

3.122 Transported and local contributions to carbon monoxide in Australasia.

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Abstract:

Distinguishing the relative contribution of transported versus local sources of atmospheric pollution is fundamental to developing realistic air quality policies and providing accurate air quality forecasts. We study sources of atmospheric carbon monoxide (CO) by exploiting the complementary information provided by the different sensitivities of satellite and ground-based remote-sensing instruments. Total column amounts of CO are compared between the satellite-borne Measurements of Pollution in the Troposphere (MOPITT) and ground-based solar FTIR instruments in the Total Carbon Column Observing Network (TCCON) and the Network for the Detection of Atmospheric Composition Change (NDACC). We focus on three Southern Hemisphere stations: Darwin and Wollongong in Australia and Lauder in New Zealand.

CO timeseries anomalies from each instrument are discussed in relation to pollution delivery pathways of local, regional and long-distance origin. The ground-based spectrometer data capture small-scale urban pollution and fire events, and also record the long-range transported effect of biomass burning emissions from South America, southern Africa and Indonesia. While large-scale pollution events impact both instruments, only the satellite instrument can provide regional and global context. For example, MOPITT can be used to track the hemispheric impact of South American and southern African fires, as well as determine the regional influence of severe Australian fires. Finally, we quantify contributions to CO variability using the Community Atmosphere Model with chemistry (CAM-chem) using tagged tracers to distinguish relative contributions from different CO source regions and sectors. Modeling is also used to calculate the relative roles of emissions and meteorology.