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# Climate teleconnections from Greenland to the tropics: evidence from corals, ice cores, and model simulations $\delta$18O data

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The nature and causes of Greenland climate variability and its teleconnections are poorly understood beyond interannual time scales due to the lack of long and reliable meteorological observations. This study analyzes the teleconnections of Greenland climate variability, on interannual to decadal time scales, using a network of annually resolved oxygen isotope ($\delta$18O) records from Greenland ice cores and tropical corals, as well as data from isotope-enabled general circulation model (ECHAM5-wiso) simulations.

Coherent interannual to multidecadal variations of western, southern and central Greenland $\delta$18O ice core records and tropical Atlantic sea surface temperature (SST) anomalies during the observational period were identified. These linkages reflect the impact of the North Atlantic Oscillation (NAO) on Greenland $\delta$18O and tropical Atlantic SST variability. Unlike in central, western and southern Greenland, the ice core $\delta$18O records from northeastern Greenland show significant correlations with western tropical Pacific SST anomalies. Consistent with this, coral $\delta$18O records from the western tropical Pacific are significantly positively correlated with the northeastern Greenland ice core $\delta$18O records during the observational period. A Pacific North American (PNA) like pattern explains this relationship. Similar linkages between Greenland $\delta$18O and tropical temperature variability are identified in a nudged simulation of ECHAM5-wiso model.

A running correlation analysis reveals that Greenland $\delta$18O and tropical temperature links are non-stationary during the observational period, both in the observed and the model data. Using high resolution Greenland ice core $\delta$18O records, as well as coral $\delta$18O records from the tropics, we show that shifts in the Greenland - tropical Atlantic and Pacific teleconnections occurred frequently during the last several hundred years. As such, we argue that the Greenland ice core and tropical coral $\delta$18O records could be used to reconstruct the variability of tropical-arctic teleconnections during the last several hundred years.