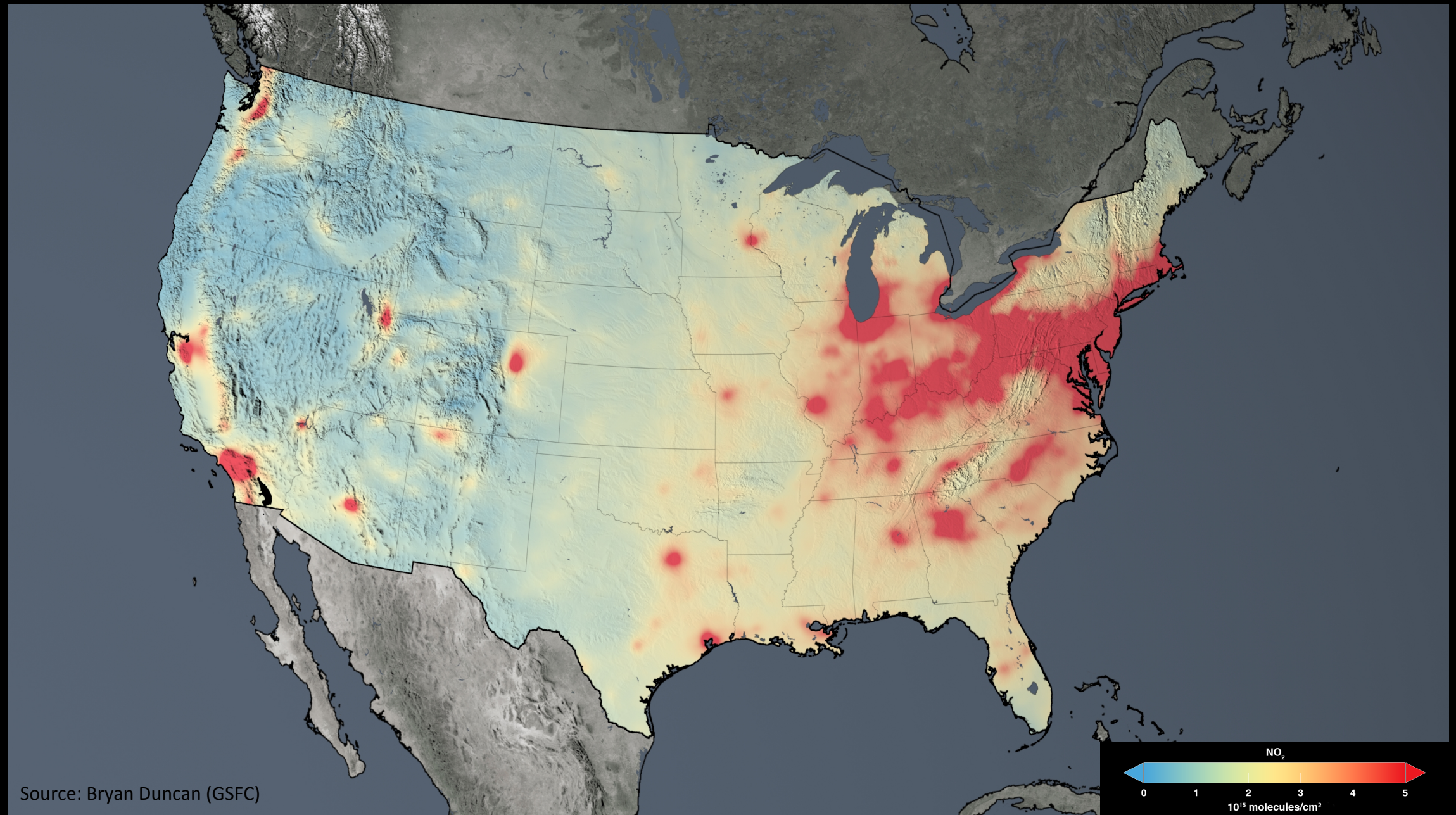
NASA's Planned Air Quality Missions – Need to Engage Stakeholders

