



Evaluation of the effects of yearly mass anomalies on long-term mass trend estimations in Antarctica

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Antarctic ice sheet mass balance change is one of the most concerned topics because it directly affects global sea level changes. In the last few decades, the estimation precision of Antarctic ice sheet mass trend has been improved significantly by development of satellite geodetic techniques. Recent study using satellite altimetry, interferometry and gravimetry techniques shows that mass trends in 1992 to 2011 are slightly increase in East Antarctica, and decrease in West Antarctica. However, the period of which such satellite data is available is at most a few decades. Therefore, the estimated linear mass trend is not free from the influence of short- and middle-term climate anomalies. The trend value changes by the difference in estimated time span. For better estimation of long-term ice sheet mass trend, which relates to century-scale global change or global warming, it is important to estimate and remove such short to middle-term mass fluctuations. In this study, using 2002 to 2012 GRACE time variable gravity field, we assessed the effect of short- and middle-term climate anomalies on Antarctic ice sheet mass trend. We divided Antarctic area into 27 drainage systems in consideration with regionally different mass change mechanism. For estimated regional mass variations of each region, we statically discussed uncertainties of mass trend values caused by the differences of data time span. Further, the estimated mass variations were compared with climate indices and global hydrological/meteorological data sets to investigate the dominant sources which cause short- or middle-term mass anomalies. Finally we discuss the effect of such short and middle-term anomalies of each region on the long-term trend estimations of East and West Antarctica.