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Increasing trend in the Greenland blocking Index: can causal inference help to explain discrepancies between observations and models?

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Changes in the Greenland Blocking Index (GBI) present a threat to both the mass loss of the Greenland ice sheet, potentially leading to increased sea level rise, and downstream regions, such as the European continent and Mediterranean Basin that may be affected by associated changes in the frequency and characteristics of weather patterns. While a consistent increase in the summer GBI has been detected in (several) observational and reanalysis datasets, global climate models and seasonal prediction systems so far have failed in capturing this historical trend. The question whether the observed trend is real and not reproduced by models or an artifact of multidecadal variability (and, hence, a transient phenomenon) has so far not been answered. Here we apply the Peter and Clark momentary conditional independence (PCMCI) causal discovery tool to (i) unravel essential causal drivers of the GBI in a set of selected atmospheric fields at intraseasonal (weekly and 3-day averages) time scales in observations and (ii) compare the latter with those found in the ECMWF SEAS5 seasonal forecasts. Observed causal links well reproduced by the dynamical model would be considered indicative of the trend in GBI found in observations more likely emerging because of the selected time frame. By contrast, any differences between the two sets of causal drivers in observations and models would support the hypothesis that some key mechanisms are not appropriately represented in the forecast model, preventing it from correctly reproducing the observed trend.