

# **Distinguishing the tropospheric and stratospheric pathways of El Niño-Southern Oscillation teleconnections**

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The El Niño-Southern Oscillation (ENSO) is a major driver of Northern Hemisphere wintertime variability and, generally, the dominant factor used in seasonal forecasts of wintertime surface climate. Previous modeling studies have suggested that the ENSO teleconnection might have both a tropospheric pathway and a stratospheric pathway. Here, using reanalyses, we carefully distinguish between the two, and separately consider anomalous ENSO winters with and without a severely perturbed stratosphere (i.e. stratospheric sudden warming events). This decomposition reveals that while ENSO's climate impacts over North America are largely associated with the tropospheric pathway (a well known fact), ENSO's climate impacts over the North Atlantic and Eurasia are almost entirely associated with the stratospheric pathway. Since stratospheric sudden warmings occur very often during non-neutral ENSO winters (75% of the time during El Niño and 67% during La Niña winters), this results highlight the stratospheric pathway as crucial to understanding ENSO teleconnections into the North Atlantic and the Eurasian continent.