

# Potential of Observations from the Tropospheric Emission Spectrometer to Constrain Continental Sources of Carbon Monoxide

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## Abstract

We have conducted an observing system simulation experiment for the Tropospheric Emission Spectrometer (TES) satellite instrument to determine the potential of nadir retrievals of carbon monoxide (CO) from this instrument to constrain estimates of continental sources of CO. We use the GEOS-CHEM global chemical transport model to produce a pseudo-atmosphere in which the relationship between sources and concentrations of CO is known. Linear profile retrievals of CO are calculated by sampling this pseudo atmosphere along the orbit of TES. These retrievals are used as pseudo-observations with a maximum a posteriori inverse algorithm to estimate the CO sources from the different continents. This algorithm accounts for the finite vertical resolution of the retrieval, instrument errors, and representation and transport errors in the GEOS-CHEM simulation of CO. The structure of the transport error is estimated using the statistics of the difference between paired GEOS-CHEM forecasts of CO, and this structure is then scaled to match the model error in the GEOS-CHEM simulation of aircraft observations of Asian outflow over the NW Pacific. We show that, with proper characterization of observation errors, just 2 weeks of observations from TES have the potential to constrain estimates of continental sources of CO to within 10%.

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