



Impact of Sugarcane Stubble Burning Activities on Local Air Quality in the Rio Grande Valley Region of South Texas



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Introduction

- The Rio Grande Valley (RGV) of South Texas is a low-resourced, Hispanic/Latino majority region with a population of 1.37 million.
- This region on the US-Mexico border is a major hub of sugarcane cultivation.
- Sugarcane stubble burning leads to episodic events of high air pollution in the area.

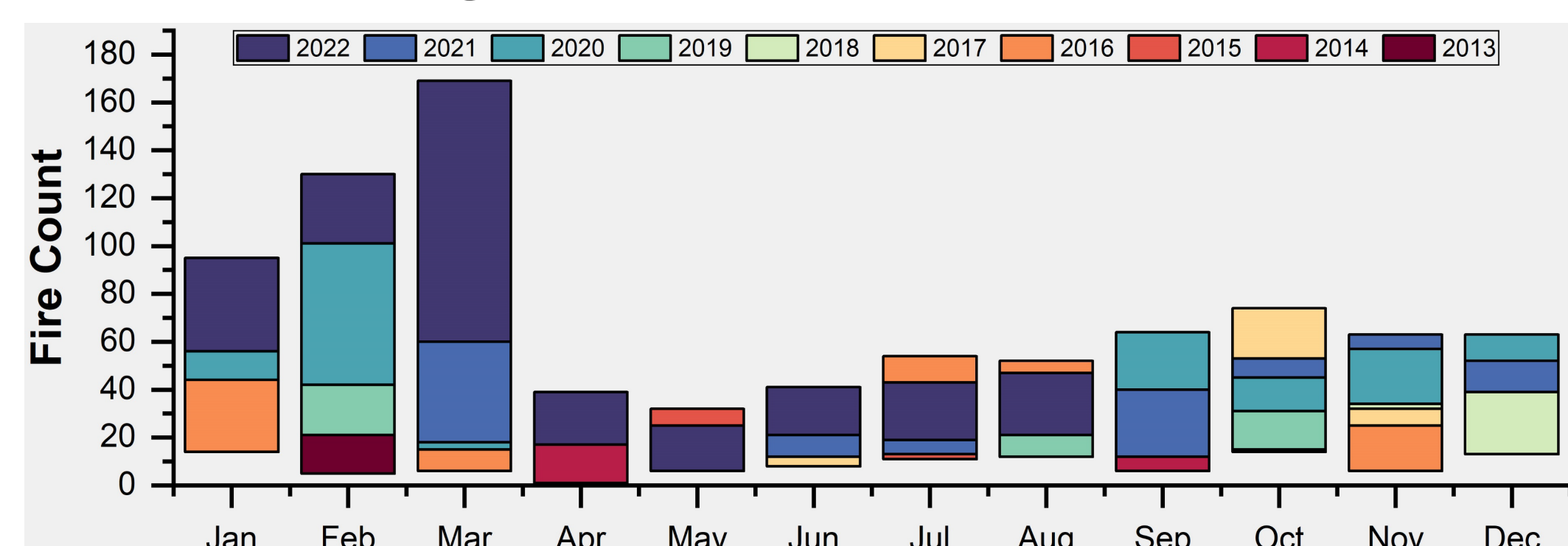


Fig 1. Fire Counts detected by VIIRS S-NPP in RGV

Ground based sensors

- Deployment of 20 Purple Air sensors and 5 Aeroqual instruments from 09/01/23 – 04/15/2024.
- Strategical placement to capture spatial and temporal trends of PM_{2.5}, NO₂ and O₃.

