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# Weakening of Western Disturbances in Response to Polar Sea Ice Melt

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Arctic sea ice has been declining in recent decades. Further, future projections under strong warming scenarios suggest that sea ice will substantially decline in both poles by the second half of 21$^{st}$ century. The effect of polar sea ice melt on low latitude weather systems is relatively less understood. The changes in equator-to-pole temperature gradient can affect the strength of subtropical jet stream which in turn can modulate transient weather systems such as western disturbances (WDs). WDs play a crucial role in the hydrological cycle of northwestern India and adjoining Himalayan region, so it is essential to know the response of WDs to polar sea ice melt.

To understand the effects of polar sea ice melt on WD activity, we have run a suite of coupled and uncoupled simulations using NCAR community earth system model (CESM1.2.2). Initially, a control (CTRL) run is performed with the model in a fully coupled configuration for 350 years, with a coarse horizontal resolution (2°x2°). By branching off the CTRL simulation at 300$^{th}$ year, another experiment is carried out in which the albedo of the sea ice is reduced so that the increased absorption of the solar radiation would melt the sea ice. We designate this experiment as sea ice melt experiment (SIME). Transient weather systems may not be adequately resolved in the coarse resolution simulations, so we ran an ensemble of high-resolution Community Atmospheric Model (CAM5) simulations using the sea surface temperature (SST) and sea ice concentration (SIC) annual cycles from the coupled model simulations.

WDs in the high-resolution CAM5 simulations are tracked using a Lagrangian tracking algorithm. Our analyses reveal that the WD activity weakens in the CAM5 simulations forced with the SST and SIC from SIME experiment. A decrease in the equator-to-pole temperature gradient and a subsequent weakening of the subtropical jetstream were also seen in those simulations.