# Building Capacity to Monitor and Assess Air Quality in Africa


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UNIVERSITY OF LEICESTER


**Air Pollution Extremes Workshop**

Columbia University

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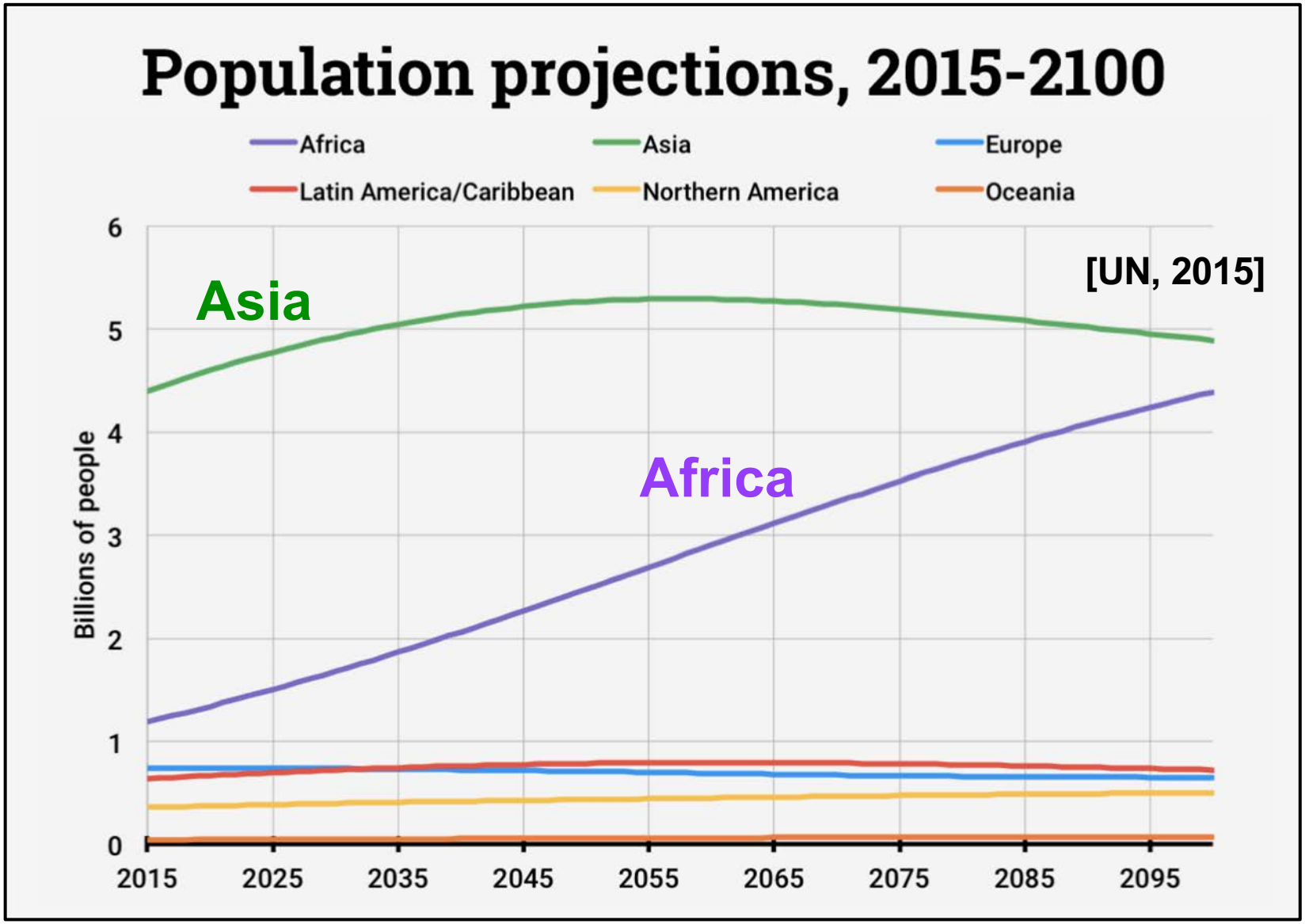
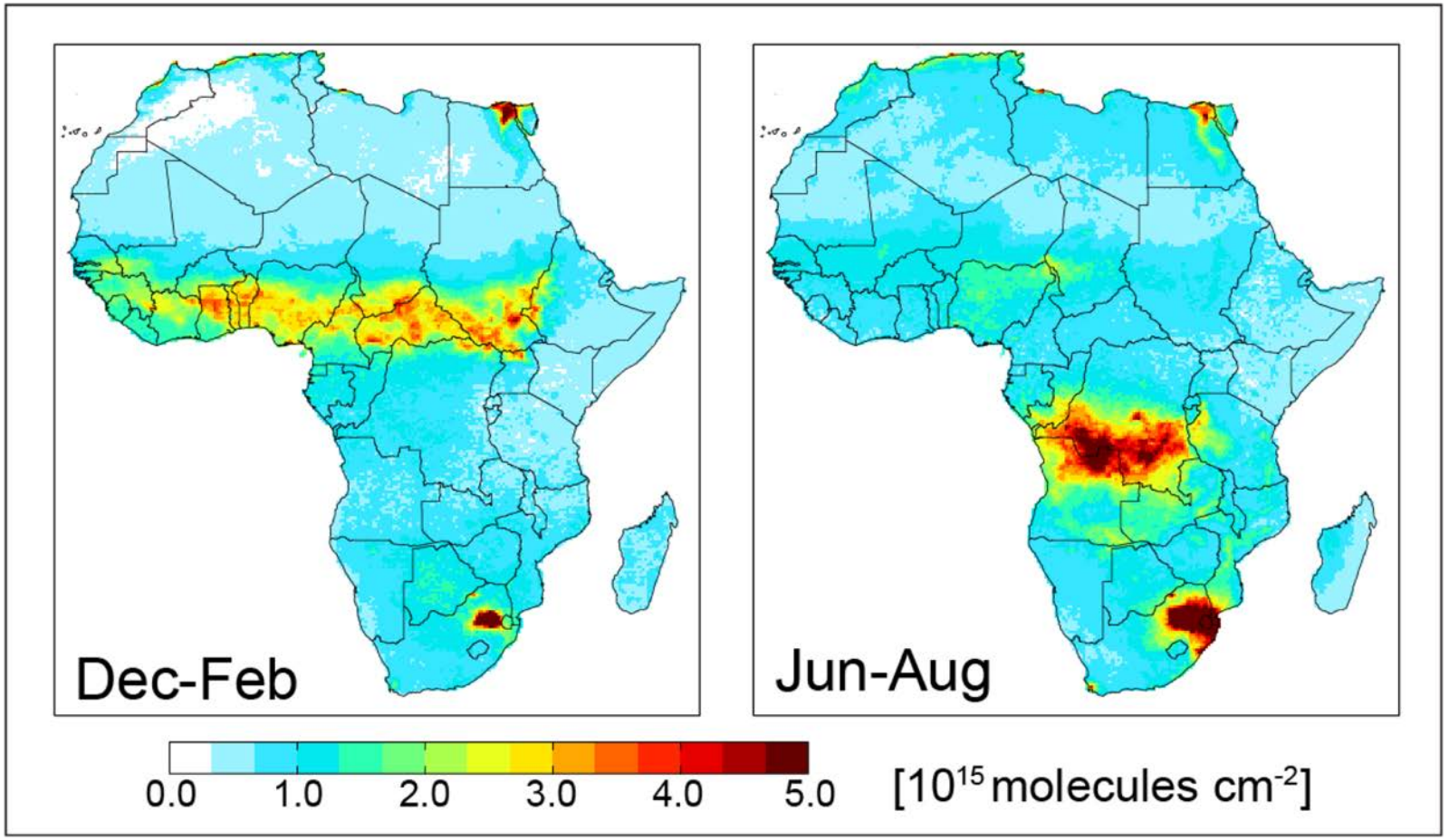
# Africa's Population is Growing Rapidly




