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.

Data Collected

The average 24-hour PM₂.₅ exceeded NAAQS during wildfires activities at Yucatan Peninsula and Central America.

Citizen Science Approach

• 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 PM₂.₅, NO₂, and O₃.

PM₂.₅ Calibration

• Visible Infrared Imaging Radiometer Suite (VIIRS) and NOAA’s Hazard Mapping system (HMS) were used to detect the fire and smoke plumes during the burning period in the region.

Impact on Community

Dashboard with the following data was made available to public:

• Ground based Purple air data

• Real time imagery of GOES – East from NASA’s Global Imagery Browse Services (GIBS)

• NOAA’s HMS Fire detection and smoke detection layers, which are a blended product composed of fire detection data from GOES/ABI, the JPSS/VIIRS and EOS/MODIS.

Satellite Data

• Integrate GOES and TEMPO data with ground-based monitoring data.

• Collect data for an additional year (July 2024 – June 2025) to assess the air quality in the region without stubble burning as sugarcane cultivation has come to an end in the region.

• Rio Grande Valley Sugar Growers, Inc. - the last remaining sugar operation in TX, shut down operation in March 2024 due to the abrogation of 1944 Water Treaty by Mexico, and future uncertainty regarding water for irrigation purposes.

Next Steps

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PM₂.₅ values collected by 20 Purple Air sensors during the study period.

NO₂ values collected by five Aeroqual instruments during the study period.

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

Fig 4. Collocation activities with FEM instruments

Fig 5. Comparison between A and B channels of PurpleAir sensor

Fig 6. Comparison between PM₂.₅ values of PurpleAir and FEM

Fig 7. Comparison between actual and predicted values by ML model

Fig 8. PM₂.₅ values collected by 20 Purple Air sensors during the study period.

Fig 9. NO₂ values collected by five Aeroqual instruments during the study period.

Fig 2. Environmental Justice (EJ) Index for PM₂.₅

Fig 3. Map & pictures of deployed sensors

Fig 10. Fire activity in RGV detected by VIIRS

Fig 11. Smoke plume by NOAA’s HMS

Fig 12. Desktop and mobile view of dashboard.

The average 24-hour PM₂.₅ exceeded NAAQS during wildfires activities at Yucatan Peninsula and Central America.

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