 7 48.66S	178 25 32.10E	2	25	11	1.9	-0.1
213	2028	65	21	S-W	18 7 46.20S	178 25 34.08E	2	24	12	-0.5	1.0
213	2144	54	45	N-W	18 7 49.48S	178 25 32.34E	2	27	11	1.7	0.1
*213	2336	63	9	S-W	18 7 50.76S	178 25 32.10E	6	11	4	4.0	-0.1
214	202	42	40	S-E	18 7 45.12S	178 25 32.70E	2	33	16	-1.6	0.5
*214	232	64	7	S-E	18 7 52.32S	178 25 34.74E	3	4	1	6.2	2.5
214	350	42	19	S-W	18 7 46.08S	178 25 30.90E	2	26	12	-0.7	-1.3
214	414	64	66	S-W	18 7 45.78S	178 25 35.28E	2	33	1	-0.9	3.1
214	606	65	18	N-E	18 7 47.04S	178 25 31.68E	2	23	10	0.3	-0.5
*214	748	54	12	S-E	18 7 42.60S	178 25 35.94E	2	19	9	-4.1	3.7
214	912	63	34	N-E	18 7 47.10S	178 25 33.12E	2	30	11	0.4	0.9
214	932	54	52	S-W	18 7 45.00S	178 25 31.14E	2	30	8	-1.7	-1.1
214	1100	63	24	N-W	18 7 46.08S	178 25 31.68E	2	28	13	-0.7	-0.5
214	1324	42	17	N-E	18 7 47.52S	178 25 32.58E	2	24	2	0.8	0.4
214	1510	42	45	N-W	18 7 48.36S	178 25 32.88E	2	34	16	1.6	0.7
214	1540	64	46	N-E	18 7 47.16S	178 25 31.80E	2	35	15	0.4	-0.4
214	1726	64	16	N-W	18 7 45.66S	178 25 31.92E	2	24	11	-1.1	-0.3
214	1756	65	18	S-E	18 7 45.12S	178 25 33.00E	2	27	12	-1.6	0.8
214	1940	65	52	S-W	18 7 46.44S	178 25 34.08E	2	38	18	-0.3	1.9
214	2054	54	67	N-E	18 7 48.60S	178 25 29.94E	2	34	15	1.9	-2.3

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 3B-6

ARITHMETIC MEAN SOLUTION AT SUVA ANT 54 METERS

NP	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
114	33	81	18 7 46.748	1.5	0.2
			178 25 32.205	1.5	0.2

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
208	950	X		X	X
208	914	X			
208	1108	X			
208	1336	X			
208	2220	X		X	X
209	10	X			
209	122	X		X	
209	300	X		X	
209	1756	X			
209	1954	X		X	
210	734				X
210	1112	X		X	
210	1330	X			
210	2046	X			
210	2110	X			
211	116	X		X	
211	1140	X		X	
211	1628			X	X
211	1808	X		X	
211	1956	X			
212	206			X	
212	654	X			
212	1118	X			X
212	1746	X			
213	112			X	
213	818	X		X	
213	1002			X	
213	1150	X			
213	1444	X			
213	1606	X			
213	2338	X		X	
214	232	X			
214	748	X			

TABLE 3C-6

BY INDIVIDUAL SATELLITE - ARITHMETIC MEAN SOLUTION AT SUVA ANT 54 METERS

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	16	18 7 46.975 178 25 32.46E	2.4 0.8	0.6 0.2
54	15	18 7 46.885 178 25 32.44E	2.4 0.9	0.6 0.2
63	17	18 7 47.00S 178 25 32.43E	2.3 0.8	0.6 0.2
64	15	18 7 46.88S 178 25 32.44E	2.4 0.9	0.6 0.2
65	18	18 7 47.02S 178 25 32.41E	2.2 0.8	0.5 0.2

TABLE 3A-7

R/V KANA KEOKI 1972 POSITIONAL DATA, SUVA, FIJI
MOORED AT THE 500 FOOT MARK AT 'KING'S WHARF'.

DAY	GMT	SAT	ELEV	FROM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
359	548	42	82	N-E	18 7 59.04S	178 25 0.90E	12	0	0	-0.9	-24.4
*359	720	54	7	N-E	18 7 58.44S	178 25 24.12E	3	0	0	-1.5	-1.2
*359	738	42	7	N-W	18 8 0.60S	178 25 22.98E	8	0	0	0.7	-2.3
*359	904	54	68	N-W	18 7 59.40S	178 25 48.06E	7	0	0	-0.5	22.8
*359	1054	54	7	N-W	18 8 1.50S	178 25 20.58E	3	0	0	1.6	-4.7
359	1144	63	36	S-E	18 7 57.84S	178 25 25.20E	2	30	9	-2.1	-0.1
359	1330	63	20	S-W	18 7 59.94S	178 25 25.08E	2	23	1	0.0	-0.2
*359	1600	64	13	S-E	18 7 57.12S	178 25 26.94E	2	18	7	-2.8	1.7
359	1738	42	64	S-S	18 7 59.76S	178 25 27.60E	2	21	1	-0.2	2.3
*359	1922	42	10	S-W	18 7 54.60S	178 25 23.34S	2	13	6	-6.3	-1.9
*359	2038	65	13	N-E	18 8 1.62S	178 25 24.96E	2	19	9	1.7	-0.3
359	2054	54	60	S-E	18 7 59.40S	178 25 27.48E	2	25	8	-0.5	2.2
359	2222	65	46	N-W	18 7 59.76S	178 25 26.76E	2	31	15	-0.2	1.6
359	2308	63	18	N-E	18 8 2.70S	178 25 24.24E	2	23	2	2.9	-1.9
360	54	63	46	N-W	18 8 0.18S	178 25 24.00E	2	33	10	0.3	-1.3
360	454	42	30	N-E	18 8 0.18S	178 25 24.66E	2	31	15	0.3	-0.6
360	514	64	70	N-E	18 8 0.54S	178 25 22.32E	2	22	0	0.6	-3.0
360	642	42	27	N-W	18 8 0.36S	178 25 25.62E	2	30	14	0.4	0.3
*360	702	64	10	N-W	18 7 57.78S	178 25 24.30E	3	11	5	-2.1	-1.0
360	814	54	34	N-S	18 8 0.84S	178 25 24.54E	2	32	15	0.9	-0.7
360	1000	54	23	N-W	18 7 59.76S	178 25 24.24E	2	25	9	-0.2	-1.0
*360	1056	63	12	S-E	18 8 0.42S	178 25 25.62E	3	16	8	0.5	0.3
360	1240	63	57	S-W	18 8 0.06S	178 25 25.62E	2	30	9	0.1	0.3
360	1640	42	21	S-E	18 7 59.22S	178 25 25.62E	2	27	13	-0.7	0.3
360	1658	64	54	S-E	18 7 58.14S	178 25 26.22E	2	32	15	-1.8	0.9

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 3B-7

ARITHMETIC MEAN SOLUTION AT SUVA, 500 FOOT MARK.

NP	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
25	10	15	18 7 59.91S	1.1	0.3
			178 25 25.28E	1.4	0.4

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
359	548		X	X	X
359	720	X			
359	738	X		X	
359	904			X	X
359	1054	X			
359	1620	X			
359	1922	X			
359	2038	X			
360	702	X			
360	1056	X			

TABLE 3C-7

BY SATELLITE --- ARITHMETIC MEAN SOLUTION AT SUVA, 500 FOOT MARK.

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	4	18 7 59.88S 178 25 25.87E	0.3 1.2	0.3 0.5
54	3	18 8 0.10S 178 25 25.96E	0.3 1.5	0.2 0.9
63	5	18 7 59.78S 178 25 26.20E	0.5 1.3	0.2 0.6
64	2	18 7 59.97S 178 25 26.13E	0.3 2.1	0.2 1.5

TABLE 3A-8

R/V KANA KEOKI 1972 POSITIONAL DATA, SUVA, FIJI
MOORED ALONGSIDE DOLPHINS AT THE GOVERNMENT SLIPWAY.

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
360	1924	42	37	S-W	18 7 46.26S	178 25 32.34E	2	32	15	-0.4	-0.1
*360	1846	64	14	S-W	18 7 45.60S	178 25 31.44E	2	22	10	-1.0	-1.0
360	1958	64	25	S-E	18 7 45.36S	178 25 32.22E	2	29	14	-1.3	-0.2
360	2134	65	61	N-E	18 7 46.38S	178 25 28.62E	2	31	14	0.3	-3.8
*360	2322	65	9	N-W	18 7 43.20S	178 25 31.38E	5	12	5	-3.4	-1.1
361	4	60	70	N-E	18 7 47.22S	178 25 30.12E	2	31	14	0.6	-2.3
*361	152	63	11	N-W	18 7 45.00S	178 25 30.06E	6	11	5	-1.6	-2.4
*361	402	42	7	N-E	18 7 25.38S	178 25 27.84E	6	4	1	-21.3	-4.6
361	422	64	26	N-E	18 7 47.70S	178 25 31.80E	2	29	14	1.1	-0.6
361	546	42	72	N-W	18 7 47.34S	178 25 40.50E	2	31	0	0.7	8.1
361	608	64	31	N-W	18 7 47.58S	178 25 33.24E	2	31	0	0.9	0.8
*361	724	64	10	N-E	18 7 48.66S	178 25 30.36E	2	15	7	2.0	-2.1
361	908	64	65	N-W	18 7 48.54S	178 25 33.78E	2	34	1	1.9	1.3
361	1108	65	17	S-W	18 7 44.58S	178 25 31.68E	2	26	12	-2.1	-0.8
361	1152	63	53	S-E	18 7 45.66S	178 25 31.92E	2	33	15	-1.0	-0.5
*361	1340	63	13	S-W	18 7 46.08S	178 25 30.72E	2	17	8	-0.6	-1.7
361	1608	64	20	S-E	18 7 46.74S	178 25 32.58E	2	27	13	0.1	0.1
361	1730	42	72	S-E	18 7 46.14S	178 25 33.42E	2	32	1	-0.5	1.0
361	1754	64	41	S-W	18 7 46.92S	178 25 32.58E	2	33	16	0.3	0.1
*361	1918	42	9	S-W	18 7 48.90S	178 25 31.92E	4	11	4	2.3	-0.6
361	2048	65	21	N-E	18 7 47.22S	178 25 32.10E	2	25	12	0.6	-0.3
361	2232	65	31	N-W	18 7 46.50S	178 25 33.42E	2	26	11	-0.1	1.0
361	2316	63	26	N-E	18 7 45.84S	178 25 32.34E	2	30	14	-0.8	-0.1
362	102	63	32	N-W	18 7 46.20S	178 25 33.00E	2	32	15	-0.4	0.6
362	452	42	33	N-E	18 7 47.46S	178 25 32.22E	2	31	14	0.8	-0.2
*362	518	64	80	N-W	18 7 46.56S	178 25 36.18E	2	33	0	-0.1	3.7
362	638	42	25	N-W	18 7 46.20S	178 25 33.12E	2	28	14	-0.4	0.7
*362	708	64	7	N-W	18 7 39.90S	178 25 26.64E	6	0	0	-6.7	-5.8
362	816	64	44	N-E	18 7 48.12S	178 25 30.72E	2	33	16	1.5	-1.7
362	836	65	20	S-E	18 7 47.52S	178 25 32.46E	2	25	12	0.9	0.0
362	1004	64	17	N-W	18 7 46.32S	178 25 32.22E	2	24	11	-0.3	-0.2
362	1022	65	44	S-W	18 7 45.20S	178 25 31.56E	2	29	13	-0.4	-0.9
362	1104	63	19	S-E	18 7 47.70S	178 25 32.22E	2	24	11	1.1	-0.2
362	1250	63	33	S-W	18 7 46.92S	178 25 32.34E	2	28	11	0.3	-0.1
362	1636	42	23	S-E	18 7 45.78S	178 25 32.34E	2	28	13	-0.8	-0.1
*362	1706	63	78	S-E	18 7 46.32S	178 25 32.76E	3	32	1	-0.3	0.3
362	1322	42	33	S-W	18 7 46.02S	178 25 32.10E	2	31	15	-0.6	-0.3
*362	1856	64	8	S-W	18 7 51.06S	178 25 31.56E	7	10	4	4.4	-0.9
362	2002	64	33	S-E	18 7 45.12S	178 25 31.56E	2	32	15	-1.5	-0.9
*362	2144	65	82	N-W	18 7 44.52S	178 26 12.00E	6	28	1	-2.1	39.6

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 3E-8

ARITHMETIC MEAN SOLUTION AT SUVA, AT DOLPHINS.

NP	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
40	12	28	18 7 46.65S	0.9	0.2
			178 25 32.48E	1.9	0.4

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
360	1846	X			
360	2322	X		X	
361	152	X		X	
361	402	X		X	X
361	724	X			
361	1340	X			
361	1918	X			
362	518		X		
362	708	X		X	
362	1706		X		
362	1856	X		X	
362	2144		X	X	X

TABLE 3C-8

BY SATELLITE --- ARITHMETIC MEAN SOLUTION AT SUVA, AT DOLPHINS.

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	7	18 7 46.46S 178 25 33.72E	0.7 3.0	0.3 1.1
54	5	18 7 46.68S 178 25 34.32E	0.7 3.5	0.3 1.6
63	6	18 7 46.53S 178 25 33.99E	0.7 3.2	0.3 1.3
64	4	18 7 46.80S 178 25 34.62E	0.7 4.0	0.3 2.0
65	6	18 7 46.53S 178 25 33.99E	0.7 3.2	0.3 1.3

TABLE 4A-1

R/V MAHI 1970 POSITIONAL DATA, RABAUL, NEW BRITAIN
MOORED AT DOCK

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
216	1400	54	14		4 11 59.14S	152 10 14.76E	3	21	10	-3.3	-3.2
216	1522	42	56		4 12 0.54S	152 10 10.92E	2	33	16	-0.9	1.9
*216	1710	42	11		4 12 3.24S	152 10 14.52E	2	17	9	1.8	-3.5
216	1748	64	28		4 12 0.36S	152 10 19.42E	2	29	12	-1.1	0.4
216	1934	64	25		4 12 0.84S	152 10 15.54E	2	30	15	-0.6	-2.4
216	2344	54	27		4 12 2.10S	152 10 20.16E	2	30	15	0.7	2.2
217	132	54	25		4 12 3.30S	152 10 15.84E	2	29	13	1.9	-2.1

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 4B-1

ARITHMETIC MEAN SOLUTION AT RABAUL

NP	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
7	2	5	4 12 1.43S 152 10 17.98E	1.2 2.2	0.6 1.0

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
215	1400	X			
216	1710	X			

TABLE 4C-1

ARITHMETIC MEAN SOLUTION BY SATELLITE AT RABAUL

SATELLITE NUMBER	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	1	4 12 0.54S 152 10 19.92E		
54	2	4 12 1.32S 152 10 20.04E	1.1 0.2	0.8 0.1
64	2	4 12 1.32S 152 10 20.04E	1.1 0.2	0.8 0.1

TABLE 5A-1

R/V MAHI 1970 POSITIONAL DATA, GUAM, TRUST TERRITORY
MOORED AT THE DILLINGHAM PIER

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSO	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
304	2358	64	19		13 27 45.30N	144 39 53.04E	2	24	5	2.7	0.4
305	228	65	22		13 27 39.96N	144 39 54.36E	2	25	11	-2.7	1.7
305	412	65	30		13 27 40.98N	144 39 52.44E	2	29	14	-1.7	-0.2
305	510	63	20		13 27 42.72N	144 39 52.56E	2	26	12	0.1	0.0
305	656	63	35		13 27 41.94N	144 39 52.68E	2	28	4	-0.7	0.1
305	716	54	56		13 27 44.22N	144 39 50.46E	2	23	7	1.6	-2.2
310	116	64	50		13 27 45.72N	144 39 52.80E	4	32	13	3.1	0.2
310	200	65	17		13 27 40.68N	144 39 54.42E	2	22	2	-2.0	1.8
*310	440	63	15		13 27 56.10N	144 39 34.68E	2	13	0	13.5	-17.9
*310	624	54	77		13 27 43.98N	144 39 8.76E	8	18	1	1.3	-43.9
310	924	42	31		13 27 42.00N	144 39 54.00E	2	31	14	-0.6	1.4
310	1110	42	23		13 27 41.88N	144 39 52.56E	2	28	4	-0.4	-0.1
310	1256	64	67		13 27 41.58N	144 39 51.60E	2	35	17	-1.1	-1.0
*310	1328	65	8		13 27 39.18N	144 39 53.04E	8	11	4	-3.5	0.4
310	1512	65	66		13 27 43.14N	144 39 48.48E	2	34	0	0.5	-4.1
*310	1608	63	7		13 27 39.12N	144 39 59.52E	13	0	0	-3.5	6.9
*310	1704	65	7		13 27 19.62N	144 39 53.10E	6	0	0	-23.0	0.5
*310	1942	63	7		13 27 38.88N	144 39 48.18E	3	0	0	-3.8	-4.4
*310	1956	54	11		13 27 41.70N	144 39 49.26E	3	19	8	-0.9	-3.4
*310	2050	42	14		13 27 46.20N	144 39 53.34E	2	20	2	3.6	0.7
310	2234	42	51		13 27 44.04N	144 39 52.44E	2	34	16	1.4	-0.2

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 5B-1

ARITHMETIC MEAN SOLUTION AT GUAM

NP	N	NSD	LATITUDE / LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
21	8	13	13 27 42.63N 144 39 52.61E	1.8 1.7	0.5 0.5

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
310	440				X
310	624		X	X	X
310	1328	X		X	
310	1608	X		X	
310	1704	X		X	X
310	1942	X			
310	1958	X			
310	2050	X			

TABLE 5C-1

ARITHMETIC MEAN SOLUTION BY SATELLITE AT GUAM

SATELLITE NUMBER	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	3	13 27 42.66N 144 39 54.00E	1.2 0.9	0.7 0.5
54	1	13 27 42.06N 144 39 54.00E		
63	2	13 27 41.97N 144 39 53.28E	0.1 1.0	0.1 0.7
64	3	13 27 42.66N 144 39 53.00E	1.2 0.9	0.7 0.5
65	4	13 27 43.05N 144 39 52.34E	1.3 1.5	0.6 0.7

TABLE 5A-2

R/V MAHI 1970 POSITIONAL DATA, GUAM, TRUST TERRITORY
MOORED AT THE GILLINGHAM PIER

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
261	732	65	20		13 27 40.74N	144 39 52.68E	3	29	14	-1.5	-0.5
261	900	63	68		13 27 43.02N	144 39 55.62E	3	31	0	0.9	2.4
*266	228	42	16		13 27 44.04N	144 39 52.80E	5	13	0	1.8	-0.4
266	304	64	35		13 27 44.28N	144 39 52.92E	2	33	15	2.1	-0.3
266	450	64	22		13 27 44.46N	144 39 51.78E	2	27	9	2.3	-1.4
266	518	65	39		13 27 40.74N	144 39 53.88E	2	35	17	-1.5	0.7
266	704	65	23		13 27 39.96N	144 39 52.44E	2	31	15	-2.2	-0.9

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 5F-2

ARITHMETIC MEAN SOLUTION AT GUAM

NF	N	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
7	1	6	13 27 42.20N 144 39 53.22E	2.0 1.4	0.8 0.6

