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Influence of the winter Atlantic Niño on the North Atlantic-European atmospheric circulation

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One of the leading modes of sea surface temperature (SST) variability in the Tropical Atlantic is the Atlantic Niño (ATLN). It shows two peaks of variability along the seasonal cycle: the first one occurs in boreal summer, which is the maximum and has been widely studied; the second one takes place in early winter (November-December) and has been much less investigated. Previous studies have shown potential for this early-winter SST variability mode to be a source of predictability for the North Atlantic-European (NAE) region. Coupled simulations and atmosphere-only experiments with the CMIP6 version of the climate model EC-EARTH (T255L91) have been performed and analysed to revisit the ATLN-NAE atmospheric teleconnection and further improve process understanding. The coupled simulation consists in a 250-year long integration, after spin-up, with fixed radiative forcing at present conditions; the atmospheric response is estimated by linear regression onto the winter Atlantic Niño index defined by Okumura&Xie. The atmosphere-only experiments comprise two 150-year long integrations keeping the radiative forcing fixed, a control run with climatological SSTs and a sensitivity run prescribing the observed ATLN with climatology elsewhere; the atmospheric response is evaluated by comparing both experiments. The atmospheric anomaly associated with ATLN shows a local Gill-type response, symmetrically straddling the equator, whose amplitude increases from November-December to January-February. In the extratropics it depicts a barotropic structure, yielding a wave-like pattern in early winter and a dipolar structure at mid-latitudes (different from the North Atlantic Oscillation) in late winter. In both seasons, the atmospheric response to ATLN displays statistically-significant precipitation anomalies over Europe.