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Petermann Glacier dynamics before and after the 2010 calving event

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Petermann Glacier in Northwest Greenland drains 5-10% of the area of the Greenland ice sheet and is thought to be approximately in balance (Joughin et al., 1999). This Glacier has a 70 km long floating tongue varying in thickness from 10 m to 600 m, whose ablation is dominated by basal melt (Rignot et al., 2008). This makes Petermann atypical of Greenland glaciers and somewhat akin to an ice shelf. In early August 2010 a calving event produced an iceberg 275 square km in area and reduced the length of the floating glacier tongue by 15 km. This event provides a natural experiment to investigate the interaction between the ocean and the ice sheet and to understand the dynamic response of a glacier to a frontal perturbation.

Here we present an analysis of surface velocities to investigate Peterman Glacier's dynamic reponse to the calving event. We detail interrannual patterns since 2006 and seasonal changes over the last 4 summers. ESA ERS and Envisat data provides the context for interrannual and seasonal velocity variations while TerraSAR-X allows a high quality analysis of velocities through the summer of 2009 and immediately after the perturbation both above and below the grounding line. There is evidence in the velocity fields both that the calving has had no significant effect on Petermann Glacier's flow rate, and that we should not have expected it to do so.

References

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