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

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Surface Monitor Network Limitations

#1 Sparse Coverage
(issue of social equity)

#2 Sparse Multi-Pollutant Monitors
(e.g., CO at 1 monitor; PM\textsubscript{2.5}, O\textsubscript{3} 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 NO$_2$

Multi-Satellite: AOD $\rightarrow$ PM$_{2.5}$

Lok Lamsal
NASA

Global Annual Average PM$_{2.5}$ Grids from MODIS and MISR Aerosol Optical Depth (AOD), 2010: Asia

Satellite-Derived Environmental Indicators

NASA GEOS-5 Model

Lesley Ott
NASA GMAO

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

Aaron van Donkelaar & Randall Martin
Dalhousie University
Which AQI to use???

AQI = “single pollutant index”

versus

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.

- Lok Lamsal sent them inferred surface OMI NO$_2$ data – NO$_2$ 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 NO$_2$ Exposure Inferred from OMI Data

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