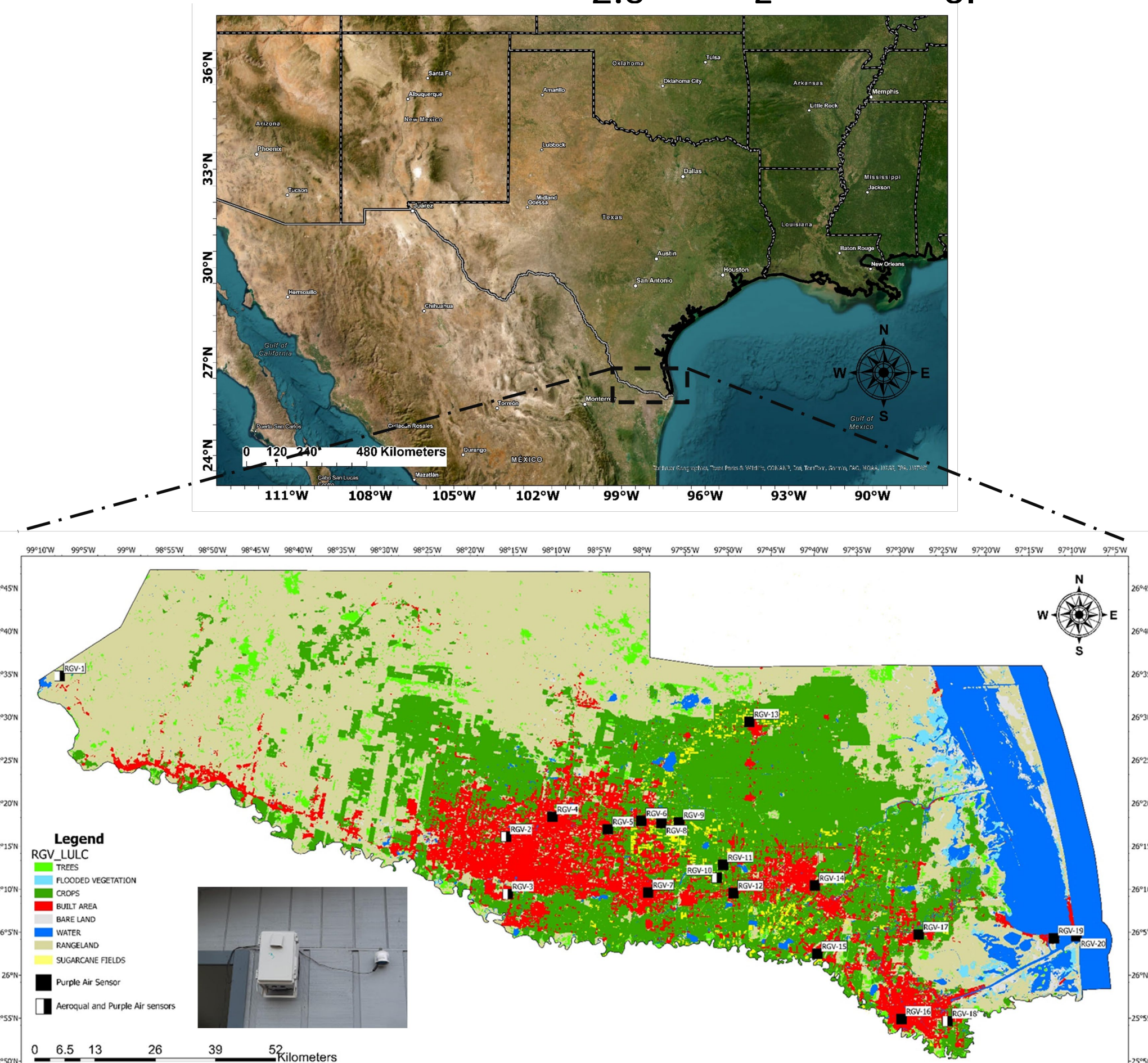


Fig 2. Map & pictures