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
266	228			x	

TABLE 5C-2

ARITHMETIC MEAN SOLUTION BY SATELLITE AT GUAM

SATELLITE NUMBER	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
63	1	13 27 43.02N 144 39 55.62E		
64	2	13 27 43.65N 144 39 54.27E	0.9 1.9	0.6 1.3
65	3	13 27 43.92N 144 39 53.44E	0.8 2.0	0.5 1.1

TABLE 68-1

R/V MAHI 1970 POSITIONAL DATA, MAJURO, MARSHALL ISLANDS
MOORED AT THE 'T WHARF'

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
278	2328	42	22		7 6 14.34N	171 22 9.18E	3	27	12	-4.6	-7.4
*279	1632	63	8		7 6 13.02N	171 22 17.58E	6	6	2	-6.0	1.0
279	1758	54	26		7 6 17.88N	171 22 19.44E	2	30	14	-1.1	2.9
279	1944	54	28		7 6 18.92N	171 22 17.64E	2	30	14	0.9	1.1
*279	2050	42	8		7 6 25.20N	171 22 23.16E	6	9	3	6.2	6.6
279	2232	42	71		7 6 23.82N	171 22 20.10E	2	35	17	4.8	3.5

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 6E-1

ARITHMETIC MEAN SOLUTION AT MAJURO

NP	N	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
6	2	4	7 6 18.99N 171 22 16.59E	4.0 5.0	2.0 2.5

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
279	1632	X		X	
279	2050	X		X	

TABLE 6C-1

ARITHMETIC MEAN SOLUTION BY SATELLITE AT MAJURO

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	2	7 6 19.08N	6.7	4.7
		171 22 14.64E	7.7	5.5
54	2	7 6 19.08N	6.7	4.7
		171 22 14.64E	7.7	5.5

TABLE 7A-1

R/V KANA KEOKI 1971 POSITIONAL DATA, PONAPE, CAROLINE ISLANDS
MOORED AT THE MAIN DOCK

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSO	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
146	428	54	25	N-W	6 59 43.26N	158 12 0.54E	2	0	0	-1.5	-1.4
146	500	63	20	S-W	6 59 45.30N	158 12 1.20E	2	0	0	1.2	-0.8
146	910	42	35	S-W	6 59 45.06N	158 12 3.12E	2	0	0	0.3	1.2
147	206	65	22	S-W	6 58 43.92N	158 12 2.76E	2	0	0	-0.8	0.8
*147	226	63	11	S-E	6 59 47.46N	158 12 4.50E	6	0	0	2.7	2.5
147	334	54	72	N-W	6 58 44.40N	158 12 3.00E	2	0	0	-0.3	1.0
*147	410	63	59	S-W	6 58 44.58N	158 12 3.30E	30	0	0	-0.2	1.3
147	1022	64	60	S-W	6 58 45.36N	158 12 3.00E	2	32	0	0.6	1.0
147	1208	65	32	N-E	6 58 43.44N	158 12 0.78E	2	34	16	-1.3	-1.2
147	1354	65	28	N-W	6 58 44.34N	158 12 3.96E	2	33	16	-0.4	2.0
*147	1416	63	10	N-E	6 58 43.38N	158 12 0.24E	3	15	7	4.6	-1.7
*147	1508	54	78	S-E	6 59 45.72N	158 11 59.22E	2	35	18	1.0	-2.7
147	1600	63	60	N-W	6 58 45.30N	158 12 3.12E	2	32	1	0.5	1.2
*147	1656	54	7	S-W	6 58 48.96N	158 11 58.14E	8	0	0	4.2	-3.9
147	1950	42	43	N-E	6 58 44.40N	158 12 2.82E	2	33	16	-0.3	0.6
*147	2020	51	7	N-E	6 60 15.18N	158 11 54.66E	5	0	0	30.4	-7.3
*147	2142	42	13	N-W	6 58 52.38N	158 12 8.70E	3	11	2	7.3	5.7
*147	2202	64	63	N-E	6 59 00.40N	158 13 19.14E	12	0	0	5.7	77.2
*147	2344	65	13	S-E	6 58 47.40N	158 12 2.10E	4	16	8	2.7	0.1
148	128	65	43	S-W	6 58 45.48N	158 12 3.00E	2	23	14	0.7	1.0
148	248	54	49	N-E	6 58 44.34N	158 12 2.22E	2	34	16	-0.4	0.2
148	330	63	73	S-E	6 58 45.36N	158 12 0.90E	2	33	1	0.6	-1.1
*148	438	54	13	N-W	6 59 40.02N	158 11 59.16E	2	17	6	-4.7	-2.4
*148	520	63	7	S-W	6 58 50.34N	158 11 58.56E	7	6	2	6.2	-3.4
148	720	42	25	S-E	6 58 44.70N	158 12 2.22E	2	25	13	-0.0	0.2
148	904	42	29	S-W	6 58 45.30N	158 12 2.22E	2	28	12	0.6	0.2
148	932	64	49	S-E	6 58 45.54N	158 12 1.20E	2	33	8	0.9	-0.6
*148	1306	65	70	N-W	6 58 44.88N	158 12 5.04E	6	35	0	0.1	3.1
148	1418	54	27	S-E	6 58 45.84N	158 12 1.44E	2	30	14	1.1	-0.5
148	1512	63	49	N-E	6 58 45.06N	158 12 1.98E	2	33	16	0.3	0.2
148	1604	54	27	S-W	6 58 45.00N	158 12 1.86E	2	30	14	0.3	-0.1
*148	1702	63	13	N-W	6 59 46.62N	158 12 3.12E	2	16	7	1.9	1.2
*148	1856	42	14	N-E	6 58 42.78N	158 12 2.46E	2	21	9	-2.0	0.5
148	2042	42	46	N-W	6 58 45.18N	158 12 2.52E	2	29	14	0.4	0.5
148	2114	64	32	N-E	6 58 44.28N	158 12 2.76E	2	30	11	-0.5	0.9
148	2306	64	22	N-W	6 58 42.54N	158 12 0.24E	2	17	4	-2.2	-1.7
149	38	65	61	S-E	6 58 45.96N	158 11 58.38E	2	0	0	1.2	-3.6
149	158	54	16	N-E	6 58 43.86N	158 12 1.98E	2	0	0	-0.9	0.0
*149	226	65	7	S-W	6 58 48.18N	158 11 57.84E	6	0	0	3.4	-4.1

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 7E-1

ARITHMETIC MEAN SOLUTION AT PONAPE MAIN DOCK

NP	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
39	15	24	6 58 44.74N	0.9	0.2
			158 12 1.97E	1.2	0.2

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
147	226	X		X	
147	410			X	
147	1416	X			
147	1508		X		
147	1658	X		X	
147	2020	X		X	X
147	2142	X			
147	2202			X	X
147	2344	X			
148	438	X			
148	520	X		X	
148	1306			X	
148	1702	X			
148	1856	X			
149	226	X		X	

TABLE 7C-1

ARITHMETIC MEAN SOLUTION BY SATELLITE AT PONAPE

SATELLITE NUMBER	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	5	6 58 44.03N 158 12 2.59E	0.4 0.4	0.2 0.2
54	6	6 58 44.65N 158 12 2.25E	0.8 0.9	0.3 0.4
63	4	6 58 44.86N 158 12 2.61E	0.4 0.5	0.2 0.2
64	4	6 58 44.86N 158 12 2.61E	0.4 0.5	0.2 0.2
65	6	6 58 44.65N 158 12 2.25E	0.8 0.9	0.3 0.4

TABLE 8A-1

R/V KANA KEOKI 1971 POSITIONAL DATA, PALAU, CAROLINE ISLANDS
MOORED AT THE MAIN DOCK ON MALAKAL ISLAND

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
167	400	63	67	S-W	7 19 47.16N	134 27 51.73E	6	0	0	-2.2	28.3
167	422	54	29	N-W	7 19 48.42N	134 27 23.64E	2	26	12	-0.9	0.1
167	740	42	26	S-E	7 19 49.50N	134 27 22.86E	2	20	7	0.2	-0.6
167	926	42	23	S-W	7 19 50.26N	134 27 25.20E	2	29	8	0.9	1.7
167	1010	64	71	S-E	7 19 50.70N	134 27 19.92E	3	33	0	1.4	-3.6
*167	1202	64	7	S-W	7 19 36.24N	134 27 22.20E	5	0	0	-13.1	-1.3
167	1350	65	42	N-W	7 19 48.12N	134 27 24.54E	2	35	16	-1.2	1.0
167	1540	63	62	N-E	7 19 49.86N	134 27 21.54E	2	31	1	-0.4	-2.0
*167	1730	63	9	N-W	7 19 46.02N	134 27 22.62E	5	11	5	-3.3	-0.3
*167	1918	42	14	N-E	7 19 49.24N	134 27 24.18E	2	21	9	-1.1	0.7
167	2102	42	46	N-W	7 19 49.20N	134 27 25.38E	2	33	15	-0.1	1.9
167	2150	64	51	N-E	7 19 48.30N	134 27 22.98E	2	32	11	-1.0	-0.6
168	120	65	74	S-W	7 19 50.04N	134 27 26.04E	2	33	16	0.7	2.5
168	312	63	35	S-E	7 19 49.50N	134 27 23.28E	2	28	9	0.2	-0.2
*168	332	54	83	N-W	7 19 48.36N	134 27 22.08E	2	25	0	-1.0	-1.4
168	500	63	22	S-W	7 19 50.58N	134 27 22.86E	2	25	0	1.2	-0.6
*168	830	42	72	S-E	7 19 51.60N	134 27 6.84E	6	33	2	2.3	-17.6
168	922	64	28	S-E	7 19 49.56N	134 27 23.22E	2	26	9	0.2	-0.3
168	1110	64	26	S-W	7 19 49.98N	134 27 22.56E	2	29	14	0.6	-0.9
*168	1300	65	76	N-E	7 19 48.36N	134 27 19.26E	2	35	16	-1.0	-5.3
*168	1450	65	8	N-W	7 19 45.12N	134 27 20.46E	5	0	0	-4.2	-3.0
168	1640	63	31	N-A	7 19 48.36N	134 27 24.96E	2	26	12	-1.0	1.5
168	2006	42	55	N-E	7 19 48.90N	134 27 21.66E	2	33	1	-0.4	-1.8
168	2104	64	19	N-E	7 19 47.22N	134 27 23.22E	2	25	11	-2.1	-0.3
*168	2156	42	11	N-W	7 19 48.18N	134 27 24.72E	4	17	7	-1.2	1.2
168	2248	64	40	N-W	7 19 49.50N	134 27 25.20E	2	33	16	0.2	1.7
169	32	65	38	S-E	7 19 49.14N	134 27 22.98E	2	31	15	-0.2	-0.5
169	220	65	16	S-W	7 19 51.24N	134 27 22.56E	2	19	7	1.0	-0.9
169	338	54	34	N-E	7 19 47.70N	134 27 24.12E	2	31	15	-1.6	0.7
169	410	63	61	S-W	7 19 49.38N	134 27 25.38E	2	37	17	0.0	1.9
169	736	42	28	S-E	7 19 49.02N	134 27 23.22E	2	28	8	-0.3	-0.3
*169	838	64	9	S-E	7 19 46.68N	134 27 23.88E	3	8	3	-2.7	0.4
169	1020	64	72	S-W	7 19 49.14N	134 27 25.20E	2	35	17	-0.2	1.7
169	1214	65	29	N-E	7 19 48.48N	134 27 23.28E	2	32	14	-0.9	-0.2
169	1400	65	29	N-W	7 19 47.76N	134 27 24.06E	2	29	11	-1.6	0.5
*169	1550	63	61	N-W	7 20 12.96N	134 32 24.96E	11	26	2	23.6	301.5
169	1914	42	16	N-E	7 19 49.26N	134 27 23.64E	2	23	11	-1.0	0.1
169	2058	42	41	N-W	7 19 49.44N	134 27 25.08E	2	32	15	0.1	1.5
*169	2200	64	76	N-E	7 19 48.66N	134 27 20.10E	2	35	17	-0.7	-3.4
*169	2348	65	12	S-E	7 19 50.40N	134 27 25.20E	2	18	8	1.1	1.7
170	132	65	48	S-W	7 19 50.40N	134 27 23.28E	2	32	15	1.1	-0.2
*170	152	54	10	N-E	7 19 50.52N	134 27 23.40E	10	10	4	1.2	-0.1
170	320	63	51	S-E	7 19 50.22N	134 27 23.28E	2	29	7	0.9	-0.2
170	508	63	15	S-W	7 19 51.30N	134 27 23.64E	2	22	6	2.0	0.1
*170	646	42	7	S-E	7 19 34.20N	134 27 22.74E	2	0	0	-15.1	-0.9

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 8A-1 (CONT.)

R/V KANA KEOKI 1971 POSITIONAL DATA, PALAU, CAROLINE ISLANDS
MOORED AT THE MAIN DOCK ON MALAKAL ISLAND

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
*170	826	42	69	S-W	7 19 48.42N	134 27 35.04E	2	33	1	-0.9	11.5
170	932	64	42	S-E	7 19 49.32N	134 27 23.10E	2	27	10	-0.0	-0.4
170	1120	64	17	S-W	7 19 49.62N	134 27 22.56E	2	23	0	0.3	-0.9
170	1310	65	74	N-W	7 19 48.60N	134 27 27.18E	2	35	16	-0.7	3.7
170	1502	64	56	S-E	7 19 49.80N	134 27 17.70E	2	16	0	0.5	-5.8
*170	2004	42	60	N-E	7 19 48.72N	134 27 21.90E	5	32	15	-0.6	-1.6
170	2112	64	28	N-E	7 19 49.74N	134 27 23.64E	2	31	15	0.4	0.1
*170	2152	42	10	N-W	7 19 51.42N	134 27 26.16E	4	14	6	2.1	2.7
170	2300	64	26	N-W	7 19 49.08N	134 27 24.06E	2	26	11	-0.3	0.6
171	42	65	59	S-E	7 19 50.64N	134 27 22.20E	2	29	13	1.3	-1.3

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE PF-1

ARITHMETIC MEAN SOLUTION AT PALAU

NP	N	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
55	18	37	7 19 49.34N 134 27 23.49E	1.0 1.7	0.2 0.3

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
167	400			X	X
167	1202	X		X	X
167	1730	X		X	
167	1918	X			
168	332		X		
168	830			X	X
168	1300		X		
168	1450	X		X	
168	2156	X			
169	838	X			
169	1550			X	X
169	2200		X		
169	2348	X			
170	152	X		X	
170	646	X			X
170	826				X
170	2004			X	
170	2152	X			

TABLE BC-1

ARITHMETIC MEAN SOLUTION BY SATELLITE AT PALAU

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	7	7 19 48.24N 134 27 23.86E	0.6 1.4	0.2 0.5
54	3	7 19 48.66N 134 27 24.48E	0.6 1.4	0.3 0.8
63	7	7 19 48.24N 134 27 23.86E	0.6 1.4	0.2 0.5
64	11	7 19 48.05N 134 27 23.10E	0.7 2.2	0.2 0.7
65	9	7 19 48.58N 134 27 23.87E	0.8 1.2	0.3 0.4

TABLE 9A-1

F/V KANA KEOKI 1971 POSITIONAL DATA, WELLINGTON, NEW ZEALAND
MOORED TO THE EAST SIDE OF 'GLASGOW' WHARF

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
241	1314	64	24	N-E	41 16 53.94S	174 46 59.16E	2	27	4	-0.3	1.6
241	1500	64	56	N-W	41 16 53.52S	174 46 56.64E	2	35	17	-0.7	-0.9
*241	1654	65	12	S-E	41 16 55.56S	174 46 59.64E	2	18	8	1.4	2.1
*241	1718	54	7	N-E	41 16 35.10S	174 47 8.52E	2	5	2	-19.1	11.0
*241	1740	65	66	S-E	41 16 52.26S	174 46 23.58E	3	23	1	-1.9	-34.0
*241	1842	63	14	S-E	41 16 53.58S	174 47 0.36E	2	20	9	-0.6	2.8
241	1900	54	59	N-E	41 16 54.84S	174 46 58.62E	2	34	14	0.6	1.1
*241	2026	63	72	S-W	41 16 52.02S	174 46 34.44E	4	27	1	-2.2	-23.1
241	2048	54	22	N-W	41 16 54.42S	174 46 57.54E	2	24	11	0.2	-0.0
*241	2216	63	13	S-W	41 16 53.04S	174 46 54.36E	2	19	9	-1.2	-3.2
241	2338	42	19	S-E	41 16 54.00S	174 46 59.64E	2	23	8	-0.2	2.1
242	116	64	24	S-E	41 16 52.86S	174 46 59.52E	2	30	14	-1.3	2.0
242	302	64	56	S-W	41 16 54.42S	174 46 57.00E	2	33	14	0.2	-0.5
242	450	65	35	N-E	41 16 55.02S	174 46 58.38E	2	31	14	0.8	0.8
*242	518	54	7	S-E	41 17 0.72S	174 47 0.84E	5	5	2	15.5	3.3
242	636	65	33	N-W	41 16 54.42S	174 46 57.42E	2	30	15	0.2	-0.1
242	700	54	55	S-E	41 16 52.98S	174 46 57.84E	2	35	16	-1.2	0.3
242	734	63	42	N-E	41 16 54.96S	174 46 58.32E	2	31	13	0.8	0.8
242	848	54	25	S-W	41 16 54.48S	174 46 56.52E	2	30	15	0.3	-1.0
242	922	63	34	N-W	41 16 54.00S	174 46 57.18E	2	31	14	-0.2	-0.4
*242	1228	64	10	N-E	41 16 58.32S	174 47 0.18E	2	15	7	4.1	2.6
242	1412	64	68	N-E	41 16 54.12S	174 46 59.52E	2	23	3	-0.1	2.0
242	1600	64	19	N-W	41 16 54.18S	174 46 57.54E	2	26	12	-0.0	-0.0
242	1650	65	38	S-E	41 16 53.10S	174 46 58.32E	2	31	14	-1.1	0.8
242	1810	54	26	N-E	41 16 54.00S	174 46 58.62E	2	29	13	-0.2	1.1
242	1838	65	31	S-W	41 16 53.82S	174 46 57.54E	2	29	14	-0.4	-0.0
242	1936	63	42	S-E	41 16 53.34S	174 46 58.74E	2	24	9	-0.9	1.2
242	1956	54	50	N-W	41 16 54.36S	174 46 56.76E	2	30	11	0.2	-0.8
242	2126	63	30	S-W	41 16 53.70S	174 46 57.18E	2	23	11	-0.5	-0.4
243	1320	42	64	N-W	41 16 54.42S	174 46 56.88E	2	31	1	0.2	-0.7
*243	1508	42	0	N-W	41 17 15.00S	174 47 23.34E	2	12	3	20.8	25.8
243	1604	65	17	S-E	41 16 53.46S	174 46 56.28E	2	12	4	-5.3	-7.1
*243	1720	54	10	N-E	41 16 55.92S	174 46 58.20E	5	15	7	1.7	0.7
243	1750	65	70	S-W	41 16 54.06S	174 46 57.84E	2	31	15	-0.1	0.3
243	1850	63	19	S-E	41 16 55.08S	174 46 58.70E	2	23	1	0.9	2.2
243	1906	54	71	N-E	41 16 55.14S	174 46 57.06E	3	32	0	0.9	-0.5
243	2034	63	68	S-W	41 16 53.52S	174 46 55.68E	2	32	15	-0.7	-1.9
243	2054	54	18	N-W	41 16 52.74S	174 46 55.56E	2	22	11	-1.5	-2.0
*243	2334	42	21	S-E	41 16 3.60S	174 45 37.44E	3	13	3	63.4	-80.1
244	118	42	64	S-W	41 16 53.34S	174 46 57.54E	3	26	2	-0.9	-0.0
244	312	64	37	S-W	41 16 53.76S	174 46 57.30E	2	23	0	-0.4	-0.2
244	500	65	50	N-E	41 16 54.66S	174 46 58.38E	2	33	16	0.5	0.8
*244	522	54	10	S-E	41 17 0.30S	174 46 47.76E	2	13	3	6.1	-9.8
244	646	65	24	N-W	41 16 54.42S	174 46 57.18E	2	27	13	0.2	-0.4
244	704	54	68	S-E	41 16 53.10S	174 46 56.50E	3	37	17	-1.1	1.0

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 9A-1 (CONT.)