Africa's population will rival that in Asia by 2100

# … but the continent is slow to industrialize

Seasonal mean tropospheric $NO_2$ column densities for 2006-2007

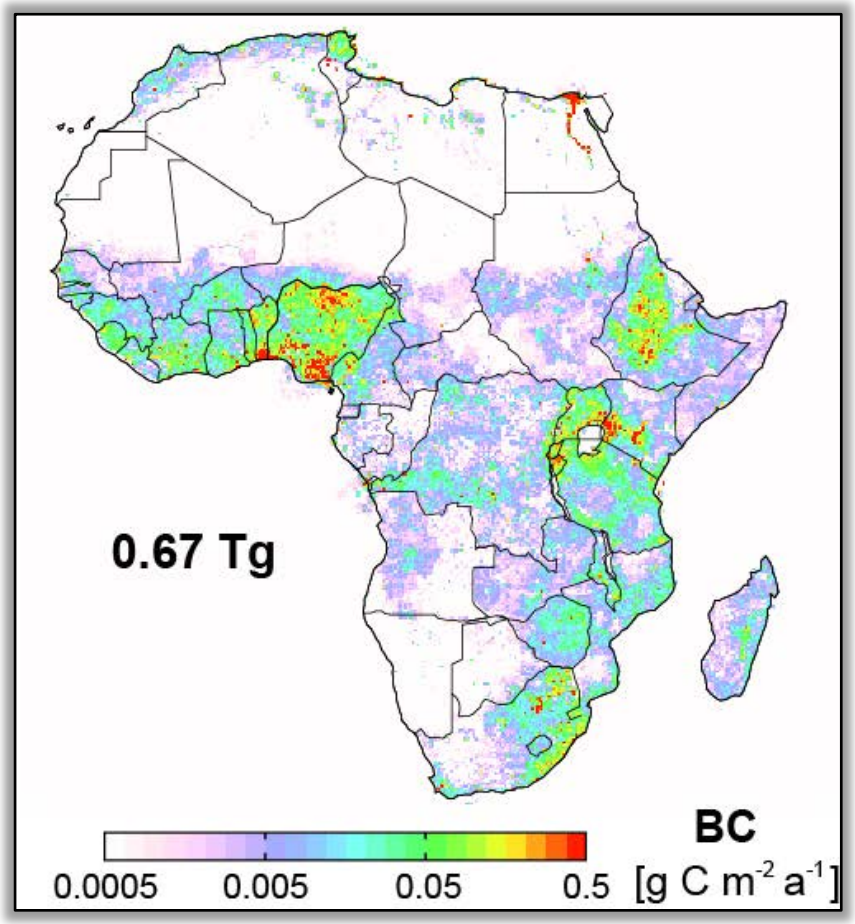



**[Marais and Chance, 2015]**

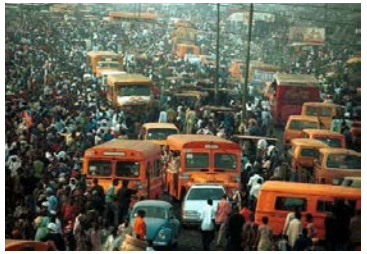
Anthropogenic sources dominated by diffuse, inefficient combustion