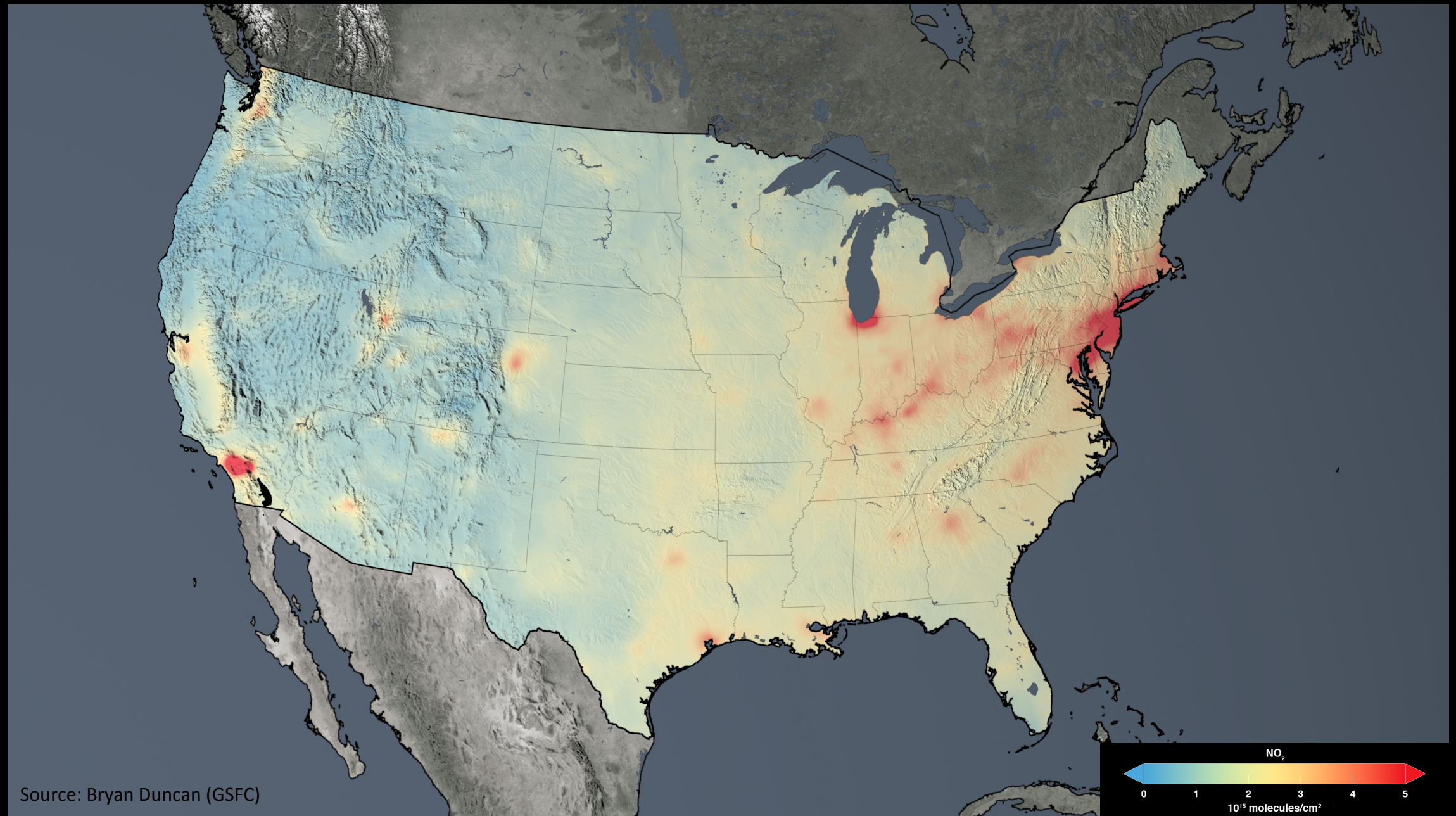
Barry Lefer
Tropospheric Composition
Earth Science Division
NASA Headquarters

OMI NO_2 for United States (2005)



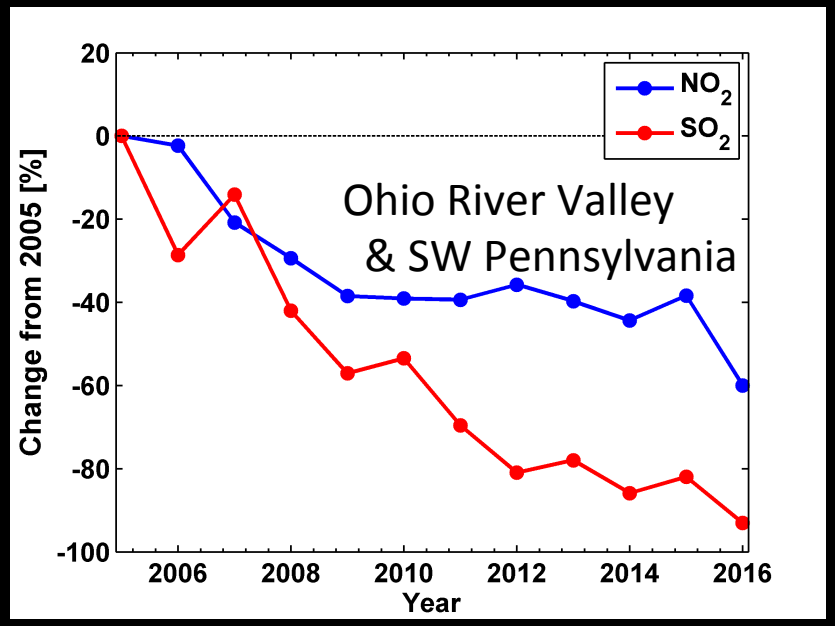
Source: Bryan Duncan (GSFC)

