

A Satellite-Based Global Health Air Quality Index (HAQI)*: *Development and Assessment*

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****Based on:*** Cooper, M., R.V. Martin, A. van Donkelaar, L. Lamsal, M. Brauer, and J. Brook, A satellite-based multi-pollutant index of global air quality, *Env. Sci. and Tech.*, 46, 8523-8524, 2012.

Surface Monitor Network Limitations

World Air Quality Project



#1 Sparse Coverage
(issue of social equity)

#2 Sparse Multi-Pollutant Monitors

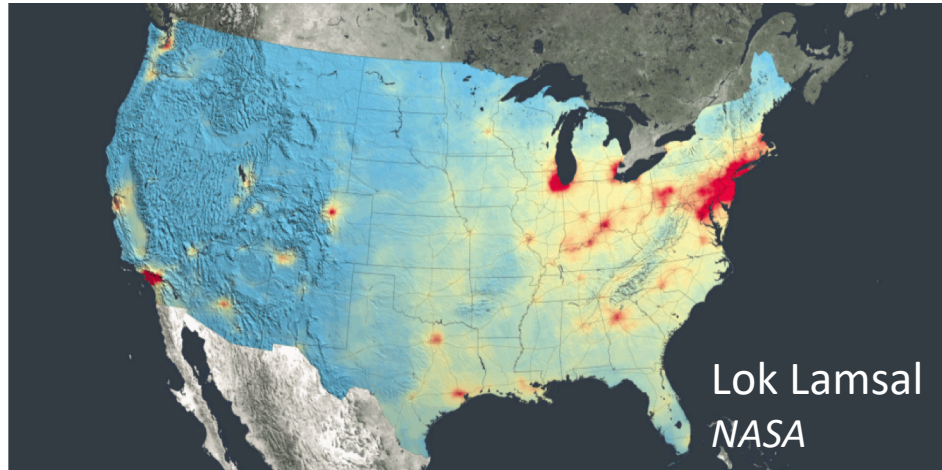
(e.g., CO at 1 monitor; PM_{2.5}, O₃ at another)



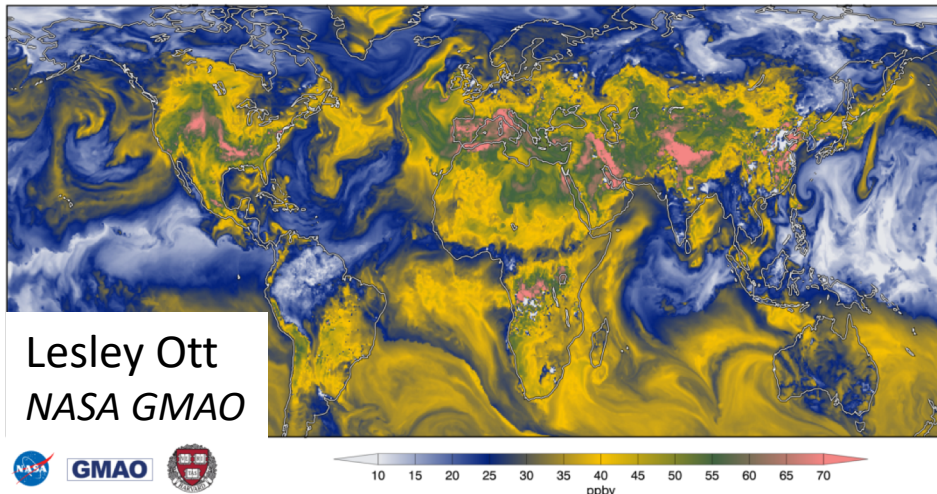
Advantages of Satellite Observations

→ The unique advantages of satellites is 1) global spatial coverage & 2) co-located observations of multiple pollutants.

