



First retrieval of tropospheric nitrogen dioxide columns from the Environmental Monitoring Instrument (EMI) onboard the Chinese GaoFen-5 satellite

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The EMI instrument onboard the Chinese GaoFen-5 satellite has been successfully launched on May 9, 2018. The EMI instrument is a nadir-viewing push broom spectrometer, measuring earthshine radiances and solar irradiances in the wavelength range of 240 to 710 nm at a moderate spectral resolution (FWHM) of 0.3 to 0.5 nm (depending on wavelength). EMI consists of an Offner imaging spectrometer with four spectral channels, and each channel is equipped with a two-dimensional (spectral and spatial) CCD detector which enables a field of view (FOV) of 114° and 0.5° in the swath and flight direction, respectively. The four spectral channels cover the following wavelength ranges: 240-315 nm, 311-403 nm, 401-550 nm, and 545-710 nm for the UV1, UV2, VIS1, and VIS2 channels, respectively. The spatial resolution of the instrument is 24×13 km.

An EMI NO_2 retrieval algorithm has been developed. The EMI NO_2 slant column densities were retrieved by analyzing the earthshine spectra at the wavelength range of 410-470nm using the DOAS technique. Cross section of other trace gas absorption such as liquid and vapour water, O_3 , O_4 , and Ring effect are included in the DOAS analysis. The EMI NO_2 SCDs were then converted to vertical column densities (VCDs) by using the concept of air mass factor (AMF). The AMFs were calculated based on the NO_2 profiles derived from the GEOS-Chem chemistry transport model simulations with a horizontal resolution of $2^\circ \times 2.5^\circ$ using the radiative transfer model VLIDORT. Vertical columns over China were calculated with a regional chemistry transport model WRF-Chem at a resolution of 10km. The tropospheric-stratospheric separation of the total NO_2 column was realized by a novel reference sector method. The first retrieval results of EMI NO_2 VCDs are presented. The result shows the EMI instrument is able to capture the spatial and temporal variability of NO_2 pollution levels and show good agreement with other satellite observations.