Geophysical Research Abstracts, Vol. 8, 06922, 2006
SRef-ID: 1607-7962/gra/EGU06-A-06922

Investigation on tidal flexure and ice flux in the grounding zone of Jutulstraumen, Antarctica

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Large amounts of the grounded Antarctic ice are drained through narrow outlet glaciers to floating ice shelves. Grounding zones, the transition regions from grounded to floating ice, are dynamically active regions, which react sensitively to changes in water level and mass balance. Jutulstraumen is a prominent outlet glacier in Dronning Maud Land, Antarctica, which drains an area of about 125.000 km2 to the Fimbul Ice Shelf through a narrow valley at about 1°W, 72°S. We present a new assessment of the ice dynamics near the grounding line of Jutulstraumen, based on 1 and 3 day ERS repeat pass data, airborne radio echo sounding, IceSat elevation data, and a tide model. A multitude of combinations of INSAR pairs is used to derive the ice bending in the tidal flexure zone, which is in addition to ice thickness the input to a simple 2D elastic plate model in order to describe ice flexure in dependence of water level. This is used to derive Young's elastic modulus of ice (E). Based on the numerical model, bedrock and ice thickness information, the grounding line position is simulated based on tidal data and compared to observations. Finally, the ice flux directly upstream the grounding line as well as ice flux and bottom melting downstream the grounding line are derived.