



Interannual variability of Antarctic sea ice and its interrelationship with atmospheric blocking and ENSO

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Relationship between atmospheric blockings and sea ice has not been well investigated yet, although the association with the El Niño – Southern Oscillation (ENSO) is better comprehended. The blocking events in South Hemisphere (SH) occur mainly between 50° and 65° S and during the winter and spring, which is the period of greater Antarctic sea ice coverage. In this sense, considering the interannual variability of Antarctic sea ice, what is the interrelationship with atmospheric blocking events and ENSO? We used the ERA-Interim reanalysis, the sea ice extent for the SH sectors (National Snow and Ice Data Center) and the monthly time series of sea surface temperature (NOAA), obtained for the Niño regions. An objective method was used for the identification of the blockings. El Niño/La Niña events were defined according to CPC/NOAA. The time series (1979-2013) were filtered on interannual time scale, where below (above) the 25% (75%) quartile were considered the extremes negative (positive) of sea ice [ENSI (EPSI)] for the austral winter. The composites were lagged in time for the interannual anomalies of atmospheric fields. Among the SH sectors analyzed, the Ross Sea and Indian Ocean sectors presented more extreme events of sea ice during El Niño/La Niña episodes. In these sectors ENSI (EPSI) occurred in El Niño (La Niña) episodes. In the Indian Ocean sector were 2 (5) events in Niño 1+2 region and 4 (3) events in Niño 3, Niño 3.4 and Niño 4. In the Ross Sea sector, from the 10 ENSI (EPSI) events, 1 (8) occurred in years of El Niño (La Niña) in the Niño 1+2, 1 (6) events in the Niño 3, 2 (6) events in the Niño 3.4 and 2 (4) events in the Niño 4. The spatial pattern of interannual atmospheric anomalies was very similar between these two sectors, with some differences in relation to central position of the anomalous pressure centers. There was a weakening (strengthening) of polar jet that contributes to a less (more) cyclonic activity in surface and, thus, positive (negative) anomalies of sea level pressure. These extratropical anomalies exhibit an equivalent barotropic structure, with the anomalous ridge (trough) in medium and high levels. These anomalies were maxima over the Southern Pacific. In ENSI (EPSI) in these sectors the anomalous ridge (trough) over South Pacific and the trough (ridge) over Southeast Pacific are present in almost all the seasonal cycle. The frequency of blocking events in 60° and 66° S latitudes shows a good association with the ridge (trough) over Southeast Pacific during ENSI (EPSI) events in El Niño (La Niña) episodes. Further, 60° S latitude shows the greatest increase (decrease) in relation to the frequency of blocking events throughout the period (1979-2013). However, in the South Atlantic this association was not evident. This study highlights the interaction between phenomena of low and high frequency, suggesting the highly nonlinear nature of atmospheric blockings.