# Diffuse and Inefficient Combustion Emissions (DICE-Africa)

## Black Carbon



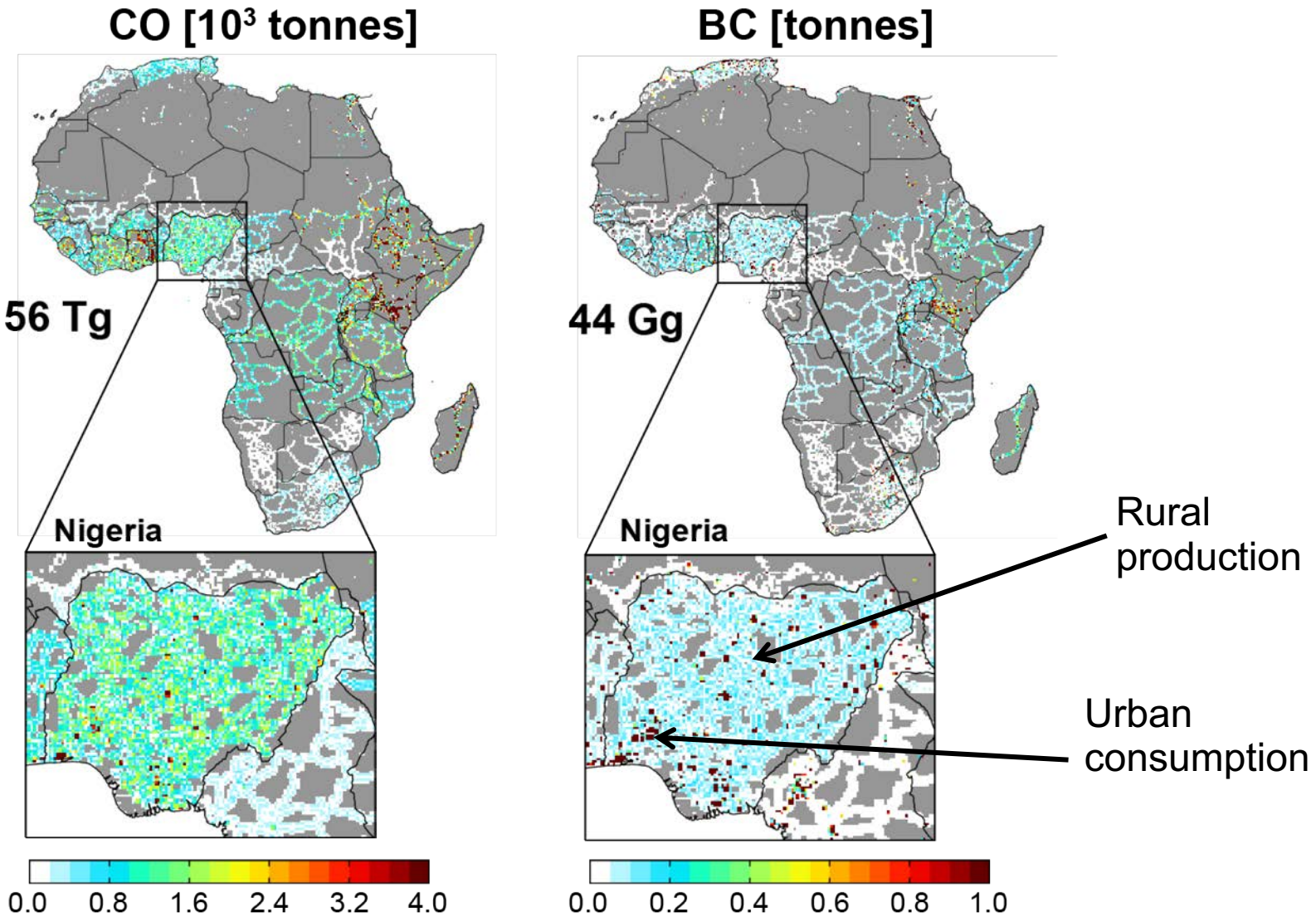

**[Marais and Wiedinmyer, 2016]**



DICE and open fire emissions similar for many pollutants

# Improved representation of charcoal emissions

Pollutant emissions from charcoal production, use and transport