R/V KANA KECKI 1971 POSITIONAL DATA, WELLINGTON, NEW ZEALAND
MOORED TO THE EAST SIDE OF 'GLASGOW' WHARF

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
244	744	63	56	N-E	41 16 54.48S	174 46 56.83E	2	33	1	0.3	-0.7
244	854	54	20	S-W	41 16 54.00S	174 46 55.68E	2	26	13	-0.2	-1.9
244	930	63	26	N-W	41 16 54.06S	174 46 57.54E	2	29	11	-0.1	-0.0
244	1226	42	54	N-E	41 16 54.72S	174 46 57.54E	2	35	16	0.5	-0.0
244	1412	42	25	N-W	41 16 53.88S	174 46 57.72E	2	30	15	-0.3	0.2
*244	1430	54	69	N-W	41 16 55.38S	174 46 22.38E	4	15	1	1.2	-35.2
*244	1518	66	7	S-E	41 16 46.56S	174 47 6.18E	13	0	0	-7.6	8.6
*244	1610	64	14	N-W	41 16 55.26S	174 46 58.08E	2	20	9	1.1	0.5
244	1700	65	53	S-E	41 16 54.00S	174 46 57.18E	2	32	15	-0.2	-0.4
244	1814	54	32	N-E	41 16 54.42S	174 46 57.72E	2	32	15	0.2	0.2
244	1850	65	22	S-W	41 16 55.08S	174 46 57.54E	2	25	12	0.9	-0.0
244	1944	63	53	S-E	41 16 53.64S	174 46 58.38E	2	26	0	-0.6	0.3
244	2004	54	40	N-W	41 16 53.76S	174 46 58.38E	2	26	11	-0.4	0.8

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 9E-1

ARITHMETIC MEAN SOLUTION AT WELLINGTON

NP	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
58	15	43	41 16 54.195 174 46 57.55E	1.0 1.5	0.2 0.2

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
241	1554	X			
241	1718	X			X
241	1740				X
241	1842	X			
241	2026				X
241	2216	X			
242	518	X		X	X
242	1228	X			
243	1508	X			X
243	1720	X		X	
243	2334				X
244	522	X			X
244	1430				X
244	1518	X		X	
244	1610	X			

TABLE 9C-1

ARITHMETIC MEAN SOLUTION BY SATELLITE AT WELLINGTON

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	5	41 16 54.07S 174 46 57.86E	0.5 1.0	0.2 0.5
54	12	41 16 54.21S 174 46 57.69E	0.6 0.9	0.2 0.3
63	9	41 16 54.12S 174 46 57.76E	0.6 0.9	0.2 0.3
64	7	41 16 54.23S 174 46 57.93E	0.5 0.9	0.2 0.3
65	10	41 16 54.11S 174 46 57.85E	0.6 0.9	0.2 0.3

TABLE 10A-1

R/V KANA KEOKI 1972 POSITIONAL DATA, CALLAO, PERU
MOORED TO PERTH 9-D (ON THE " FISHING PIER ")

	DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
	15	1752	63	7	N-W	12 3 17.64S	77 9 1.62W	5	0	0	-2.0	2.7
	15	2114	42	60	N-W	12 3 22.98S	77 8 57.06W	2	23	1	3.4	-1.9
	15	2144	64	72	N-E	12 3 21.30S	77 9 2.82W	2	31	1	1.7	3.9
*	15	2334	64	7	N-W	12 3 12.66S	77 9 2.40W	2	1	0	-7.0	3.4
*	16	44	64	7	N-E	12 3 26.58S	77 8 55.14W	6	0	0	7.0	-3.8
	16	56	65	41	S-E	12 3 19.50S	77 8 58.44W	2	20	6	0.2	-0.5
*	16	226	54	84	N-W	12 3 20.40S	77 8 40.62W	2	31	0	0.8	-18.3
	16	346	63	64	S-E	12 3 18.60S	77 8 58.14W	2	33	2	-1.0	-0.8
*	16	416	64	7	N-W	12 3 10.08S	77 9 6.42W	6	0	0	-9.5	7.5
*	16	534	63	9	S-W	12 3 17.22S	77 8 59.58W	4	14	6	-2.4	0.5
	16	850	42	67	S-E	12 3 17.76S	77 9 1.32W	3	32	9	-1.9	2.4
	16	928	64	56	S-E	12 3 18.66S	77 8 58.86W	2	36	17	-1.0	-0.1
*	16	1038	42	7	S-W	12 3 24.00S	77 7 0.30W	4	0	0	4.4	-113.7
*	16	1116	64	13	S-W	12 3 18.42S	77 8 58.98W	2	20	9	-1.2	0.0
	16	1222	65	23	N-E	12 3 18.90S	77 9 0.36W	2	25	11	-0.7	1.4
*	16	1514	63	49	N-E	12 3 20.64S	77 8 59.70W	7	25	1	1.0	0.7
*	16	1558	54	10	S-W	12 3 18.60S	77 9 0.00W	2	14	3	-1.0	1.9
	17	1612	63	59	N-W	12 3 20.76S	77 8 59.32W	2	22	1	1.1	-3.6
*	17	2014	64	8	N-E	12 3 6.48S	77 9 3.00W	4	9	4	-13.1	4.1
	17	2106	42	62	N-W	12 3 21.30S	77 8 56.22W	2	34	17	1.7	-2.7
	17	2154	64	69	N-W	12 3 21.00S	77 8 53.70W	2	34	1	1.4	-5.3
*	18	48	64	9	N-E	12 3 16.20S	77 8 59.40W	4	12	5	-3.4	0.4
	18	102	65	64	S-E	12 3 18.24S	77 8 59.22W	2	31	15	-1.4	0.3
	18	232	64	64	N-W	12 3 21.30S	77 8 56.10W	2	33	16	1.7	-2.9
*	18	252	65	8	S-W	12 3 33.18S	77 8 56.94W	3	9	4	13.6	-2.0
*	18	356	63	66	S-W	12 3 18.30S	77 9 11.22W	11	0	0	-1.3	12.3
*	18	546	63	7	S-W	12 3 12.24S	77 9 6.12W	8	0	0	-7.4	7.2
*	18	846	42	64	S-E	12 3 15.96S	77 9 30.72W	16	0	0	-3.7	31.2
*	18	936	64	78	S-E	12 3 19.48S	77 9 3.42W	3	33	0	-1.1	4.5
*	18	1036	42	7	S-W	12 3 32.16S	77 8 58.44W	6	0	0	12.5	-0.5
*	18	1128	64	7	S-W	12 3 34.50S	77 8 54.60W	2	0	0	14.0	-4.4
	18	1228	65	34	N-E	12 3 20.64S	77 9 0.0 W	2	33	16	1.0	1.0
	18	1530	63	50	N-E	12 3 21.42S	77 8 57.96W	2	18	4	1.8	-1.3
	18	1710	63	15	N-W	12 3 18.96S	77 9 0.0 W	2	24	11	-0.7	1.3
	18	2012	42	42	N-E	12 3 20.58S	77 8 59.70W	2	31	8	1.3	0.7
	18	2106	64	43	N-E	12 3 21.00S	77 9 0.78W	2	28	7	1.4	1.2
*	18	2200	42	17	N-W	12 3 33.24S	77 9 32.04W	2	21	5	12.6	33.1
	18	2256	64	17	N-W	12 3 19.80S	77 8 59.40W	2	13	2	0.2	0.4
	19	14	65	21	S-E	12 3 20.22S	77 8 59.34W	2	25	11	0.5	0.4
	19	140	64	43	N-E	12 3 19.68S	77 9 0.48W	2	33	15	0.1	1.5
	19	200	65	23	S-W	12 3 19.38S	77 8 58.86W	2	29	13	-0.2	-0.1
	19	306	63	34	S-E	12 3 14.34S	77 8 54.06W	2	30	10	-5.1	-4.9
	19	328	54	16	N-W	12 3 20.94S	77 8 58.98W	2	22	10	1.3	0.2
	19	454	63	21	S-W	12 3 17.70S	77 9 0.60W	2	26	12	-1.2	1.6

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 10A-1 (CONT.)

R/V KANA KEOKI 1972 POSITIONAL DATA, CALLAO, PERU
MOORED TO BERTH 9-D (ON THE ' FISHING PIER ')

	DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
	19	752	42	28	S-E	12 3 19.20S	77 8 58.92W	2	30	14	-0.4	-0.0
	19	850	64	31	S-E	12 3 18.00S	77 8 57.66W	2	32	15	-1.6	-1.3
	19	938	42	26	S-W	12 3 17.94S	77 8 58.92W	2	29	14	-1.7	-0.0
	19	1036	64	25	S-W	12 3 17.94S	77 8 59.04W	2	30	14	-1.7	0.1
*	19	1142	65	12	N-E	12 3 18.66S	77 8 59.94W	3	19	9	-1.0	1.0
	19	1322	54	30	S-E	12 3 19.50S	77 8 58.02W	2	29	5	-0.1	-0.9
	19	1438	63	18	N-E	12 3 19.24S	77 8 55.80W	2	13	3	-1.4	-3.2
	19	1508	54	26	S-W	12 3 16.56S	77 9 0.06W	2	27	10	-3.1	1.1
	19	1620	63	44	N-W	12 3 20.58S	77 9 57.60W	2	30	5	1.0	-1.4
*	19	1920	42	12	N-E	12 3 15.06S	77 9 1.20W	2	13	4	-4.6	2.2
	19	2022	64	15	N-E	12 3 18.30S	77 9 0.78W	4	14	3	-1.3	1.8
	19	2104	42	56	N-W	12 3 21.60S	77 8 56.40W	2	34	15	2.0	-2.6
	19	2204	64	47	N-W	12 3 21.60S	77 8 57.24W	2	32	2	2.0	-1.7
*	20	50	54	14	N-E	12 3 19.92S	77 9 59.88W	2	20	9	0.3	0.9
*	20	222	63	11	S-E	12 3 24.42S	77 8 59.28W	3	15	7	4.8	0.3
	20	236	54	48	N-W	12 3 22.14S	77 8 59.28W	2	32	16	2.5	0.3
	20	404	63	61	S-W	12 3 19.78S	77 8 59.58W	2	35	17	-0.8	0.6
*	20	702	42	7	S-E	12 3 33.06S	77 9 1.56W	4	0	0	13.4	2.6
*	20	804	64	10	S-E	12 3 19.38S	77 8 57.48W	4	13	1	-0.2	-1.5
	20	844	42	62	S-W	12 3 19.02S	77 8 58.86W	3	29	0	-0.6	-5.1
	20	946	64	68	S-W	12 3 18.36S	77 8 57.78W	2	36	18	-1.3	-1.2
*	20	1032	42	7	S-W	12 3 28.62S	77 9 1.62W	15	0	0	9.0	2.7
	20	1238	65	51	N-E	12 3 20.82S	77 9 1.62W	2	34	3	1.2	2.7
	20	1416	54	63	S-W	12 3 16.98S	77 9 8.28W	2	13	0	-3.5	9.3
	20	1532	63	56	N-E	12 3 21.30S	77 9 3.84W	2	24	0	1.7	4.5
*	20	1720	63	9	N-W	12 3 18.48S	77 8 59.82W	4	9	0	-1.1	0.9
	20	2008	42	47	N-E	12 3 20.46S	77 8 55.26W	2	19	5	0.8	-3.7
	20	2114	64	63	N-E	12 3 20.46S	77 9 3.00W	2	31	0	0.8	4.0
	20	2158	42	15	N-W	12 3 21.60S	77 9 0.24W	2	19	5	2.0	1.3
*	20	2304	64	10	N-W	12 3 19.26S	77 9 0.0 W	6	12	0	-0.4	1.0
	21	24	65	33	S-E	12 3 19.14S	77 8 59.40W	2	29	13	-0.5	0.4
	21	144	54	58	N-E	12 3 21.66S	77 9 3.60W	2	34	15	2.0	4.8
	21	212	65	18	S-W	12 3 19.20S	77 8 59.04W	2	23	11	-0.4	0.1
	21	316	63	49	S-E	12 3 18.60S	77 8 57.66W	2	32	16	-1.0	-1.3
*	21	502	63	14	S-W	12 3 19.72S	77 8 59.64W	2	22	10	-0.2	0.7
	21	750	42	31	S-S	12 3 18.90S	77 8 58.56W	2	29	3	-0.7	-0.4
	21	936	42	24	S-W	12 3 18.12S	77 8 59.16W	2	29	13	-1.5	0.2
	21	1046	64	16	S-W	12 3 19.48S	77 8 59.04W	2	24	11	-1.1	0.1
	21	1152	65	19	N-E	12 3 20.40S	77 9 0.06W	2	28	13	0.8	1.1
	21	1326	54	40	S-E	12 3 19.20S	77 8 58.38W	2	31	6	-0.4	-0.5
	21	1448	63	26	N-E	12 3 19.80S	77 9 0.30W	2	20	6	0.2	1.3
	21	1512	54	19	S-W	12 3 18.78S	77 8 59.40W	2	26	12	-0.8	0.4
	21	1630	63	30	N-W	12 3 19.80S	77 8 58.38W	2	29	4	0.2	-0.6
*	21	1916	42	14	N-E	12 3 19.50S	77 8 59.58W	2	15	6	-0.1	0.6
	21	2030	64	23	N-E	12 3 19.44S	77 9 0.78W	2	20	5	-0.2	1.8
	21	2100	42	51	N-W	12 3 20.76S	77 8 56.76W	2	32	11	1.1	-2.2
	21	2214	64	32	N-W	12 3 20.64S	77 8 57.78W	2	30	7	1.0	-1.2

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 10A-1 (CONT.)

R/V KANA KEOKI 1972 POSITIONAL DATA, CALLAO, PERU
MOORED TO BERTH 9-D (ON THE ' FISHING PIER ')

	DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
*	21	2338	65	10	S-E	12 3 15.24S	77 8 56.16W	2	13	6	-4.4	-2.8
	22	52	54	19	N-E	12 3 20.28S	77 8 59.70W	2	25	12	0.7	0.7
	22	122	65	55	S-W	12 3 18.60S	77 8 58.20W	2	30	15	-1.0	-0.8
	22	228	63	17	S-E	12 3 19.20S	77 8 57.60W	2	25	11	-0.4	-1.4
	22	246	54	36	N-W	12 3 21.24S	77 8 57.84W	2	14	1	1.6	-1.1
	22	412	63	42	S-W	12 3 19.50S	77 8 59.40W	2	32	11	-0.1	0.4
	22	812	64	16	S-E	12 3 18.08S	77 8 57.66W	2	22	0	-0.5	-1.3
	22	840	42	70	S-W	12 3 19.14S	77 8 58.80W	3	31	0	-0.5	-0.2
	22	956	64	46	S-W	12 3 19.14S	77 8 58.20W	2	34	16	-0.5	-0.8
*	22	1236	54	13	S-E	12 3 20.10S	77 8 57.72W	3	20	8	0.5	-1.2
	22	1254	65	75	N-E	12 3 21.06S	77 9 1.62W	3	23	1	1.4	2.7
*	22	1358	63	7	N-E	12 2 55.86S	77 9 6.84W	10	4	2	-23.8	7.9
	22	1420	54	56	S-W	12 3 19.14S	77 8 59.64W	2	30	10	-0.5	0.7

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 10B-1

ARITHMETIC MEAN SOLUTION AT CALLAO BERTH 3-D

NP	N	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
104	34	70	12 3 19.625 77 8 58.97W	1.5 2.3	0.2 0.3

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
15	1752	X		X	
15	2334	X			
16	44	X		X	
16	226		X		X
16	416	X		X	
16	534	X			
16	1039	X			X
16	1116	X			
16	1514			X	
16	1558	X			
17	2014	X			X
18	48	X			
18	252	X			X
18	356			X	X
18	546	X		X	
18	646			X	X
18	936		X		
18	1036	X		X	X
18	1128	X			X
18	2200				X
19	1142	X			
19	1920	X			
20	50	X			
20	222	X			
20	702	X			X
20	804	X			
20	1032	X		X	
20	1720	X			
20	2304	X		X	
21	502	X			
21	1316	X			
21	2338	X			
22	1236	X			
22	1358	X		X	X

TABLE 10C-1

BY SATELLITE ----- ARITHMETIC MEAN SOLUTION AT CALLAO BERTH 3-C

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	14	12 3 19.98S	1.6	0.4
		77 8 57.04W	2.1	0.6
54	13	12 3 20.04S	1.7	0.5
		77 8 57.88W	2.1	0.6
53	15	12 3 20.06S	1.6	0.4
		77 8 57.82W	2.0	0.5
64	16	12 3 20.04S	1.5	0.4
		77 8 57.92W	2.1	0.5
65	13	12 3 20.04S	1.7	0.5
		77 8 57.88W	2.1	0.5