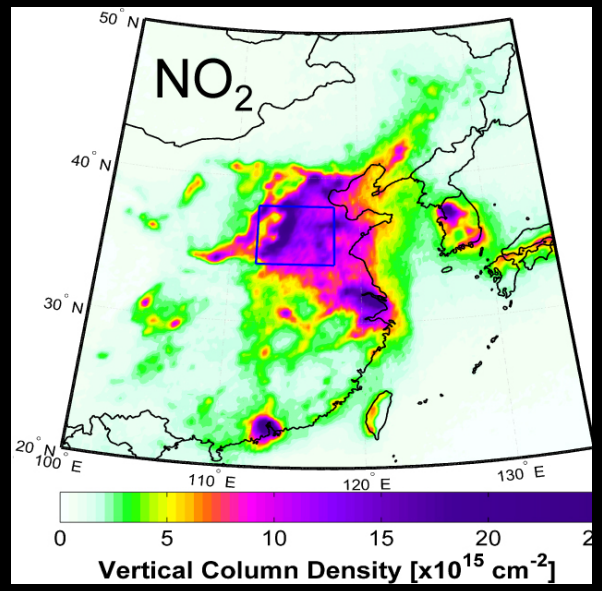
OMI NO_2 for United States (2014)

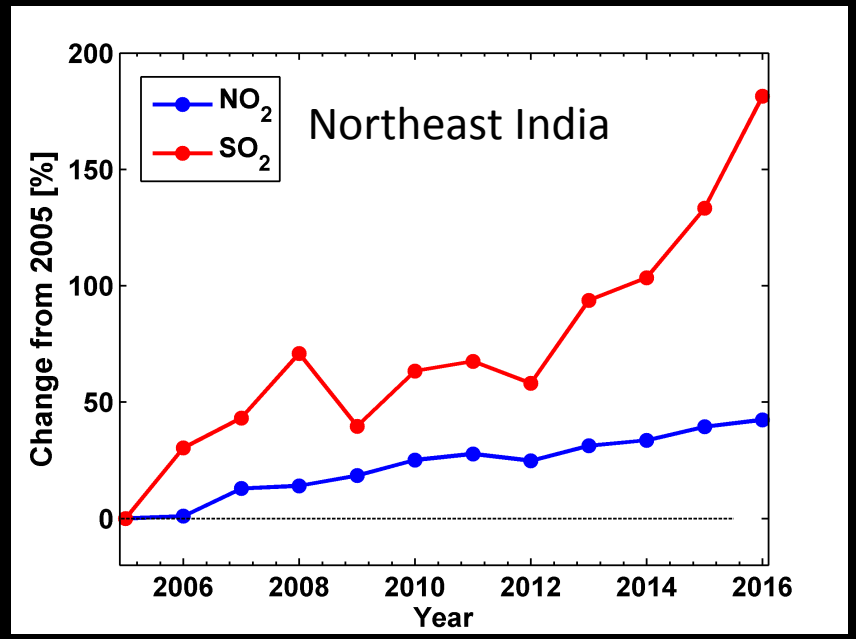


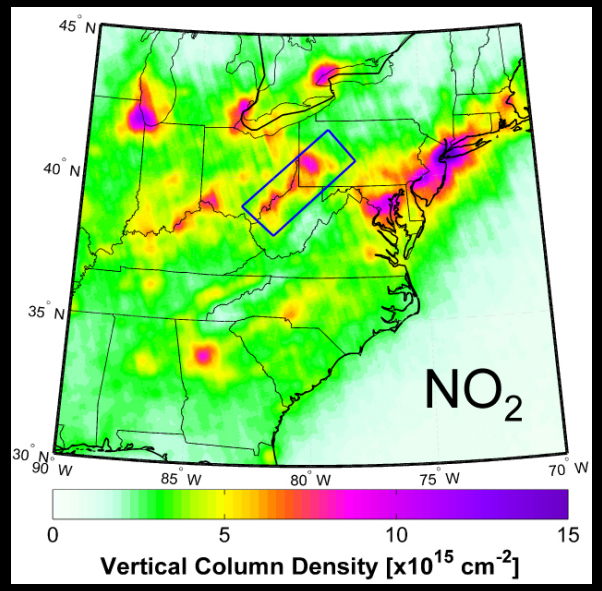
Source: Bryan Duncan (GSFC)

