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First carbon monoxide retrieval from TROPOMI's shortwave infrared radiance measurements

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The Tropospheric Monitoring Instrument (TROPOMI) was successfully launched as a single payload of ESA's Sentinel-5 Precursor mission on October 13th, 2017. The instrument observes Earth's reflected radiances from the ultraviolet to the shortwave infrared spectral range with unprecedented radiometric accuracy and daily global coverage with a spatial resolution down to 7x7 km2. The telluric absorption of carbon monoxide (CO) around 2.3 provides information on this atmospheric trace gas and the operational data are processed using the Shortwave Infrared CO Retrieval (SICOR) algorithm, developed by SRON. In this contribution, we show the first results of the TROPOMI CO data product inferred from observations during the instrument commissioning phase. The preliminary data product captures CO air pollution by wild fires in Brazil, Africa, Madagascar, and Australia but also resolves weaker atmospheric CO signals by urban pollution. With a repeat cycle of only one day, TROPOMI also observes the evolution of pollution events on short time scales like the atmospheric transport of the extreme high air pollution in North India during November 2017. We verify the quality of the preliminary data product with collocated ground-based measurements at selected sites of the TCCON and NDACC networks. Furthermore, we compare the data with assimilated CO fields of the Copernicus Atmospheric Monitoring Service (CAMS) on regional and global scale. Overall, we find the accuracy of the preliminary TROPOMI CO data product to be , which meets the data user requirements already during the commissioning phase. The results underline the outstanding performance of the spectrometer and point to a wide range of operational and scientific applications.