Geophysical Research Abstracts
Vol. 14, EGU2012-1842, 2012
EGU General Assembly 2012

Antarctic elevation changes and variability from Envisat and ICESat altimeters

T. Flament, E. Berthier, and F. Rémy
LEGOS, Toulouse, France (thomas.flament@legos.obs-mip.fr)

From 2002 to 2010, Envisat provided continuous radar altimetry measurements every 35 days. ICESat provided laser altimetry measurement from 2003 to 2009 with a lower temporal sampling but a smaller footprint ($\sim$70 m), better suited for ice surfaces. We developed an along-track processing to extract elevation time series every kilometre along track for both altimeters. The processing is a classical least square fit, compensating for the local slope and computing an average height trend over the period (dh/dt). Concerning Envisat, we implement some supplementary corrections to take into account changes in snow-pack characteristics that affect the radar echo.
Even if small biases can cause large errors for the continental mass balance (1 cm of ice over 12.10^6 km^2 correspond to 110 Gt), significant elevation changes of $\pm$15 cm/yr can still be observed. Comparison with previous results from ERS-2 reveals large scale variations due to the variability in meteorological forcing, especially in East Antarctica. Some coastal areas are experiencing rapid changes with thinning rates reaching several meters per year. Comparison between ICESat and Envisat over the common 2003-2009 period reveals that ICESat is likely overestimating dh/dt in the inner continent while Envisat encounters problems that become apparent north from 70°S and where surface slope exceeds 1°.

Both radar and laser altimeter technologies have advantages and drawbacks and combining both allows to go further in the study of many different phenomena from overall continental mass balance to small scale and rapid events such as subglacial lakes drainage. We will focus on the Pine Island Glacier for mass balance as this basin alone lost about 30km3/yr in the last decade, where both sensors agree. A smaller scale analysis is conducted on the Cook ice shelf (East Antarctica) for a singular lake drainage event.