

## **Carbon monoxide during pollution events in Asia: evolution and trends from 17 years of IASI data**

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### **ABSTRACT**

Asia stands out as one of the most polluted continents in the world. Rapid industrialization, urbanization, population growth and seasonal biomass combustion have led to significant emissions of pollutants, including those of carbon monoxide (CO). Major urban areas in South, South-East and East Asia often endure severe air pollution episodes. These episodes are characterized by high levels of particulate matter and elevated CO concentrations, posing serious health risks to billions of inhabitants.

In this study, we use the 17 years of IASI CO Climate Data Record (CDR), which have recently been released by EUMETSAT, to analyze the evolution of daytime and nighttime CO concentrations. We demonstrate that nighttime CO data, often disregarded due to assumed low sensitivity to the lower troposphere, can exhibit improved sensitivity under certain conditions (high negative thermal contrast between the surface and the atmosphere), making them valuable in the analysis of certain pollution events.

We elaborate a method to average the daytime and nighttime IASI pixels with the latter filtered based on measurement error. This CO product correlates better than the classic day and night average when compared to TROPOMI (Sentinel-5P), an instrument with better sensitivity near the surface.

By applying this method over the whole IASI time series, we show the trends of CO concentrations in various regions of Asia where severe pollution episodes regularly occur. We focus on pollution events during the post-monsoon season (October and November) in the Indo-Gangetic Plain, the winter season (December to March) in the North China Plain, and the dry season (November to April) in mainland Southeast Asia. The CO concentrations from IASI and their evolution in these regions are also compared to emission inventories and in-situ measurements when available.