

A Connection from Arctic Stratospheric Ozone to El Niño-Southern Oscillation

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Abstract

Antarctic stratospheric ozone depletion is thought to influence the Southern Hemisphere tropospheric climate. Recently, Arctic stratospheric ozone (ASO) variations have been found to affect the middle–high latitude tropospheric climate in the Northern Hemisphere. This paper demonstrates that the impact of ASO can extend to the tropics, with the ASO variations leading El Niño–Southern Oscillation (ENSO) events by about 20 months. Using observations, analysis, and simulations, the connection between ASO and ENSO is established by combining the high-latitude stratosphere to troposphere pathway with the extratropical to tropical climate teleconnection. This shows that the ASO radiative anomalies influence the North Pacific Oscillation (NPO), and the anomalous NPO and induced Victoria Mode anomalies link to the North Pacific circulation that then influences ENSO. Our results imply that incorporating realistic and time-varying ASO into climate system models may help to improve ENSO predictions.

Keywords: Arctic stratospheric ozone (ASO), ENSO, North Pacific Oscillation (NPO), Victoria Mode.