Diagnosing Regional Air Quality Using Earth Observations and GEOS-Chem

Alfred: Charcoal Production in Africa

Karn: Evolving Air Quality in Cities in the UK and India

Gongda: Aggressive Emission Controls in China

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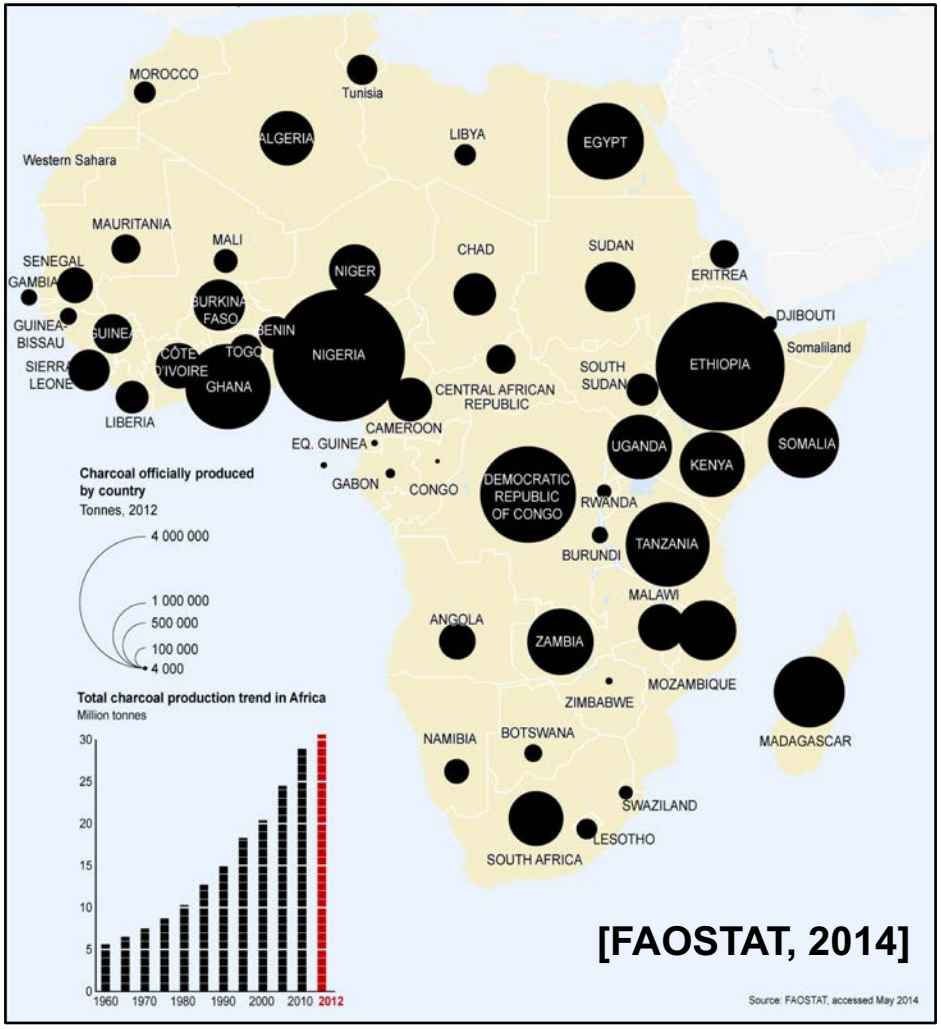
22 March 2019