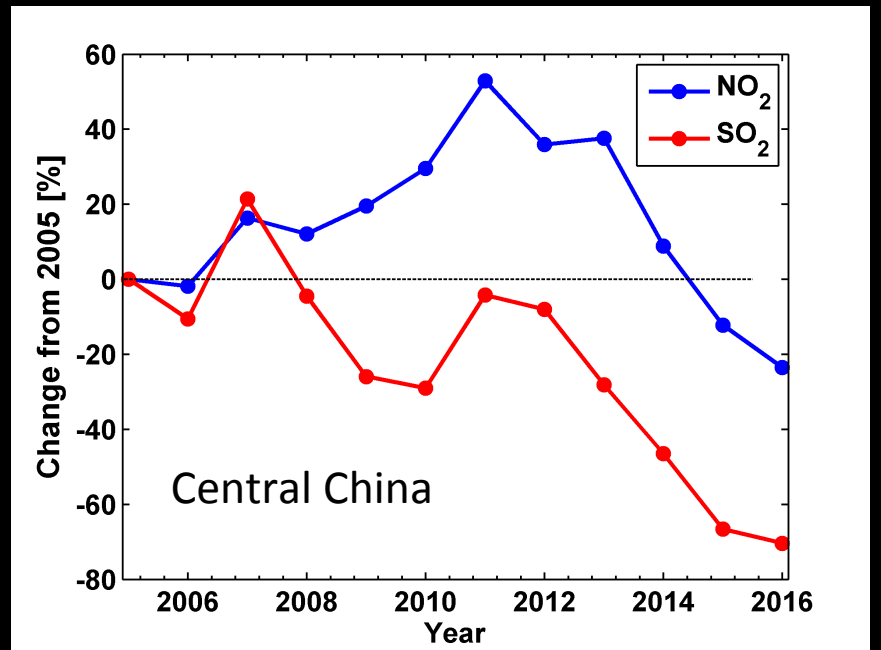
OMI NO_2 Trends (Annual 2005 to 2016)

