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PROPOSAL PREVIEW

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[Quantitative Daily Maps of PM2.5 Episodes for California and Other Regions: Satellite Column Water and Optical Depth as Allied Tracers of Dilution](#)

Proposal Category: Platform or Technical Poster

Proposal Status: Active

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TopicThe text that displays above the topic field

Air Quality Issues - Atmospheric Processes

- AP07 - Innovative Air Quality Modeling Techniques

Was this abstract solicited?

- YES

Solicitor

- Other (John Watson, DRI, and Judy Chow, DRI)

Platform or Poster

- Platform or Poster

Abstract Description

The Western US and many regions globally present daunting difficulties in understanding PM2.5 episodes. We evaluate extensions of a method independent of modeled source-description and transport/transformation and using several satellite remote sensing products from imaging spectrometers.

The San Joaquin Valley (SJV) especially suffers few-day episodes due to shallow mixing; PM2.5 retrieval suffers low satellite AOT and bright surfaces. Nevertheless, we find residual errors in our maps of typically 5–8 $\mu\text{g}/\text{m}^3$ Episodes in the Valley reaching 60–100 $\mu\text{g}/\text{m}^3$. These maps detail pollution from Interstate 5 at the scale of a few kilometers. The maps are based on NASA's MODerate resolution Imaging Spectrometer data at ca. 1 km as processed with the Multi-Angle Implementation of Atmospheric Correction.

The Bay Area Air Quality Management District has requested that we test our methods in their challenging environment characterized by multiple sub-basins defined by complex topography. Our tests suggest that nearly similar precision may be expected for wintertime conditions with high PM2.5. We note difficulties when measured PM2.5 is less than 8–10 $\mu\text{g}/\text{m}^3$, but good relative precision when PM2.5 rises above 20; i.e. in episodes of concern for morbidity and mortality.

Our method stresses physically meaningful functions of MODIS-MAIAC-derived AOD and total water vapor column. A mixed-effects statistical model exploiting existing station data works powerfully to allow us daily AOT-to-PM2.5 relationships that allow a calibration of the map. In those cases where water vapor and particles have generally similar surface sources, using the ratio of AOT / Column_{water} can improve the daily calibrations so as to reach our quoted precision. We briefly present some cartoon idealizations that explain this success and also the likely reasons that our mixed effects model (or "daily calibration") works; also when it should not work.

The combined satellite/mixed-effects model works best for wintertime San Joaquin Valley episodes, where the meteorology of particle and H2O(v) dilution is quite appropriate. We extended and tested the methodology (a) for the Bay Area wintertime situations and (b) for smoke plume events (e.g. the October 2017 fire events of the Sonoma area).

Our SJV work was evaluated using NASA's DISCOVER-AQ airborne measurements, and by season- long measurements in Fresno. If the composition and size distribution of the aerosols can be assessed for the regions we describe, retrievals should have improved accuracy.

Keywords

PM2.5 Regional Satellite

Awards-Young Professional Best Paper Award**Young Professional Best Paper Award**

Is the primary author a YP (35 years or younger) by the end of Calendar Year 2017 and NOT a full time student?

No

Please enter your birth month and year in order to confirm your age at the time of submission.

NA