Impact of Charcoal Production on Local Air Quality and Regional Climate

Charcoal Production in Africa



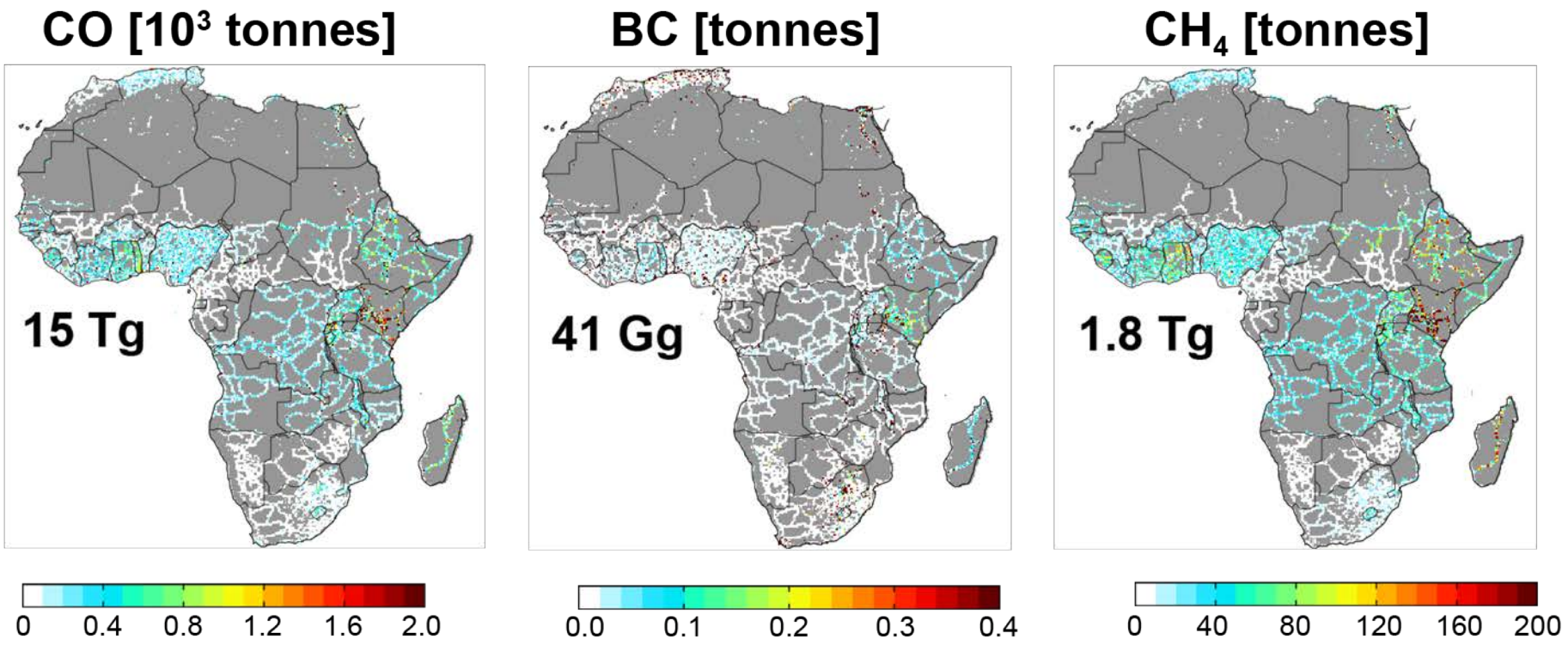
6-9% per year increase in production

Major export in Somalia fueling civil unrest

Includes plastic burning

Impact of Charcoal Production on Local Air Quality and Regional Climate

Pollutant emissions from charcoal production, use and transport

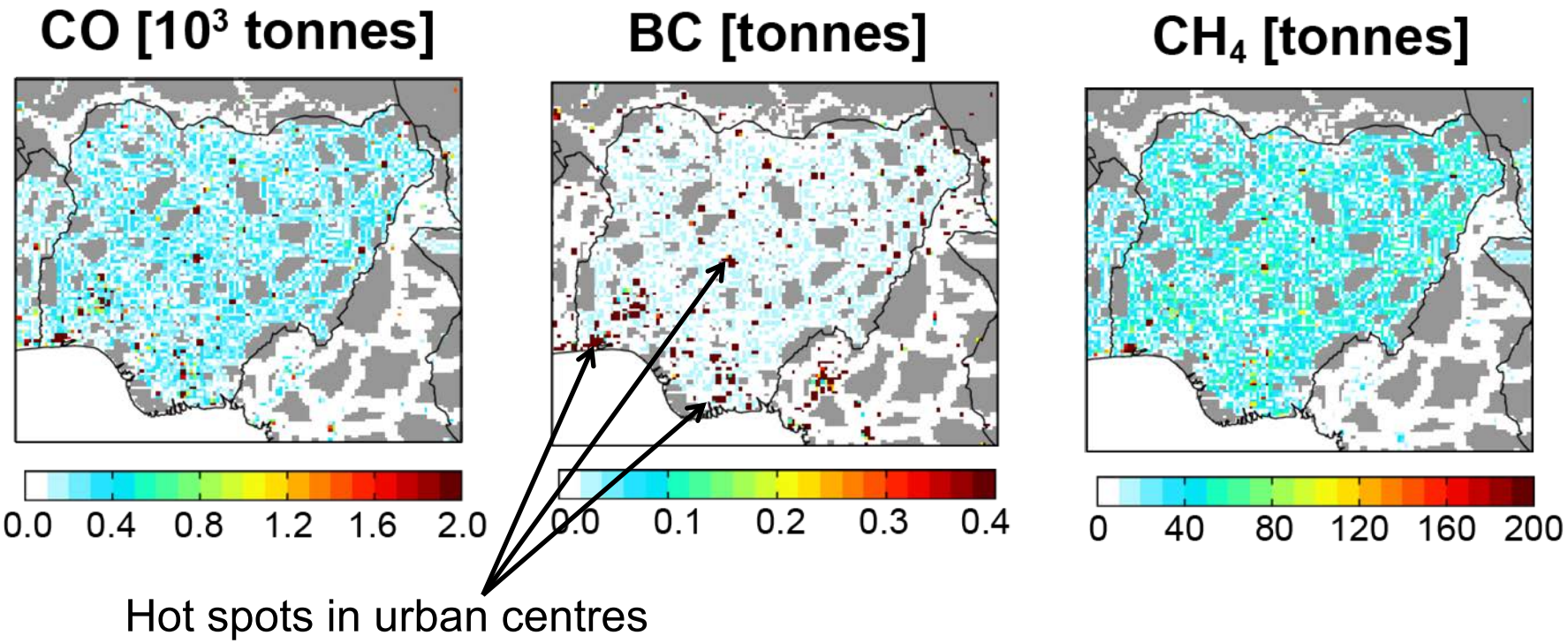


Annual biomass burning emissions in Africa:

440 Tg CO; **2.6 Tg BC**; **15 Tg CH_4** [Y. Shi et al., 2015]

Impact of Charcoal Production on Local Air Quality and Regional Climate

Zoom in to Nigeria (largest charcoal producer in Africa)



Is charcoal production in Africa sustainable?

