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AUSTRAL TELECONNECTION PATTERNS ASSOCIATED TO GENERALIZED FROSTS OVER SOUTHERN SOUTH AMERICA

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Abstract:

The identification of teleconnection patterns and the analysis of their effect on the horizontal structure of the atmospheric circulation can be very useful to understand anomalous events in many regions of the world. Previous observational studies of the mean atmospheric circulation leading to generalized frosts (GF) in central Southern South America, suggested that specific large scale patterns can be associated to the frequency of occurrence of these events through the propagation of Rossby waves remotely excited. This hypothesis is tested through a teleconnection analysis for austral winters which present an extreme frequency of occurrence of GF in southeastern South America. Rossby wave propagation regions are identified for two basic states given by the composition of winters with maximum and minimum frequency of GF occurrence, during the 1961–1990 period.

Based on the stationary wavenumber (K_s) it is possible to identify regions where the Rossby wave propagation is permitted and those where it will be inhibited ($Ks = 0$), highlighting the importance of the upper level jets as waveguides. The differences found indicate that the location of the wave generation and its later evolution are conditioned by the basic state. Results are validated through a baroclinic model, which simulates the Rossby wave patterns responsible for the teleconnection. Numerical experiments confirm that the principal wave activity takes place inside the subtropical and polar jets. In particular, for the basic state with maximum frequency of GF occurrence, the wave trains propagating inside the subtropical and polar waveguides merge just before entering the continent, in agreement with the observations prior to the occurrence of GF events. This configuration favors the development of an intense south wind anomaly with large meridional extension which results in the intensification of anticyclonic circulation in southern South America, with cold dry air advection from the south, dropping the temperature in the center and east of the southern South American continent. A conceptual model will be presented summarizing all these results.