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The Southern Hemisphere Annular Mode and atmospheric characteristics over South America/adjacent oceans

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The Southern Hemisphere annular mode or Antarctic Oscillation (AAO) represents a large-scale alternation of atmospheric mass between middle and high latitudes in the Southern Hemisphere which had been identified in previous studies of atmospheric circulation in this hemisphere. In the present study, the atmospheric characteristics of the AAO are analyzed during the four seasons and their influences over South America and adjacent oceans are discussed for the active period of November. The typical pattern with opposite signs between polar and middle latitudes is common during the four seasons presenting barotropic equivalent structure. Composites of extreme AAO index in both phases show a dominance of wavenumber three around the hemisphere. Streamline anomalies composites for extreme AAO index display a PSA-type wavetrain during November resulting in a center around South America with opposite signal in the two AAO phases. This PSA-type center is intensified from the troposphere throughout the stratosphere by the AAO pattern generating downstream centers. Maximum upward planetary wave propagation into stratosphere during November is linked to the strongest AAO configuration in stratosphere during this month and a maximum troposphere-stratosphere coupling, affecting the dynamic characteristics. The displacement of jets northwards in the negative phases occur in the four months and are apparent in eddy kinetic energy. The maximum eddy kinetic energy occurs in July in the troposphere and in November in the stratosphere and it is stronger in the positive phase. These results suggest that maximum tropospheric jet in July promotes the upward propagation of planetary waves into stratosphere, culminating in a maximum propagation and consequently maximum eddy kinetic energy during November. The dynamic characteristics presented in the results suggest that they have an important role in shaping the circulation in November and this, consequently, influences the climate over South America and adjacent regions. The anomaly precipitation dipole over South America with reversal signal between AAO phases is consistent with the atmospheric configurations. Anomalous circulations close to South America, which are part of wavetrains PSA-kind, are affected by AAO signal and intensify anomalous centers over the continent. The dipole is also consistent with the jets configuration. The larger intensity of eddy kinetic energy slight southward of positive precipitation anomaly latitudes in negative AAO phase indicates the higher frequency of transients in those latitudes.