GEOS-Chem

Evolving Air Quality in Cities in the UK and India

Tool for Recording and Assessing the City Environment

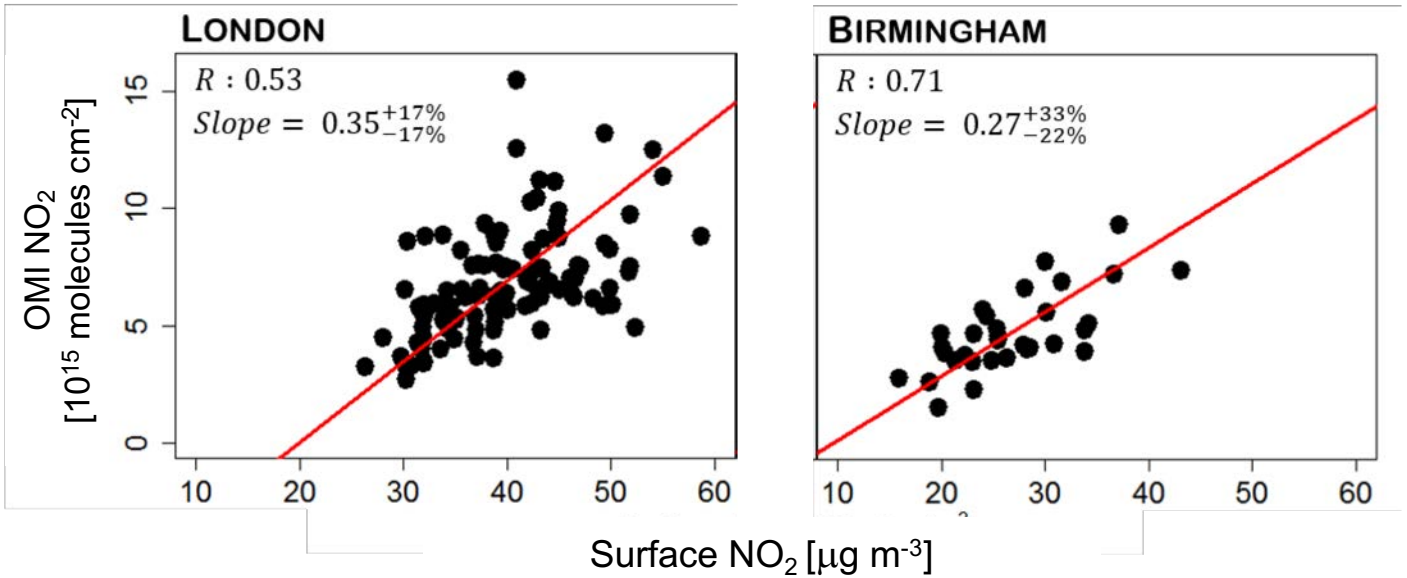
TRACE

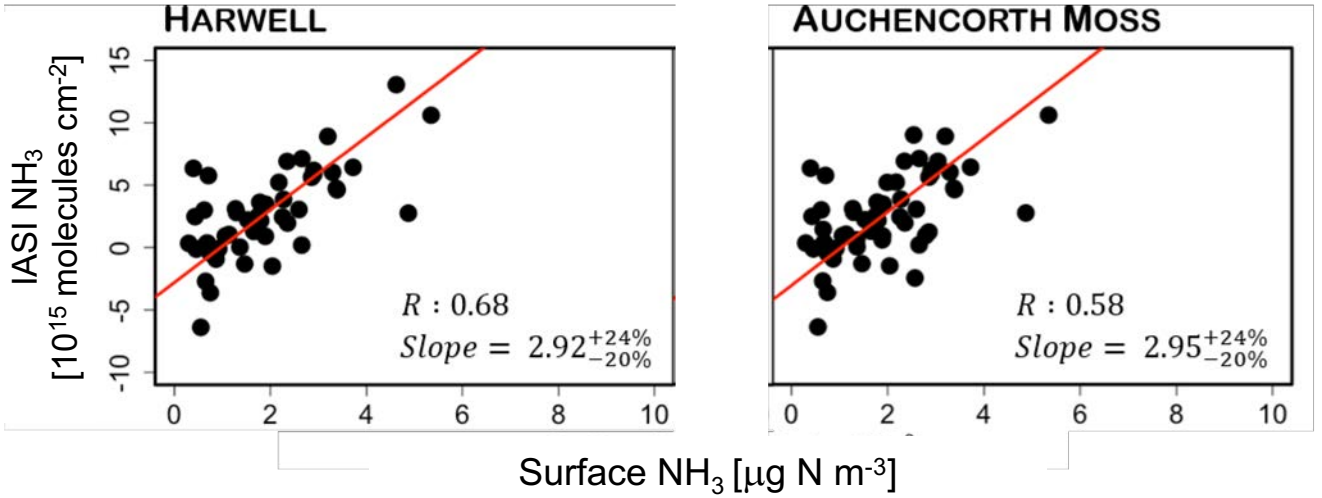
Already evidence of willingness to use:

Birmingham City Council, London City Council, Bath City Council

Evolving Air Quality in Cities in the UK and India

Assess using surface observations in the UK

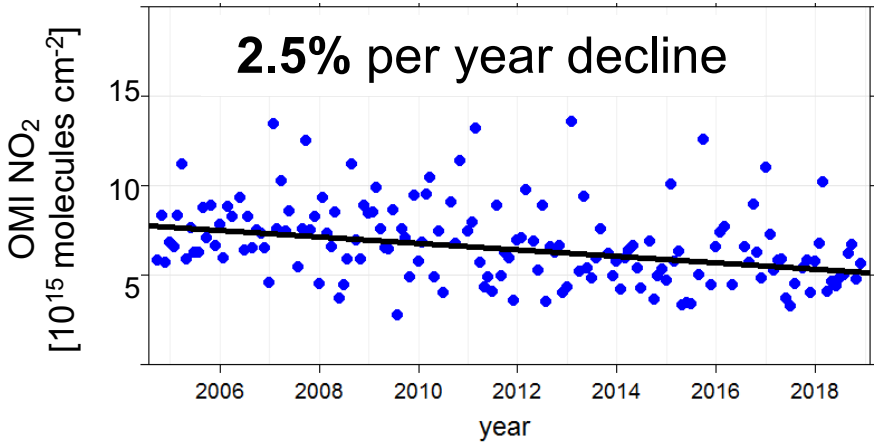




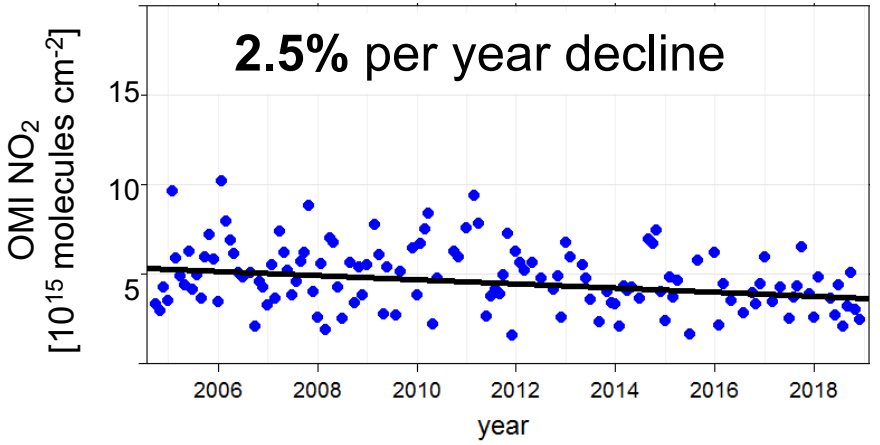
Evolving Air Quality in Cities in the UK and India