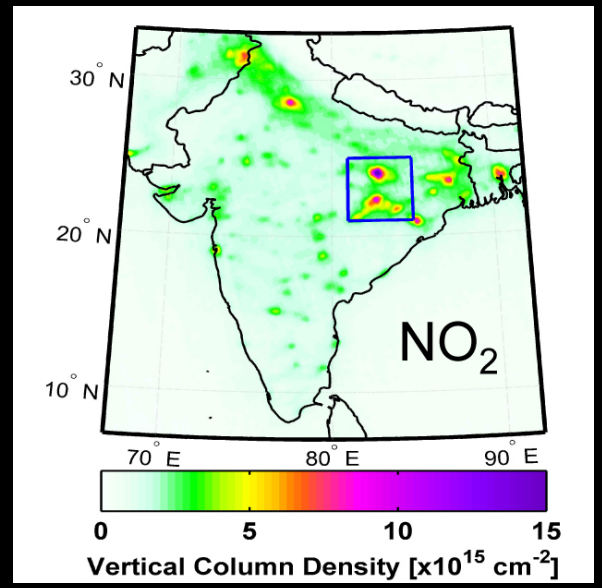






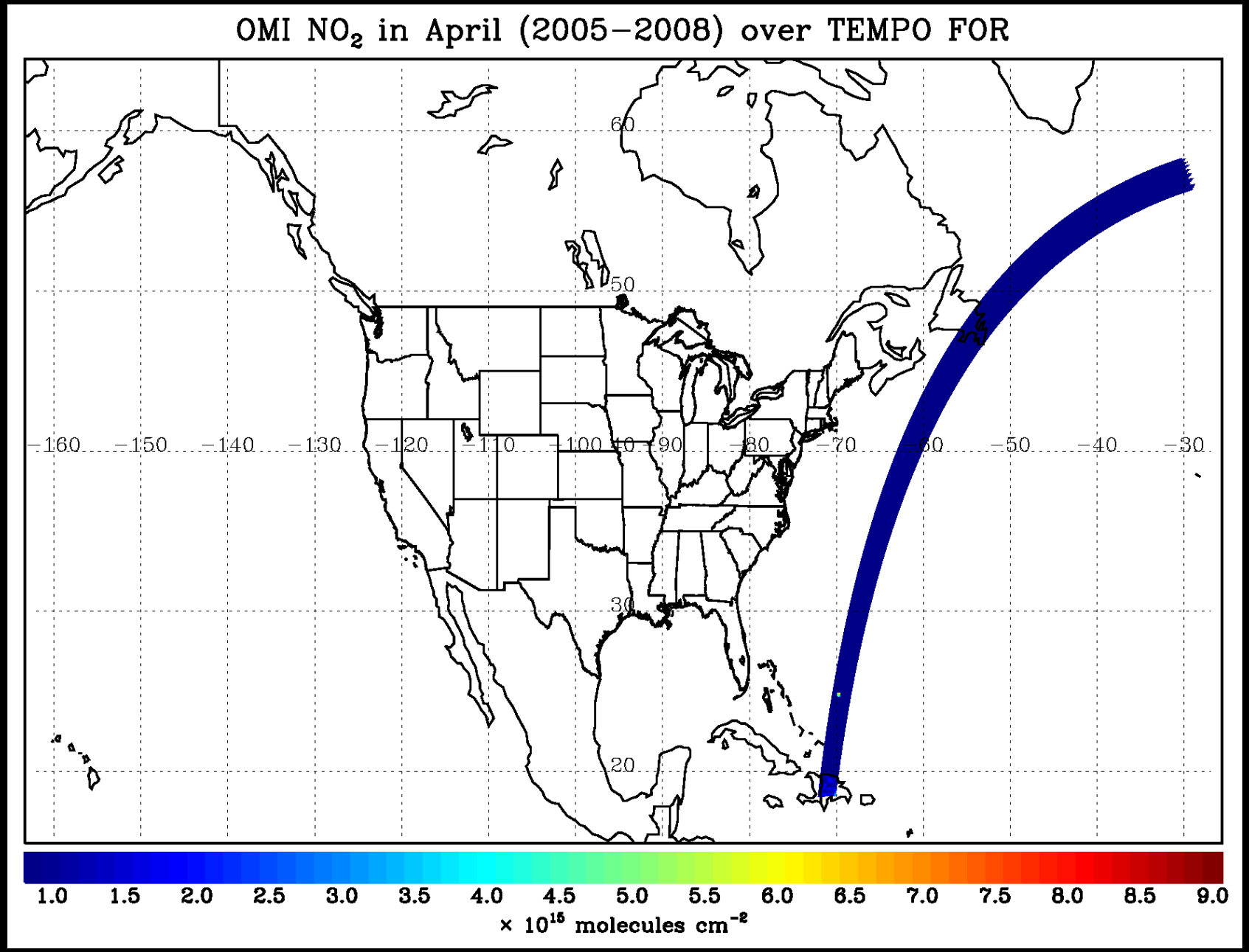






Source: Bryan Duncan (GSFC)

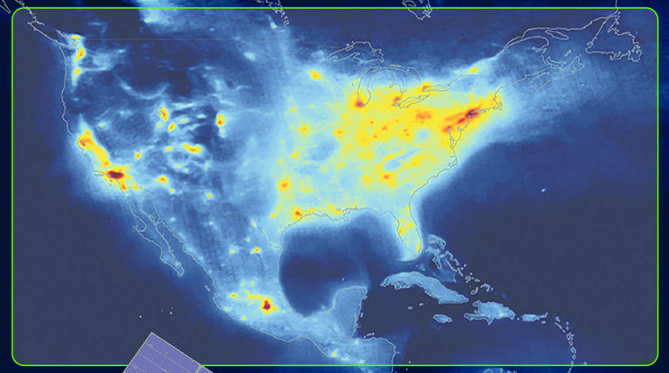
Tropospheric Emissions: Monitoring of Pollution (TEMPO)



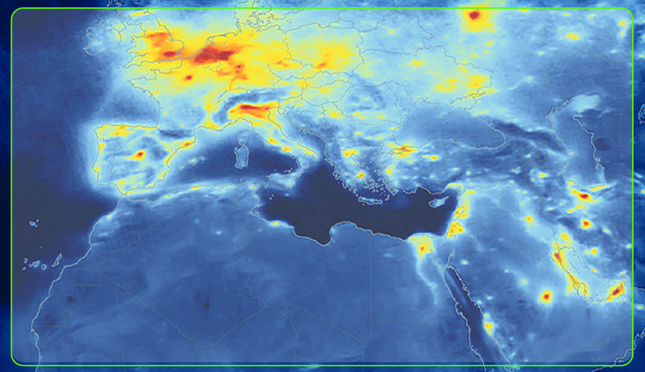
Source: Kelly Chance (SAO)

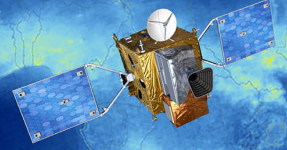
Future Global Air Quality Monitoring Constellation

