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Causal model evaluation of Arctic-midlatitude process during the boreal cold season in CMIP6

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Linked to increased sea ice loss, the Arctic region has warmed at least four times faster than the global average over the past 40 years. Mutual links between amplified Arctic warming with changes and variability in midlatitude weather have been discussed in several studies. Nevertheless, the lack of consistent conclusions between observations and model simulations obfuscates the interpretation behind the mechanisms of Arctic-midlatitude teleconnections. To contribute to the understanding of Arctic-midlatitude connections that occur in conditions of amplified Arctic warming, we applied causal discovery to analyse causal and contemporaneous links. Initially, we calculated causal dependencies for monthly mean ERA5 reanalysis data from the European Centre for Medium-Range Weather Forecasts (ECMWF) and Hadley Centre Sea Ice and Sea Surface Temperature among local and remote processes. Then, by comparing causal graphs detected in reanalyses data with a number of climate model historical simulations from the Coupled Model Intercomparison Project Phase 6 (CMIP6), we assessed the performance of climate models and evaluated the robustness of the observed Arctic-midlatitude connections in the current climate. By comparing causal graphs from the CMIP6 historical and Scenario Model Intercomparison Project (ScenarioMIP) we estimated future changes in Arctic-midlatitude teleconnections towards the end of the century. In this study, we focus on the differences in the mechanism of Arctic-midlatitude teleconnections that occur during the boreal cold season, i.e. early winter (October-November-December), winter (December-January-February), and late winter (January-February-March). In this study, we will present the major findings of *Galytska et al., 2022* discussing how causal model evaluation helps to summarize major differences between causal interdependencies detected in observations and simulated by a number of climate models. Understanding these differences can be the basis for further improvement of the representation of Arctic-midlatitude teleconnections in climate models.

References.

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