of deployed sensors

Collocation performance

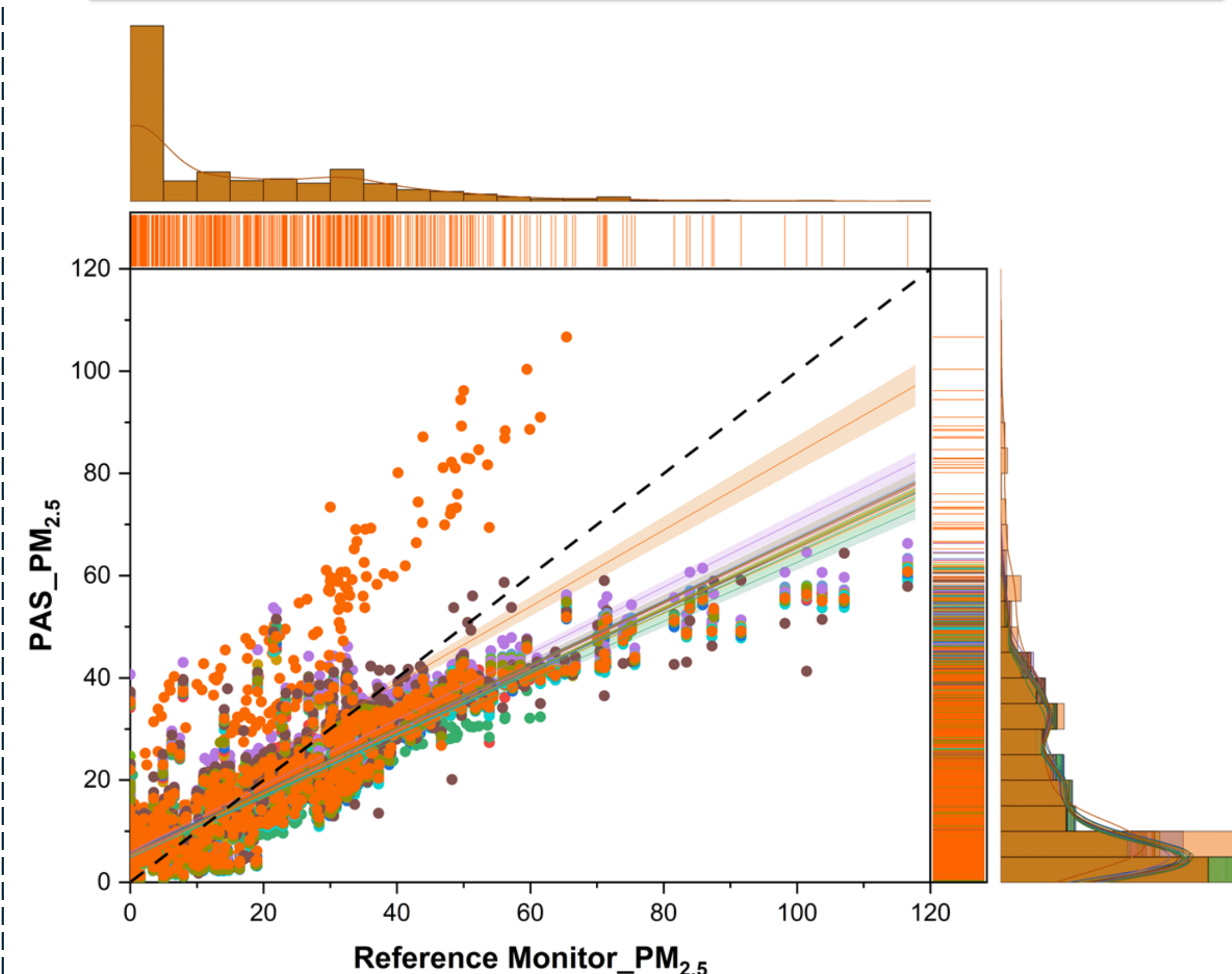
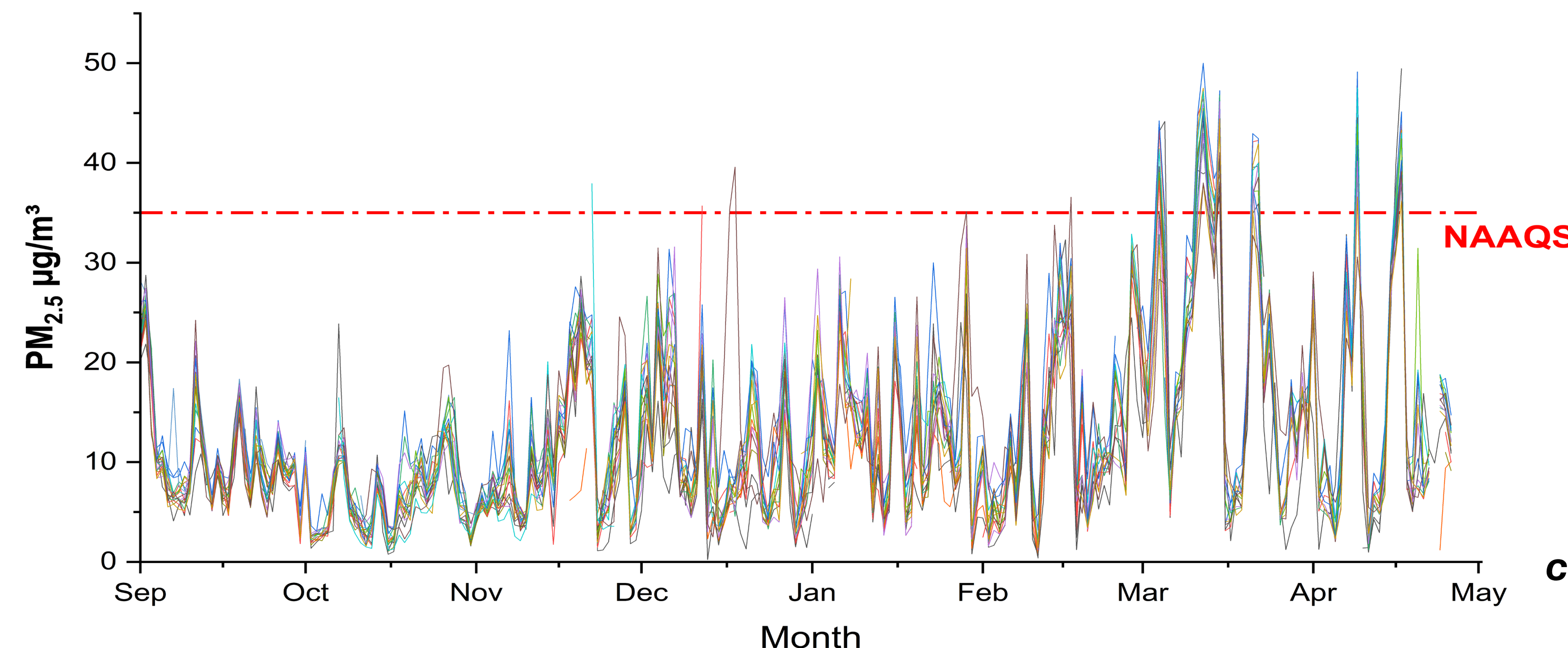