TABLE 10A-2

P/V KANA KECKI 1972 POSITIONAL DATA, CALLAO, PERU
MOORED TO PERTH 4-A

	DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
	54	708	64	77	S-E	12 2 49.32S	77 8 42.42W	2	30	0	-1.1	-2.5
	54	746	42	16	S-W	12 2 49.26S	77 8 44.82W	2	23	10	-1.2	-0.1
*	54	856	64	7	S-W	12 3 2.88S	77 8 46.20W	3	5	2	12.5	1.2
	54	1010	65	39	N-E	12 2 51.96S	77 8 46.20W	2	36	18	1.6	1.2
*	54	1150	54	76	S-W	12 2 49.08S	77 8 42.84W	2	33	12	-1.3	-2.1
	54	1240	63	29	N-E	12 2 50.04S	77 8 44.76W	2	26	12	-0.4	-0.2
*	54	1342	54	7	S-W	12 3 17.76S	77 8 49.44W	16	0	0	27.3	4.5
	54	1430	63	24	N-W	12 2 52.32S	77 8 44.76W	2	23	10	-2.0	-0.2
	54	1724	42	21	N-E	12 2 50.34S	77 8 45.30W	2	27	13	-0.1	0.3
	54	1836	64	40	N-E	12 2 51.54S	77 8 45.78W	2	31	1	1.1	0.8
	54	1914	42	34	N-W	12 2 51.78S	77 8 44.10W	2	25	10	1.4	-0.9
	54	2024	64	18	N-W	12 2 51.72S	77 8 42.96W	2	20	1	1.3	-2.0
	54	2156	65	24	S-E	12 2 49.44S	77 8 43.26W	2	25	4	-1.0	-1.7
	54	2318	54	56	N-E	12 2 52.02S	77 8 46.20W	2	33	9	1.6	1.2
	54	2340	65	29	S-W	12 2 47.58S	77 8 46.86W	2	29	14	-2.8	1.9
	55	26	63	22	S-E	12 2 49.14S	77 8 43.14W	2	26	12	-1.3	-1.8
*	55	104	54	13	N-W	12 2 50.94S	77 8 44.70W	2	19	8	0.5	-0.3
	55	208	63	37	S-W	12 2 51.00S	77 8 45.78W	2	25	1	0.6	0.8
*	55	306	42	14	S-E	12 3 25.56S	77 8 46.56W	2	21	10	35.1	1.5
	55	420	64	28	S-E	12 2 49.56S	77 8 43.86W	2	30	14	-0.9	-1.1
	55	650	42	52	S-W	12 2 49.20S	77 8 45.00W	2	32	10	-1.2	0.0
	55	806	64	26	S-W	12 2 47.76S	77 8 44.40W	2	30	14	-2.7	-0.6
*	55	924	65	13	N-E	12 2 54.36S	77 8 45.12W	4	22	10	3.9	0.2
	55	1100	54	37	S-E	12 2 49.56S	77 8 43.08W	2	31	15	-1.5	-1.9
*	55	1154	63	8	N-E	12 2 51.84S	77 8 41.94W	4	8	3	1.4	-3.0
	55	1246	54	19	S-W	12 2 49.56S	77 8 45.30W	2	25	11	-0.9	0.3
	55	1340	63	69	N-W	12 2 53.58S	77 8 43.92W	2	21	0	3.2	-1.0
*	55	1748	64	14	N-E	12 2 51.96S	77 8 45.54W	2	21	9	1.5	0.5
*	55	1816	42	76	N-E	12 2 53.10S	77 8 48.36W	2	33	1	2.7	3.4
	55	1934	64	51	N-W	12 2 53.28S	77 8 42.60W	2	32	2	2.9	-2.4
*	55	2004	42	7	N-W	12 2 40.02S	77 8 42.42W	6	2	1	-10.4	-2.5
	55	2226	54	19	N-E	12 2 50.04S	77 8 45.90W	2	23	5	-0.4	0.9
	55	2252	65	55	S-W	12 2 46.56S	77 8 53.70W	2	29	1	-3.9	8.1
	56	12	54	39	N-W	12 2 51.78S	77 8 42.90W	2	33	15	1.4	-2.1
*	56	42	65	7	S-A	12 2 50.88S	77 8 59.76W	7	0	0	0.5	14.8
*	56	120	63	53	S-E	12 2 49.20S	77 8 32.16W	5	23	9	-1.2	-12.3
*	56	310	63	7	S-W	12 2 44.76S	77 8 47.10W	2	1	0	-5.7	2.1
	56	556	42	51	S-E	12 2 47.52S	77 8 44.04W	2	33	10	-2.9	-0.9
	56	718	64	73	S-W	12 2 47.16S	77 8 43.38W	2	28	9	-3.3	-1.5
*	56	742	42	14	S-W	12 2 49.92S	77 8 43.86W	2	21	10	-0.5	-1.1
*	56	908	64	7	S-W	12 3 12.24S	77 8 53.16W	4	0	0	21.8	8.2
*	56	1012	54	11	S-E	12 2 49.56S	77 8 43.32W	4	15	7	-0.9	-1.6
	56	1028	65	55	N-E	12 2 53.88S	77 8 46.44W	2	20	3	3.5	1.5
	56	1154	54	59	S-W	12 2 49.44S	77 8 44.94W	2	34	16	-1.0	-0.0
	56	1250	63	42	N-E	12 2 52.38S	77 8 45.66W	2	28	9	2.0	0.7
	56	1436	63	16	N-W	12 2 52.50S	77 8 43.20W	2	20	7	2.1	-1.9

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 10A-2 (CONT.)

R/V KANA KEOKI 1972 POSITIONAL DATA. CALLAO, PERU
RECORED TO EARTH 4-A

	DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
	56	1722	42	23	N-E	12 2 51.96S	77 8 45.12W	2	29	12	1.5	0.2
	56	1846	64	59	N-E	12 2 51.60S	77 8 46.48W	2	27	0	1.2	0.5
*	56	1908	42	31	N-W	12 8 5.88S	77 15 22.68W	3	27	8	315.5	397.7
*	56	2034	64	12	N-W	12 2 53.70S	77 8 45.60W	3	13	4	3.3	0.6
	56	2204	65	36	S-E	12 2 49.20S	77 8 41.76W	2	30	1	-1.2	-3.2
	56	2320	54	74	N-E	12 2 51.48S	77 8 50.34W	4	32	2	1.1	5.4
	56	2350	65	19	S-W	12 2 48.96S	77 8 45.36W	2	24	5	-1.5	0.4
	57	32	63	32	S-E	12 2 49.06S	77 8 42.90W	2	31	8	-2.4	-2.1
*	57	110	54	8	N-W	12 2 49.38S	77 8 43.02W	3	10	4	-1.0	-1.0
	57	504	42	15	S-E	12 2 50.70S	77 8 42.06W	2	22	10	0.3	-2.9
	57	628	64	42	S-E	12 2 49.08S	77 8 43.38W	2	31	13	-1.3	-1.6
	57	648	42	47	S-W	12 2 48.00S	77 8 45.12W	2	29	10	-1.5	-0.2
	57	816	64	17	S-W	12 2 48.48S	77 8 44.52W	2	24	11	-1.3	-0.4
	57	932	65	21	N-E	12 2 53.10S	77 8 44.88W	2	29	14	2.7	-0.1
	57	1104	54	49	S-E	12 2 49.68S	77 8 43.32W	2	32	16	-1.8	-1.6
	57	1124	65	40	N-W	12 2 52.74S	77 8 43.38W	2	24	9	2.3	-1.6
*	57	1202	63	14	N-E	12 2 52.68S	77 8 43.86W	3	21	9	2.3	-1.1
*	57	1250	54	14	S-W	12 2 48.60S	77 8 44.82W	2	21	10	-0.8	-0.1
	57	1348	63	47	N-W	12 2 53.28S	77 8 42.24W	2	26	8	2.8	-2.7
	57	1758	64	22	N-E	12 2 51.00S	77 8 44.34W	2	27	1	0.5	-0.6
	57	1816	42	62	N-E	12 2 53.58S	77 8 50.16W	3	20	0	3.2	5.2
	57	1944	64	35	N-W	12 2 52.80S	77 8 44.16W	2	29	15	2.4	-0.8
*	57	2004	42	7	N-W	12 1 40.80S	77 8 13.26W	13	0	0	-69.6	-31.7
*	57	2118	65	12	S-E	12 2 47.52S	77 8 41.04W	2	18	8	-2.9	-3.3
	57	2230	54	26	N-E	12 2 50.58S	77 8 45.72W	2	30	14	0.2	0.8
	57	2302	65	55	S-W	12 2 48.90S	77 8 47.16W	2	34	17	-1.5	2.2
*	57	2348	63	10	S-E	12 2 35.94S	77 8 34.68W	3	13	1	-14.5	-10.3
	58	16	54	30	N-W	12 2 50.34S	77 8 43.14W	2	30	14	-0.1	-1.9
*	58	128	63	51	S-W	12 3 21.72S	77 8 12.24W	3	22	0	31.3	-32.7
*	58	542	64	14	S-E	12 2 49.12S	77 8 42.66W	2	21	9	-2.3	-2.3
	58	600	42	53	S-E	12 2 48.12S	77 8 54.36W	2	11	1	-2.3	9.4
	58	726	64	49	S-W	12 2 48.18S	77 8 43.86W	2	34	16	-2.2	-1.1
*	58	848	65	7	N-E	12 2 53.04S	77 8 41.40W	11	0	0	2.6	-3.6
	58	1014	54	16	S-E	12 2 50.64S	77 8 42.90W	2	23	11	0.2	-2.1
*	58	1032	65	78	N-E	12 2 53.04S	77 8 53.52W	6	31	2	2.6	8.6
	58	1158	54	43	S-W	12 2 49.08S	77 8 43.02W	2	31	14	-1.3	-1.0
*	58	1218	65	8	N-W	12 2 49.60S	77 8 45.18W	2	11	4	-1.8	0.2
	58	1258	63	62	N-E	12 2 52.38S	77 8 46.32W	2	28	1	2.0	1.4

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 10B-2

ARITHMETIC MEAN SOLUTION AT CALLAO BESTH 4-A

NP	N	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
84	30	54	12 2 50.43S	1.9	0.3
			77 8 44.97W	2.5	0.3

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
54	708		X		
54	856	X			X
54	1150		X		
54	1342	X		X	X
55	104	X			
55	506	X			X
55	924	X			
55	1154	X			
55	1748	X			
55	1916		X		
55	2004	X		X	X
56	42	X		X	X
56	120			X	X
56	310	X			
56	742	X			
56	908	X			X
56	1012	X			
56	1908				X
56	2034	X			
57	110	X			
57	1202	X			
57	1250	X			
57	2004	X		X	X
57	2118	X			
57	2348	X			X
58	128				X
58	542	X			
58	848	X		X	
58	1032		X	X	
58	1218	X			

TABLE 10C-2

BY SATELLITE ----- ARITHMETIC MEAN SOLUTION AT CALLAO BERTH 4-A

SATELLITE NUMBER	NSD	LATITUDE / LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	10	12 2 50.14S 77 8 46.01W	1.9 3.6	0.6 1.1
54	12	12 2 50.19S 77 8 45.78W	1.8 3.3	0.5 1.0
63	10	12 2 50.14S 77 8 46.01W	1.9 3.6	0.6 1.1
64	12	12 2 50.19S 77 8 45.78W	1.8 3.3	0.5 1.0
65	10	12 2 50.14S 77 8 46.01W	1.9 3.6	0.6 1.1

TABLE 11A-1

R/V KANA KEOKI 1372 POSITIONAL DATA, ANCON, PERU
SWINGING AT ANCHOR, BUT NOT DRAGGING

	DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSO	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
	59	2354	63	16		11 44 26.76S	77 10 28.56W	2	0	0	-4.8	3.8
	60	20	54	23		11 44 32.88S	77 10 22.86W	2	0	0	1.4	-1.9
	60	138	63	48		11 44 33.72S	77 10 28.20W	2	0	0	2.2	3.5
	60	550	42	51		11 44 29.52S	77 10 17.40W	2	0	0	-2.0	-7.3
	60	736	64	33		11 44 30.78S	77 10 25.56W	2	0	0	-0.7	0.8
*	60	856	05	10		11 44 34.44S	77 10 26.70W	4	0	0	2.9	2.0
	60	1018	54	22		11 44 30.78S	77 10 24.66W	2	0	0	-0.7	-0.1
	60	1040	65	70		11 44 36.00S	77 10 24.48W	2	0	0	4.5	-0.3
	60	1202	54	32		11 44 31.68S	77 10 26.16W	2	0	0	0.2	1.4
*	60	1230	65	7		11 44 25.62S	77 10 36.72W	7	0	0	-5.3	12.0
*	60	1306	63	77		11 45 14.76S	77 19 35.46W	8	0	0	43.2	550.7

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 11E-1

ARITHMETIC MEAN SOLUTION AT ANCON - ANCHORED

NP	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
11	3	8	11 44 31.515 77 10 24.73W	2.9 3.5	1.0 1.2

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
60	856	X			
60	1230	X		X	
60	1306		X	X	X

TABLE 11C-1

BY SATELLITE ----- ARITHMETIC MEAN SOLUTION AT ANCON - ANCHORED

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	1	11 44 28.52S 77 10 17.40W		
54	3	11 44 31.06S 77 10 21.64W	1.7 3.8	1.0 2.2
63	2	11 44 31.20S 77 10 20.13W	2.4 3.9	1.7 2.7
64	1	11 44 29.52S 77 10 17.40W		

TABLE 12A-1

P/V KANA KEOKI 1972 POSITIONAL DATA, TALARA, PERU
SWINGING AT ANCHOR, BUT NOT DRAGGING

	DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
	74	508	64	21	S-E	4 33 41.94S	81 17 19.80W	2	23	7	-2.6	-0.6
*	74	526	42	79	S-E	4 33 40.62S	81 17 15.72W	5	26	10	-3.9	-4.7
	74	652	64	34	S-W	4 33 41.28S	81 17 19.08W	2	32	16	-3.2	-1.4
*	74	822	65	9	N-E	4 33 53.70S	81 17 20.88W	5	12	5	9.2	0.4
*	74	858	54	7	S-E	4 33 52.98S	81 17 17.88W	0	0	0	8.5	-2.6
	74	1008	65	62	N-W	4 33 47.82S	81 17 17.64W	2	33	2	3.3	-2.8
*	74	1040	54	78	S-W	4 33 43.98S	81 17 14.76W	2	34	16	-0.5	-5.7
*	74	1222	63	67	N-E	4 33 49.20S	81 17 34.26W	2	27	0	4.7	13.8
*	74	1412	63	7	N-W	4 33 30.96S	81 17 18.24W	2	0	0	-13.5	-2.2
*	74	1642	64	11	N-E	4 33 45.84S	81 17 21.84W	2	13	3	1.3	1.4
	74	1658	42	41	N-E	4 33 47.34S	81 17 23.04W	2	18	5	2.8	2.6
	74	1828	64	60	N-W	4 33 48.60S	81 17 19.20W	2	31	14	4.1	-1.2
*	74	2146	65	78	S-E	4 33 45.72S	81 17 30.18W	3	33	0	1.2	9.7
	74	2212	54	60	N-E	4 33 46.20S	81 17 25.14W	2	35	16	1.7	4.7
*	75	0	54	11	N-W	4 33 40.56S	81 17 20.64W	5	18	8	-3.9	0.2
*	75	148	63	13	S-W	4 33 37.14S	81 17 22.32W	2	19	8	-7.4	1.0
	75	432	42	24	S-E	4 33 41.76S	81 17 17.52W	2	22	8	-2.7	-2.8
*	75	604	64	72	S-E	4 33 41.76S	81 17 31.38W	13	0	0	-2.7	10.9
*	75	754	64	7	S-W	4 34 3.78S	81 17 19.44W	5	0	0	19.3	-1.0
	75	919	65	47	N-E	4 33 43.14S	81 17 22.02W	2	33	16	-1.4	1.6
	75	950	54	35	S-E	4 33 41.70S	81 17 19.92W	2	32	15	-2.8	-0.5
*	75	1106	65	13	N-W	4 33 46.98S	81 17 20.04W	2	19	8	2.5	-0.4
	75	1134	54	19	S-W	4 33 44.88S	81 17 21.72W	2	16	5	0.4	1.3
	75	1320	63	24	N-W	4 33 44.94S	81 17 19.74W	2	26	9	0.4	-0.7
*	75	1600	42	11	N-E	4 33 34.02S	81 17 16.68W	2	16	7	-10.5	-3.9

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 12P-1

ARITHMETIC MEAN SOLUTION AT TALARA - ANCHORED, SWINGING

NF	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
25	14	11	4 33 44.51S 81 17 20.44W	2.7 2.3	0.8 0.7

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
74	526		X	X	
74	822	X		X	
74	858	X		X	
74	1040		X		
74	1222				X
74	1412	X			X
74	1642	X			
74	2146		X		
75	0	X		X	
75	148	X			
75	604			X	X
75	754	X		X	X
75	1106	X			
75	1600	X			X

TABLE 12C-1

BY SATELLITE ---- ARITHMETIC MEAN SOLUTION AT TALARA - ANCHORED, SWINGING

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	2	4 33 44.55S 81 17 20.28W	3.9 3.9	2.8 2.8
54	3	4 33 45.10S 81 17 21.90W	2.9 3.9	1.7 2.3
63	1	4 33 47.34S 81 17 23.04W		
64	3	4 33 45.10S 81 17 21.90W	2.9 3.9	1.7 2.3
65	2	4 33 44.55S 81 17 20.28W	3.9 3.9	2.8 2.8

TABLE 13A-1

F/V KANA KEOKI 1972 POSITIONAL DATA, GUAYAQUIL, ECUADOR
MOORED AT BERTH NUMBER 2, PUERTO MARITIMO

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
104	1856	65	31	S-E	2 16 56.26S	79 54 20.83W	3	34	16	-1.6	0.5
104	1938	53	36	N-E	2 17 1.14S	79 54 21.18W	2	30	15	1.3	0.8
104	2042	65	27	S-W	2 16 57.72S	79 54 19.08W	2	25	11	-2.1	-1.3
104	2126	54	19	N-W	2 17 0.90S	79 54 21.42W	2	23	11	1.1	1.1
104	2236	63	64	S-W	2 16 58.68S	79 54 17.28W	2	29	0	-1.2	-3.1
*105	152	42	7	S-E	2 17 1.02S	79 54 18.00W	3	6	1	1.2	-2.3
105	306	64	27	S-E	2 16 57.48S	79 54 19.38W	2	30	14	-2.4	-0.4
105	334	42	69	S-W	2 17 0.36S	79 54 17.28W	2	33	1	0.5	-3.1
105	452	64	27	S-W	2 16 59.10S	79 54 18.72W	2	25	9	-0.7	-1.5
*105	632	65	13	N-E	2 17 0.84S	79 54 20.82W	2	19	8	1.0	0.5
105	714	54	21	S-E	2 16 57.12S	79 54 20.46W	2	24	8	-2.7	0.1
105	818	65	40	N-W	2 17 1.86S	79 54 18.36W	2	30	14	2.0	-2.0
105	900	54	33	S-W	2 16 57.18S	79 54 20.88W	2	31	15	-2.7	0.5
105	1010	63	58	N-E	2 17 1.38S	79 54 27.36W	2	31	0	1.5	7.0
*105	1200	63	8	N-W	2 16 55.86S	79 54 20.76W	5	7	3	-4.0	0.4
105	1442	64	15	N-E	2 17 1.80S	79 54 21.12W	2	19	2	2.0	0.8
105	1508	42	63	N-E	2 17 1.26S	79 54 23.28W	2	29	0	1.4	2.0
105	1626	64	46	N-W	2 17 1.02S	79 54 18.30W	2	32	2	2.1	-2.0
*105	1656	42	9	N-W	2 16 45.36S	79 54 19.20W	2	12	0	-14.5	-1.1
*105	1810	65	10	S-E	2 17 2.70S	79 54 20.58W	4	16	7	2.9	0.2
*105	1850	54	10	N-E	2 17 0.12S	79 54 21.06W	3	16	7	0.3	0.7
105	1954	65	70	S-W	2 16 58.74S	79 54 15.84W	3	35	1	-1.1	-4.5
105	2032	54	59	N-W	2 17 1.92S	79 54 17.52W	2	35	17	2.1	-2.8
105	2148	63	45	S-E	2 16 58.38S	79 54 20.88W	2	33	16	-1.5	0.5
*105	2336	63	14	S-W	2 16 58.68S	79 54 20.64W	2	17	3	-1.2	0.3
*106	220	64	7	S-E	2 17 2.76S	79 54 17.04W	5	3	0	2.9	-3.3
106	240	42	36	S-E	2 16 57.96S	79 54 21.84W	2	24	10	-1.9	1.5
106	402	64	71	S-W	2 16 58.86S	79 54 13.50W	2	34	1	0.0	-6.8
106	426	42	19	S-W	2 17 2.10S	79 54 20.88W	2	21	8	2.3	0.5
106	728	65	66	N-E	2 17 1.92S	79 54 26.94W	2	33	15	2.1	6.6
*106	808	54	77	S-E	2 16 59.58S	79 54 25.08W	2	33	0	-1.3	4.7
*106	918	65	7	N-W	2 16 58.62S	79 54 21.42W	2	0	0	-1.2	1.1
*106	958	54	7	S-W	2 17 3.70S	79 54 22.50W	12	0	0	3.9	2.2
106	1108	63	28	N-W	2 17 1.74S	79 54 19.20W	2	29	14	1.9	-1.1
106	1538	64	66	N-E	2 17 1.32S	79 54 25.26W	2	35	17	1.5	4.9
106	1558	42	37	N-W	2 16 58.50S	79 54 18.96W	2	31	15	-1.3	-1.4
*106	1726	64	9	N-W	2 17 0.60S	79 54 21.00W	3	12	5	0.8	0.7
106	1904	63	46	S-E	2 16 59.10S	79 54 20.94W	2	34	16	-0.7	0.5
106	1942	54	48	N-E	2 17 0.84S	79 54 23.76W	2	33	15	1.0	3.4
106	2054	65	18	S-W	2 15 59.28S	79 54 19.98W	2	27	13	-0.8	-0.4
*106	2130	54	14	N-W	2 16 54.24S	79 54 22.92W	4	17	1	-5.5	2.6
106	2246	63	43	S-W	2 16 57.78S	79 54 19.20W	2	30	4	-2.1	-1.1
*107	148	42	9	S-E	2 17 2.28S	79 54 16.38W	3	12	5	2.4	-4.0
107	314	64	40	S-E	2 16 58.56S	79 54 19.68W	2	31	15	-1.3	-0.4
107	334	42	64	S-W	2 16 58.26S	79 54 19.50W	2	29	0	-1.6	-0.8

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 13A-1 (CONT.)

