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Calving dynamics of Jakobshavn Isbræ

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Jakobshavn Isbræ, a large outlet glacier of the Greenland ice sheet, has changed dramatically in the last ten years. Fast surface lowering, calving front retreat and doubled flow velocity are hallmark changes, similar to those observed at other Greenland ice streams. To understand the interaction between processes that lead to the fast changes in geometry and dynamics, and to answer the question whether ice streams react to changes in ocean temperatures or to increased ablation and melt water production on the ice sheet, we measured flow velocity at high time resolution along a central flow line from 50 km inland to the terminus. Geodetic GPS were installed where landing a helicopter was possible, and conventional survey reflectors tracked by an automatic total station were deployed in the difficult to access region near the terminus. Tidal forcing has no significant effect on flow velocities in the terminus area, as was observed twenty years ago. The glacier terminus reacts with a spatially and temporally consistent acceleration to the 1 km retreat of the terminus during each big calving event, when tens of ice bergs of typically 500m width, 500 m length and 900 m depth break off. The bergs are accelerated to more than 10 m/s by the energy released by rotation, inducing seismic events that could be detected at a nearby seismometer.