

Satellite Overview and Potential Data Applications for NW-AIRQUEST

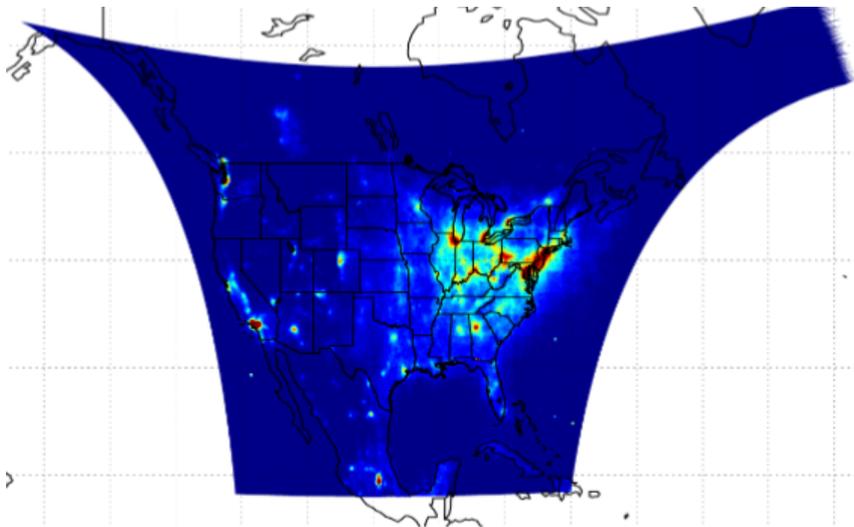
TEMPO (Tropospheric Emissions: Monitoring of Pollution)

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TEMPO specs

- Harvard-Smithsonian Astrophysical Observatory/NASA mission
- Geostationary grating spectrometer
- Field of Regard: CONUS from Atlantic to Pacific, Mexico City to Canadian Oil Sands



tempo.si.edu

TEMPO specs

- Pollutants measured
 - NO_2 , O_3 , aerosol, clouds, H_2CO , $\text{C}_2\text{H}_2\text{O}_2$, SO_2
 - O_3 profile products: 0-2 km O_3 , free tropospheric O_3 , stratospheric O_3 column
- Spatial resolution
 - 2 km (N/S) x 4.5 km (E/W) at center of FOR
- Temporal resolution
 - Hourly samples for NO_2 , O_3 , aerosol, clouds
 - 3x day for H_2CO , $\text{C}_2\text{H}_2\text{O}_2$, SO_2
 - Samples during daylight hours only

TEMPO specs

- Standard observations = hourly (75% of observing time)
- Special operations (pointing) = 10 minute intervals
 - Available for 25% of observing time
 - Events: volcanic eruptions, wildfires, dust storms
 - Chemistry experiments
 - 1-hour notice required to start pointing
- Intended launch date
 - 2020
 - Science team wants to have standard data products ready to go by launch

General data applications

- Air quality and health
 - Assimilation with AQ models for forecasting and emissions constraints
 - Improved AQIs, NRT pollution reports
 - Epidemiological studies
- Biomass burning
 - Investigate chemical processes associated with ozone production from fires
- Advanced aerosol products
 - New aerosol retrieval algorithms when combined with GOES bands
 - Aerosol plume height
- Soil NO_x
 - Hourly observations after fertilizer application, rainfall
- Ship tracks
 - Should be able to resolve these
- ...
- Corn sweat
 - Blame corn: it makes heat waves and air pollution worse



High time resolution experiments

- Lightning NO_x
 - Better quantification of lightning NO_x and related tropospheric O_3 production
 - Can point instrument at thunderstorms
- Highway emissions
 - Increased frequency of scans on east and west coasts to coincide with morning and evening rush hour
 - Should be able to resolve NO_x and VOC emissions of mobile sources on major highways

Applications relevant to NW-AIRQUEST

- Model assimilation
 - Modify initial conditions, emissions (NO_x , O_3 , AOD)
- Model validation
 - TEMPO's continuous spatial coverage and hourly resolution could supplement monitor verification
- EI verification
 - NO_x especially
- Improved understanding of ozone production from crop residue burning and wildfires
 - Hourly measurements could improve understanding of chemical processes
- Background concentrations (see Ranil's talk tomorrow)
 - Assimilate or "fuse" TEMPO data with AIRPACT output and monitor data
- Dust product for exceptional events
- Others? (discussion point)

Data product development and distribution

- NRT and L-1, L-2, L-3 type products
- GIS-compatible data products
- Website for visualization, subsetting, downloading
- Want to engage with end users
 - 2016 Applications Workshop
 - 2017 Early Adopters Meeting
 - <http://tempo.si.edu/presentations.html>
- Creating synthetic data to test products
- Will provide training
 - Product training workshop (tbd)
 - NASA SPoRT