Sensitivity of Northern Hemispheric Tropospheric Ozone to Anthropogenic Emissions as Observed by Satellite Observations

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Atmospheric composition is rapidly changing in response to changes in industrialization, land-use, and climate. Tropospheric ozone is at the nexus of atmospheric chemistry, air-quality, and climate as it is not only the third most important greenhouse gas and a primary air pollutant, but also affects carbon dioxide by damaging plants and the lifetime of atmospheric methane by influencing the oxidative capacity of the atmosphere.

Observed trends in free-tropospheric ozone, as observed by ozone-sondes and more recently by satellite measurements from the Aura Tropospheric Emission Spectrometer (TES) and Infrared Atmospheric Sounding Interferometer (IASI) instruments, do not agree with models that are driven by observed changes in ozone pre-cursor emissions. As a consequence, estimates of ozone radiative forcing and the future trajectory of tropospheric ozone concentrations are highly uncertain. In this study, we explore the use of satellite observations of ozone and its pre-cursors for constraining the sensitivity of Northern hemispheric tropospheric ozone to anthropogenic emissions. New measurements of peroxyacetyl nitrate (PAN) from the TES instrument suggest that one explanation for the model/data mismatch in trends is reduced ventilation of reactive nitrogen into the free-troposphere over Asia. Ultimately, continued well validated observation of ozone and its pre-cursors from IASI, Atmospheric Infrared Sounder (AIRS),Cross-track Infrared Sounder (CRIS), and Tropospheric Monitoring Instrument (Trop-OMI) will be needed to solve this critical scientific question.

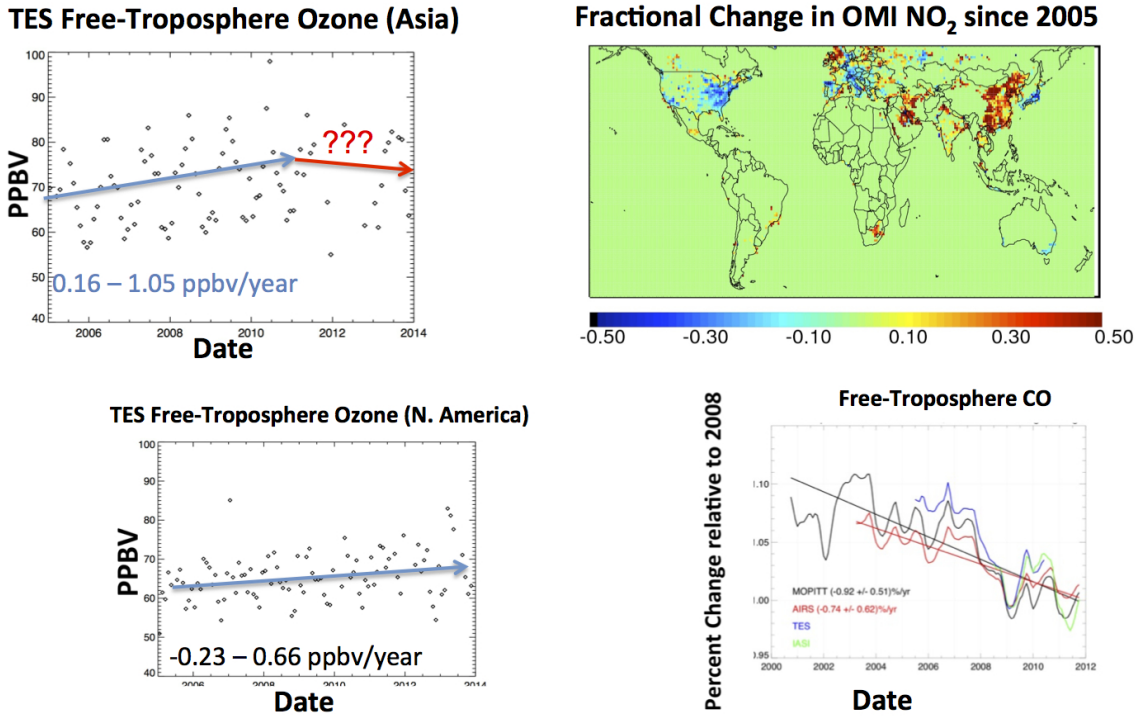

Figure 1. Changes in Tropospheric Ozone and its pre-cursors as Observed by Satellite Observations.