EMS Annual Meeting Abstracts
Vol. 16, EMS2019-76, 2019

Southern Annular Mode: different definitions of the index and their climate impacts

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The teleconnection patterns such as the North Atlantic Oscillation (NAO) and Pacific / North American pattern (PNA) strongly affect surface climate conditions, including temperature, precipitation, sunshine duration, and other variables in the northern hemisphere. Southern Annular Mode (SAM), also known as the Antarctic Oscillation, is the leading mode of circulation variability in the southern hemisphere. SAM is characterised by synchronous anomalies of opposite geopotential height in the mid and high latitudes. SAM variability has large impacts on surface temperatures and precipitation mainly in Antarctica, Southern America and Australia. Several definitions of the SAM have been employed in climatological studies. Perhaps the most widely used measure is the difference between normalized monthly zonal mean of sea level pressure at 40°S and 65°S. Some indices are based on station data and some on principal component analyses (PCA) applied to different geopotential height levels.

In this contribution, we compare several different definitions of SAM, which have often been employed in recent studies, for their effects (quantified in terms of correlations) on surface temperature and precipitation in different places in the southern hemisphere. The analysis is based on monthly mean data. The preliminary results show that there are no large differences in the similarity of time series of indices between winter and summer. Low correlations are found between PCA-based indices and the others. The sensitivity of SAM effects on both surface temperature and precipitation to the choice of the circulation index is considerably higher in summer. Correlations differ among the indices not only in their magnitude but in some regions in summer also in their sign.