Aura/OMI NO₂

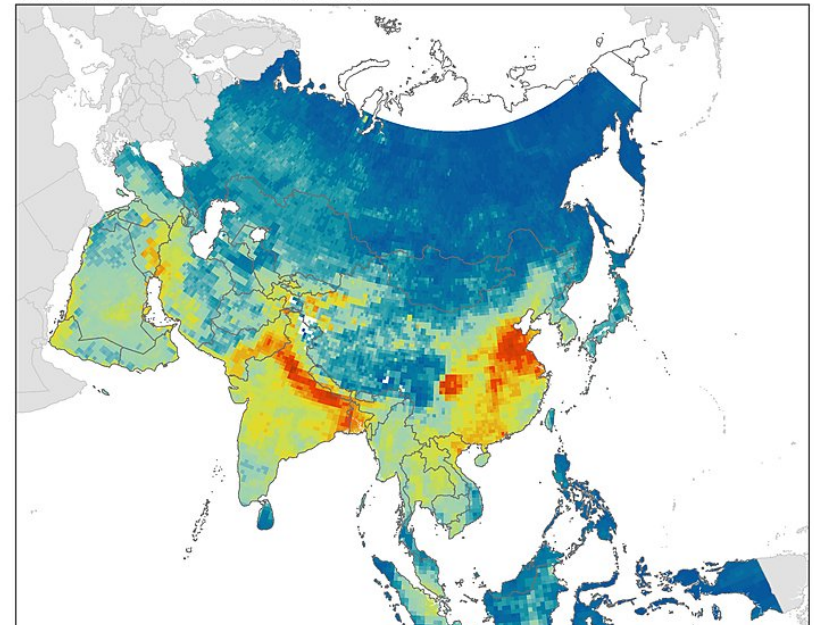


NASA GEOS-5 Model



Multi-Satellite: AOD → PM_{2.5}

Global Annual Average PM_{2.5} Grids from MODIS and MISR Aerosol Optical Depth (AOD), 2010: Asia
Satellite-Derived Environmental Indicators



Aaron van Donkelaar & Randall Martin
Dalhousie University

Monthly/Annual HAQI for now with
goal of Near-Real Time in future.

Which AQI to use???



versus



AQI = “single pollutant index”

AQHI = “multi-pollutant index”

(PM , O_3 , NO_2)

- The health community agrees that the multi-pollutant index is better.
- But, if it is to adopt a multi-pollutant index, the US will have to make an investment in co-located observations of PM , O_3 , & NO_2 = expensive.

→ **Kevin Cromar (NYU):**

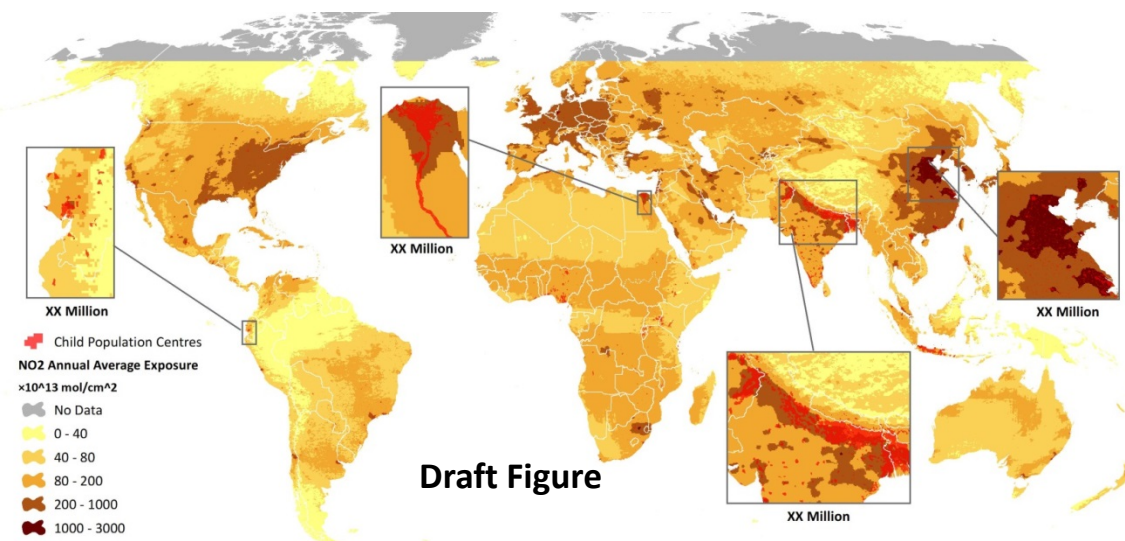
He is developing a multi-pollutant HAQI based on mortality and morbidity statistics for US cities wants to test his Index with satellite data since few US EPA monitors measure all air pollutants simultaneously (none in Manhattan!) and monitors are sparse.

UNICEF – Nicholas Rees

UNICEF Report: “The impact of air quality on children”

- Lok Lamsal sent them inferred surface OMI NO₂ data – NO₂ is well correlated with mortality and morbidity.
- Randall Martin's group (Dalhousie U.) sent inferred surface PM_{2.5} data (from AOD data) – the most important pollutant for mortality and morbidity.

Children's Annual Average NO₂ Exposure Inferred from OMI Data



Cover of a similar report on climate change.



Other End Users

American Thoracic Society (ATS)

**American Public Health Association (APHA;
Vina Hulamm)**

Global Burden of Disease (GBD) Project (Mohammad Forouzanfar)

AQICN – World Air Quality Index