Long-term (2005-2018) trends in OMI NO_2

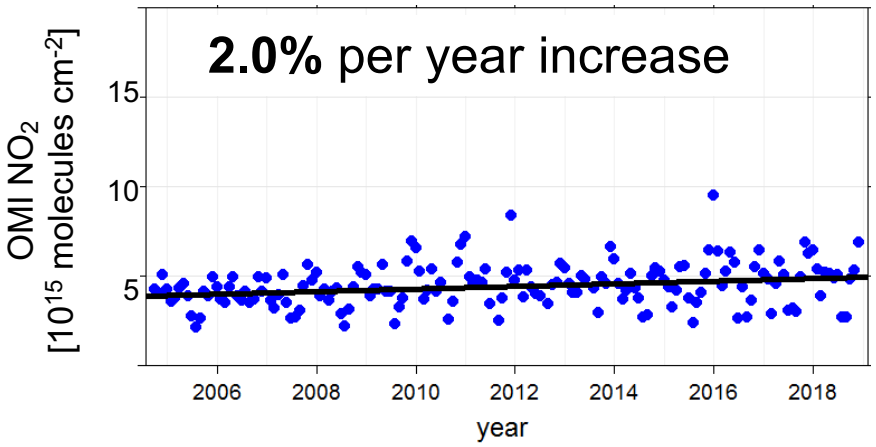
London



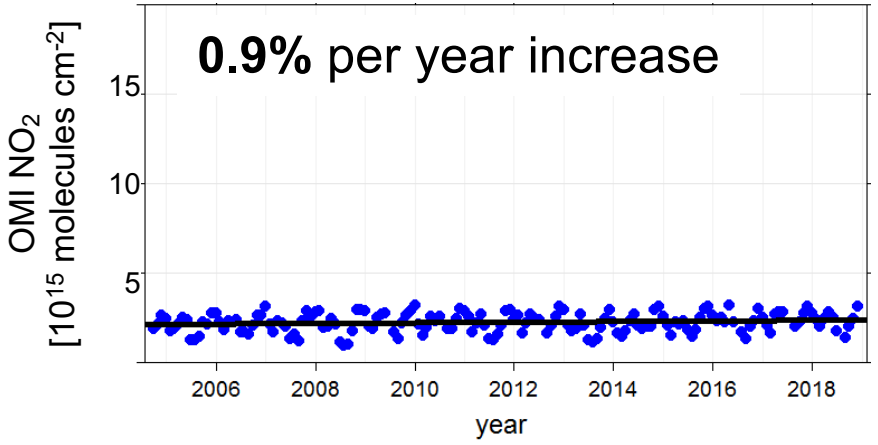
Birmingham



Delhi

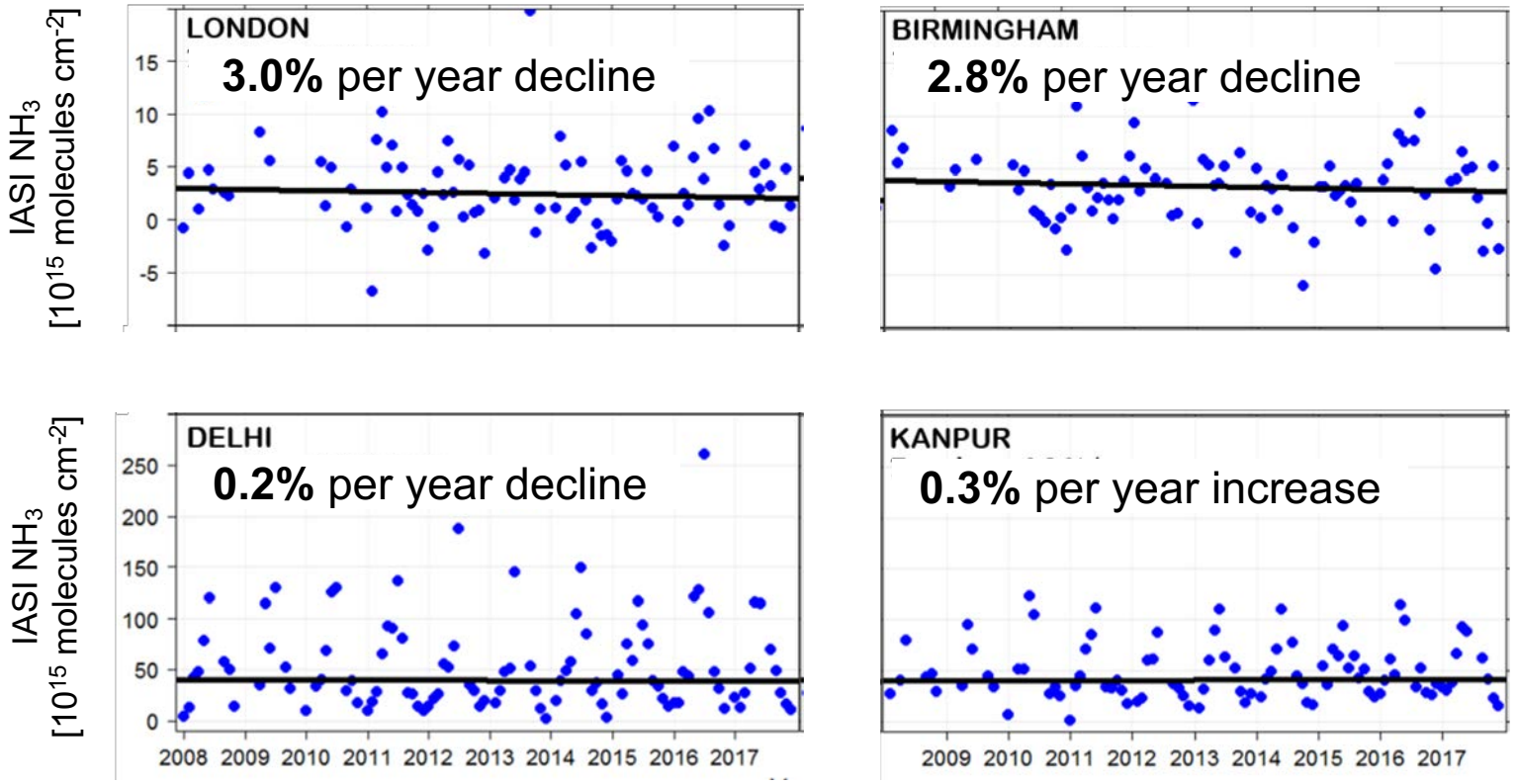


Kanpur



Evolving Air Quality in Cities in the UK and India

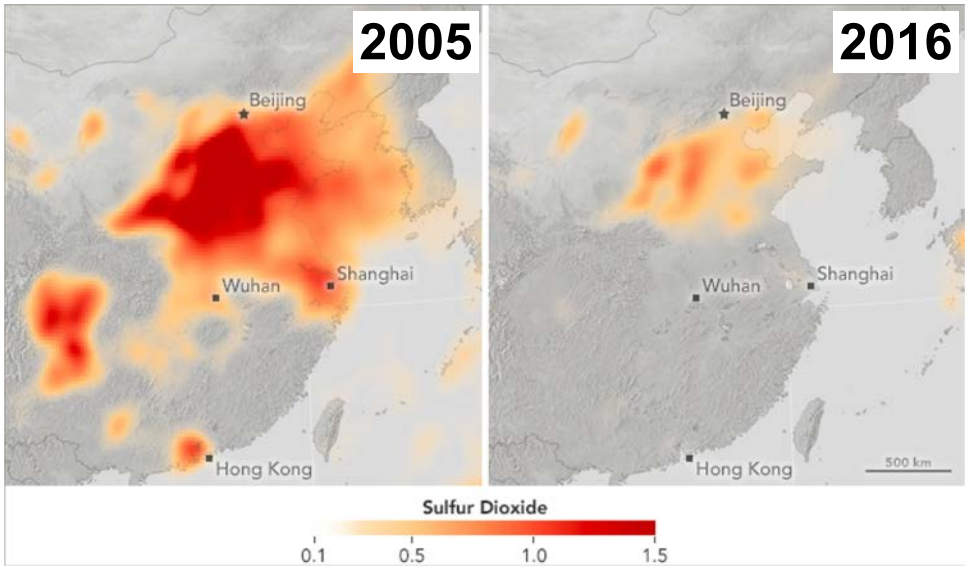
Long-term (2008-2017) absence of trends in IASI NH_3



