Mapping $PM_{2.5}$ exposures over New York State

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Seattle, WA
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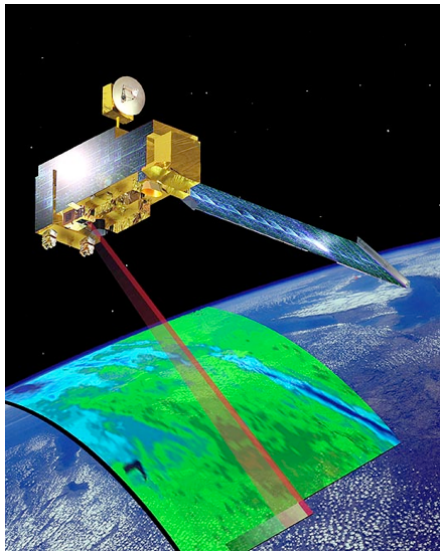
Approach: Combine satellite observed Aerosol Optical Depth (AOD) with models to infer ground-level $PM_{2.5}$

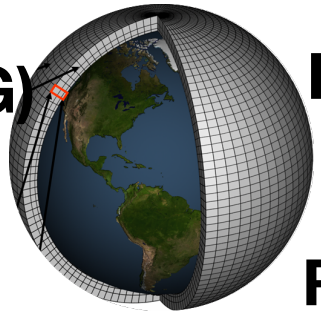
GEOS-Chem
(2x2.5°, 2004-2012)

MODIS: 10 x 10 km²
10:30 AM and 1:30 PM



Re-grid (EPA RSIG)

FlexAOD



Evaluate

Re-grid (EPA RSIG)

Hourly AQS $PM_{2.5}$

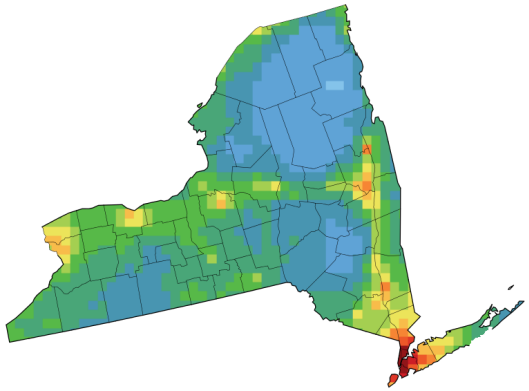
CMAQ
(12x12 km², 2011 only)

AOD → $PM_{2.5}$

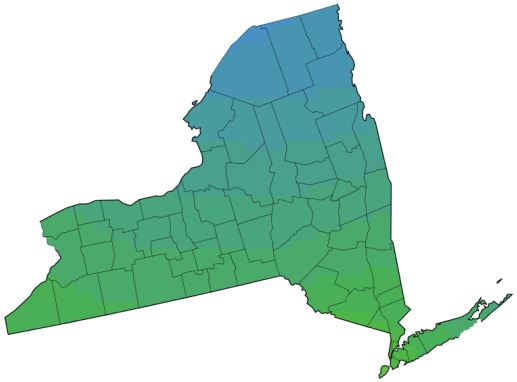
$$PM_{2.5_MODIS} = \frac{PM_{2.5_\text{model}}}{AOD_{\text{model}}} \times AOD_{MODIS}$$

Multiple approaches to deriving annual mean (2011) $PM_{2.5}$ distributions over NYS offer a measure of uncertainty

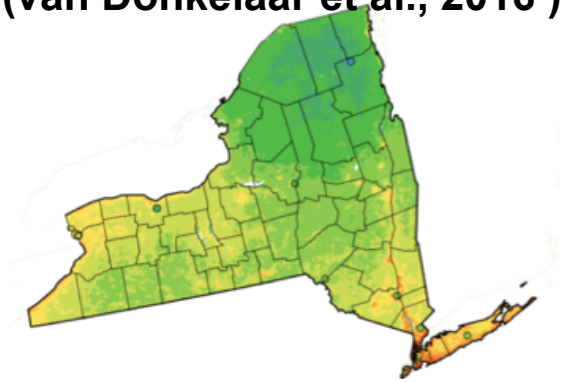
CMAQ Model



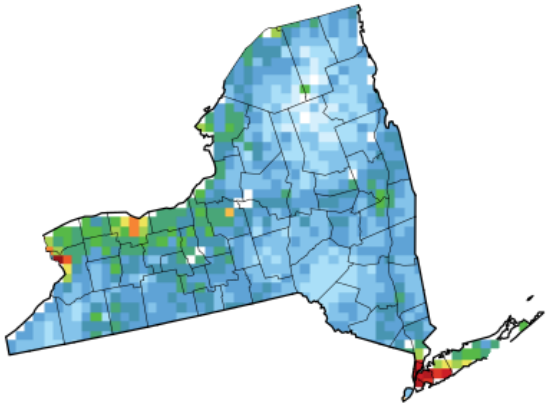
GEOS-Chem model



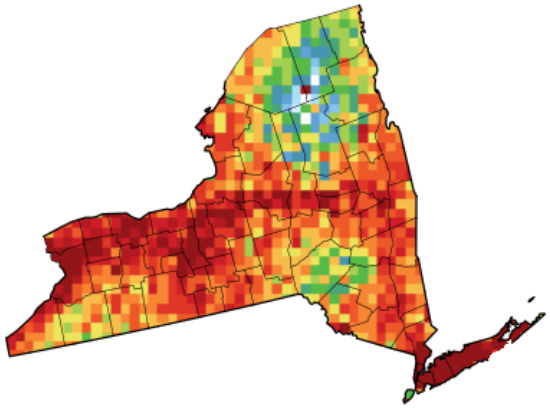
Multi-satellite product (van Donkelaar et al., 2016)



