

# Cross-Seasonal Influence of the December–February Southern Hemisphere Annular Mode on March–May Meridional Circulation and Precipitation

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New evidence suggests that interannual variability in zonal-mean meridional circulation and precipitation can be partially attributed to the Southern Hemisphere annular mode (SAM), the dominant mode of climate variability in the Southern Hemisphere (SH) extratropics. A cross-seasonal correlation exists between the December–February (DJF) SAM and March–May (MAM) zonal-mean meridional circulation and precipitation. This correlation is not confined to the SH: it also extends to the Northern Hemisphere (NH) subtropics. When the preceding DJF SAM is positive, counterclockwise, and clockwise meridional cells, accompanied by less and more precipitation, occur alternately between the SH middle latitudes and NH subtropics in MAM. In particular, less precipitation occurs in the SH middle latitudes, the SH tropics, and the NH subtropics, but more precipitation occurs in the SH subtropics and the NH tropics. A framework is built to explain the cross-seasonal impact of SAM-related SST anomalies. Evidence indicates that the DJF SAM tends to lead to dipolelike SST anomalies in the SH extratropics, which are referred to in this study as the SH ocean dipole (SOD). The DJF SOD can persist until the following MAM when it begins to modulate MAM meridional circulation and large-scale precipitation. Atmospheric general circulation model simulations further verify that MAM meridional circulation between the SH middle latitudes and the northern subtropics responds to the MAM SOD.

Keywords: Southern Hemisphere Annular Mode, Southern Ocean Dipole, zonal-mean precipitation

