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- **Susan O'Neill** (*USDA Forest Service*)
- **Ted Russell** (*Georgia Tech*)
- **Daniel Tong** (*George Mason University*)
- **Jason West** (*University of North Carolina, Chapel Hill*)
- **Mark Zondlo** (*Princeton University*)

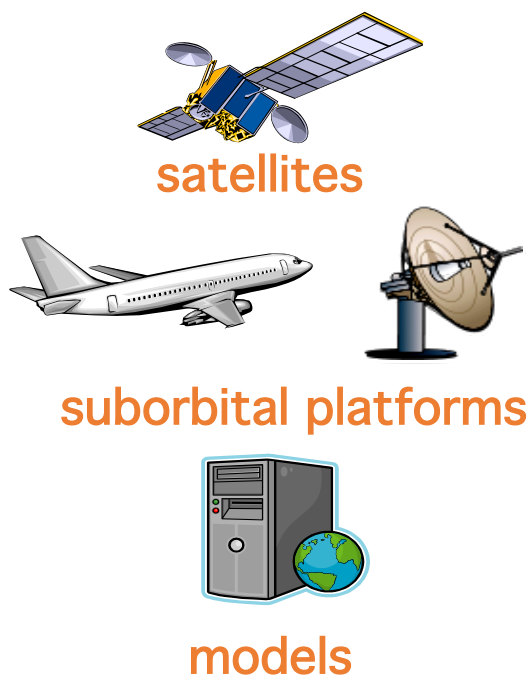
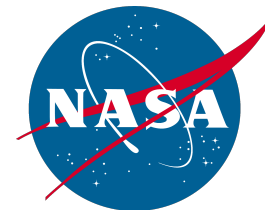
# NASA Health & Air Quality Applied Sciences Team (HAQAST)

Goddard Space Flight Center

Bryan Duncan

# NASA Health & Air Quality Applied Sciences Team

*Earth Science Serving Health & AQ Management Needs*



- Pollution monitoring*
- Exposure assessment*
- AQ forecasting*
- Source attribution*
- Quantifying emissions*
- External influences*
- Exceptional events*
- Climate interactions*

**Earth Science resources**

**US Health & AQ management**

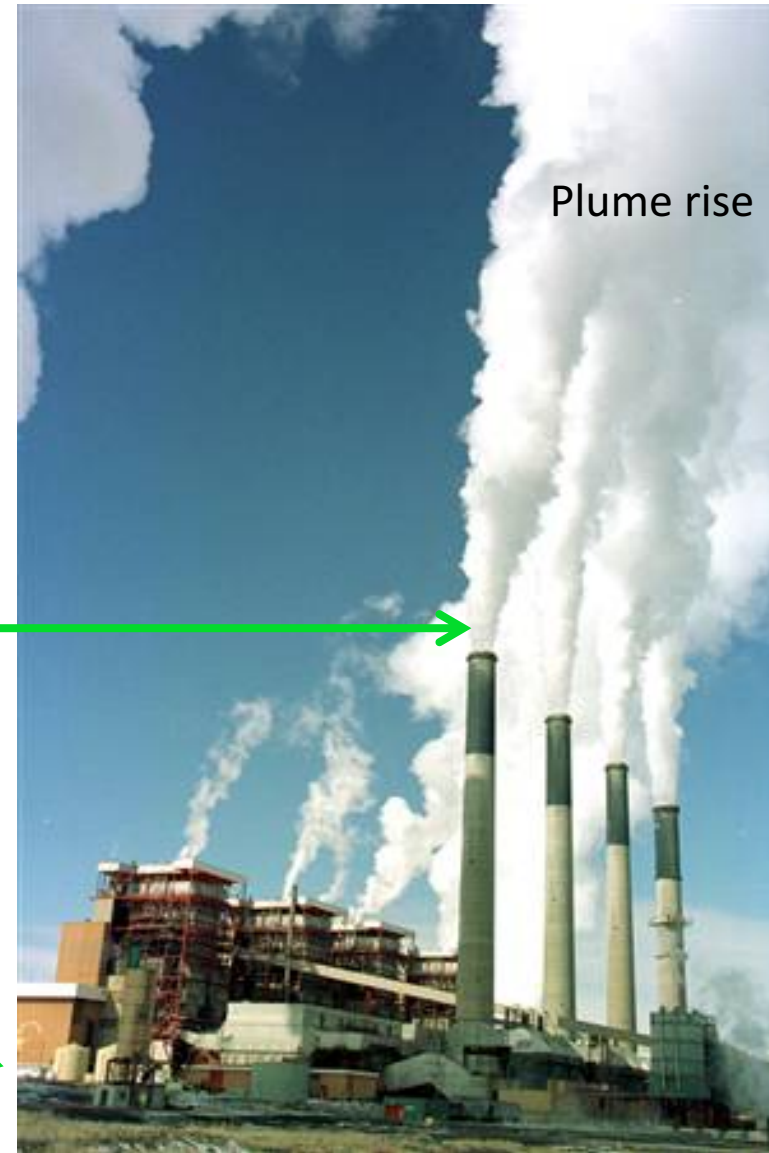
# How does an Aura Ozone Monitoring Instrument (OMI) Column Nitrogen Dioxide (NO<sub>2</sub>) Data Relate to Quantities Familiar to the AQ Community??