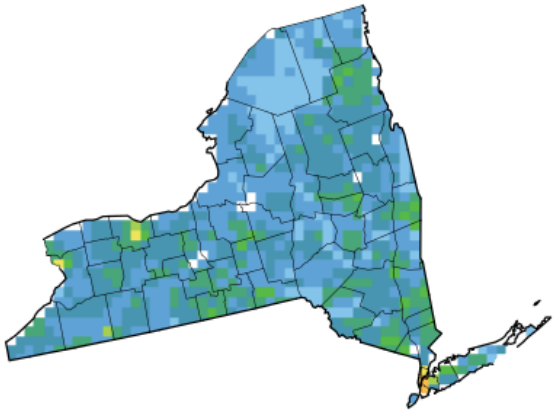
MODIS derived with CMAQ PM-AOD

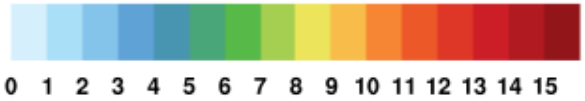


MODIS derived with GEOS-Chem PM-AOD



MAIAC derived using CMAQ PM-AOD





$PM_{2.5}$ µg m^{-3}

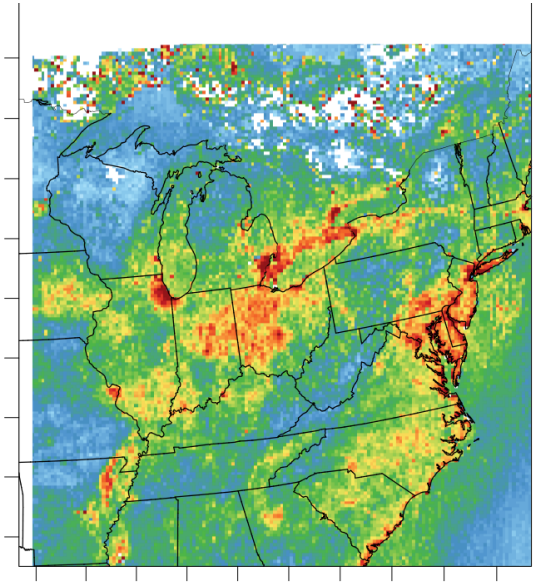
Next Steps for Mapping $PM_{2.5}$ over New York State

- Extend to other years and averaging times
- Investigate temporal and spatial trends and variability in satellite-derived products & link these to health records
- Evaluation

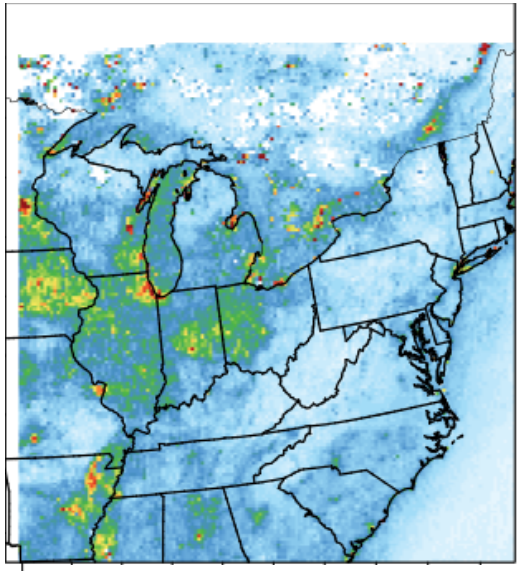
2011 ANNUAL MEAN $PM_{2.5}$

Derived from MODIS

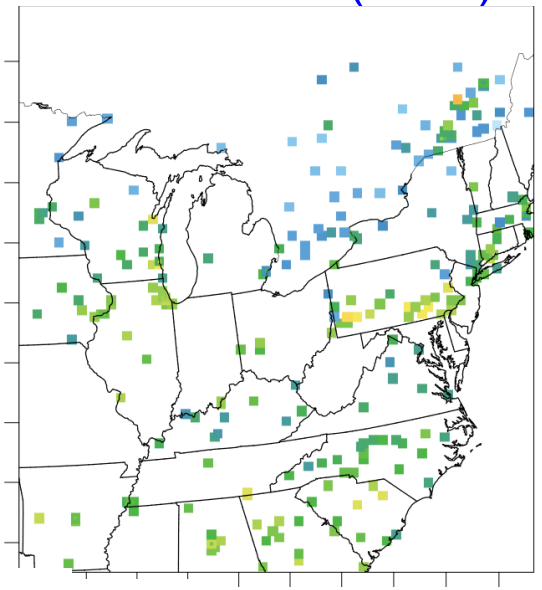
w/ GEOS-Chem PM-AOD



w/ CMAQ PM-AOD



OBSERVED (AQS)



$PM_{2.5}$ µg m^{-3}

0 5 10 15 20 25