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Calving at Pine Island Glacier

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The calving mechanism of tabular icebergs is one of the major unknowns in glaciology and hence calving events at locations where the glaciological variables of ice shelves or ice tongues are well known are ideal natural setups for studying these mechanisms. Pine Island Glacier, a marine based outlet glacier of the West Antarctic Ice Sheet, reaches velocities of up to 4 km/a in the vicinity of the calving front. Its floating tongue has an average thickness of about 500m. This floating tongue loses mass by strong basal melting and calving events of large tabular icebergs. In October 2011 a new 24 km long rift has formed and propagated to a length of 28km in the subsequent weeks. Since then an area of about 750km2 is suspected to calve off in the near future.
We will present the temporal evolution of this well surveyed calving event using high resolution radar imagery obtained by the TerraSAR-X satellite. This includes rift length and width, as well as the changes in the flow velocities estimated using speckle tracking. Furthermore, we will discuss the changes of the shear margin and the melange area that constrains the tongue at its eastern side over the past decade. In particular, the changes at an ice rise located in the shear margin and in the vicinity of the rift will be investigated using SAR interferometry. The decline of the formerly dome-like grounded spot has contributed to a widening of the shear margin and the formation of a heterogeneous ice melange. This changes the lateral (stress) boundary condition that the floating part of the glacier experiences. Therefore, we compare the rift creation and evolution of the upcoming calving event with the one in 2007.