Satellite measures an "atmospheric column" (molecules/cm<sup>2</sup>)

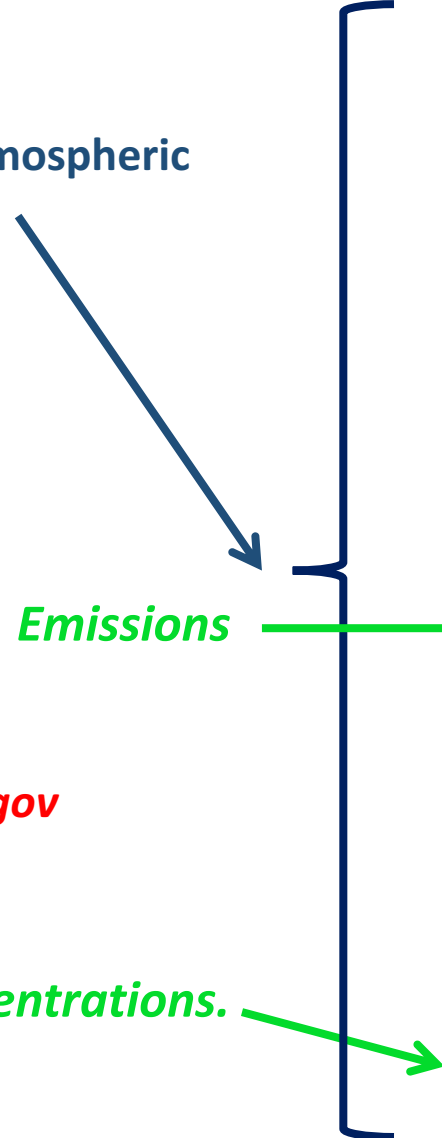
*Emissions*

*Check out:  
<https://airquality.gsfc.nasa.gov>*

*"Nose-level" concentrations.*



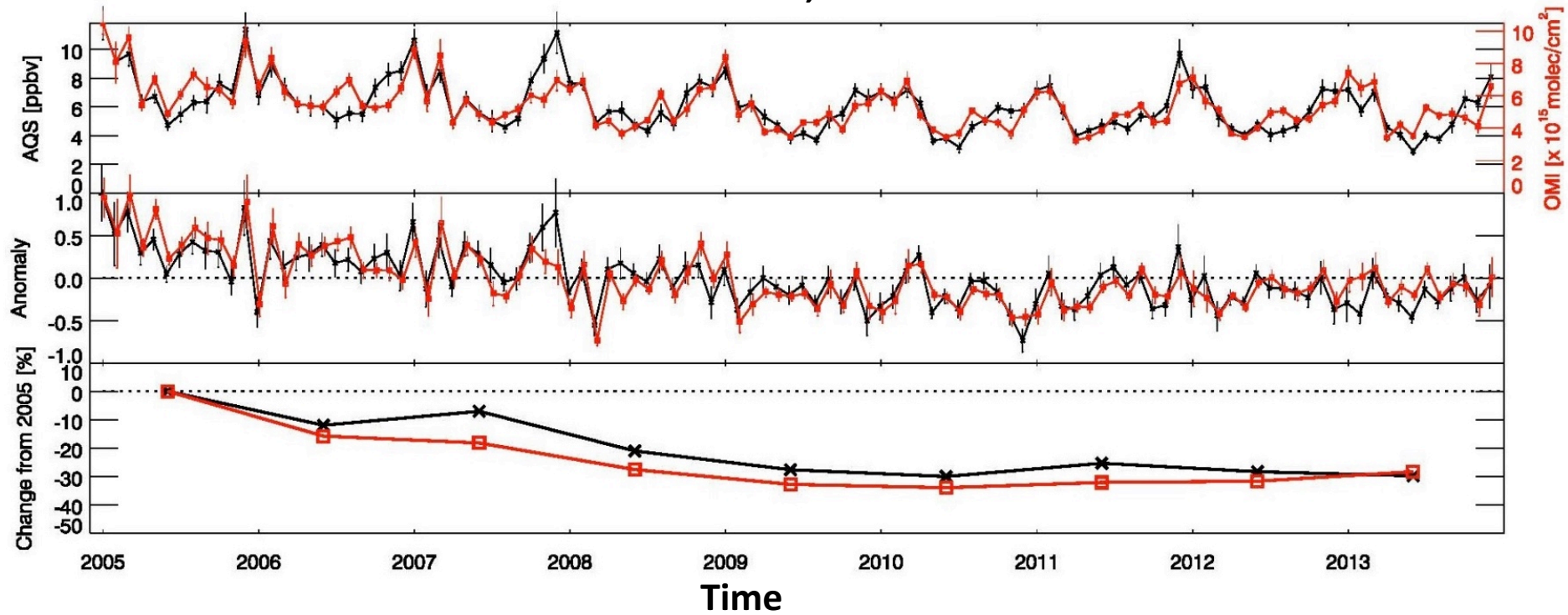
