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0.1 Antarctic Snow/Ice Mass Balance and Imbalance from GRACE

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Using 35 monthly time-variable gravity fields from the Gravity Recovery and Climate Experiment (GRACE) mission during the period 2002 through 2005, we estimate possible long-term snow/ice mass changes over Antarctica. These 3 years of GRACE data reveal a clear mass deficit in the Enderby Land region along the coast in West Antarctica, and also a significant mass accumulation in the Amundsen Sea Embayment in East Antarctica. After restoring possible leakage effects from the spatial smoothing that is required to suppress high degree and order errors in the GRACE gravity fields, GRACE-observed mass deficit in the Enderby Land region is $\sim$ –77 km^3/yr, which is in surprising agreement with the assessment ($\sim$ –72 km^3/yr) from other remote sensing techniques (Rihnot and Thomas 2002, Science). The mass accumulation in the Amundsen Sea Embayment in East Antarctica is equivalent to $\sim$ 89 km^3/yr, which is yet to be verified by other measurements or climate models. This study demonstrates the great potential of GRACE in monitoring long-term snow/ice mass balance in the Earth climate system.