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Atmospheric influences on the 2016 anomaly in Antarctic seasonal sea ice decay

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In contrast to the Arctic, where total sea ice extent (SIE) has been decreasing for the last three decades, Antarctic SIE has shown a small, but significant increase during the same time period. However, in 2016, the maximum Antarctic SIE was already reached in August, earlier than the normal maximum end of September, and was followed by a rapid decrease. The decay was particularly strong in November where Antarctic SIE exhibited a negative anomaly (compared to the 1981-2010 average) of almost 2 Mio. km2, which combined with reduced Arctic SIE led to a distinct minimum in global SIE. The main area of reduced SIE is situated off the coast of Eastern Dronning Maud Land (approximately 30°-90°E) in the Indian Ocean sector of the Southern Ocean and in the Pacific sector (approx. 160°E-170°W). The southern retreat of the ice edge is largest north of Enderby Land. This loss is only partly counteracted by a positive anomaly in SIE off Mary Byrd Land, east of the Ross Sea (centred at approx. 130°W) and at the northern edge of the Weddell Sea.
We use NCEP/NCAR reanalysis data (mainly 500hPa geopotential height, sea level pressure and surface winds, but also air temperature and sea surface temperature (SST)) to investigate possible atmospheric influences on the observed phenomena. While SST and air temperature anomalies do not explain the reduced sea ice extent, atmospheric flow patterns hint at a mainly dynamic explanation. Although the picture is not consistent over the entire melt period, taking into account Ekman transport, distinct regional positive and negative anomalies in SIE can be explained by atmospheric dynamics. However, SIE, by definition, only refers to the area with at least 15% sea ice concentration. Sea ice concentration showed positive anomalies in November 2016 in some, but not all of the areas south of the areas of ice loss. A better spatial and temporal coverage of reliable ice thickness data is needed to assess the change in ice mass rather than ice area.