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# Contributions of atmospheric forcing and ocean preconditioning in the 2016 Antarctic sea ice extent drop

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The observed evolution of Antarctic sea ice extent is marked by an abrupt decrease in 2016/2017. After several years of gradual increase culminated in an all-time record high in 2014/2015, a rapid decline in 2016 led to an unprecedented minimum, and unusual low extents have been observed since then. Even though this record has now been beaten, the sudden drop from extreme high values to a minimum in less than two years is unique to this event, whose dynamics are still uncertain. While it was likely triggered by anomalous atmospheric conditions in the prior months, the contribution of the ocean conditions, as a preconditioning which amplified the response of the sea ice or helped to maintain the anomalies for a longer period, still needs to be quantified.

To evaluate the respective influences of the atmosphere and ocean on this 2016 event, we have performed sensitivity experiments using the circum-Antarctic fully coupled model (ice-sheet–ocean–sea-ice–atmosphere) PARASO. First, a control experiment with the model forced by lateral boundary conditions derived from observations (ERA5 in the atmosphere, ORAS5 in the ocean) is performed over the period 1985-2018. In such a set-up, the model correlates well with the observations and is able to capture the 2016 drop. Then, the model is integrated again between 2016 and 2018 with the same atmospheric boundary forcing, but with different initial conditions in the ocean: namely, ocean conditions from previous years in the control run are used as initial state in 2016 in the sensitivity experiments, producing an ensemble of 5 members.

Preliminary results indicate that the 2016 drop is captured by all members, suggesting the atmospheric boundary forcing as the dominant driver and confirming that the event is induced by large-scale atmospheric dynamics. However, some variability is present in the amplitude and timing of the drop, as well as in the evolution and recovery of the sea ice in the following months, which may be influenced by the different states of the ocean. Related processes are further investigated by examining different oceanic and atmospheric fields, focussing on the role of ocean preconditioning by identifying the differences between the members and their impact.