R/V KANA KEOKI 1972 POSITIONAL DATA, GUAYAQUIL, ECUADOR
MOORED AT BERTH NUMBER 2, PUERTO MARITIMO

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSO	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
107	502	64	17	S-W	2 16 59.10S	79 54 19.80W	2	19	6	-0.7	-0.8
107	642	65	22	N-E	2 17 1.22S	79 54 21.42W	2	25	12	1.4	1.1
107	718	64	28	S-E	2 16 58.08S	79 54 20.16W	2	31	15	-1.8	-0.2
107	828	65	26	N-W	2 17 1.56S	79 54 19.50W	2	27	12	1.7	-0.8
107	906	64	25	S-W	2 16 57.60S	79 54 20.46W	2	26	12	-2.2	0.1
*107	1020	63	77	N-W	2 17 0.30S	79 54 14.04W	2	36	17	1.1	-6.3
107	1450	64	23	N-E	2 17 1.14S	79 54 21.66W	2	28	4	1.3	1.3
107	1636	64	30	N-W	2 17 0.78S	79 54 18.78W	2	28	7	0.9	-1.5
107	1818	65	17	S-E	2 16 58.02S	79 54 20.10W	2	24	0	-1.8	-0.2
107	1852	64	15	N-E	2 17 1.08S	79 54 21.84W	2	23	11	1.2	1.5
107	2004	65	48	S-W	2 16 57.72S	79 54 18.36W	2	36	17	-2.1	-2.0
107	2036	64	44	N-W	2 17 0.48S	79 54 19.00W	2	25	12	0.6	-2.2
107	2156	63	66	S-E	2 16 58.32S	79 54 21.72W	2	32	1	-1.5	1.4
*107	2346	63	8	S-W	2 17 7.86S	79 54 19.62W	2	7	1	5.9	-0.7
*108	228	64	13	S-E	2 16 59.76S	79 54 19.20W	2	21	10	-0.1	-1.1
108	412	64	48	S-W	2 16 58.32S	79 54 18.96W	2	30	1	-1.5	-1.4
*108	630	64	7	S-E	2 17 1.14S	79 54 17.34W	2	5	2	1.3	-3.0
*108	738	65	73	N-W	2 17 1.38S	79 54 9.60W	2	29	0	1.5	-12.7
108	812	64	73	S-W	2 16 59.34S	79 54 18.54W	2	30	1	-0.5	-1.8
108	930	63	39	N-E	2 17 2.04S	79 54 22.08W	2	28	5	2.2	1.7
108	1118	63	19	N-W	2 17 1.38S	79 54 19.86W	2	24	12	1.5	-0.5
*108	1406	64	7	N-E	2 16 47.46S	79 54 20.64W	2	0	0	-12.4	0.3
108	1546	64	65	N-W	2 17 1.26S	79 54 26.52W	2	29	0	2.0	6.2
108	1814	65	65	S-E	2 16 59.10S	79 54 22.50W	2	34	0	-0.7	2.2
108	1946	64	64	N-E	2 17 1.50S	79 54 24.36W	2	33	16	1.7	4.0
*108	2104	65	11	S-W	2 17 2.70S	79 54 22.32W	3	12	1	2.9	2.0
*108	2136	64	9	N-W	2 16 52.86S	79 54 21.18W	2	11	0	-7.0	0.8
108	2256	63	29	S-W	2 16 58.26S	79 54 19.74W	2	27	2	-1.6	-0.6
*109	144	42	10	S-E	2 16 55.20S	79 54 18.54W	2	15	7	-4.6	-1.8
109	324	64	60	S-E	2 16 57.72S	79 54 21.12W	2	34	9	-2.1	-0.5
*109	512	64	10	S-W	2 17 3.36S	79 54 19.44W	2	10	0	3.5	-0.9
109	652	65	35	N-E	2 17 1.62S	79 54 21.96W	2	29	13	1.8	1.6
109	720	64	38	S-E	2 16 59.28S	79 54 20.52W	2	33	15	-0.6	0.2
109	839	65	16	N-W	2 17 3.24S	79 54 21.78W	2	17	7	3.4	1.4
109	909	64	19	S-W	2 16 59.46S	79 54 19.74W	2	25	7	-0.4	-0.6
109	1028	63	53	N-W	2 17 0.84S	79 54 17.16W	2	35	18	1.0	-3.2
*109	1456	64	35	N-E	2 17 7.38S	79 54 32.82W	2	16	5	7.5	12.5
109	1646	64	20	N-W	2 17 0.78S	79 54 20.04W	2	18	1	0.9	-0.3
109	1828	65	26	S-E	2 16 58.08S	79 54 20.04W	2	31	4	-1.8	-0.3
109	1956	64	21	N-E	2 17 0.06S	79 54 22.02W	2	25	3	0.2	1.7
109	2014	65	33	S-W	2 16 58.26S	79 54 19.02W	2	33	15	-1.6	-1.3
109	2042	54	33	N-W	2 16 59.70S	79 54 18.60W	2	29	11	-0.1	-1.7
*109	2204	63	81	S-W	2 17 1.80S	79 54 2.40W	2	31	0	2.0	-17.9
*110	232	64	22	S-E	2 20 12.18S	79 51 43.02W	3	22	10	192.3	-157.3
110	420	42	15	S-W	2 16 59.94S	79 54 19.32W	3	19	7	0.1	-1.0
*110	606	65	10	N-E	2 17 2.34S	79 54 18.54W	2	14	6	3.1	-1.8

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 13A-1 (CONT.)

F/V KANA KEOKI 1972 POSITIONAL DATA, GUAYAQUIL, ECUADOR
MOORED AT BERTH NUMBER 2, PUERTO MARITIMO

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
*110	632	54	11	S-E	2 17 1.26S	79 54 19.08W	2	18	9	1.4	-1.3
110	748	65	50	N-W	2 17 0.36S	79 54 17.58W	2	31	15	0.5	-2.8
110	816	54	56	S-W	2 16 58.26S	79 54 18.84W	2	35	17	-1.6	-1.9
110	940	63	57	N-E	2 17 1.20S	79 54 23.88W	2	34	2	1.4	3.5
*110	1128	63	12	N-W	2 17 0.30S	79 54 20.76W	2	19	9	0.5	0.4
110	1406	42	24	N-E	2 17 1.02S	79 54 20.04W	2	27	0	1.2	-0.3
110	1550	42	30	N-W	2 17 0.60S	79 54 18.36W	2	31	15	0.8	-2.0
*110	1742	65	7	S-E	2 16 58.14S	79 54 17.82W	7	0	0	-1.7	-2.5
*110	1924	65	81	S-W	2 16 59.28S	79 54 11.04W	2	30	0	-0.6	-9.3
*110	1950	54	84	N-E	2 17 2.10S	79 54 38.10W	3	34	14	2.3	17.8
*110	2140	54	7	N-W	2 16 43.98S	79 54 24.42W	6	0	0	-15.9	4.1
110	2304	63	19	S-W	2 16 59.28S	79 54 19.86W	2	25	13	-0.6	-0.6
*111	140	42	12	S-E	2 17 8.04S	79 54 23.46W	4	17	6	8.2	3.1
111	324	42	52	S-W	2 16 59.34S	79 54 19.50W	2	32	9	-0.5	-0.8
111	700	65	34	N-E	2 17 1.08S	79 54 23.22W	2	32	16	1.2	2.9
111	724	54	50	S-E	2 16 58.92S	79 54 20.28W	2	35	17	-0.9	-0.1
*111	850	65	9	N-W	2 16 55.50S	79 54 21.06W	5	13	6	-4.3	0.7
*111	914	54	13	S-W	2 16 59.28S	79 54 20.88W	2	21	10	-0.6	0.5
111	1036	63	37	N-W	2 16 59.70S	79 54 18.72W	2	33	16	-0.1	-1.6

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 13E-1

ARITHMETIC MEAN SOLUTION AT GUAYAQUIL, BERTH # 2

NP	N	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
110	37	73	2 16 53.84S 79 54 20.35W	1.5 2.4	0.2 0.3

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
105	152	x			
105	632	x			
105	1200	x		x	
105	1656	x			x
105	1810	x			
105	1950	x			
105	2336	x			
106	220	x		x	
106	808		x		
106	918	x			
106	958	x		x	
106	1726	x			
106	2130	x			
107	148	x			
107	1020		x		
107	2346	x			
108	228	x			
108	630	x		x	
108	738				x
108	1406	x			x
108	2104	x			
108	2136	x			
109	144	x			
109	512	x			
109	1458				x
109	2204		x		x
110	232				x
110	606	x			
110	632	x			
110	1126	x			
110	1742	x		x	
110	1924		x		
110	1950		x		x
110	2140	x		x	x
111	140	x			
111	950	x		x	
111	914	x			

TABLE 13C-1

BY SATELLITE ----- ARITHMETIC MEAN SOLUTION AT GUAYAQUIL, BERTH # 2

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	10	2 16 59.93S 79 54 19.90W	1.4 1.7	0.4 0.5
54	18	2 16 59.67S 79 54 20.27W	1.7 1.7	0.4 0.4
63	13	2 16 59.68S 79 54 20.15W	1.5 1.5	0.4 0.4
64	14	2 16 59.69S 79 54 20.21W	1.6 1.5	0.4 0.4
65	19	2 16 59.75S 79 54 20.35W	1.7 1.7	0.4 0.4

TABLE 13A-2

R/V KANA KEOKI 1973 POSITIONAL DATA, GUAYAQUIL, ECUADOR.
PORT SIDE TO BERTH NO. 2, PUERTO MARITIMO, STERN 13 METERS BEYOND END.

	DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
	46	1814	64	30	N-E	2 17 1.74S	79 54 20.46W	2	29	4	2.0	-0.0
	46	1924	42	71	N-E	2 17 1.32S	79 54 20.46W	3	34	17	1.6	-0.0
	46	2000	64	23	N-W	2 17 3.78S	79 54 17.94W	2	25	6	4.0	-2.5
*	46	2114	42	7	N-W	2 17 2.52S	79 54 24.18W	4	5	2	2.8	3.7
*	46	2224	54	80	N-E	2 17 1.44S	79 54 23.46W	2	30	1	1.7	3.0
	46	2320	65	54	S-E	2 16 57.90S	79 54 22.80W	2	31	15	-1.9	2.3
*	47	14	54	7	N-W	2 16 56.70S	79 54 26.76W	5	0	0	-3.1	6.3
*	47	110	65	9	S-W	2 17 2.52S	79 54 19.80W	2	11	4	2.8	-0.7
	47	302	63	26	S-W	2 16 58.20S	79 54 17.82W	2	30	14	-1.6	-2.6
	47	552	64	19	S-E	2 16 58.80S	79 54 21.42W	2	26	12	-1.0	1.0
	47	658	42	41	S-E	2 16 59.16S	79 54 21.54W	2	34	17	-0.6	1.1
	47	736	64	38	S-W	2 16 59.46S	79 54 17.58W	2	31	13	-1.3	-2.9
	47	846	42	17	S-W	2 16 59.76S	79 54 18.48W	2	22	9	0.0	-2.0
	47	1000	54	49	S-E	2 16 58.32S	79 54 22.32W	2	34	16	-1.4	1.9
	47	1054	65	36	N-E	2 17 1.56S	79 54 21.36W	2	36	17	1.3	1.3
*	47	1148	54	13	S-W	2 16 59.28S	79 54 18.54W	2	20	9	-0.5	-1.9
	47	1240	65	24	N-W	2 17 0.24S	79 54 20.10W	2	28	12	0.5	-0.4
*	47	1436	63	43	N-W	2 17 1.14S	79 54 21.42W	2	26	7	1.4	1.0
	47	1436	63	43	N-W	2 17 1.14S	79 54 21.42W	2	26	7	1.4	1.0
*	47	1728	64	9	N-E	2 16 58.02S	79 54 19.38W	2	11	5	-1.7	-1.1
	47	1832	42	21	N-E	2 17 1.14S	79 54 20.34W	2	24	5	1.4	-0.1
	47	1910	64	65	N-W	2 17 2.04S	79 54 19.90W	2	33	2	2.3	-1.5
	47	2018	42	32	N-W	2 17 0.12S	79 54 22.08W	2	30	2	0.4	1.6
	47	2134	54	27	N-E	2 17 1.32S	79 54 20.46W	2	30	14	1.6	-0.0
	47	2232	65	17	S-E	2 16 58.44S	79 54 21.72W	2	23	10	-1.3	1.3
	47	2320	54	25	N-W	2 17 1.80S	79 54 21.00W	2	29	14	2.0	0.5
	48	18	65	32	S-W	2 16 57.42S	79 54 17.40W	2	28	13	-2.3	-3.1
*	48	608	42	11	S-E	2 16 57.72S	79 54 19.20W	2	17	8	-2.0	-1.6
	48	212	63	71	S-W	2 17 0.72S	79 54 19.79W	2	30	1	1.0	-1.7
	48	648	64	72	S-E	2 16 57.42S	79 54 26.50W	2	33	0	-2.3	3.0
	48	750	42	56	S-W	2 16 58.86S	79 54 16.32W	2	34	17	-0.9	-4.1
*	48	838	64	7	S-W	2 17 15.06S	79 54 20.52W	7	0	0	15.3	0.1
	48	910	54	16	S-E	2 16 50.52S	79 54 22.62W	2	23	11	-9.2	2.2
*	48	1008	65	12	N-E	2 17 1.14S	79 54 15.54W	3	21	10	1.4	-4.9
	48	1056	54	43	S-W	2 16 57.84S	79 54 18.00W	2	34	15	-1.9	-2.5
	48	1150	65	62	N-W	2 17 1.50S	79 54 18.84W	2	35	15	1.7	-1.6
	48	1346	63	67	N-E	2 17 0.66S	79 54 22.74W	2	34	16	0.9	2.3
*	48	1536	63	8	N-W	2 17 2.82S	79 83 22.62W	2	5	1	3.1	-57.9
	48	1822	64	45	N-E	2 17 1.80S	79 54 21.84W	2	34	16	2.0	1.4
*	48	1922	42	72	N-E	2 17 2.22S	79 54 23.46W	6	0	0	2.5	3.0
	48	2010	64	15	N-W	2 17 1.92S	79 54 21.84W	2	18	1	2.2	1.4
*	48	2110	42	7	N-W	2 16 50.70S	79 54 24.78W	2	1	0	-9.1	4.3
*	48	2228	54	76	N-W	2 17 1.80S	79 54 18.54W	5	32	0	2.0	-1.9
*	48	2330	65	84	S-E	2 16 56.70S	79 54 38.10W	2	30	1	-3.1	17.6
	49	122	63	42	S-E	2 16 59.40S	79 54 21.24W	2	32	10	-0.4	0.8

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 13A-2 (CONT.)

R/V KANA KEOKI 1973 POSITIONAL DATA, GUAYAQUIL, ECUADOR.
PORT SIDE TO BERTH NO. 2, PUERTO MARITIMO, STERN 13 METERS BEYOND END.

	DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
	49	310	63	17	S-W	2 16 59.58S	79 54 18.42W	2	20	4	-0.2	-2.9
	49	600	64	28	S-E	2 16 57.90S	79 54 21.84W	2	30	14	-1.9	1.4
	49	656	42	45	S-E	2 16 58.74S	79 54 20.88W	2	31	6	-1.0	0.4
	49	746	64	25	S-W	2 16 58.98S	79 54 18.06W	2	30	14	-0.8	-2.4
	49	844	42	15	S-W	2 16 59.46S	79 54 19.80W	2	22	10	-0.3	-0.7
	49	1004	54	65	S-E	2 16 59.88S	79 54 20.46W	2	33	0	0.1	-0.2
	49	1104	65	53	N-E	2 17 0.12S	79 54 19.86W	2	38	18	0.4	-0.6
*	49	1152	54	9	S-W	2 20 25.32S	79 54 2.46W	4	11	5	205.6	-18.0
	50	28	65	20	S-W	2 17 0.12S	79 54 20.52W	3	24	10	0.4	0.1
	50	220	63	49	S-W	2 16 59.76S	79 54 23.88W	2	25	5	0.0	3.4
*	50	514	64	8	S-E	2 17 13.38S	79 54 21.18W	2	7	2	13.6	0.7
*	50	602	42	13	S-E	2 17 0.60S	79 54 20.04W	2	20	9	0.9	-0.4
	50	656	64	71	S-W	2 16 59.04S	79 54 17.34W	2	35	17	-0.7	-3.1
	50	916	54	22	S-E	2 16 57.84S	79 54 17.40W	2	22	4	-1.9	-3.1
	50	1016	65	20	N-E	2 17 2.59S	79 54 22.62W	2	29	14	2.8	2.2
	50	1058	54	32	S-W	2 16 58.92S	79 54 19.86W	2	32	16	-0.8	-0.6
	50	1204	65	43	N-W	2 17 1.86S	79 54 18.72W	2	33	15	2.1	-1.7
*	50	1354	63	58	N-W	2 16 47.28S	79 51 53.16W	3	29	0	-12.5	-147.3
	50	1932	64	68	N-E	2 17 1.08S	79 54 24.84W	3	35	17	1.3	4.4

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 138-2

ARITHMETIC MEAN SOLUTION, GUAYAQUIL, NO. 2, STERN 13 METERS EXTENDED.

