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Elevation trends in the Amundsen Coast region using altimmetry from Envisat RA-2

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It is apparent that late 20th and early 21st century ice sheet mass-balance is dominated by regional behaviours. Predictions of the future contribution to sea level rise from ice sheets must account for regionally varying contributions at the margins of ice sheets. The West Antarctic Ice Sheet contains enough ice to raise global sea level by over 5 m, and thinning along the Amundsen coast has been observed. It is still uncertain, however, if this thinning is a recent and temporary phenomenon as the ice sheet adjusts to new external conditions, or if it indicates a longer term thinning in this region. The fact that simultaneous thinning has been observed at a number of glaciers along the Amundsen Coast may indicate that the thinning of these glaciers is the result of some common trigger in the ocean. However, an internal ice-flow instability is also possible.

An acceleration of the thinning in this region between the 1990s and 2002/2003 has also been reported. This is based on thinning rates derived from a combination of satellite and airborne altimmetry during 2002 to 2003, that has been compared with thinning observed during the 1990s. Envisat RA-2 altimmetry provides an opportunity to observe trends in this region from 2002 onwards, and test claims of accelerated thinning. We have extended to 2006 timeseries of elevation change over streams draining into the Amundsen Sea, using elevation measurements from Envisat RA-2. Our elevations have been corrected for atmospheric and ionospheric delays, and solid Earth and ocean loading tides. Dual-cycle satellite crossover differences were binned at 10 km^2 resolution. Careful cross calibration between ERS2 and Envisat altimmetry has allowed accurate comparisons to be made between elevation change in the 1990s, and in the period from 2002 to 2006. We use our combined ERS/Envisat timeseries to measure the rate of thinning in this area over the period 1995 to 2006, and to assess claims of accelerated thinning.