



CONTEXT

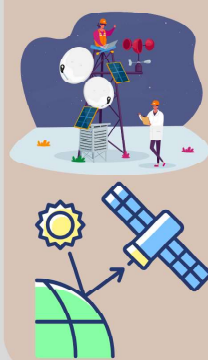


Air pollution is one of the leading causes for premature mortality in humans and has adverse effects on the climate

Someone call the atmosphere repair crew, this pollution's wreaking havoc!



MONITORING

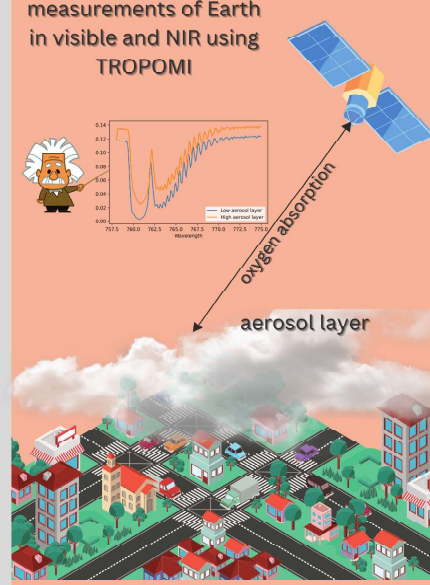


In-situ monitors offer localized air pollution data

Current passive satellite sensors track aerosol pollution's surface distribution

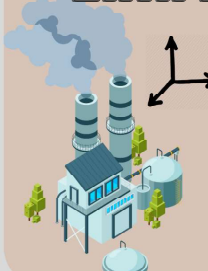
APPROACH

Hyperspectral measurements of Earth in visible and NIR using TROPOMI



Continuous aerosol pollution measurements in 3D over land and ocean

LIMITATION



Air pollution and its impacts depend on their 3D atmospheric pathways

Background

Fine particulate matter (PM) play an important role in human health and the evolution of climate by directly affecting the earth's radiative budget and altering the cloud properties (Choi and Chung 2014). Therefore, an in-depth assessment of the origins and multiple environmental impacts of the particles, which is directly tied to the three-dimensional (3D) distribution of the particles, is required to restrict and mitigate its adverse effects.

Aim & Methods

We present new satellite observations of multi-type aerosols over the USA using AEROS5P (Lemmouchi et al., 2022). This method extracts vertical aerosol extinction profiles from cloud-free Tropospheric Monitoring Instrument (TROPOMI) pixels using hyperspectral top of atmosphere (TOA) reflectance data in visible and near infrared wavelength. It incorporates prior knowledge of particle properties, surface reflectance, meteorological data, and aerosol profiles

Results

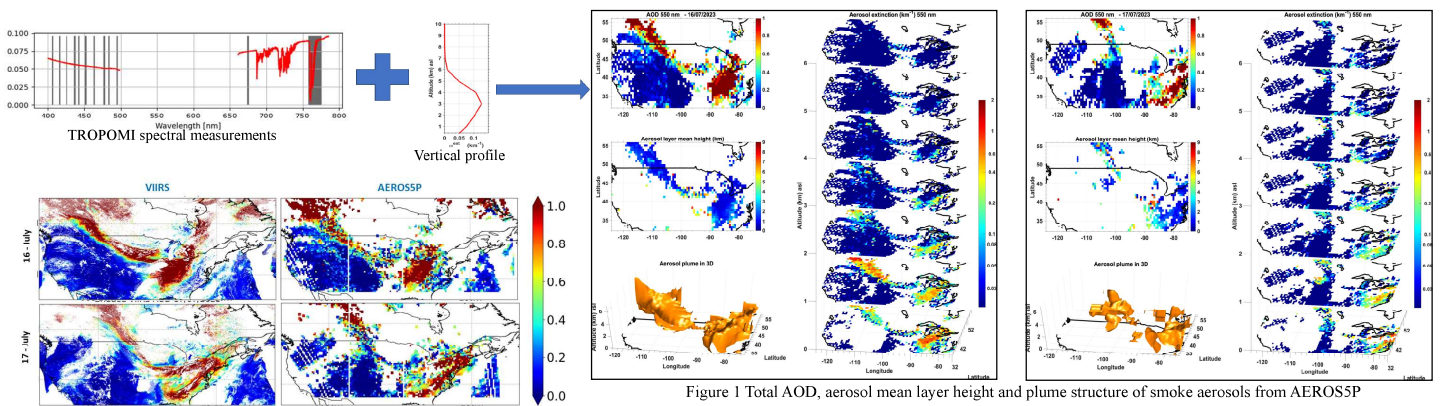


Figure 1 Total AOD, aerosol mean layer height and plume structure of smoke aerosols from AEROS5P

Retrieval of AOD from AEROS5P at every 10th TROPOMI pixel
Visible high AOD across the smoke transport path over the USA
AEROS5P AOD shows good agreement against VIIRS AOD

Figure 2. Comparison of spatial distribution of AOD from AEROS5P against standard VIIRS AOD

Conclusion and Perspective

In this poster, we demonstrate a case of a Canadian fire reaching the USA in July 2023. The multi-type AEROS5P provides a continuous 3D distribution of aerosol trajectories, including their presence in densely populated areas like New York on July 17th. These results will help us better understand their effects on climate and human health and will assist in formulating observation-based policies to mitigate their adverse impact

References

Choi, Jung-Ok, and Chul E. Chung. "Sensitivity of aerosol direct radiative forcing to aerosol vertical profile." *Tellus B: Chemical and Physical Meteorology* 66.1 (2014): 24376.
Lemmouchi, Farouk, et al. "Three-Dimensional Distribution of Biomass Burning Aerosols from Australian Wildfires Observed by TROPOMI Satellite Observations." *Remote Sensing* 14.11 (2022): 2582.