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Shedding light on the intraseasonal variations of the winter ENSO teleconnection in the Northern Hemisphere

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This study delves into the large observed variations in the Northern Hemisphere ENSO teleconnection across winter, which occur in both the North Pacific-American (NPA) and North Atlantic-European (NAE) sectors, extend to the stratosphere and cannot be attributed to changes in the tropical Pacific SST forcing, whose spatial structure exhibits little change from early-fall to late-winter. In particular, and rather surprisingly, a strong response is found in early-fall in the NAE sector, characterized by an equivalent barotropic cyclonic anomaly in the North Atlantic during El Niño events, reminiscent of the East Atlantic pattern. This is distinct from the response observed in the following months in structure (late-winter being characterized by a circulation dipole reminiscent of the negative NAO at the surface) and in that it does not extend to the stratosphere. The different nature of the ENSO teleconnection in fall and winter is poorly understood, as is the tendency for the latter signal to project onto the NAO at the surface.

Here we assess, via random sampling techniques, whether the apparent evolution of the ENSO signal across the winter season in both the NPA and NAE sectors, and in the troposphere and stratosphere, is robust to sampling variability. We also use transient-eddy diagnostics to show that, despite the similarities between the ENSO and NAO surface signatures in late-winter, this ENSO signal cannot be interpreted as related to NAO dynamics but rather to large-scale, Rossby wavetrain dynamics. Finally, we compare the observational results with AMIP century-long simulations using two models of different complexity and resolution (SPEEDY and IFS).