NF	N	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
64	19	45	2 16 59.76S 79 54 20.46W	2.1 2.3	0.3 0.3

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
46	2114	X			
46	2224		X		
47	14	X		X	
47	110	X			
47	1148	X			
47	1436				X
47	1728	X			
48	608	X			
48	838	X		X	X
48	1028	X			
48	1536	X			X
48	1922			X	
48	2110	X			
49	2228		X	X	
49	2330		X		X
49	1152	X			X
50	514	X			X
50	602	X			
50	1354				X

TABLE 13C-2

BY SATELLITE, MEAN SOLUTION, GUAYAQUIL, NO. 2, STEP 13 METERS EXTENDED.

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	8	2 16 59.82S 79 54 19.99W	1.0 1.8	0.3 0.7
54	8	2 16 59.82S 79 54 19.99W	1.0 1.8	0.3 0.7
63	7	2 16 59.87S 79 54 20.01W	1.0 2.0	0.4 0.8
64	12	2 16 59.21S 79 54 20.53W	3.0 1.8	0.9 0.5
65	10	2 16 59.82S 79 54 20.27W	1.1 1.8	0.4 0.6

TABLE 13A-3

F/V KANA KECKI 1973 POSITIONAL DATA, GUAYAQUIL, ECUADOR.
PORT SIDE TO CARRIBEAN TUNA., PUERTO MARITIMO.

	DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
	50	2022	64	8	N-W	2 17 1.38S	79 54 24.42W	2	6	2	3.3	2.8
*	50	2050	54	11	N-E	2 16 58.02S	79 54 22.44W	4	15	7	-0.1	-1.3
*	50	2156	65	7	S-E	2 17 6.00S	79 54 21.12W	4	2	0	7.9	-2.5
	50	2232	54	58	N-W	2 16 59.76S	79 54 21.12W	2	34	8	1.5	-2.5
	50	2340	65	62	S-W	2 16 57.24S	79 54 21.54W	2	32	16	-0.9	-2.1
*	51	132	63	61	S-E	2 17 9.54S	79 54 9.48W	2	31	11	10.9	-14.2
*	51	332	63	11	S-W	2 17 5.16S	79 54 24.96W	7	15	3	7.0	1.3
	51	608	64	32	S-E	2 16 57.36S	79 54 22.50W	2	34	17	-0.8	-1.2
	51	652	42	50	S-E	2 16 57.00S	79 54 22.62W	2	34	16	-1.1	-1.0
	51	756	64	16	S-W	2 16 58.38S	79 54 22.62W	3	20	6	-0.0	-1.0
*	51	840	42	13	S-W	2 16 56.26S	79 54 21.90W	2	18	6	-2.9	-1.8
	51	1008	54	71	S-E	2 16 56.16S	79 54 25.44W	3	32	0	-2.0	4.4
*	51	1114	65	77	N-E	2 16 58.74S	79 54 32.58W	2	35	1	0.5	8.9
*	51	1158	54	7	S-W	2 17 17.76S	79 54 24.78W	9	0	0	19.6	1.1
*	51	1306	65	9	N-W	2 15 38.22S	79 54 19.80W	6	0	0	-19.3	-3.9
	51	1500	63	19	N-W	2 17 0.72S	79 54 25.44W	3	13	1	2.6	1.8
	51	1744	64	24	N-E	2 16 58.32S	79 54 24.66W	2	28	13	2.9	1.0
	51	1826	42	26	N-E	2 16 58.68S	79 54 23.22W	2	27	13	0.6	-0.4
	51	1930	64	29	N-W	2 16 58.58S	79 54 23.10W	2	26	7	0.9	-0.6
	51	2140	54	48	N-E	2 16 57.16S	79 54 25.74W	2	34	17	1.0	2.1
	51	2252	65	43	S-E	2 16 55.32S	79 54 22.86W	2	30	14	-2.8	-0.8
*	51	2328	54	14	N-W	2 16 37.50S	79 54 33.18W	3	21	0	-20.6	3.5

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 13B-3

ARITHMETIC MEAN SOLUTION, GUAYAQUIL, PORT SIDE TO CARRIBEAN TUNA.

NP	N	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
22	10	12	2 16 58.11S 79 54 23.65W	1.6 2.1	0.4 0.6

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
50	2022	X			
50	2050	X			
50	2156	X			
51	132				X
51	322	X		X	
51	340	X			
51	1114		X		
51	1158	X		X	X
51	1306	X		X	X
51	2328	X			X

TABLE 13C-3

BY SATELLITE, MEAN SOLUTION, GUAYAQUIL, EAST SIDE TO CARRIBEAN TIUNA.

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	2	2 16 57.84S	1.2	0.8
		79 54 22.92W	0.4	0.3
54	3	2 16 58.48S	1.4	0.8
		79 54 22.32W	1.1	0.6
63	1	2 16 57.00S		
		79 54 22.62W		
64	4	2 16 57.90S	1.6	0.8
		79 54 23.85W	3.2	1.6
65	2	2 16 57.84S	1.2	0.8
		79 54 22.92W	0.4	0.3

TABLE 13A-4

R/V KANA KEOKI 1973 POSITIONAL DATA. GUAYAQUIL. ECUADOR.
PORT SIDE TO BERTH NO. 6. PUERTO MARITIMO.

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
65	1848	64	22	N-W	2 16 43.62S	79 54 43.44W	4	24	8	-0.2	-1.2
* 65	1546	42	12	N-W	2 16 46.38S	79 54 44.04W	2	18	8	2.5	-0.6
65	2020	54	30	N-E	2 16 43.62S	79 54 46.50W	2	31	15	-0.2	1.9
65	2208	54	24	N-W	2 16 44.34S	79 54 43.86W	2	28	10	2.5	-0.7

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 13F-4

ATITHMETIC MEAN SOLUTION, GUAYAQUIL, PORT SIDE TO PERTH NO. 6.

NP	N	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
4	1	3	2 16 43.866 79 54 44.60W	0.4 1.7	0.2 1.0

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
65	1946		X		

TABLE 130-4

BY SATELLITE, MEAN SOLUTION, GUAYAQUIL, PORT SIDE TO BERTH NO. 6.

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
54	2	2 16 43.58S 79 54 45.18W	0.5 1.9	0.4 1.3

TABLE 14A-1

R/V KANA KEOKI 1972 POSITONAL DATA, PUNTARENAS, COSTA RICA
SWINGING AT ANCHOR, BUT NOT DRAGGING

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
122	1830	54	27	N-E	9 57 51.36N	84 49 27.66W	3	29	14	0.0	1.3
122	2018	54	26	N-W	9 57 49.98N	84 49 27.90W	2	22	6	-1.3	1.5
122	2204	63	41	S-W	9 57 51.24N	84 49 25.56W	2	32	16	-0.1	-0.8
*123	116	42	13	S-E	9 57 54.12N	84 49 23.76W	2	19	7	2.8	-2.6
123	240	64	52	S-E	9 57 52.32N	84 49 25.08W	2	34	16	1.0	-1.3
123	300	42	50	S-W	9 57 51.54N	84 49 23.94W	2	33	16	0.2	-2.5
*123	428	64	13	S-W	9 57 48.00N	84 49 27.24W	2	19	7	-3.3	0.9
*123	600	54	14	S-E	9 57 52.38N	84 49 26.52W	2	18	3	1.1	0.1
123	618	65	40	N-E	9 57 50.10N	84 49 27.48W	2	32	15	-1.2	1.1
123	744	54	51	S-W	9 57 51.60N	84 49 26.58W	2	35	17	0.3	0.2
*123	804	63	12	N-E	9 57 51.06N	84 49 26.22W	3	17	4	-0.3	-0.2
123	946	63	62	N-W	9 57 51.30N	84 49 25.26W	2	36	13	-0.0	-1.1
*123	1256	42	7	N-E	9 57 54.90N	84 49 25.62W	3	0	0	3.6	-0.8
123	1420	64	35	N-E	9 57 50.04N	84 49 26.58W	2	32	16	-1.3	0.2
*123	1440	42	76	N-W	9 57 50.34N	84 49 19.32W	2	30	1	-1.0	-7.1
123	1608	64	20	N-W	9 57 53.64N	84 49 25.02W	2	23	2	2.3	-1.4
*123	1742	54	7	N-E	9 57 47.40N	84 49 23.70W	3	0	0	-3.9	-2.7
*123	1924	54	77	N-W	9 57 50.70N	84 49 20.10W	2	34	17	-0.6	-6.3
123	2116	63	71	S-E	9 57 51.48N	84 49 29.28W	2	31	13	0.2	2.9

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 14E-1

ARITHMETIC MEAN SOLUTION AT PUNTARENAS - ANCHORED

NP	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
19	8	11	S 57 51.33N 84 49 26.39W	1.1 1.6	0.3 0.5

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
123	116	X			
123	428	X			
123	600	X			
123	804	X			
123	1256	X			
123	1440		X		
123	1742	X			
123	1924		X		

TABLE 14C-1

BY SATELLITE ----- ARITHMETIC MEAN SOLUTION AT PUNTA ARENAS - ANCHORED

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	1	9 57 51.54N 84 49 23.94W		
54	3	9 57 50.96N 84 49 26.50W	0.9 2.2	0.5 1.3
63	3	9 57 50.96N 84 49 26.50W	0.9 2.2	0.5 1.3
64	3	9 57 50.96N 84 49 26.50W	0.9 2.2	0.5 1.3

TABLE 15A-1

R/V KANA KEOKI 1972 POSITIONAL DATA, ACAPULCO, MEXICO
MOORED AT DOCK

DAY	GMT	SAT	ELEV	QECM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
132	1652	54	30	N-E	16 50 52.14N	99 54 15.96W	2	12	2	-1.6	0.1
*132	1926	65	76	S-W	16 50 52.44N	99 53 39.84W	3	21	8	-1.3	-36.0
132	2040	54	24	N-W	16 50 49.56N	99 54 15.06W	2	10	3	-4.2	-0.8
132	2102	63	28	S-E	16 51 0.60N	99 54 26.76W	2	25	5	6.8	10.9
*132	2248	63	26	S-W	16 51 0.18N	99 54 4.74W	2	22	2	6.4	-11.1
*133	242	42	65	S-E	16 50 56.34N	99 54 30.30W	2	29	13	2.6	14.4
*133	326	64	87	S-W	16 50 41.76N	99 53 36.96W	3	30	0	-12.0	-218.7
*133	430	42	10	S-W	16 51 5.76N	99 54 10.92W	8	9	3	12.0	-4.9
*133	618	54	15	S-E	16 50 52.68N	99 54 14.64W	5	11	1	-1.1	-1.2
133	712	65	60	N-E	16 50 50.10N	99 54 11.34W	2	11	1	-3.7	-4.5
133	804	54	51	S-W	16 50 54.72N	99 54 13.50W	2	19	1	1.0	-2.4
133	850	63	23	N-E	16 50 52.20N	99 54 17.76W	3	21	7	-1.6	1.9
133	1034	63	37	N-W	16 50 53.64N	99 54 14.64W	2	20	5	-0.1	-1.2
133	1426	42	46	N-E	16 50 53.34N	99 54 17.16W	2	13	0	-0.4	1.3
*133	1512	64	70	N-S	16 50 51.00N	99 54 38.28W	2	32	15	-2.8	22.4
133	1614	42	15	N-W	16 50 52.32N	99 54 10.74W	2	15	4	-1.4	-5.1
*133	1700	64	9	N-W	16 51 1.68N	99 54 10.68W	5	10	3	7.9	-5.2
133	1838	65	41	S-E	16 50 55.26N	99 54 14.22W	2	18	2	1.5	-1.6
133	1946	54	44	N-W	16 50 53.34N	99 54 25.74W	2	12	0	-0.4	9.9
133	2026	65	19	S-W	16 50 57.90N	99 54 7.50W	2	24	12	4.1	-8.4

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 15E-1

ARITHMETIC MEAN SOLUTION AT ACAPULCO - DOCKED

NP	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
20	8	12	16 50 53.76N 99 54 15.86W	3.1 5.6	0.9 1.6

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
132	1926		x		x
132	2248				x
133	242				x
133	926		x		x
133	430	x		x	x
133	619			x	
133	1512				x
133	1700	x		x	

TABLE 15C-1

BY SATELLITE ----- ARITHMETIC MEAN SOLUTION AT ACAPULCO - DOCKED

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	2	16 50 52.83N 99 54 13.95W	0.7 4.5	0.5 3.2
54	4	16 50 51.84N 99 54 14.73W	1.6 2.9	0.8 1.4
63	3	16 50 52.60N 99 54 14.62W	0.6 3.4	0.4 2.0
65	3	16 50 52.60N 99 54 14.62W	0.6 3.4	0.4 2.0

TABLE 15A-2

R/V KANA KEOKI 1972 POSITIONAL DATA, ACAPULCO, MEXICO
MOORED AT DOCK, 60 METERS WEST OF POSITION ON DAYS 132 - 133.

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSO	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
133	2200	63	71	S-W	16 50 54.12N	99 53 43.26W	2	24	1	-0.5	-35.9
134	150	42	20	S-E	16 51 1.38N	99 54 20.69W	2	20	9	6.7	1.7
134	238	64	35	S-E	16 51 1.92N	99 54 23.83W	2	29	14	7.3	4.7
*134	334	42	37	S-W	16 50 59.74N	99 54 8.94W	2	27	1	4.1	-10.2
134	424	64	23	S-W	16 50 57.00N	99 54 11.70W	2	29	14	2.3	-7.5
134	628	65	32	N-E	16 50 53.58N	99 54 17.94W	2	20	4	-1.1	-1.2
134	712	54	58	S-E	16 50 54.18N	99 54 19.80W	2	34	17	-0.5	0.5
134	812	65	27	N-W	16 50 53.10N	99 54 16.50W	2	20	6	-1.6	-2.7
*134	900	54	13	S-W	16 50 53.46N	99 54 14.76W	2	21	10	-1.2	-4.4
*134	948	63	68	N-E	16 50 51.06N	99 54 37.02W	5	19	0	-3.6	17.0
*134	1332	42	14	N-E	16 50 49.74N	99 54 18.00W	3	17	6	-4.0	-1.2
*134	1430	64	25	N-E	16 50 53.22N	99 54 32.28W	7	12	1	-1.4	13.1
134	1516	42	52	N-W	16 50 52.92N	99 54 17.46W	2	22	1	-1.7	-1.7
134	1610	64	30	N-W	16 50 54.60N	99 54 10.14W	2	28	1	-0.1	-9.1
134	1752	65	15	S-E	16 51 3.18N	99 54 25.68W	2	20	10	8.5	9.5
*136	2054	54	13	N-W	16 51 11.34N	99 54 14.10W	10	8	0	16.7	-5.1
*136	2120	63	59	S-E	16 50 55.86N	99 54 39.96W	2	23	9	1.2	20.8
137	200	64	19	S-E	16 50 50.58N	99 54 26.34W	2	23	11	-4.1	7.2
137	346	64	40	S-W	16 50 54.54N	99 54 16.80W	2	10	0	-0.1	-2.4
137	548	65	19	N-E	16 50 50.04N	99 54 11.88W	2	22	10	-3.7	-7.3
137	626	54	27	S-E	16 50 57.12N	99 54 15.78W	2	27	7	2.5	-3.4
137	730	65	46	N-W	16 50 52.86N	99 54 19.68W	2	26	0	-1.8	0.5
137	812	54	30	S-W	16 50 54.66N	99 54 15.24W	2	11	0	0.0	-3.0
137	904	63	47	N-E	16 50 54.06N	99 54 19.38W	2	33	15	-0.5	0.2
137	1054	63	17	N-W	16 50 50.82N	99 54 15.90W	2	20	8	-3.8	-3.3
*137	1346	64	13	N-E	16 50 55.08N	99 54 21.30W	4	20	9	1.3	2.1
137	1416	42	56	N-E	16 50 53.34N	99 54 24.90W	2	34	17	-1.3	5.7
*137	1530	64	55	N-W	16 50 55.50N	99 54 7.80W	2	32	16	0.9	-11.4
*137	1910	54	18	N-E	16 50 56.46N	99 54 33.60W	2	23	7	1.8	14.4
*137	1958	65	80	S-E	16 51 15.48N	99 55 11.76W	14	23	0	20.8	292.6
*138	256	64	76	S-E	16 50 45.84N	99 54 8.28W	3	31	3	-8.8	-10.0
*138	328	42	31	S-W	16 50 58.56N	99 54 5.64W	2	24	7	3.0	-13.5
*138	1630	64	12	N-W	16 50 55.20N	99 54 7.62W	2	19	8	0.5	-11.5
138	1810	65	33	S-E	16 50 57.30N	99 54 29.16W	2	30	14	2.6	10.0
*138	1904	54	60	N-E	16 50 51.84N	99 54 52.14W	2	34	17	-2.8	33.0
138	1958	65	23	S-W	16 50 54.30N	99 54 17.40W	2	13	4	-0.4	-1.8
*138	2128	63	56	S-E	16 50 56.70N	99 56 1.50W	3	17	0	2.0	102.3
139	208	64	29	S-E	16 50 57.06N	99 54 22.86W	2	29	14	2.4	3.7
*139	232	42	95	S-E	16 51 0.42N	99 55 34.44W	3	27	0	5.8	75.3
*139	354	64	28	S-W	16 50 56.16N	99 54 4.98W	2	28	0	4.5	-14.2
139	556	65	28	N-E	16 50 51.96N	99 54 20.22W	2	29	14	-2.7	1.1
139	646	65	69	N-E	16 50 52.68N	99 54 23.40W	4	27	9	-2.0	4.2
*139	720	54	83	S-W	16 50 53.28N	99 53 19.38W	4	32	14	-1.4	-59.8

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 15A-2 (CONT.)

R/V KANA KEOKI 1372 POSITIONAL DATA, ACAPULCO, MEXICO
MOORED AT DOCK, 60 METERS WEST OF POSITION ON DAYS 132 - 133.

