



Boreal winter modes of circulation in the stratosphere-troposphere system under the influence of the ENSO polarity

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The stratospheric circulation has been recently proposed to play an important role in transmitting the ENSO signal to the Euro-Atlantic region, which projects on annular-like patterns. In this context, the influence of the ENSO polarity on the winter circulation modes in the stratosphere-troposphere system over the Northern Hemisphere is studied. Principal Component Analysis of the geopotential at different levels is performed partitioning the data into El Niño and La Niña winters (DJFM; 1957/58-2001/02 period).

On the one hand, it is found that the 20-hPa annular mode retains almost a 10% more variance of the geopotential in cold-La Niña than in warm-El Niño winters. However, stratospheric zonal-wavenumber-1 modes accumulate more variability for warm-El Niño winters. Our results support the presence of more stratospheric wave-like anomalies coming from the troposphere during warm-El Niño conditions.

On the other hand, the spatial structure of the surface annular-like mode during warm-El Niño winters presents a clear difference with the neutral-conditions pattern, which is well-known to have a weak (but statistically significant) Azores-Aleutian positive correlation. Concretely, El Niño case shows anticorrelated anomalies between the Azores and Aleutian centres, which implies the presence of anomalies of the same sign at middle and high latitudes in the North Pacific. During La Niña winters, the Aleutian centre in the annular mode reinforces. The discrepancy between El Niño and La Niña surface patterns is also found in the surface signature associated with the corresponding stratospheric annular mode. Our results point to a stratosphere-troposphere interaction in the mentioned differences, which agrees with previous works that highlight the role of the stratosphere in connecting the North Pacific and the North Atlantic.