Atmospheric Triggers of Ice-Shelf Fronts Calving Events in Antarctica

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Ice shelf instability is one of the main sources of uncertainty in Antarctica's contribution to future sea level rise. Calving events play a crucial role in ice shelf weakening but remain unpredictable, with their governing processes still poorly understood. In this talk, the potential effect of atmospheric forcing on two recent calving events, the February 2021 Brunt Ice Shelf and the September 2019 Amery Ice Shelf calvings, is investigated using a combination of in-situ and satellite-derived observations and reanalysis data. In both, a warm and moist low-latitude air intrusion and strong wind speeds, in the top 1% of the climatological distribution, in association with the passage of the attendant cyclones, acted to weaken the ice shelf. The high oceanward sea-surface slopes that followed, with anomalies in excess of 0.05 □, led to the calving along the pre-existing rifts. The D28 iceberg from the Amery Ice Shelf and the A-74 iceberg from the Brunt Ice Shelf, with surface areas in the range 1,300-1,700 km2, subsequently drifted into the Southern Ocean at speeds of up 50 km day-1. Our analysis highlights the need for ice sheet models, which are used to generate sea level rise projections, to account for the atmospheric forcing, together with sea ice and ocean waves, if they are to accurately simulate the changes in ice sheets and glaciers and their contribution to sea level rise.