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
139	816	63	17	N-E	16 50 52.68N	99 54 18.60W	2	0	0	-2.0	-0.6
*139	832	65	11	N-W	16 50 44.28N	99 54 18.36W	3	0	0	-10.4	-0.8
139	1006	63	47	N-W	16 50 54.60N	99 54 14.58W	2	22	6	-0.1	-4.6
139	1328	42	18	N-E	16 50 49.56N	99 54 19.20W	2	15	4	-5.1	0.0

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 15E-2

ARITHMETIC MEAN SOLUTION AT ACAPULCO - 60 M WEST

NP	N	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
47	21	26	16 50 54.65N 99 54 19.16W	3.4 4.9	0.7 1.0

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
133	2200				x
134	334				x
134	900	x			
134	948			x	x
134	1332	x			
134	1430			x	x
136	2054	x		x	x
136	2120				x
137	1346	x			
137	1530				x
137	1810				x
137	1854		x	x	x
138	256		x		x
138	328				x
138	1530	x			x
138	1904				x
138	2128				x
139	232		x		x
139	354				x
139	720		x		x
139	832	x			x

TABLE 15C-2

BY SATELLITE ---- ARITHMETIC MEAN SOLUTION AT ACAPULCO - 60 M WEST

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	4	16 50 54.30N	5.0	2.5
		99 54 20.61W	3.2	1.6
54	3	16 50 55.48N	4.8	2.8
		99 54 21.09W	3.7	2.1
63	4	16 50 54.30N	5.0	2.5
		99 54 20.61W	3.2	1.6
64	6	16 50 54.75N	4.1	1.7
		99 54 19.67W	3.1	1.3
65	9	16 50 54.23N	3.5	1.2
		99 54 18.73W	3.1	1.0

TABLE 15A-3

R/V KANA KEOKI 1974 POSITIONAL DATA, ACAPULCO, MEXICO.
MOORED TO MAIN PIER

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
195	1102	42	28	N-E	16 50 53.52N	99 54 19.08W	2	27	13	-0.3	1.8
195	1148	54	61	N-W	16 50 54.66N	99 54 20.22W	3	23	0	0.8	3.0
195	1248	42	27	N-W	16 50 53.22N	99 54 17.46W	2	27	7	-0.6	0.2
195	1548	65	66	S-W	16 50 53.94N	99 54 18.38W	3	11	0	0.1	-3.9
195	1710	63	45	S-E	16 50 53.88N	99 54 16.02W	2	13	1	0.0	-1.2
*195	1816	99	53	N-E	16 50 30.78N	99 51 11.88W	3	33	16	-23.1	-185.4

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 15B-3

ARITHMETIC MEAN SOLUTION, ACAPULCO, MAIN PIER

NP	N	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
6	1	5	16 50 53.84N 99 54 17.23W	0.5 2.7	0.2 1.2

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	 >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
195	1816				X

TABLE 15C-3

BY SATELLITE, MEAN SOLUTION, ACAPULCO, MAIN PIER.

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	2	16 50 53.37N	0.2	0.2
		99 54 18.27W	1.1	0.8
54	1	16 50 53.52N		
		99 54 19.08W		
63	1	16 50 53.52N		
		99 54 19.08W		

TABLE 16A-1

R/V KANA KEOKI 1372 POSITIONAL DATA. SAND ISLAND. MIDWAY
MOORED TO THE MAIN PIER.

DAY	GMT	SAT	ELEV	OPCN	LATITUDE	LONGITUDE	IT	CTS	CTSO	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
203	222	42	20	S-E	28 12 48.14N	177 21 47.22W	5	0	0	-1.2	-1.2
203	334	64	66	S-E	28 12 51.96N	177 21 48.00W	2	0	0	1.5	-0.4
203	408	42	46	S-W	28 12 49.32N	177 21 47.22W	2	0	0	-1.0	-1.2
*203	518	64	13	S-W	28 12 52.50N	177 21 49.02W	2	0	0	2.1	0.6
*203	604	65	7	N-E	28 13 3.78N	177 21 51.72W	2	0	0	13.4	3.3
203	642	54	23	S-E	28 12 48.60N	177 21 46.80W	2	0	0	-1.8	-1.8
*203	748	65	77	N-E	28 12 49.80N	177 21 50.52W	3	0	0	-0.6	2.1
203	830	54	39	S-W	28 12 49.98N	177 21 48.42W	2	0	0	-0.4	0.0
*203	938	65	8	N-W	28 13 1.98N	177 21 43.08W	3	0	0	11.6	-5.3
203	1022	63	73	N-E	28 12 49.78N	177 21 53.76W	4	0	0	-1.6	5.4
203	1558	42	55	N-W	28 12 50.40N	177 21 46.56W	2	0	0	0.0	-1.5
203	1710	64	16	N-W	28 12 47.52N	177 21 50.10W	2	0	0	-2.8	1.7
203	1834	54	19	N-E	28 12 49.44N	177 21 46.56W	2	0	0	-0.9	-1.8
203	1904	65	37	S-E	28 12 51.90N	177 21 47.10W	2	0	0	1.5	-1.3
203	2018	54	50	N-W	28 12 50.46N	177 21 46.80W	2	0	0	0.1	-1.6
203	2052	65	26	S-W	28 12 51.48N	177 21 49.44W	2	0	0	1.1	1.0
203	2138	63	39	S-E	28 12 51.78N	177 21 48.12W	2	0	0	1.4	-0.3
203	2324	63	26	S-W	28 12 53.16N	177 21 49.98W	2	0	0	2.9	1.6

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 16E-1

ARITHMETIC MEAN SOLUTION AT MIDWAY

NP	N	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
18	5	13	28 12 50.37N 177 21 48.40W	1.6 2.0	0.5 0.6

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
203	222			X	
203	518	X			
203	604	X			X
203	748		X		
203	938	X			X

TABLE 16C-1

ARITHMETIC MEAN SOLUTION BY SATELLITE AT MIDWAY

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	2	28 12 49.96N	0.8	0.5
		177 21 47.04W	0.3	0.2
54	4	28 12 49.57N	0.8	0.4
		177 21 47.32W	0.8	0.4
63	3	28 12 49.44N	0.8	0.5
		177 21 46.96W	0.2	0.1
64	2	28 12 49.86N	0.8	0.5
		177 21 47.04W	0.3	0.2
65	2	28 12 49.86N	0.8	0.5
		177 21 47.04W	0.3	0.2

TABLE 17A-1

F/V KANA KEOKI 1973 POSITIONAL DATA, PAPEETE, TAHITI.
MOORED PORT SIDE TO NORTH END OF MAIN WHARF

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSO	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
21	104	64	56	N-E	17 32 2.64S	149 34 21.90W	2	31	15	1.1	0.1
21	128	42	50	N-E	17 32 2.40S	149 34 21.42W	2	33	16	0.9	-0.4
21	1246	64	42	S-E	17 32 0.12S	149 34 22.74W	2	34	17	-1.4	0.9
21	1310	42	36	S-E	17 32 1.26S	149 34 21.66W	2	32	15	-0.2	-0.1
21	1436	64	19	S-W	17 31 59.58S	149 34 20.70W	2	26	12	-1.9	-1.1
21	1456	42	22	S-W	17 32 3.90S	149 34 22.08W	3	28	13	2.4	0.3
21	1622	54	44	S-E	17 32 0.60S	149 34 22.08W	2	34	17	-0.9	0.3

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 17E-1

ARITHMETIC MEAN SOLUTION AT PAPEETE, MAIN PHASE

NP	N	NSC	LATITUDE / LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
7	0	7	17 32 1.505	1.5	0.6
			149 34 21.80W	0.6	0.2

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15 >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC

TABLE 17C-1

BY SATELLITE --- ARITHMETIC MEAN SOLUTION AT FAREETE, MAIN WHARF

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	3	17 32 2.52S 149 34 21.72W	1.3 0.3	0.9 0.2
54	1	17 32 2.40S 149 34 21.42W		
64	3	17 32 2.52S 149 34 21.72W	1.3 0.3	0.8 0.2

TABLE 17A-2

R/V KANA KECKI 1973 POSITIONAL DATA, PAPEETE, TAHITI.
RECORED AT THE FUEL DOCK

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSO	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
151	1034	65	24	N-W	17 32 14.70S	149 34 11.88W	2	26	9	0.5	1.2
151	1118	63	43	N-E	17 32 15.42S	149 34 11.10W	2	30	6	1.2	0.4
151	1304	63	20	N-W	17 32 15.18S	149 34 9.66W	2	23	6	1.0	-1.0
*151	1632	64	77	N-E	17 32 20.16S	149 35 30.66W	6	30	0	5.9	80.0
151	1708	42	54	N-E	17 32 14.76S	149 34 11.10W	2	30	14	0.5	0.4
*151	1920	64	7	N-W	17 31 57.30S	149 34 12.90W	7	0	0	-16.9	2.2
*151	1954	42	14	N-W	17 32 13.32S	149 34 9.48W	2	19	8	-0.9	-1.2
151	1926	54	63	N-E	17 32 14.34S	149 34 11.58W	2	33	16	0.7	0.9
151	2034	65	25	S-E	17 32 14.46S	149 34 10.56W	2	26	12	0.2	-0.1
*151	2114	54	11	N-W	17 32 17.22S	149 34 9.06W	2	15	5	3.0	-1.6
151	2220	65	27	S-W	17 32 13.80S	149 34 9.60W	2	26	6	-0.4	-1.1
151	2302	63	31	S-E	17 32 13.98S	149 34 9.36W	2	30	14	-0.2	-1.3
152	48	63	25	S-W	17 32 13.44S	149 34 10.14W	2	25	9	-0.9	-0.5
152	416	64	68	S-E	17 32 12.54S	149 34 12.42W	2	36	17	-1.7	1.7
152	448	42	38	S-S	17 32 13.26S	149 34 10.14W	2	33	16	-1.0	-0.5

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 176-2

ARITHMETIC MEAN SOLUTION, TAHITI, FUEL DOCK

NP	N	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
15	4	11	17 32 14.22S	0.6	0.3
			149 34 10.69W	1.0	0.3

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
151	1632		X	X	X
151	1920	X		X	X
151	1954	X			
151	2114	X			

TABLE 17C-2

BY SATELLITE, MEAN SOLUTION, TAHITI, MAIN WHARF ???????

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	2	17 32 14.01S 149 34 10.62W	1.1 0.7	0.8 0.5
54	1	17 32 14.76S 149 34 11.10W		
63	4	17 32 14.59S 149 34 10.98W	0.9 0.6	0.5 0.3
64	1	17 32 14.76S 149 34 11.10W		
65	4	17 32 14.59S 149 34 10.98W	0.9 0.6	0.5 0.3

TABLE 18A-1

R/V KANA KEOKI 1973 POSITIONAL DATA, ANTOFAGASTA, CHILE
MOORED PORT SIDE TO SITIC NO. 2.

	DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
	91	218	64	21	S-E	23 39 12.30S	70 24 18.84W	2	24	11	-1.4	-1.6
*	91	400	42	67	S-E	23 39 13.86S	70 24 8.64W	5	20	0	0.2	-11.8
*	91	548	42	9	S-W	23 39 32.40S	70 24 20.76W	2	11	4	18.7	0.4
	91	612	64	43	S-E	23 39 12.66S	70 24 19.06W	2	29	13	-1.0	-2.3
	91	722	65	32	N-E	23 39 14.16S	70 24 20.88W	2	28	14	0.5	0.5
	91	758	64	19	S-W	23 39 11.82S	70 24 22.32W	2	26	12	-1.9	1.9
	91	906	65	26	N-W	23 39 15.12S	70 24 20.46W	2	28	11	1.5	0.1
*	91	1032	63	67	N-E	23 39 15.60S	70 24 29.64W	6	28	0	1.9	9.2
*	91	1218	63	7	N-W	23 39 9.96S	70 24 22.80W	5	4	1	-3.7	2.1
	91	1520	42	34	N-E	23 39 13.56S	70 24 21.18W	2	31	14	-0.1	0.8
	91	1706	42	25	N-W	23 39 14.04S	70 24 20.88W	2	29	14	0.3	0.5
	91	1732	64	22	N-E	23 39 14.70S	70 24 20.40W	2	27	13	1.0	-0.2
	91	1910	65	30	S-E	23 39 13.20S	70 24 18.78W	2	33	16	-0.5	-1.8
	91	2054	65	35	S-W	23 39 12.66S	70 24 21.66W	2	35	17	-1.0	1.3
	91	2220	63	74	S-E	23 39 12.24S	70 24 19.26W	3	26	1	-1.5	-1.1
*	92	8	63	10	S-W	23 39 9.96S	70 24 23.46W	2	16	7	-3.7	3.1
	92	308	42	27	S-E	23 39 13.80S	70 24 18.72W	2	24	11	0.1	-1.7
	92	452	42	32	S-W	23 39 12.60S	70 24 21.36W	2	31	14	-1.1	1.0
	92	522	64	15	S-E	23 39 12.84S	70 24 19.50W	2	21	10	-0.9	-0.9
*	92	636	65	11	N-E	23 39 11.28S	70 24 18.78W	2	14	7	-2.4	-1.8
	92	704	64	33	S-W	23 39 11.10S	70 24 21.84W	2	34	17	-2.6	1.4
	92	818	65	58	N-W	23 39 15.24S	70 24 21.12W	2	34	15	1.5	0.7
	92	942	63	33	N-E	23 39 13.74S	70 24 20.70W	2	31	14	0.0	0.3
*	92	1008	65	7	N-W	23 38 42.12S	70 24 35.64W	4	0	0	-31.6	15.2
	92	1128	63	25	N-W	23 39 15.72S	70 24 20.28W	2	26	11	2.0	-0.1
	92	1434	64	39	N-E	23 39 13.80S	70 24 19.68W	2	30	9	0.1	-0.7
	92	1612	42	73	N-W	23 39 15.90S	70 24 23.16W	2	15	0	2.2	2.3
	92	1622	64	23	N-W	23 39 16.14S	70 24 21.96W	2	28	0	2.4	1.6
*	92	1758	42	7	N-W	23 39 16.44S	70 24 26.16W	3	0	0	2.7	5.9
*	92	1826	65	11	S-E	23 39 10.44S	70 24 17.94W	6	17	8	-3.3	-2.5
	92	2006	65	73	S-W	23 39 11.04S	70 24 24.18W	3	30	1	-2.7	3.4
	92	2132	63	29	S-E	23 39 13.62S	70 24 17.70W	2	25	8	-0.1	-2.7
*	92	2156	65	8	S-W	23 39 17.88S	70 24 18.96W	2	8	3	4.2	-1.4
	92	2318	63	31	S-W	23 39 13.26S	70 24 21.84W	2	24	3	-0.4	1.4
	93	226	64	31	S-E	23 39 12.42S	70 24 18.30W	2	25	10	-1.3	-2.1
*	93	356	42	68	S-E	23 39 12.06S	70 24 0.78W	6	0	0	-1.6	-19.5
	93	418	64	28	S-W	23 39 12.78S	70 24 21.84W	3	15	1	-0.9	1.4
*	93	546	42	7	S-W	23 39 16.80S	70 24 24.60W	2	6	1	3.1	4.2
	93	614	64	57	S-E	23 39 11.52S	70 24 18.06W	2	34	17	-2.2	-2.3
	93	730	65	46	N-E	23 39 14.16S	70 24 21.90W	2	33	15	0.5	1.5
*	93	802	64	14	S-W	23 39 11.22S	70 24 19.26W	2	21	9	-2.5	-1.1
*	93	856	63	11	N-E	23 39 14.34S	70 24 20.10W	6	16	7	0.6	-0.3
	93	918	65	17	N-W	23 39 14.64S	70 24 21.84W	2	24	11	0.9	1.4
	93	1040	63	66	N-W	23 39 14.76S	70 24 19.26W	3	33	16	1.1	-1.1
*	93	1230	63	7	N-W	23 38 39.54S	70 24 32.28W	7	0	0	-34.2	11.9
*	93	1348	64	14	N-E	23 39 11.10S	70 24 19.08W	2	14	2	-2.6	-1.3

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 19A-1 (CONT.)

R/V KANA KEOKI 1973 POSITIONAL DATA, ANTOFAGASTA, CHILE
MOORED BOAT SIDE TO SITE NO. 2.

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
93	1516	42	37	N-E	23 39 14.70S	70 24 21.36W	2	28	3	1.0	1.0
93	1536	64	59	N-W	23 39 15.48S	70 24 21.19W	2	24	0	1.8	0.8
93	1702	42	22	N-W	23 39 15.42S	70 24 20.76W	2	28	13	1.7	0.4
93	1734	64	28	N-E	23 39 15.06S	70 24 21.24W	2	0	0	1.4	0.8
93	1918	65	43	S-E	23 39 15.18S	70 24 13.08W	2	0	0	1.5	-7.3
93	2106	65	25	S-W	23 39 11.94S	70 24 20.82W	2	31	15	-1.8	0.4

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE IPE-1

ARITHMETIC MEAN SOLUTION, ANTOFAGASTA, SITIC NO. 2.

NP	N	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
52	16	36	23 39 13.70S 70 24 20.40W	1.4 2.0	0.2 0.3

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
91	400			x	x
91	548	x			x
91	1032			x	
91	1218	x		x	
92	8	x			
92	636	x			
92	1008	x			x
92	1758	x			
92	1926	x		x	
92	2156	x			
93	356			x	x
93	546	x			
93	802	x			
93	856	x		x	
93	1230	x		x	x
93	1349	x			

TABLE 18C-1

BY SATELLITE, MEAN SOLUTION, ANTOFAGASTA, SITIO NO. 2.

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	7	23 39 14.29S	1.1	0.4
		70 24 21.06W	1.3	0.5
54	7	23 39 14.29S	1.1	0.4
		70 24 21.06W	1.3	0.5
63	6	23 39 14.10S	1.1	0.5
		70 24 21.11W	1.4	0.6
64	6	23 39 14.10S	1.1	0.5
		70 24 21.11W	1.4	0.6
65	11	23 39 13.82S	1.3	0.4
		70 24 20.70W	1.5	0.4

TABLE 19A-1

R/V KANA KEOKI 1973 POSITIONAL DATA, EASTER ISLAND
SWINGING AT ANCHOR IN COOK BAY, CROSS BEARINGS BY JOHN C. ROSE

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
119	1824	54	30	N-E	27 8 31.98S	109 26 21.18W	2	28	14	1.6	2.7
119	1944	65	23	S-E	27 8 27.24S	109 26 17.52W	2	30	14	-3.2	-0.9
119	2014	54	31	N-W	27 8 29.92S	109 26 16.26W	2	19	5	-0.6	-2.2
119	2130	65	44	S-W	27 8 28.74S	109 26 18.24W	2	36	17	-1.7	-0.2
119	2234	63	38	S-E	27 8 31.44S	109 26 17.82W	2	30	8	1.0	-0.6
120	22	63	23	S-W	27 8 31.44S	109 26 18.12W	2	25	12	1.0	-0.3
120	336	64	57	S-E	27 8 32.22S	109 26 18.78W	2	33	10	1.8	0.4
120	404	42	34	S-S	27 8 30.84S	109 26 16.14W	2	30	11	0.4	-2.3
120	524	64	16	S-W	27 8 29.32S	109 26 22.02W	2	22	11	-2.1	3.6
120	554	42	27	S-W	27 8 32.22S	109 26 18.96W	2	21	7	1.8	0.5
120	612	54	25	S-S	27 8 31.08S	109 26 17.58W	2	29	14	0.7	-0.9
*120	706	65	7	N-E	27 8 20.70S	109 26 17.46W	5	0	0	-9.7	-1.0
120	758	54	39	S-W	27 8 29.76S	109 26 18.54W	2	34	17	-0.7	0.1
*120	850	65	73	N-E	27 8 33.18S	109 26 26.86W	2	30	1	2.8	10.4

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 19E-1

ARITHMETIC MEAN SOLUTION, EASTER ISLAND, COOK BAY

NP	N	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
14	2	12	27 8 30.42S 109 26 18.43W	1.6 1.7	0.5 0.5

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
120	706	x		x	
120	850				x

TABLE 19C-1

BY SATELLITE, MEAN SOLUTION, EASTER ISLAND, COOK BAY.

