Model projections indicate a possible collapse of marine Antarctic ice sheets under moderate to strong RCP scenario warming conditions. A rapid disintegration of the ice sheets could contribute more than one meter of global mean sea level rise by 2100, with the corresponding peak freshwater fluxes exceeding 1 Sv. We have used a climate model of intermediate complexity, LOVECLIM, to explore the climatic response to such forcing. In my presentation, I will discuss changes in rainfall, temperature and ocean circulation, their sensitivity to modeling parameters, and possible feedback mechanisms to the Antarctic Ice Sheets.