Plume rise



# How do the OMI NO<sub>2</sub> data compare to EPA's surface levels?

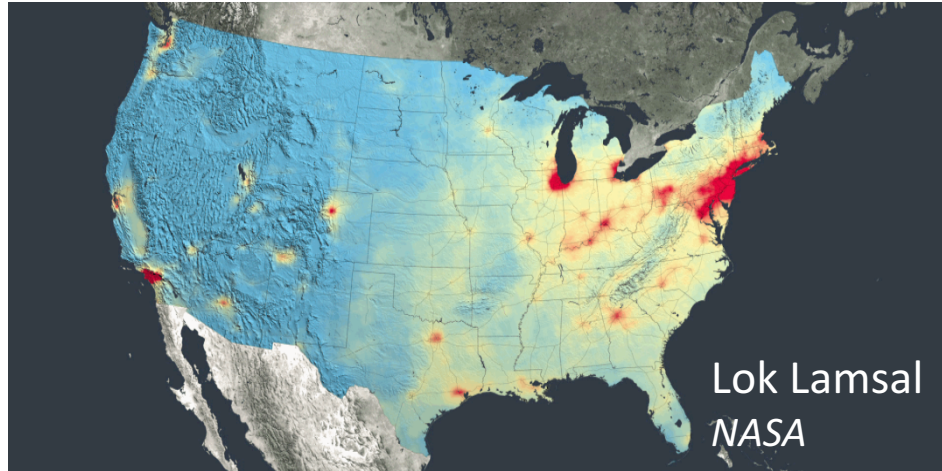
**Aura OMI**   **EPA AQS**

## Houston, Texas

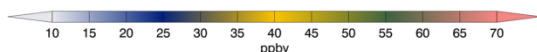
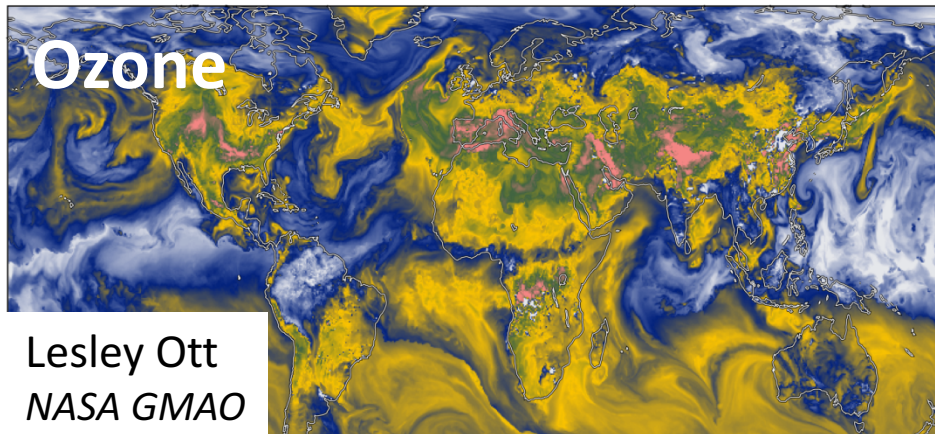


