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ENSO teleconnections to the extratropics: role of El Niño amplitude and seasonal cycle

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ENSO is a key driver of interannual climate variability in many regions of the world. However, disentangling the dependence of ENSO teleconnections on the specific characteristics of events is challenging given the relatively small number of observed events and multiple sources of internal variability. In this talk I will present recent work from my group using targeted climate model experiments to investigate the mechanisms underpinning ENSO teleconnections to two extratropical regions spanning both hemispheres: the North Atlantic and the Amundsen sea low. I will focus on how the tropical-extratropical teleconnections vary as a function of ENSO amplitude and the role of the seasonal cycle.

In contrast to some previous studies, we show that the influence of El Niño on the winter North Atlantic Oscillation (NAO) is approximately linear over the range of observed El Niño amplitudes. The NAO response is tied to a weakening of the Arctic polar vortex and an increase in the frequency of major sudden stratospheric warmings. In the Southern hemisphere, the El Niño teleconnection to the Amundsen sea region is largest in austral winter, despite the fact El Niño typically peaks in austral spring/summer. In austral winter, the region of strong absolute vorticity near $\sim$30°S provided by the subtropical jet, in combination with the changes to upper tropospheric divergence due to the El Niño perturbation, acts as an anomalous Rossby wave source that is largely absent in austral summer. Furthermore, in austral summer the poleward propagation of tropically-sourced Rossby waves into the Amundsen sea region is inhibited by the strong polar front jet in the south Pacific sector, which leads to Rossby wave reflection away from the Amundsen sea region.

I will conclude the presentation by giving my perspective on some of the key outstanding questions in understanding ENSO teleconnections to the extratropics.