Tracking wildfire emissions of CO, NH_3, and HCOOH in Southeast Asia from FY-4B/GIIRS

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ABSTRACT

The Geostationary Interferometric Infrared Sounder (GIIRS) on board the FengYun-4 series of satellites is the world's first geostationary hyperspectral infrared sounder. With hyperspectral measurements collected from a geostationary orbit, it covers the carbon monoxide (CO) absorption window around 2150 cm^{-1}, the strong ammonia (NH_3) absorption window at 955-975 cm^{-1}, and the formic acid (HCOOH) absorption window around 1105 cm^{-1}. GIIRS provides a unique opportunity to track the wildfire emissions of CO, NH_3, and HCOOH in Southeast Asia.

Every spring, especially from March to April, strong emissions from forest fires are transported across the Southeast Asian region. The wildfires are caused by the agricultural practice of slash-and-burn, in which trees, shrubs or crop residues are cut down and dried after harvest and then burned to clear the land. The strong enhancement of CO, NH_3 and HCOOH due to the wildfires in Southeast Asia can be observed in the FY-4B/GIIRS retrievals. Long-range transport to the South China Sea and the Indian Ocean demonstrates the large impact of the wildfire emissions on the surrounding regions.

In this study, the spatial and temporal variations of wildfire emissions of CO, NH_3 and HCOOH from Southeast Asia in 2023 and 2024 are analysed using FY-4B/GIIRS retrievals and cross-compared with IASI retrievals. In addition, we compare the retrievals with GEOS-Chem model simulations to understand the ability of the model to capture the diurnal cycle of these emissions.