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Understanding common aspects and interactions between ENSO and the NAO

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The leading mode of natural climate variability in the Tropics is the El Niño/Southern Oscillation (ENSO) phenomenon. It originates in the Tropical Pacific and has global climatic impacts. In the North Atlantic Sector, the leading natural variability mode is the North Atlantic Oscillation (NAO) which has widespread consequences for Northern Hemisphere climate. While ENSO is an inherently coupled air-sea mode, the NAO can be understood to first order solely by atmospheric dynamics. This is supported by spectral analysis: Typical ENSO spectra are red and peaked at the main ENSO frequency, while the NAO spectrum is almost white. There may be some influence of the ocean on the NAO. A clear picture of this possible feedback, however, is still pending.

ENSO influences the NAO, although correlations are generally weak during the instrumental record. Multi-century climate model simulations, however, indicate highly non-stationary behaviour, with winter-time correlations ranging from -0.4 to +0.4 on multi-decadal timescales. Whether or not there is a feedback of the NAO on ENSO is unclear. On long decadal timescales, possible feedbacks involving the thermohaline circulation are discussed based on climate model simulations. Greenhouse warming may influence both ENSO and the NAO. Climate model projections for the 21st century, however, differ considerably among each other. Likewise the response of ENSO-NAO interactions to global warming is highly uncertain and varies a lot from model to model.