Preliminary: Still to conduct trend analysis that accounts for seasonality

Efficacy of Air Quality Policies in China

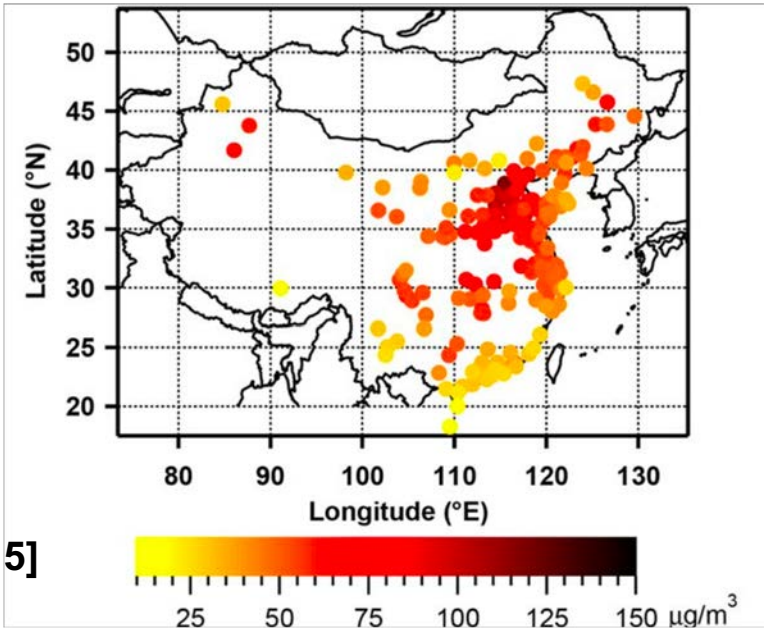
Decline in SO_2 [DU]



[Li et al., 2017]

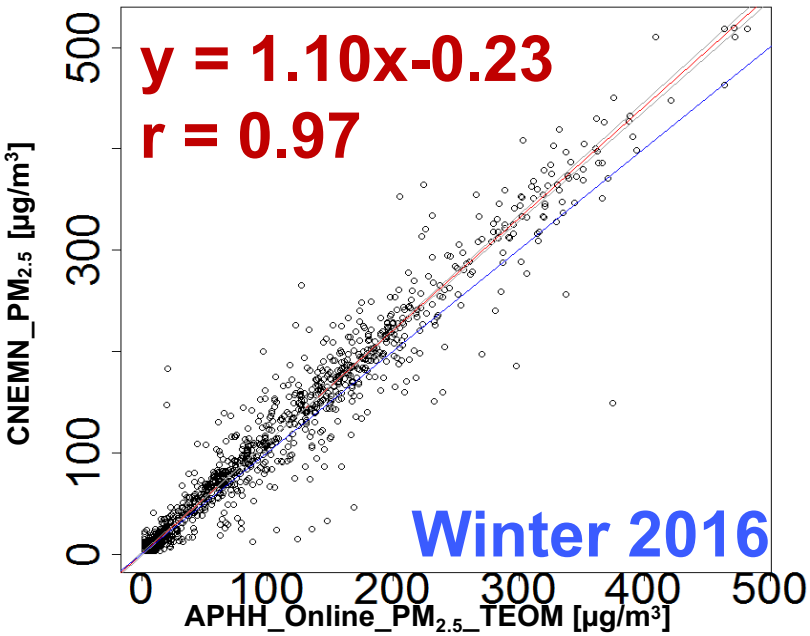
Annual mean $PM_{2.5}$ (2014-2015)

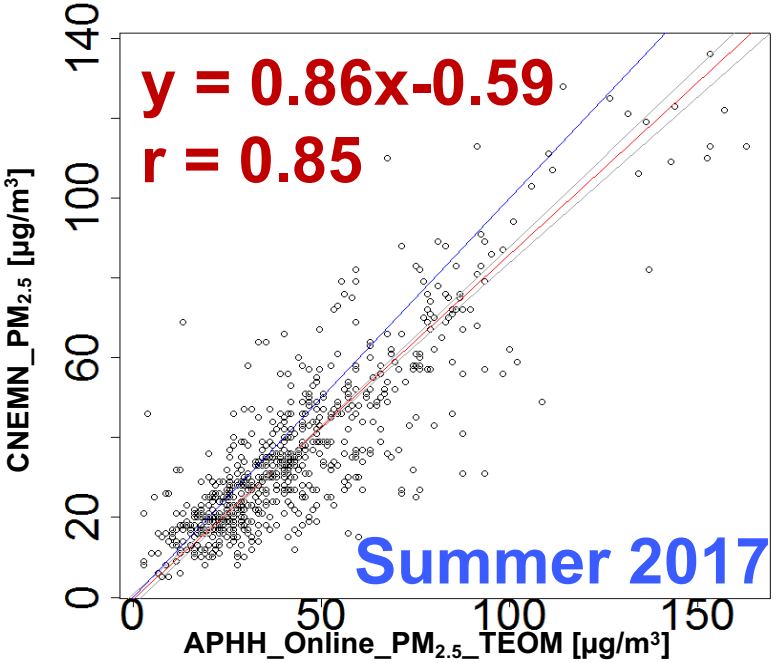
$PM_{2.5}$ still exceedingly high:

