



Investigating the temporal and spatial calving variability of Pine Island Glacier in Amundsen Sea Embayment, West Antarctica

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During the last twenty-five years we have observed a substantial thinning, acceleration and mass loss of Pine Island Glacier in the West Antarctic Ice Sheet. The mass loss mechanisms, such as calving, are still poorly understood and questions remain about the processes that both destabilize and stabilize the glacier. Since 2001, we have detected six major tabular calving events, increasing in number by exponential rate, with a recorded historical terminus retreat at the latest, during October 2018. We are investigating the temporal and spatial calving variability of Pine Island Ice Shelf, and the potential impact of each calving event on glacier's dynamics. In particular, we examine the role of pre-existing bottom crevasses (rifts) at the center of the ice tongue, along with the role of the lateral ice-shelf shear zones in the western and eastern region. The initial results show no significant acceleration after each calving event, indicating that the observed buttressing loss was not relevant for the glacier's dynamics. However, we observe that a small acceleration began in March 2018, likely through weakening of west lateral side. These findings indicate that the western and eastern side disintegration of the marginal ice shelf, and the ice shelf thinning play a dominate role for the increased rate of calving events and retreat of terminus position. In our experiments we use a state-of-art ice dynamics model (Úa). The results of this study will increase our knowledge for the tabular ice-shelf calving mechanism for Antarctic Glaciers, which is poorly understood and represented in numerical glacier models.