TEMPO *(hourly)*
Tropospheric Emissions:
Monitoring of Pollution

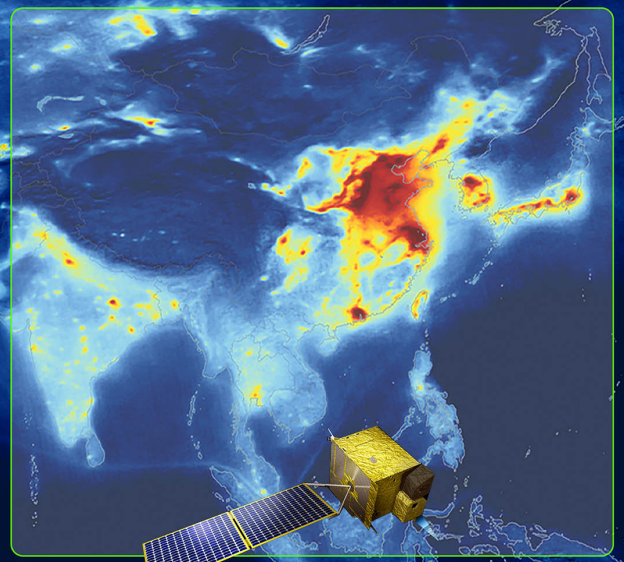


Sentinel-4 *(hourly)*





GEMS *(hourly)*
Geostationary Environmental
Monitoring Spectrometer

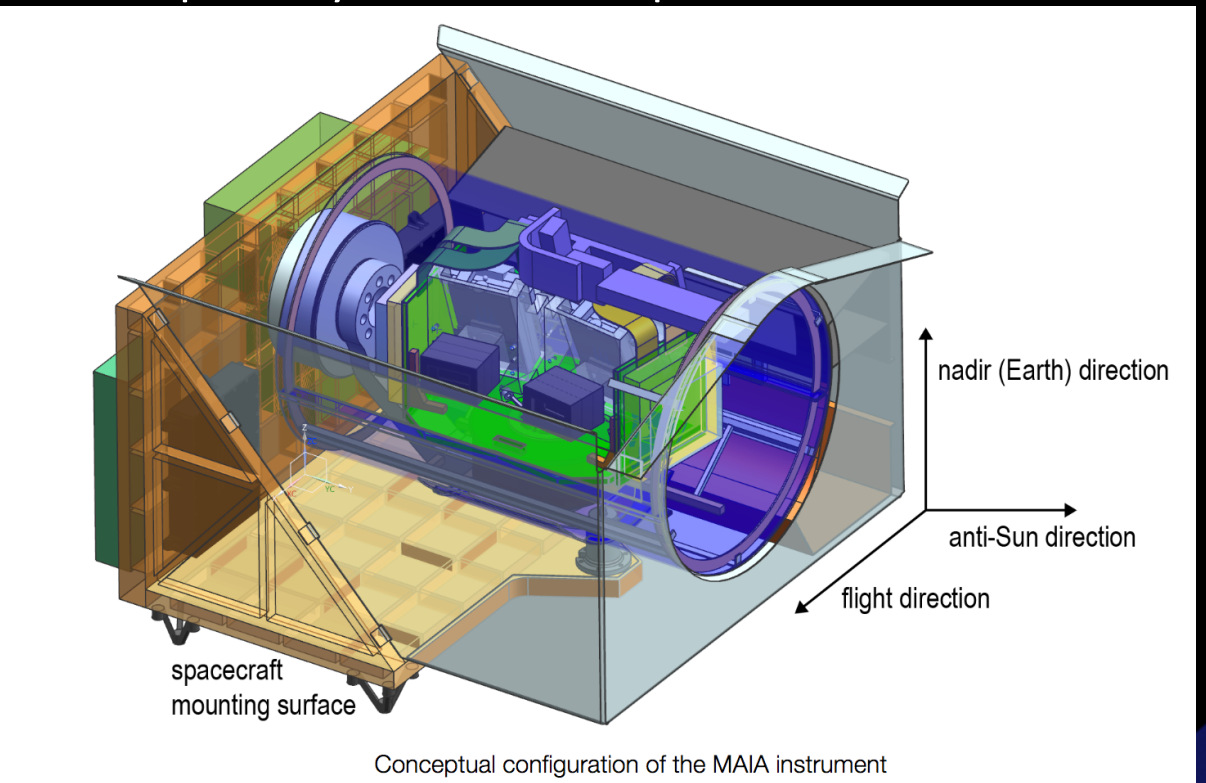


Sentinel-5P *(once per day)*

GaoFen-5 *(once per day)*

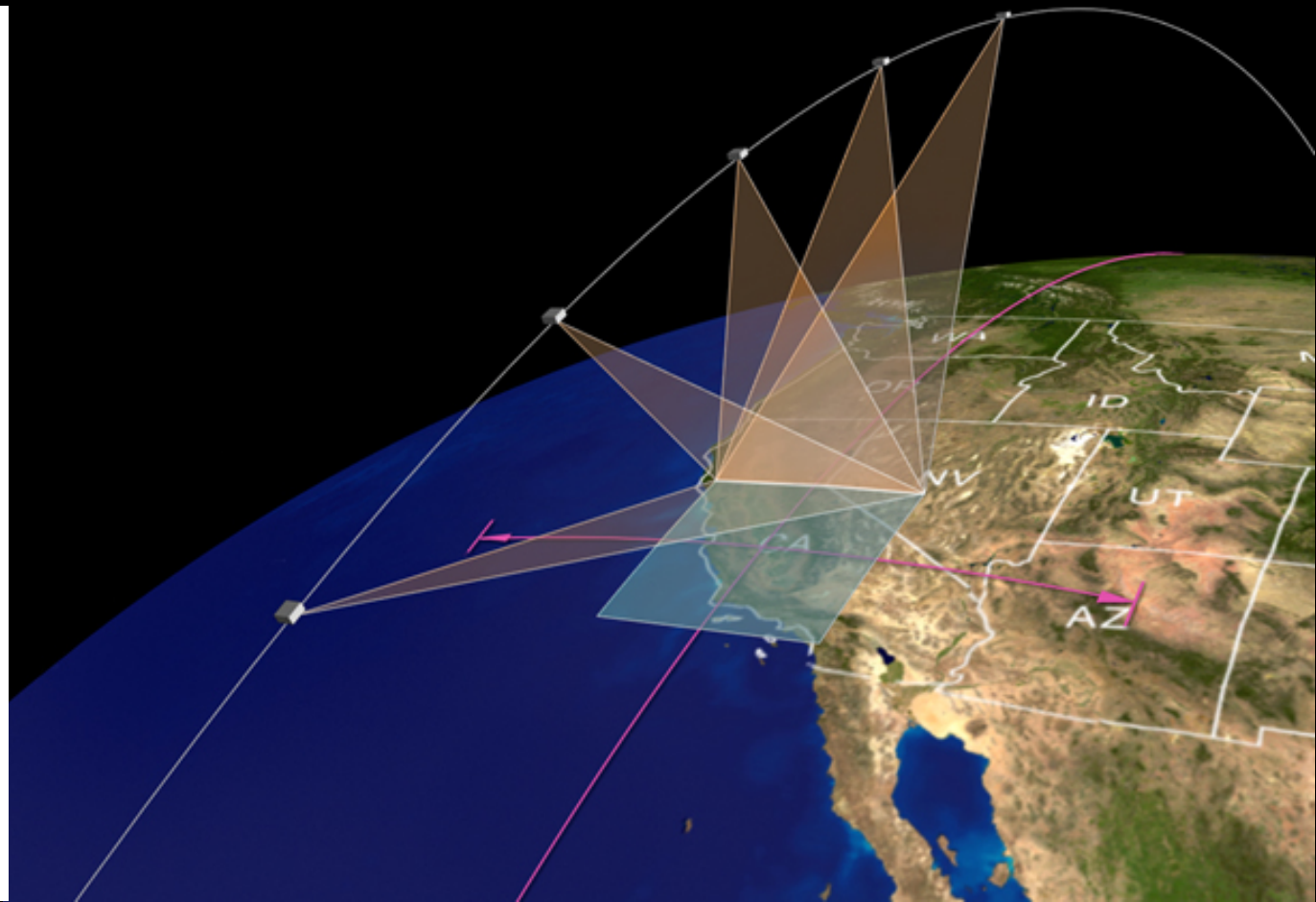
Multi-Angle Imager for Aerosols (MAIA)

MAIA uses a twin-camera instrument that will make radiometric and polarimetric measurements needed to characterize the sizes, compositions and quantities of particulate matter in air pollution. As part of the MAIA investigation, researchers will combine MAIA measurements with population health records to better understand the connections between aerosol pollutants and health problems such as adverse birth outcomes, cardiovascular and respiratory diseases and premature deaths.