# Some NASA Satellite Observations & Model Output

## Aura/OMI NO<sub>2</sub>



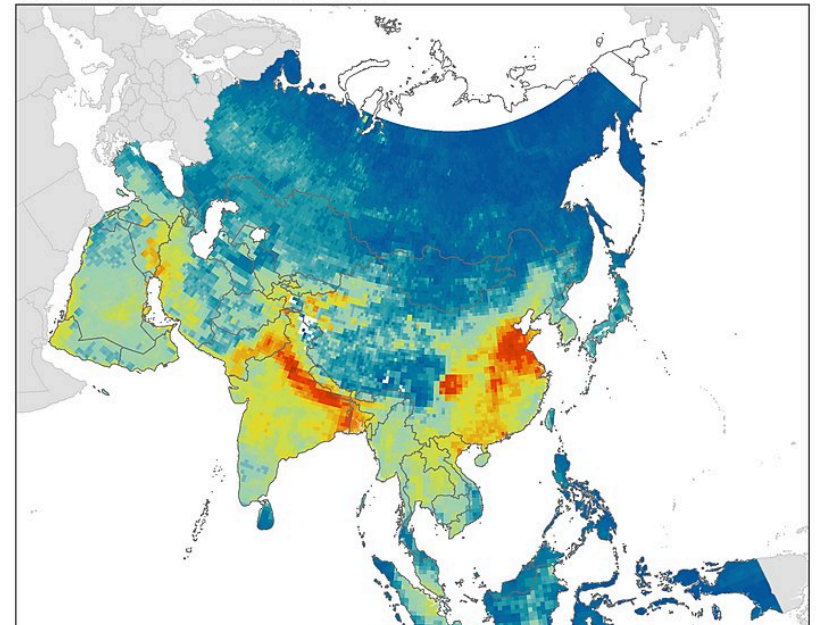
## NASA GEOS-5 Model



## Multi-Satellite: AOD → PM<sub>2.5</sub>

Global Annual Average PM<sub>2.5</sub> Grids from MODIS and MISR Aerosol Optical Depth (AOD), 2010: Asia