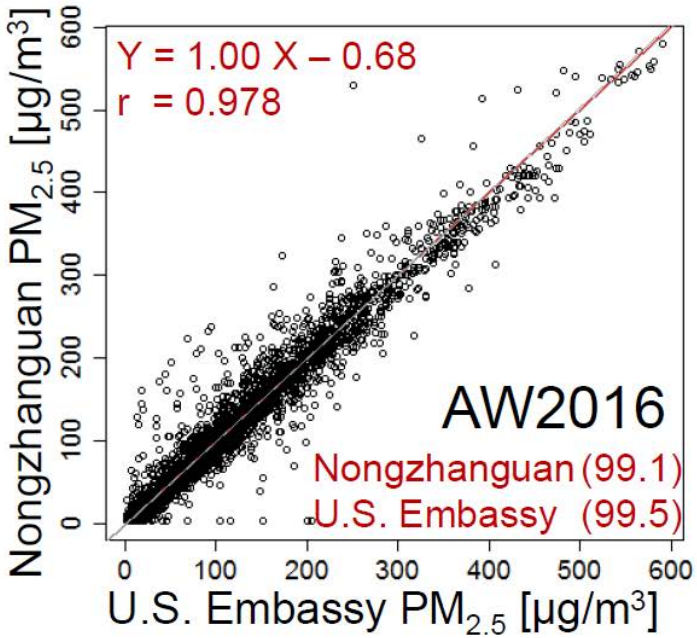


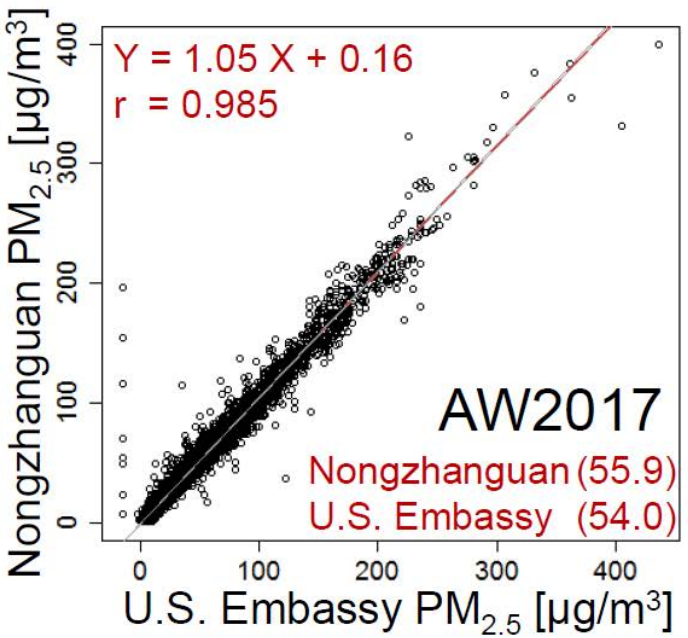
[Zhang and Cao, 2015]