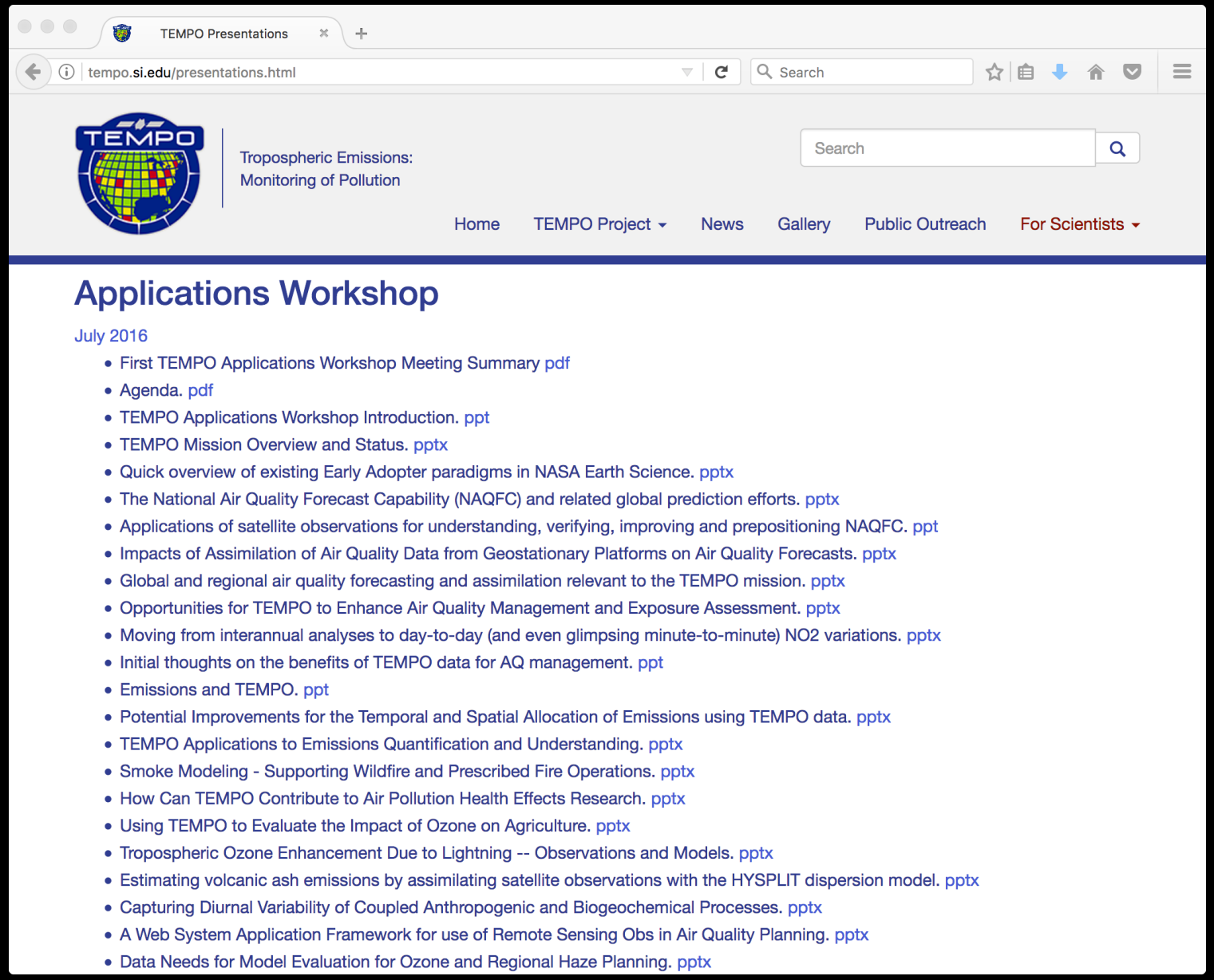


Conceptual configuration of the MAIA instrument

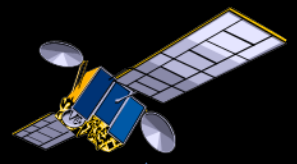
Acknowledgment
The MAIA instrument is being developed by the Jet Propulsion Laboratory, California Institute of Technology under a contract with the National Aeronautics and Space Administration (NASA). MAIA is a Venture-class investigation within NASA's Earth System Science Pathfinder Program.



TEMPO 1st applications workshop (July 2016)



Combined assets from the international atmospheric science communities to implement an integrated observing system for improving our understanding of Air Quality

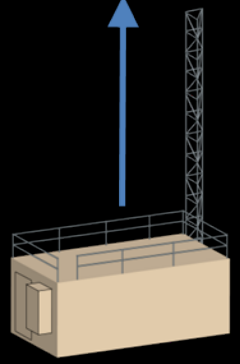


Broad spatial and temporal coverage for key air quality components, but lacking details and specific ground-level information

Detailed atmospheric composition and vertical structure needed for process-level understanding, but only possible for short, targeted periods of time

Model evaluation and improvement, chemical process understanding, satellite validation and observing strategies

Operational Air Quality Forecasts, Prediction and Evaluation of Air Quality Mitigation Strategies



Continuous monitoring of exposure to key pollutants and their precursors, but limited to discrete locations with limited information on conditions aloft.