Rural production nearby roads and charcoal use in dense urban centres

# Air Quality Monitoring in Cities

## Tool for Recording and Assessing the City Environment

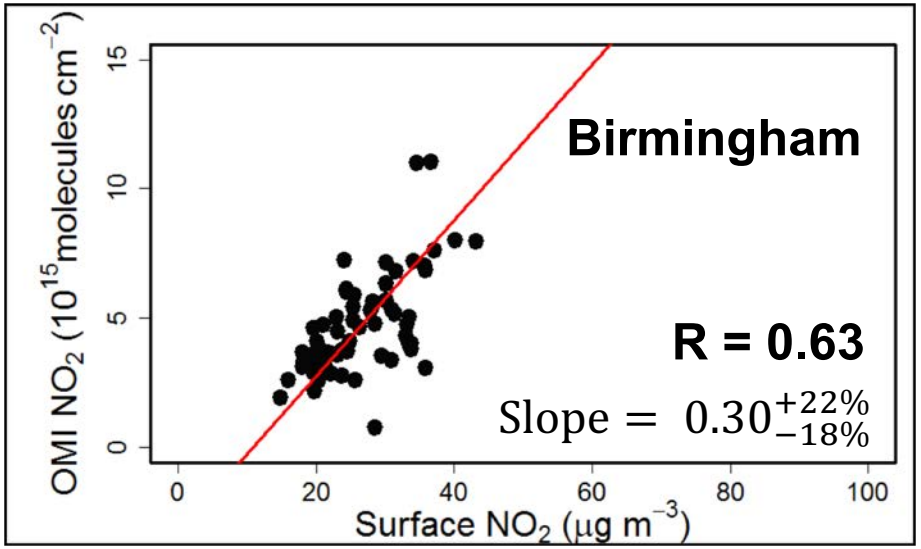
TRACE

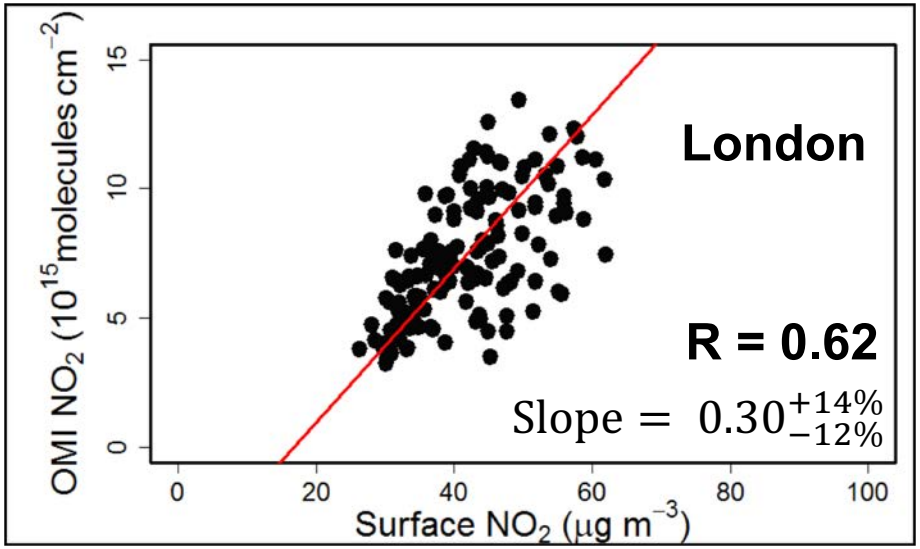
Data transformation and interpretation of Earth observations into information about air quality in cities