Efficacy of Air Quality Policies in China



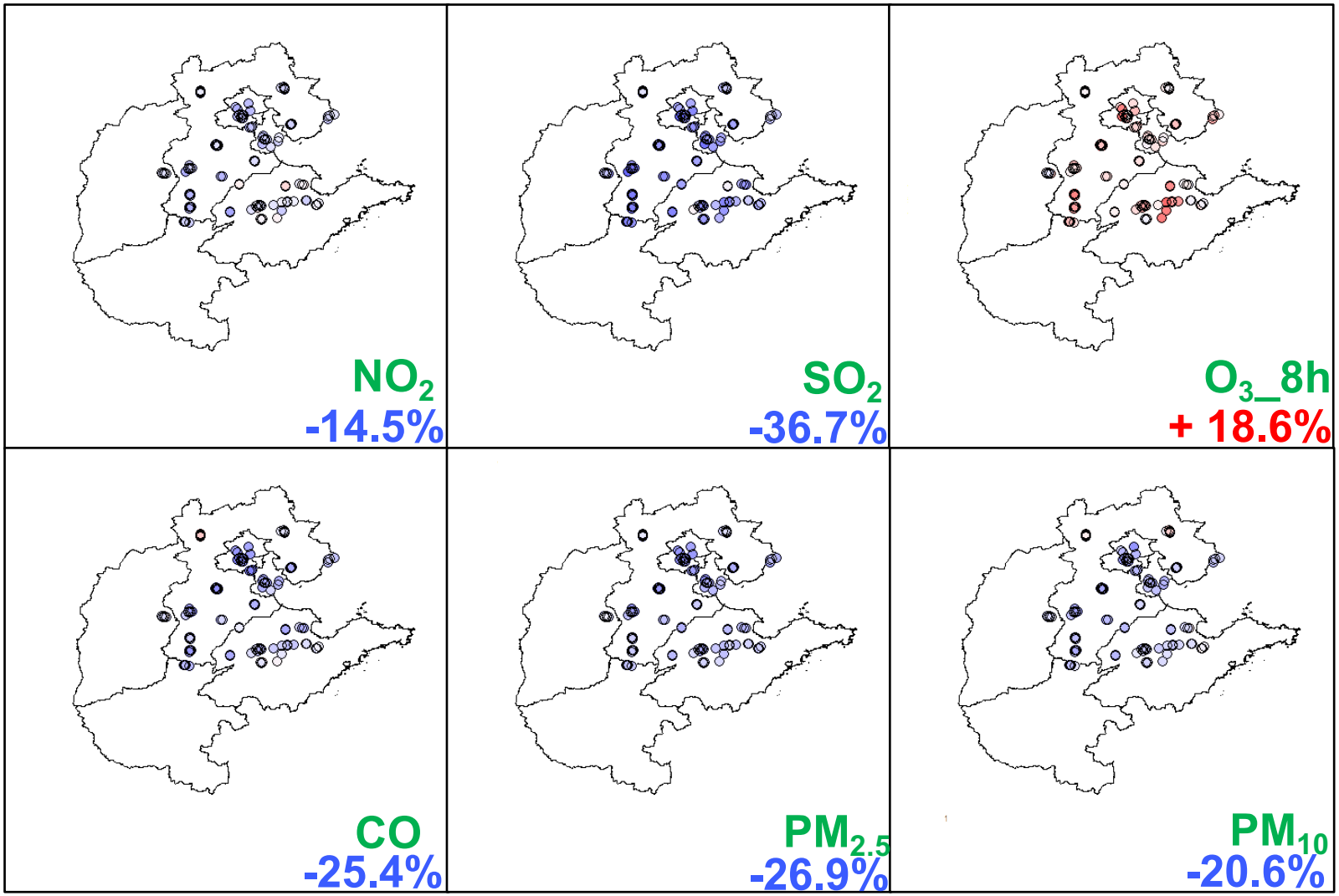






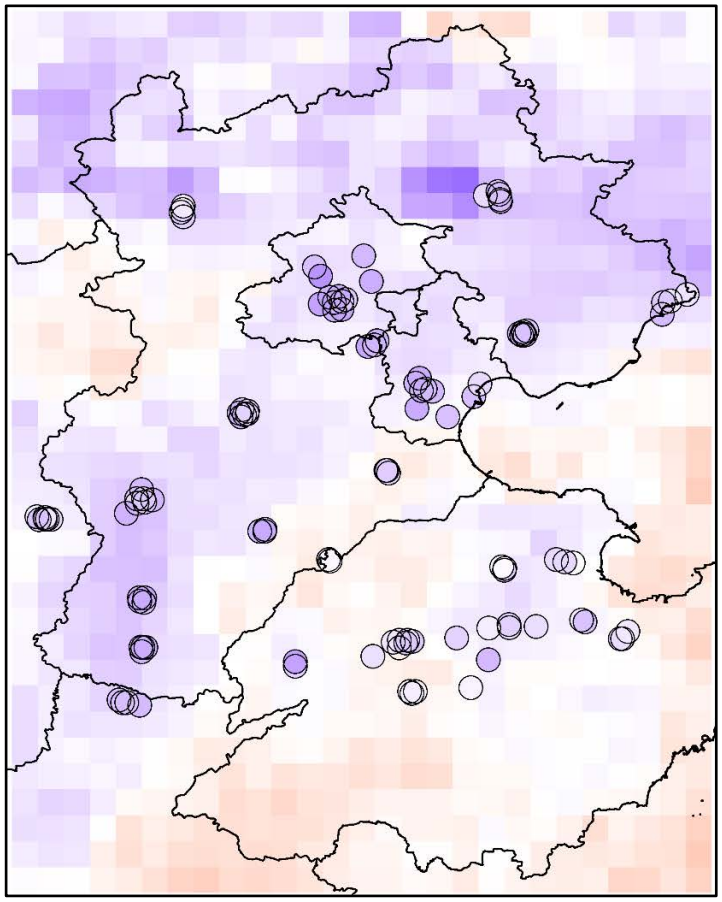
Efficacy of Air Quality Policies in China

Change in Autumn-Winter 2017 vs Autumn-Winter 2016



Efficacy of Air Quality Policies in China

Change in Autumn-Winter 2017
vs Autumn-Winter 2016



-100% -50% +50% +100%

Background: OMI NO_2

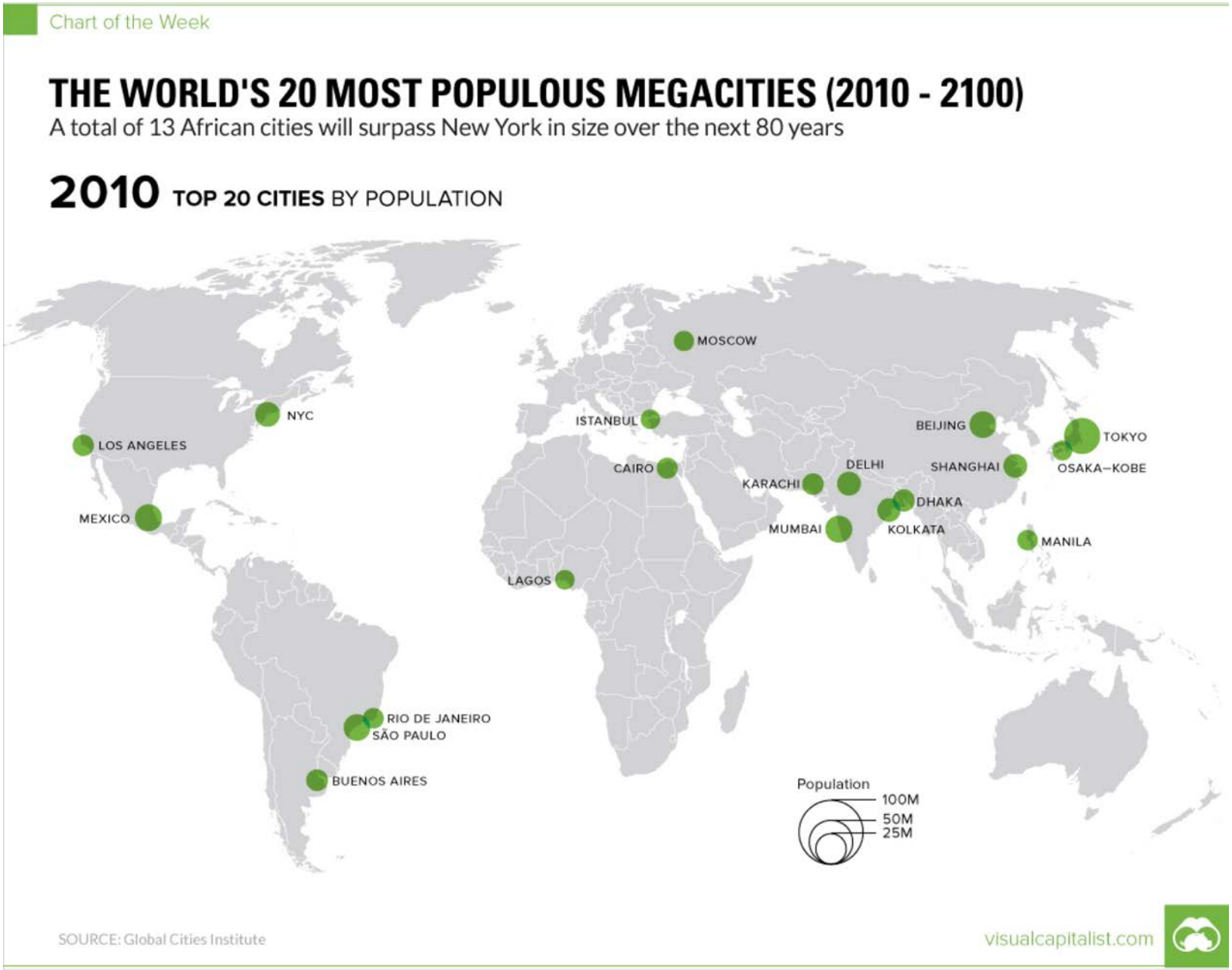
Circles: Monitoring network NO_2

Preliminary comparison suggests similar spatial patterns

Next Step:

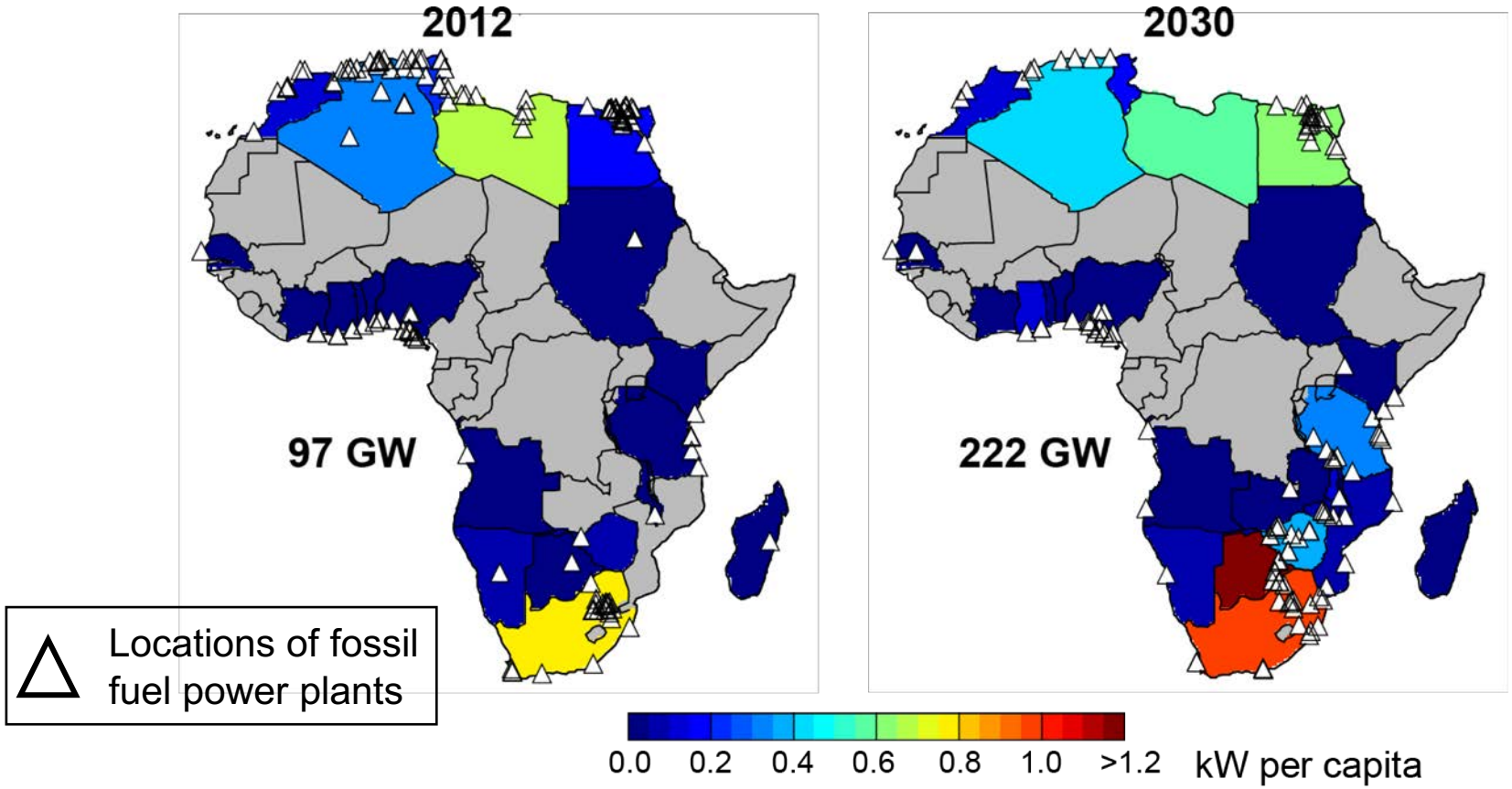
GEOS-Chem

Impact of future fossil fuels on air quality in Africa



Impact of future fossil fuels on air quality in Africa

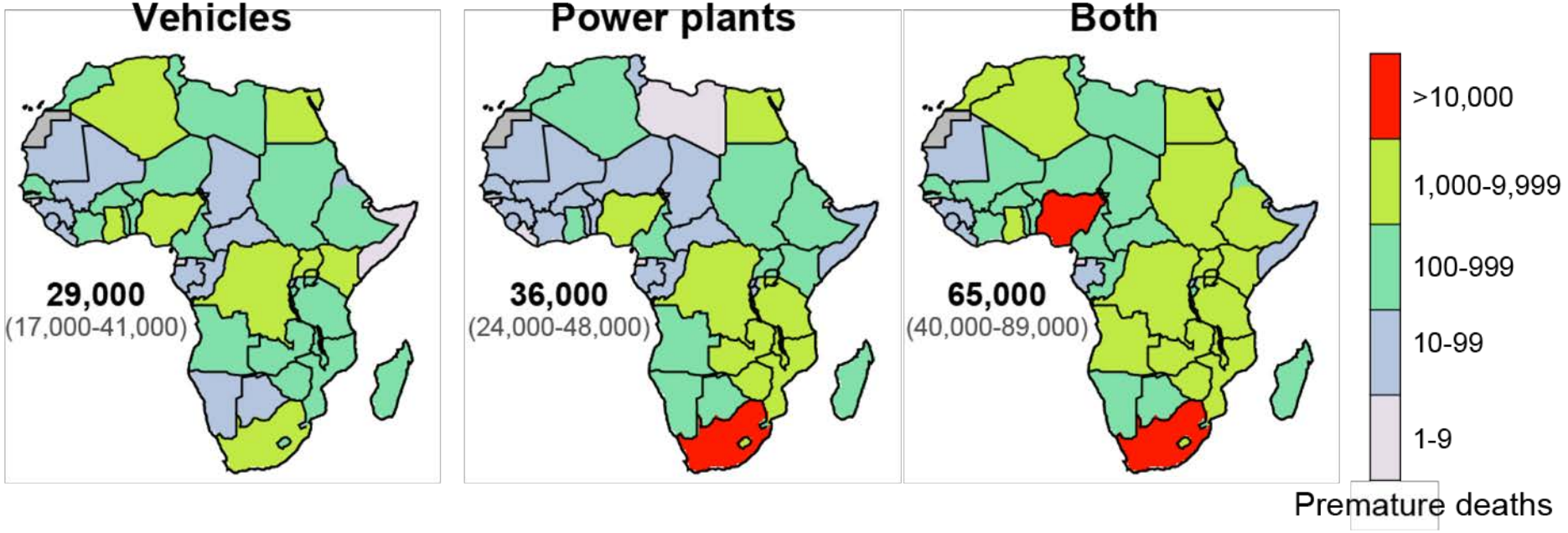
Total and per capita generating capacity from fossil fuels



Generating capacity to increase by almost 130%
(mostly North and southern Africa)

Impact of future fossil fuels on air quality in Africa

Deaths attributable to exposure to $PM_{2.5}$ from future fossil fuel use

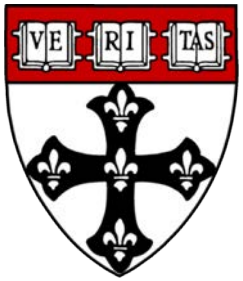


Total avoidable premature deaths in Africa from exposure to fossil fuel $PM_{2.5}$:
65,000

[Marais et al., *in prep*, 2019]

Acknowledgements

Collaborators and Contributors



Funders and Network Support