Geophysical Research Abstracts,
Vol. 11, EGU2009-3282, 2009
EGU General Assembly 2009

The Variability of Tropospheric Carbon Monoxide: A Satellite Perspective

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Satellite observations have made a significant contribution to the scientific understanding of tropospheric composition. Together with ground-based and aircraft measurements, they provide a global long-term perspective as part of an integrated observing strategy. The data are both illustrative of specific events, pollution releases, fires, and the subsequent transport pathways for instance, and useful for quantitative studies such as improvements to source emission estimates through inverse modeling.

This paper focuses on the geographical, seasonal, and inter-annual variability of tropospheric carbon monoxide as revealed by multi-year satellite observations. Measurements show how regional and global pollution levels depend on a mix of anthropogenic urban and industrial emissions together with a large contribution from wildfires and tropical biomass burning. The global nature of the pollution problem is also emphasized by frequent observations of intercontinental transport, and I describe some of the field campaign investigations to quantify this effect through the combination of satellite and aircraft measurements and chemical transport models. The evidence of a direct response to climate variations such as ENSO and the deterioration of regional air quality as a result of increased fire emissions will also be discussed. I will conclude with a review of community initiatives aimed at integrating satellite observational capability in tropospheric composition and air quality forecasting.