The ocean-atmosphere interactions in the extratropical Southern Hemisphere: a multimodel approach.

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Abstract

The Southern Annular Mode (SAM) is the leading mode of extratropical climate variability in the Southern Hemisphere (SH). Defined as the first empirical orthogonal function (EOF) of the 500 hPa geopotential field, its positive phase corresponds to negative sea level pressure anomaly over Antarctica and positive at the midlatitudes, signs are reversed for the negative phase. Variations in the SAM have profound effects on the other climate variables and they are a topic of growing interest because of the climate change induced positive trend the SAM has shown over the last decades. Understanding how variations in the SAM will affect the climate in the future requires a solid comprehension of the impacts of SAM in the present climate. It is essential to identify the climate models that are able to represent the current state of the SAM with strong accuracy, so that they can be relied upon for future projections. Starting from this framework, this work aims to investigate the connection between the SAM and the sea surface temperature (SST) based on ERA5 reanalysis, through a regression analysis the SST response to the SAM is characterized. The second goal of the work is to assess the accuracy in the representation of the coupled SST-SAM variability by the models participating in the sixth phase of the Coupled Model Intercomparison Project (CMIP6). Such a characterization will support the choice of which models to use for future predictions of the impacts of SAM variations in the SH climate.

Keywords: Southern Annular Mode, SAM, Sea Surface Temperature, SST, CMIP6, Climate variability, ocean, atmosphere interactions, Model representation

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