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Atmospheric circulation sensitivity to changes in Arctic soil thermodynamics and hydrology

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Changes in modes of atmospheric circulation contribute to shape climate at regional scale by interacting with orography. Earth System Models (ESM) tackle the response of these modes to global warming. However, there exists considerable uncertainty regarding the magnitude and impact of the changes in modes of variability. This uncertainty is mainly due to internal variability, and inter-model variability related to the different resolution and parametrisation of physical processes in ESMs. One example of the latter is the representation of soil thermodynamics and hydrology in the Arctic. Different representations of Arctic dynamics have the potential to affect the circulation, not only locally in the Arctic, but also at mid-latitudes and the tropics via a series of teleconnections. The physical processes linking Arctic warming and sea-ice loss to lower latitude climate variability are still not well understood. This study addresses how changes in Arctic soil thermodynamics and hydrology affect the global atmospheric circulation. To do so, a modified version of the Max Plank Institute Earth System Model (MPI-ESM) was used to produce an ensemble of simulations with different set-ups of its Land Surface Model (JSBACH). These configurations consider different representation of the Arctic thermo-hydrodynamics leading to comparatively drier or wetter states. Preliminary analysis show sensitivity of atmospheric circulation to changes in the Arctic Amplification. Results are shown for a comparison of the response of extratropical (Arctic and Antarctic oscillations) and intertropical (monsoons and ENSO) modes across the ensemble of simulations.