

Session OA32. Glaciers and ice sheets, Convenors: J.L. Bamber, H. Gudmundsson, and P. Huybrechts.

Title: Tidal flexure zones at ice sheet margins: Comparison of InSAR with an elastic plate model.

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Interferometric Synthetic-Aperture Radar (InSAR) is a powerful tool for examining tidal flexure at ice sheet margins, over large areas, at a high spatial resolution. The observations have implications for the estimation of the glacier and ice shelf mass balance, oceanic tides, and mechanical properties of the ice (e.g. flexural rigidity, thickness). In this study, we compare a finite element model simulation of the tidal flexure of an elastic plate of ice with InSAR observations of tidal flexure in the Antarctic and in Greenland. The comparison reveals a number of features: 1) the pattern of tidal flexure is highly dependent on the thickness profile of the glacier in the proximity of the grounding line; 2) the longitudinal gradient in ice-shelf thickness near the grounding line, which is large due to high basal melting, has a detectable effect on the pattern of flexure; 3) the model comparison shows excellent agreement with InSAR in areas where ice thickness is well known; elsewhere, inversion of the model results provides a proxy indication of ice thickness. Examples are shown in the case of Nioghalvfjerdbrae in north-east Greenland, Pine Island Bay in West Antarctica, and Drygalski Ice Tongue in East Antarctica. The latter example confirms that the grounding line thickness of this glacier is exceptionally high, resulting in a stretching of the zone of flexure over 30 km instead of the usual 10 km.

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