Using Geostationary Environment Monitoring Spectrometer (GEMS) Measurements To Investigate The Emission, Transport And Chemistry Processes That Determine Diurnal Variability Of Pollutant Distributions Over Asia

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Abstract

Since its launch in 2020, the GEMS instrument has provided four years of geostationary Earth orbit (GEO) hourly, high spatial resolution, shortwave retrievals of atmospheric pollutants over Asia. This has allowed studies of the diurnal variation of trace gas and aerosol concentrations and the consequences for changing air quality and how this depends on emission, transport, and chemistry processes. In this paper, we concentrate on nitrogen dioxide (NO_2) measurements and discuss how the relative importance of these processes changes according to different environments and seasons. Including low Earth orbit (LEO) infrared retrievals of carbon monoxide (CO) from MOPITT (morning overpass) and CrIS and TROPOMI (afternoon overpass) also allows helps differentiate combustion sources. We further compare with the NO_2 diurnal variability observed by ground-based Pandora sun spectrometer measurements at polluted and less-polluted Asian sites. To help understand the daily differences in diurnal patterns at these regional and local scales, we use the Multi-Scale Infrastructure for Chemistry and Aerosols (MUSICAv0). This uses a global modeling framework with regional grid refinement to resolve chemistry at emission and exposure relevant scales. Finally, we report on the combined use of GEMS, Pandora and MUSICAv0 modeling to assess the expected NO_2 distributions for locations of the 2023 ASIA-AQ aircraft field campaign.

Early Career Scientist

NO, I am not an early career scientist.