Satellite-Derived Environmental Indicators



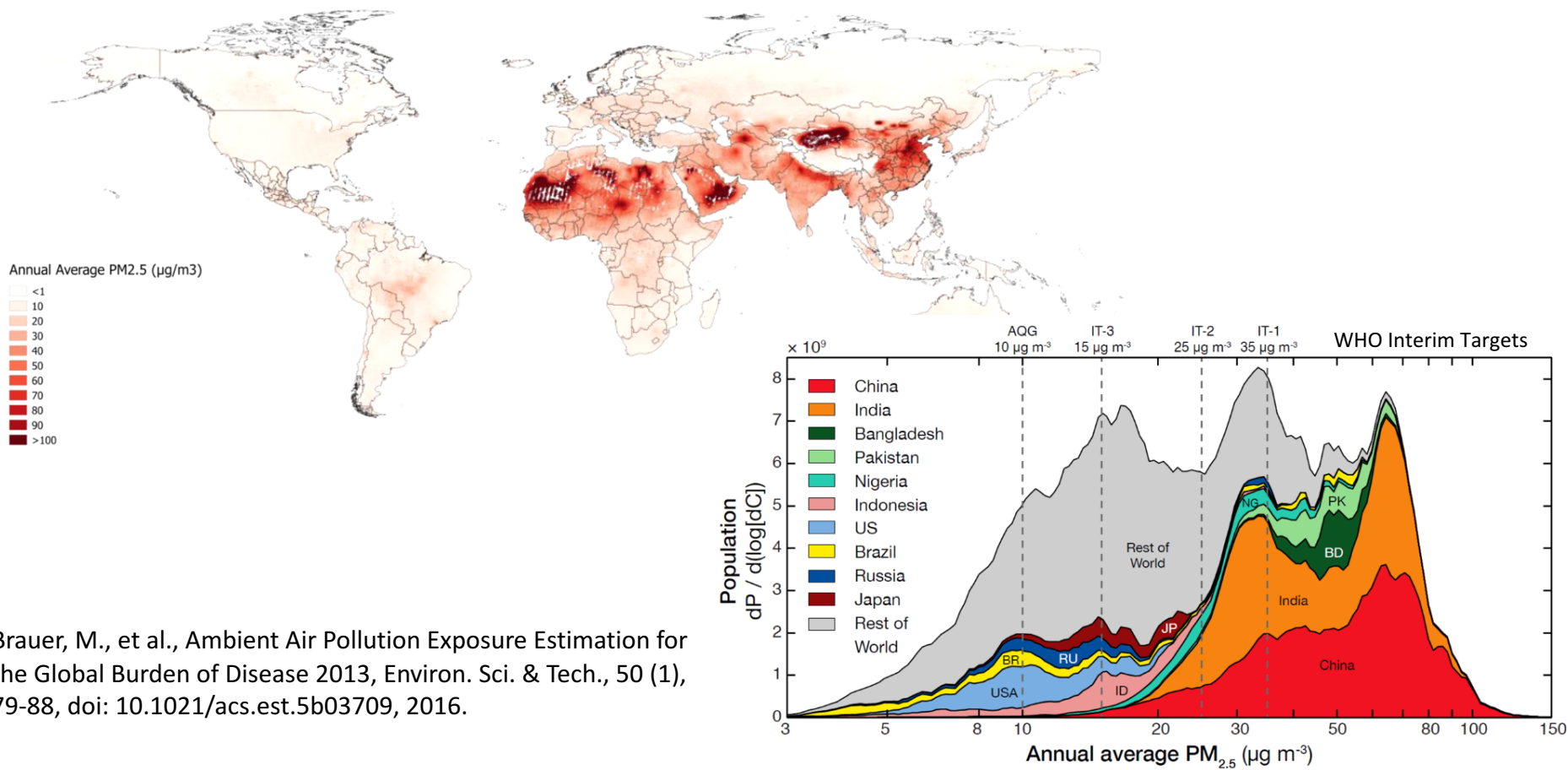
Aaron van Donkelaar & Randall Martin  
Dalhousie University

# The Health Community is beginning to use satellite data!

## An Example:

### Ambient Air Pollution Exposure Estimation for the Global Burden of Disease 2013

Michael Brauer<sup>†</sup>, Greg Freedman<sup>†</sup>, Joseph Frostad<sup>†</sup>, Aaron van Donkelaar<sup>§</sup>, Randall V. Martin<sup>§</sup>, Frank Dentener<sup>‡</sup>, Rita van Dingenen<sup>‡</sup>, Kara Estep<sup>†</sup>, Heresh Amini<sup>‡</sup>, Joshua S. Apte<sup>#</sup>, Kalpana Balakrishnan<sup>∇</sup>, Lars Barregard<sup>h</sup>, David Broday<sup>◊</sup>, Valery Feigin<sup>◆</sup>, Santu Ghosh<sup>∇</sup>, Philip K. Hopke<sup>‡</sup>, Luke D. Knibbs<sup>▲</sup>, Yoshihiro Kokubo<sup>∞</sup>, Yang Liu<sup>★</sup>, Stefan Ma<sup>⊙</sup>, Lidia Morawska<sup>♣</sup>, José Luis Texcalac Sangrador<sup>⊙</sup>, Gavin Shaddick<sup>f</sup>, H. Ross Anderson<sup>◁</sup>, Theo Vos<sup>‡</sup>, Mohammad H. Forouzanfar<sup>‡</sup>, Richard T. Burnett<sup>✕</sup>, and Aaron Cohen<sup>Ⓝ</sup>



Brauer, M., et al., Ambient Air Pollution Exposure Estimation for the Global Burden of Disease 2013, Environ. Sci. & Tech., 50 (1), 79-88, doi: 10.1021/acs.est.5b03709, 2016.