Fig 3. Scatterplot of intercomparisons during collocation before deployment.

- The top and right histograms show the value distributions for the reference monitor and PAS sensors

Ground based PM_{2.5} data



- PM2.5 concentrations typically remain below the U.S. EPA's 24-hour standard of 35 µg/m³, but occasional spikes occur from March and April, indicating episodic events.

Fig 4. Time series of 24-hour averaged calibrated PM_{2.5} data collected through 20 purple air sensors.

Fire and smoke activity detection

- NOAA's Hazard Mapping system (HMS) was used to identify the fire and smoke plumes during the burning period in the region.

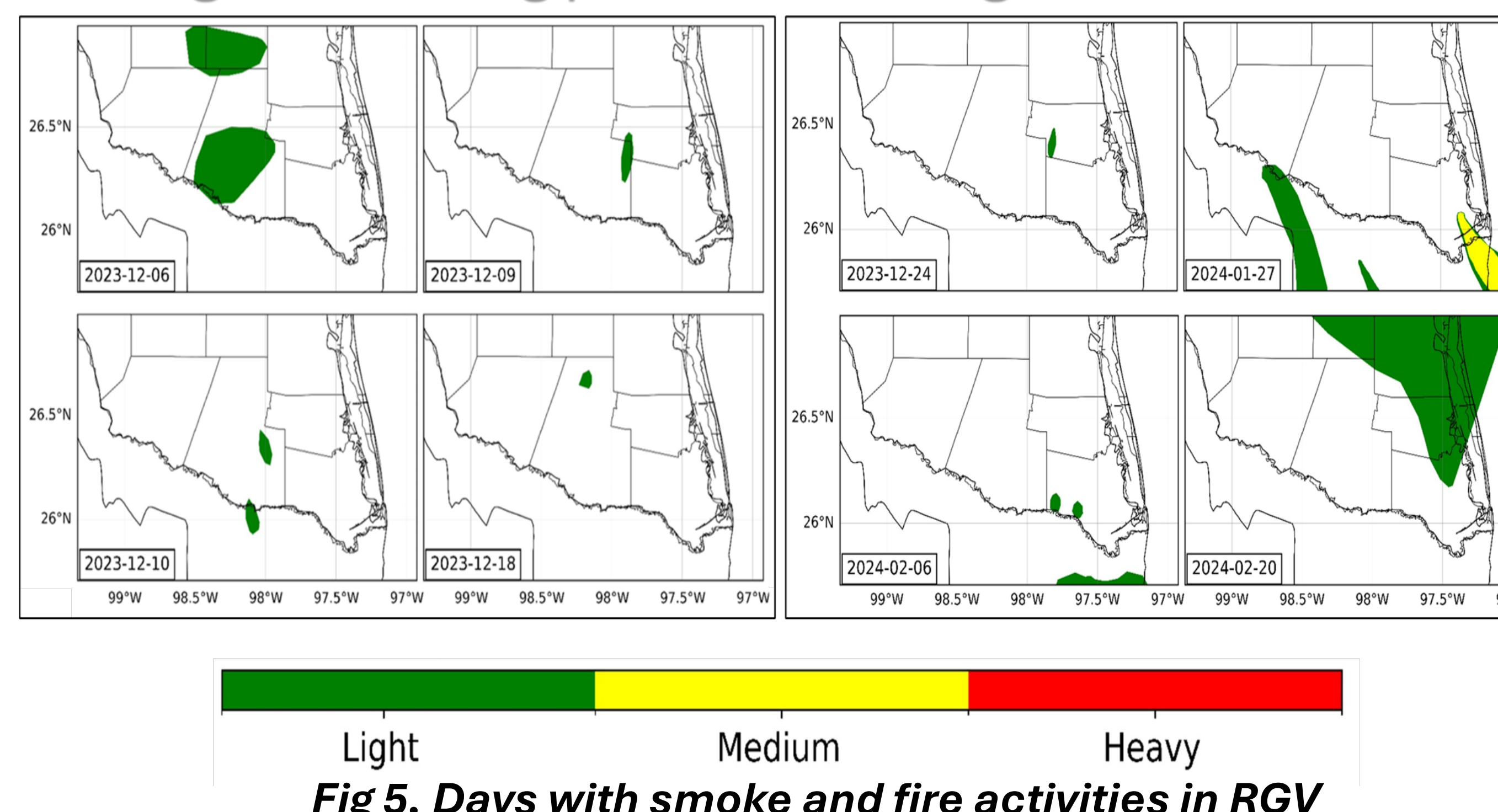


Fig 5. Days with smoke and fire activities in RGV

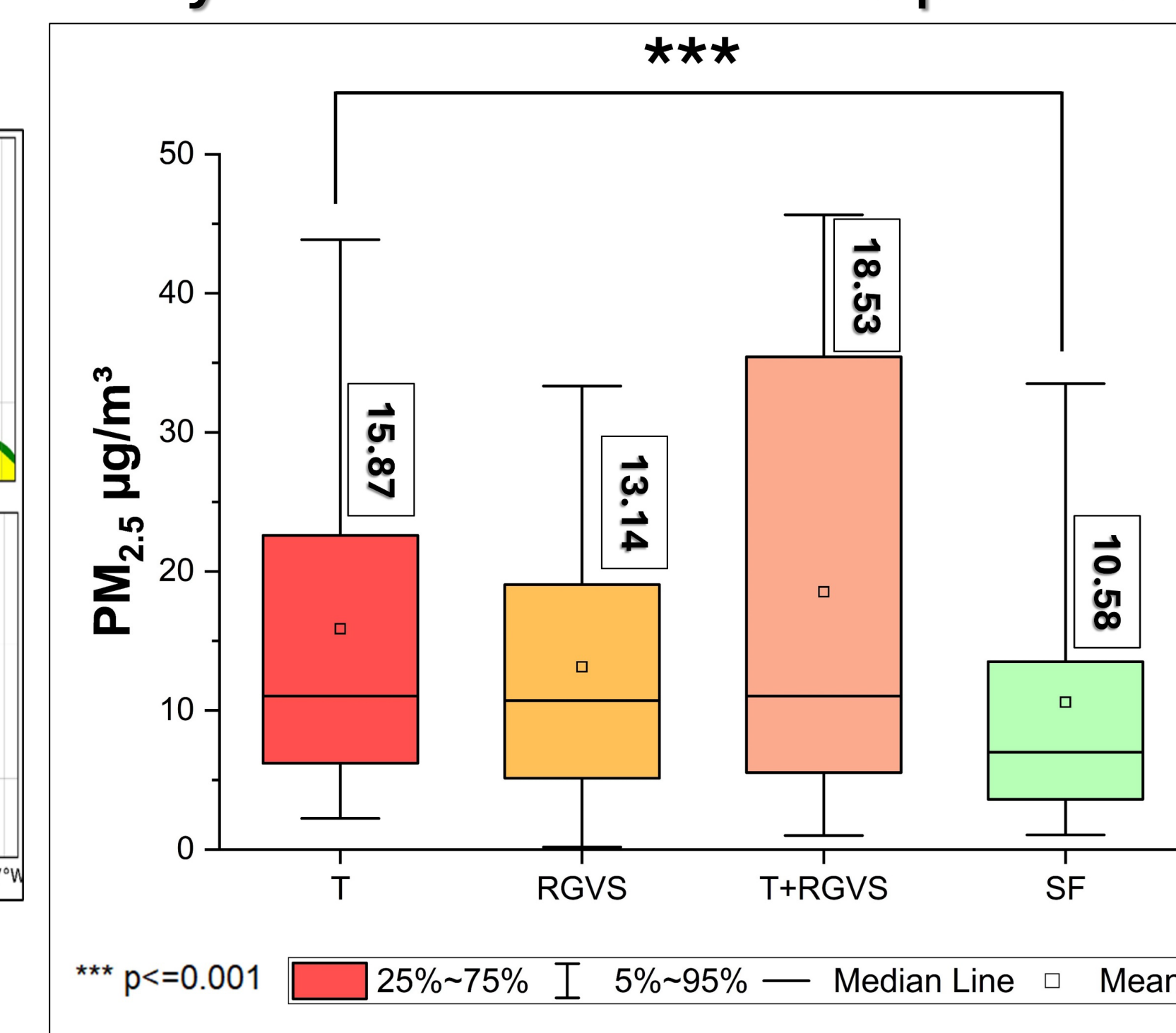


Fig 6. Comparison of PM_{2.5} levels on different smoke scenarios

AOD from GOES-EAST comparison to Ground-based PM_{2.5}

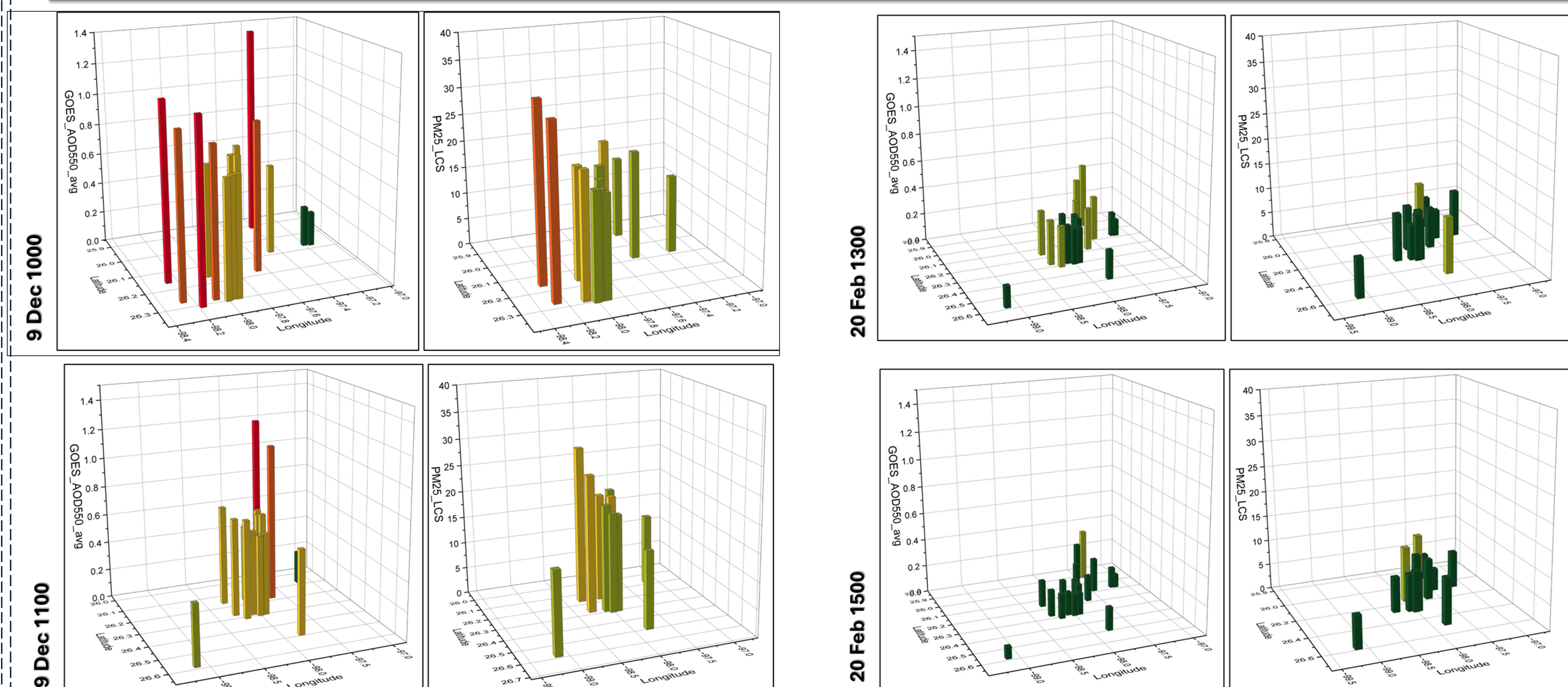


Fig 7. A comparison between AOD and ground based PM_{2.5} indicating spatial alignment in pollution hotspots

Conclusions

- Daily averaged PM_{2.5} largely remained below the U.S. EPA's 24-hour standard of 35 µg/m³, although exceedances occurred during early spring.
- Agricultural stubble burning impacted air quality negatively.
- However, the impact is larger when transboundary smoke is added to the local pollution sources.

Acknowledgements

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