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	2	27 8 31.53S	1.0	0.7
		109 26 17.55W	2.0	1.4
54	4	27 8 31.21S	1.1	0.6
		109 26 18.13W	2.4	1.2
63	2	27 8 31.53S	1.0	0.7
		109 26 17.55W	2.0	1.4
64	2	27 8 31.53S	1.0	0.7
		109 26 17.55W	2.0	1.4
65	2	27 8 31.53S	1.0	0.7
		109 26 17.55W	2.0	1.4

TABLE 20A-1

R/V KANA KEOKI 1973 POSITIONAL DATA, PITCAIRN ISLAND
SWINGING AT ANCHOR IN BOUNTY BAY, CROSS BEARINGS BY JOHN ROSE.

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
143	1720	42	44	N-W	25 3 53.88S	130 5 36.48W	3	29	14	1.9	0.3
143	1908	54	73	N-W	25 3 52.26S	130 5 38.58W	2	30	14	0.2	2.4
143	1956	65	33	S-E	25 3 51.24S	130 5 36.24W	2	30	14	-0.8	0.1
143	2142	65	24	S-W	25 3 51.72S	130 5 35.82W	2	27	12	-0.3	-0.3
143	2230	63	44	S-E	25 3 51.60S	130 5 33.72W	2	31	14	-0.4	-2.4
144	16	63	19	S-W	25 3 51.42S	130 5 36.18W	2	24	11	-0.6	0.0

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 205-1

ARITHMETIC MEAN SOLUTION, PITCAIRN, IN BOUNTY BAY.

NP	N	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
6	0	6	25 3 52.025 130 5 36.17W	1.0 1.6	0.4 0.6

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15 >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC

TABLE 20C-1

BY SATELLITE, MEAN SOLUTION, PITCAIRN, IN BOUNTY BAY.

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	1	25 3 53.885 130 5 36.48W		
54	1	25 3 53.885 130 5 36.48W		
63	2	25 3 53.07S 130 5 37.53W	1.1 1.5	0.8 1.0
65	2	25 3 53.07S 130 5 37.53W	1.1 1.5	0.8 1.0

TABLE 21A-1

R/V KANA KEOKI 1974 POSITIONAL DATA, VALPARAISO, CHILE
SECURED PORT SIDE TO HEATH NO. 4

DAY	GMT	SAT	ELEV	QUAD	LATITUDE	LONGITUDE	IT	CTS	CTSO	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
142	1424	54	26	N-W	33 2 1.32S	71 37 37.14W	2	29	14	0.9	0.4
*142	2329	42	7	S-E	33 1 56.40S	71 37 30.72W	2	0	0	-4.1	-6.0
142	2349	64	39	S-W	33 1 59.58S	71 37 37.56W	2	0	0	-0.9	0.8
143	108	42	67	S-E	33 1 59.70S	71 37 33.30W	2	0	0	-0.8	-3.4
143	216	54	32	S-W	33 1 59.28S	71 37 37.98W	2	33	16	-1.2	1.3
*143	258	42	14	S-W	33 2 1.26S	71 37 37.14W	2	20	10	0.8	0.4
*143	326	65	10	N-E	33 1 58.44S	71 37 36.72W	2	14	6	-2.0	0.0
*143	512	66	81	N-W	33 2 2.22S	71 37 35.70W	3	30	14	2.3	-1.0
143	646	90	10	S-E	33 1 59.82S	71 37 35.22W	2	26	12	-0.7	-1.5
*143	710	63	88	N-E	33 2 2.34S	71 37 47.58W	6	0	0	1.9	10.9
143	830	66	60	S-A	33 1 58.86S	71 37 38.04W	2	76	18	-1.6	1.3
*143	858	63	12	N-W	33 2 1.26S	71 37 37.32W	4	18	8	0.8	0.6
*143	920	64	11	N-E	33 2 1.62S	71 37 36.90W	2	19	8	1.1	0.2
*143	1106	64	69	N-W	33 2 7.32S	71 38 37.68W	3	29	0	6.8	61.0
143	1146	66	15	N-E	33 2 0.12S	71 37 36.24W	2	23	10	-0.4	-0.5
143	1224	42	29	N-E	33 2 1.26S	71 37 36.72W	2	30	14	0.8	0.0
145	2058	90	30	N-W	33 2 2.34S	71 37 36.90W	2	25	11	1.9	0.2
145	2124	64	14	S-E	33 1 58.80S	71 37 34.50W	2	23	11	-1.7	-2.2
145	2208	64	66	S-W	33 1 58.56S	71 37 38.76W	2	36	18	-1.9	2.0
145	2344	54	18	S-E	33 1 59.82S	71 37 35.40W	2	26	12	-0.7	-1.3
146	12	42	28	S-E	33 2 0.06S	71 37 34.14W	2	30	14	-0.4	-2.6
146	128	54	61	S-W	33 1 58.86S	71 37 37.92W	2	36	18	-1.6	1.2
146	158	42	37	S-W	33 1 59.34S	71 37 37.80W	2	33	15	-1.1	1.1
146	432	66	56	N-E	33 2 2.52S	71 37 38.04W	2	33	16	2.0	1.3
146	620	65	16	N-W	33 2 2.70S	71 37 36.48W	2	22	10	2.2	-0.2
*146	638	63	41	N-E	33 2 2.88S	71 37 47.52W	3	13	1	2.4	10.8
146	656	90	29	S-E	33 1 59.82S	71 37 34.92W	2	32	15	-0.7	-1.8
146	819	63	22	N-W	33 2 2.64S	71 37 36.48W	2	25	12	2.2	-0.2
146	840	90	40	S-W	33 1 58.92S	71 37 37.86W	2	34	9	-1.6	1.1
146	1026	64	69	N-E	33 2 1.68S	71 37 38.04W	2	34	17	1.2	2.3
*146	1100	54	7	N-E	33 1 45.12S	71 37 30.24W	7	0	0	-15.4	-6.5
*146	1126	42	10	N-E	33 2 2.70S	71 37 35.70W	2	15	6	2.2	-1.0
146	1214	64	18	N-W	33 2 1.68S	71 37 36.42W	2	24	12	1.2	-0.3
146	1244	54	64	N-E	33 2 1.92S	71 37 38.70W	2	34	16	1.4	2.0
*146	1312	42	84	N-W	33 2 2.76S	71 37 49.32W	13	29	0	2.3	12.6
146	1432	54	16	N-W	33 2 3.30S	71 37 37.38W	2	23	10	2.8	0.7
*146	1500	42	11	N-W	33 2 2.10S	71 37 37.98W	3	15	7	1.6	1.3
146	1626	65	59	S-E	33 1 58.98S	71 37 34.98W	2	32	0	-1.5	-1.7

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 21F-1

ARITHMETIC MEAN SOLUTION, VALPARAISO, BERTH NO. 4.

NP	N	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
3F	13	25	33 2 0.48S	1.5	0.3
			71 37 36.72W	1.6	0.3

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
142	2328	X			
143	258	X			
143	326	X			
143	512		X		
143	712		X	X	
143	858	X			
143	920	X			
143	1106				X
146	638				X
146	1100	X		X	X
146	1120	X			
146	1312		X	X	X
146	1500	X			

TABLE 21C-1

BY SATELLITE. MEAN SOLUTION. VALPARAISO. BERTH NO. 4.

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	4	33 2 0.09S	0.8	0.4
		71 37 35.49W	2.1	1.1
54	7	33 2 0.15S	0.8	0.3
		71 37 36.13W	1.8	0.7
63	1	33 1 59.70S		
		71 37 33.30W		
64	5	33 2 0.34S	0.9	0.4
		71 37 35.82W	2.0	0.9
65	3	33 2 0.34S	0.8	0.5
		71 37 34.72W	1.8	1.0
99	5	33 2 0.34S	0.9	0.4
		71 37 35.82W	2.0	0.9

TABLE 22A-1

R/V KANA KEOKI 1974 POSITIONAL DATA BALBOA, PANAMA
MOORED TO NORTH SIDE OF PIER NO. 2, ROOSEVELT NAVAL BASE, 75 METERS INWARD.

DAY	GMT	SAT	ELEV	GEOM	LATITUDE	LONGITUDE	IT	CTS	CTSQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
167	1530	66	48	N-W	8 52 4.80N	79 30 22.02W	2	30	14	-302.1	-240.0
167	2104	64	31	S-E	8 57 6.54N	79 34 23.34W	3	31	15	-0.3	0.4
*167	2226	54	7	S-E	8 56 58.22N	79 34 24.24W	4	0	0	-10.6	1.3
167	2252	64	25	S-W	8 57 6.72N	79 34 22.38W	2	28	10	-0.1	-0.5
167	2318	42	22	S-E	8 57 7.14N	79 34 22.86W	2	27	13	0.3	-0.0
*168	10	54	77	S-W	8 57 7.62N	79 34 22.02W	2	33	1	0.8	-0.9
168	104	42	32	S-W	8 57 8.46N	79 34 23.16W	2	31	15	1.6	0.3
168	258	65	25	N-E	8 57 6.78N	79 34 24.78W	2	32	16	-0.1	1.9
*168	442	63	13	N-E	8 57 11.40N	79 34 22.50W	2	20	9	4.5	-0.4
*168	1432	65	5	S-E	8 57 17.10N	79 34 23.28W	2	12	1	10.2	0.4
168	1616	65	57	S-W	8 57 6.66N	79 34 22.56W	2	32	15	-0.2	-0.2
*168	1758	63	71	S-E	8 57 8.16N	79 34 24.12W	5	31	1	1.3	1.2
168	1824	66	33	N-E	8 57 6.30N	79 34 24.72W	2	28	13	-0.5	1.8
168	2010	66	16	N-W	8 57 6.00N	79 34 22.86W	2	20	9	-0.8	-0.0
168	2202	64	68	S-W	8 57 7.80N	79 34 21.90W	2	36	17	0.8	-1.0
*168	2228	42	7	S-E	8 56 33.00N	79 34 22.20W	10	0	0	-33.9	-0.7
168	2318	54	36	S-E	8 57 8.16N	79 34 23.82W	2	33	16	1.3	0.9
*169	10	42	79	S-E	8 57 8.34N	79 34 26.58W	2	33	15	1.5	3.7
169	106	54	21	S-W	8 57 7.68N	79 34 22.74W	2	28	13	0.8	-0.3
*169	158	42	7	S-W	8 57 10.26N	79 34 24.00W	5	0	0	3.4	1.1
*169	212	65	7	N-E	8 57 13.50N	79 34 25.32W	7	0	0	6.6	2.4
*169	356	65	76	N-W	8 57 7.38N	79 34 5.94W	2	35	0	0.5	-17.0
169	538	63	57	N-E	8 57 4.56N	79 34 25.68W	2	35	17	-2.3	2.8
*169	726	63	12	N-W	8 56 57.24N	79 34 24.18W	2	19	8	-9.6	1.3
*169	944	64	82	N-E	8 57 5.34N	79 34 32.64W	2	34	17	-1.5	9.7
169	1058	54	22	N-E	8 57 6.36N	79 34 24.24W	2	27	12	-0.5	1.3
169	1146	42	50	N-E	8 57 6.24N	79 34 25.80W	2	30	13	-0.6	2.9
169	1244	54	31	N-W	8 57 6.00N	79 34 22.68W	2	31	15	-0.8	-0.2
*169	1334	42	13	N-W	8 57 7.38N	79 34 23.34W	2	19	9	0.5	0.4
169	1528	65	49	S-E	8 57 8.52N	79 34 23.04W	2	32	15	1.7	0.1
*169	1716	65	12	S-W	8 57 5.52N	79 34 23.40W	2	16	7	-1.3	0.5
169	1858	63	24	S-W	8 57 8.28N	79 34 23.58W	2	25	11	1.4	0.7
169	2114	64	45	S-E	8 57 7.80N	79 34 22.86W	2	34	16	0.6	-0.3
*169	2228	54	11	S-E	8 57 2.58N	79 34 19.68W	2	17	7	-4.3	-3.2
169	2302	64	16	S-W	8 57 7.38N	79 34 22.56W	2	24	11	0.5	-0.3
169	2320	42	24	S-E	8 57 7.08N	79 34 22.80W	2	18	5	0.2	-0.1
170	14	54	61	S-W	8 57 8.40N	79 34 22.14W	2	31	0	1.5	-0.8
170	100	42	29	S-W	8 57 6.72N	79 34 22.62W	2	30	14	-0.1	-0.3
170	308	65	37	N-E	8 57 5.70N	79 34 25.74W	2	35	13	-1.2	2.8
170	450	63	20	N-E	8 57 5.64N	79 34 24.42W	2	26	12	-1.2	1.5
170	624	66	44	S-E	8 57 8.16N	79 34 23.52W	2	34	16	1.3	0.6
170	810	66	18	S-W	8 57 6.72N	79 34 21.96W	2	26	12	-0.1	-0.9
170	854	64	30	N-E	8 57 7.50N	79 34 24.84W	2	30	15	0.6	1.9
170	1042	64	24	N-W	8 57 7.20N	79 34 22.26W	2	29	14	0.3	-0.6
*170	1152	54	68	N-E	8 57 3.06N	79 35 6.90W	8	0	0	-3.8	44.0

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 22A-1 (CONT.)

R/V KANA KECKI 1974 POSITIONAL DATA BALBOA, PANAMA
MOORED TO NORTH SIDE OF PIER NO. 2, RODMAN NAVAL BASE, 75 METERS INWARD.

DAY	GMT	SAT	ELEV	CREW	LATITUDE	LONGITUDE	IT	CTS	CISQ	DEVIATION FROM THE MEAN (IN SECONDS OF ARC) LATITUDE	LONGITUDE
170	1238	42	46	N-W	8 57 6.42N	79 34 20.82W	2	34	16	-0.4	-2.1
170	1440	65	14	S-E	8 57 5.34N	79 34 22.14W	2	20	6	-0.9	-0.8
*170	1622	63	8	S-E	8 57 6.78N	79 34 21.54W	2	8	1	-0.1	-1.4
170	1758	99	19	N-E	8 57 6.60N	79 34 23.70W	2	23	10	-0.3	0.8
170	1942	99	27	N-W	8 57 5.64N	79 34 22.80W	2	26	5	-1.2	-0.1
170	2026	64	16	S-E	8 57 8.34N	79 34 23.28W	2	22	7	1.5	0.4
170	2212	64	46	S-W	8 57 8.10N	79 34 23.40W	2	29	3	1.2	0.5
170	2322	54	48	S-E	8 57 8.76N	79 34 23.16W	2	31	12	1.9	0.3
*171	6	42	72	S-E	8 57 8.46N	79 34 35.28W	3	31	0	1.6	12.4
171	110	54	19	S-W	8 57 9.30N	79 34 22.44W	2	21	8	2.4	-0.5
*171	156	42	7	S-W	8 57 3.54N	79 34 26.04W	6	0	0	-3.3	3.1
*171	220	65	13	N-E	8 57 3.18N	79 34 24.72W	4	22	10	-3.7	1.8
171	404	66	61	N-W	8 57 5.28N	79 34 19.62W	2	38	18	-1.6	-3.3
*171	518	99	0	S-E	8 57 7.02N	79 34 23.52W	3	12	5	0.2	0.6
*171	546	63	67	N-E	8 57 4.44N	79 34 35.52W	6	0	0	-2.4	12.6
171	702	99	74	S-W	8 57 9.36N	79 34 21.24W	3	37	18	2.5	-1.7
*171	808	64	9	N-E	8 57 3.30N	79 34 22.12W	4	11	4	-2.4	-0.6
171	952	64	67	N-W	8 57 5.46N	79 34 19.80W	2	35	17	-1.4	-3.1
171	1102	54	30	N-E	8 57 6.24N	79 34 24.30W	2	31	15	-0.6	1.4
171	1144	42	55	N-E	8 57 7.92N	79 34 20.82W	2	34	16	1.1	-2.1
*171	1720	63	42	S-E	8 56 57.12N	79 35 8.88W	2	27	11	-9.7	46.0
171	2122	64	66	S-E	8 57 2.28N	79 34 17.22W	3	36	17	-4.6	-5.7
171	2232	54	16	S-E	8 57 7.50N	79 34 20.76W	2	24	11	0.6	-2.1
172	16	54	46	S-W	8 57 7.74N	79 34 25.08W	2	34	17	0.9	2.2
172	54	42	27	S-W	8 57 6.54N	79 34 22.80W	2	29	14	-0.3	-0.1
172	316	65	55	N-E	8 57 6.54N	79 34 25.68W	2	34	9	-0.3	2.9
172	458	63	29	N-E	8 57 5.28N	79 34 23.82W	2	31	14	-1.6	0.9
172	556	99	29	S-E	8 57 7.86N	79 34 23.22W	2	32	15	1.0	0.3
172	644	63	25	N-W	8 57 4.80N	79 34 22.14W	2	29	14	-2.1	-0.9
172	740	99	20	S-W	8 57 7.44N	79 34 21.96W	2	32	15	0.6	-0.9
172	904	64	44	N-E	8 57 5.28N	79 34 24.00W	2	33	15	-1.6	1.1
*172	1014	54	8	N-E	8 57 14.16N	79 34 27.12W	6	8	3	7.3	4.2
172	1050	42	16	N-E	8 57 7.14N	79 34 23.34W	2	19	2	0.3	0.4
172	1156	54	70	N-W	8 57 5.34N	79 34 22.02W	2	34	17	-1.5	-0.9
172	1234	42	42	N-W	8 57 6.24N	79 34 21.42W	2	33	16	-0.6	-1.5
172	1450	65	25	S-E	8 57 7.74N	79 34 22.80W	2	27	12	0.9	-0.1

* = FIX NOT USED FOR COMPUTATION OF THE MEAN

TABLE 22E-1

ARITHMETIC MEAN SOLUTION, PANAMA, CODMAN PIER NO. 2, NORTH SIDE.

NP	N	NSC	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
81	26	55	8 57 6.8EN	1.3	0.2
			79 34 22.9CW	1.6	0.2

ALL PROBLEM PASSES ARE LISTED BELOW

DAY	GMT	ELEVATION <15	ELEVATION >75	ITERATIONS >5	DEVIATION >10 SECS OF ARC
167	1930				x
167	2226	x			
168	10		x		
168	442	x			
168	1432	x			x
168	1758			x	
168	2228	x		x	x
169	10		x		
169	158	x		x	
169	212	x		x	
169	356		x		x
169	726	x			
169	944		x		
169	1334	x			
169	1716	x			
169	2228	x			
170	1152			x	x
170	1622	x			
171	6				x
171	156	x		x	
171	220	x			
171	518	x			
171	546			x	x
171	808	x			
171	1720				x
172	1014	x		x	

TABLE 22C-1

BY SATELLITE, MEAN SOLUTION, PANAMA, BODMAN PIER NO. 2, NORTH SIDE.

SATELLITE NUMBER	NSD	LATITUDE LONGITUDE	STANDARD DEVIATION (SECONDS)	STANDARD DEVIATION OF THE MEAN (SECONDS)
42	10	8 57 6.93N 79 34 22.64W	0.7 1.5	0.2 0.5
54	11	8 57 7.10N 79 34 22.75W	0.8 1.4	0.2 0.4
63	5	8 57 7.13N 79 34 23.45W	0.8 1.3	0.4 0.5
64	12	8 57 7.14N 79 34 22.75W	0.8 1.4	0.2 0.4
65	8	8 57 7.06N 79 34 22.71W	0.8 1.6	0.3 0.6
99	9	8 57 7.07N 79 34 22.78W	0.7 1.5	0.2 0.5