

Seminar “Ocean, Ice and Atmosphere”,  
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## Consistency Between Zonal Mean Stratospheric and Total Column Ozone Trends (2000-2024)

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This talk presents an updated assessment of stratospheric and total column ozone trends over the 2000-2024 period using six merged limb-profile datasets and six merged total ozone datasets. Long-term changes were quantified using a multiple linear regression framework that accounts for dynamical and chemical variability. In addition to standard regressors (solar cycle, QBO, ENSO, stratospheric aerosol optical depth), we include Arctic and Antarctic Oscillation indices and the eddy heat flux in each hemisphere as proxies for dynamic variability. Volcanic (and wildfire) aerosol forcing is represented by separate proxies for three periods dominated by the major volcanic events of El Chichón, Pinatubo, and post-2000 volcanic eruptions, including Hunga-Tonga.

These period-specific proxies are employed to better account for varying dynamical ozone responses that largely depend on the season and location of the eruptions. All profile datasets consistently show positive trends in the upper stratosphere, with the strongest ozone recovery in southern mid-latitudes, in agreement with other studies. In the lower stratosphere, trends remain weak, spatially heterogeneous, and predominantly negative.

A comparison of stratospheric column trends derived from profile data with total ozone trends shows close agreement across latitude bands. Within the trend uncertainties, total column trends since 2000 are largely driven by stratospheric ozone changes, while tropospheric contributions to zonal-mean total ozone trends (the difference between total and stratospheric column trends) appear negligible. The extended regression framework improves the representation of recent dynamical variability and provides an updated perspective on stratospheric ozone recovery through 2024.