Relationships Between Antartic Oscillation and ENSO, and their Impacts on Rainfall and Temperature over Southern Brazil

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This study investigates the AOI-ENSO seasonal relationships and their combined impacts on rainfall and maximum and minimum temperature over Southern Brazil. Monthly 3x3 contingency tables, evaluated by ROC scores, were used to assess the significant, simultaneous and 1 to 6 months lagged relationships between their lower and upper terciles. Significant simultaneous relationships between the negative (positive) AOI phases and El Niño (La Niña) events were obtained during the austral fall months (ROC= 0.61 and 0.63) and spring months (ROC=0.52 and 0.44). Furthermore, significant 1, 3, and 6 months Niño/La Niña lagged relationships were respectively found in fall and spring, in summer, fall, and winter, and in fall and winter. Three months AOI lagged relationships were significant in summer, fall, and spring, and 6 months lagged in fall. Related to the AO and ENSO impacts on the surface regional climate, we observed that El Niño (La Niña) events were respectively, simultaneously and 1 month lagged, associated with above (below) normal rainfall in Spring (ROC=0.65, 0.74, 0.46 and 0.35), and with lags of 2 and 3 months in winter (ROC=0.68, 0.54, 0.69, and 0.60). The AOI positive phases were simultaneously associated with below normal rainfall in the austral summer (ROC=0.35), winter (0.38) and spring months (0.30) and the AOI negative phases with above normal rainfall in summer (ROC=0.34). Both AOI phases were inversely related to 1 and 3 months lagged rainfall anomalies in winter. El Niño (La Niña) events were significantly associated with above (below) normal minimum temperature (Tmin) anomalies in the spring months (ROC=0.31, and 0.34).With 1 month lag, only El Niño events were related to above normal Tmin in summer and winter, with 2 months lag the significant relations were between La Niña and below normal Tmin in fall, and with 3 months lag, both ENSO events were directly associated with Tmin anomalies. The AOI positive phases were simultaneously associated with above normal Tmin in fall (ROC=0.54), and in spring (ROC=0.32), and their negative phases, with below normal anomalies in spring (ROC=0.38). With 1 and 2 months lag, the significant relations were between -AOI and above normal Tmin in summer and winter, and +AOI and below normal Tmin in summer. El Niño (La Niña) events were also associated with above (below) normal maximum temperature (Tmax) anomalies in fall (ROC=0.45 and 0.37), and inversely related in spring (ROC=0.33 and 0.36). With 1 month lag, significant direct relationships were observed in fall and inverse ones in spring. With 2 months lag, the significant relationships were in fall, winter and spring. The lagged and simultaneous relationships between AO, ENSO and the surface climate over southern Brazil provide a useful tool for monitoring and prediction of rainfall, Tmin and Tmax in the region.