# Validation of Satellite Observations

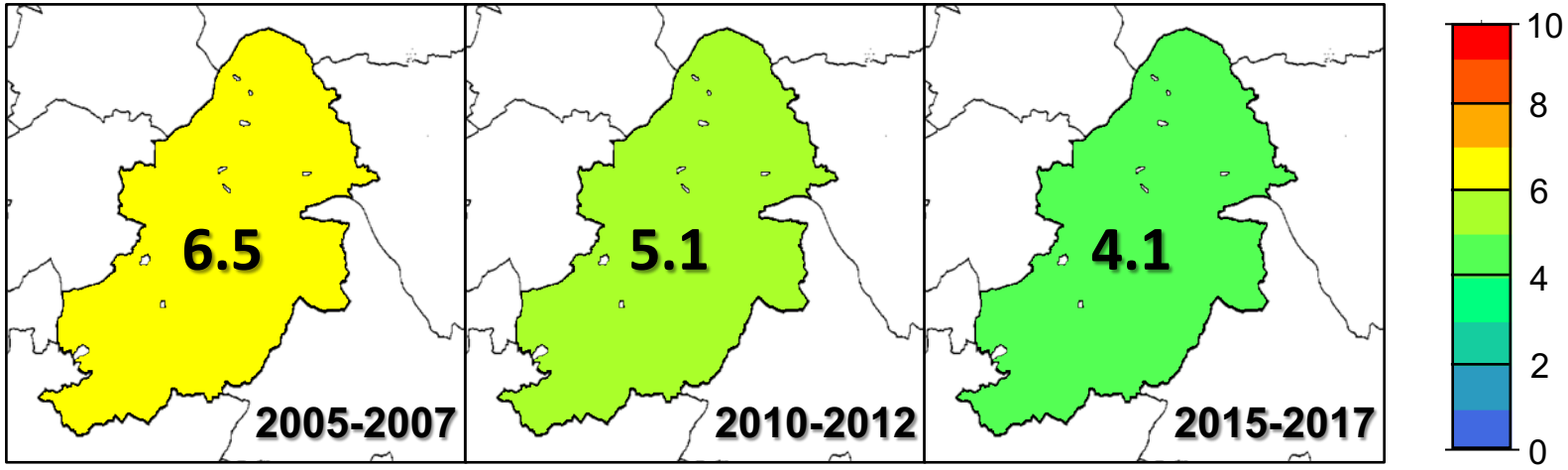
TRACE

## OMI $NO_2$ validation with Surface Measurements




## Estimate long-term changes in air quality using OMI $NO_2$

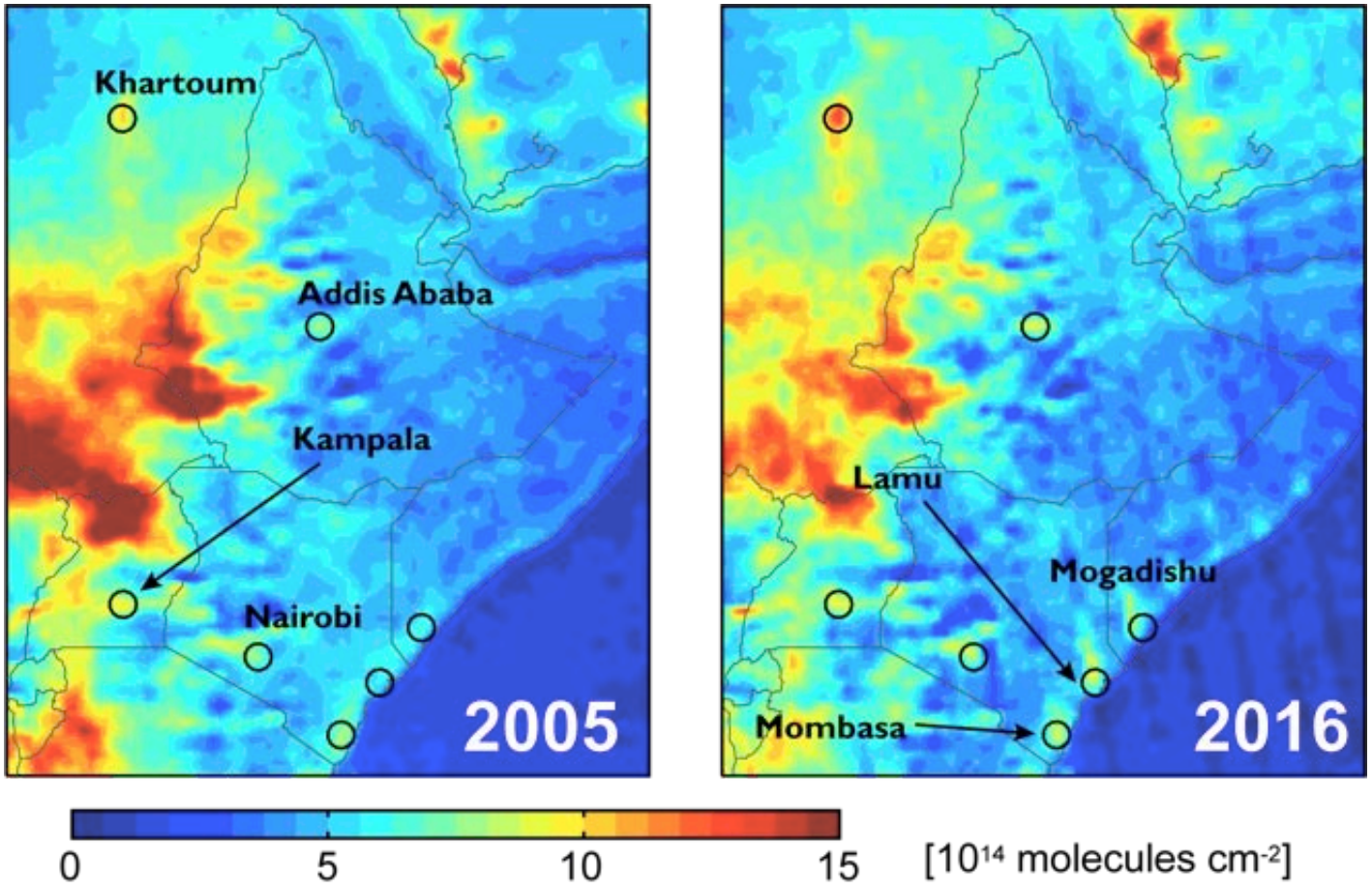



**Birmingham (UK): 3.1% decline per year**

[$10^{15}$ molecules $cm^{-2}$]

# Some evidence of increases in $NO_2$

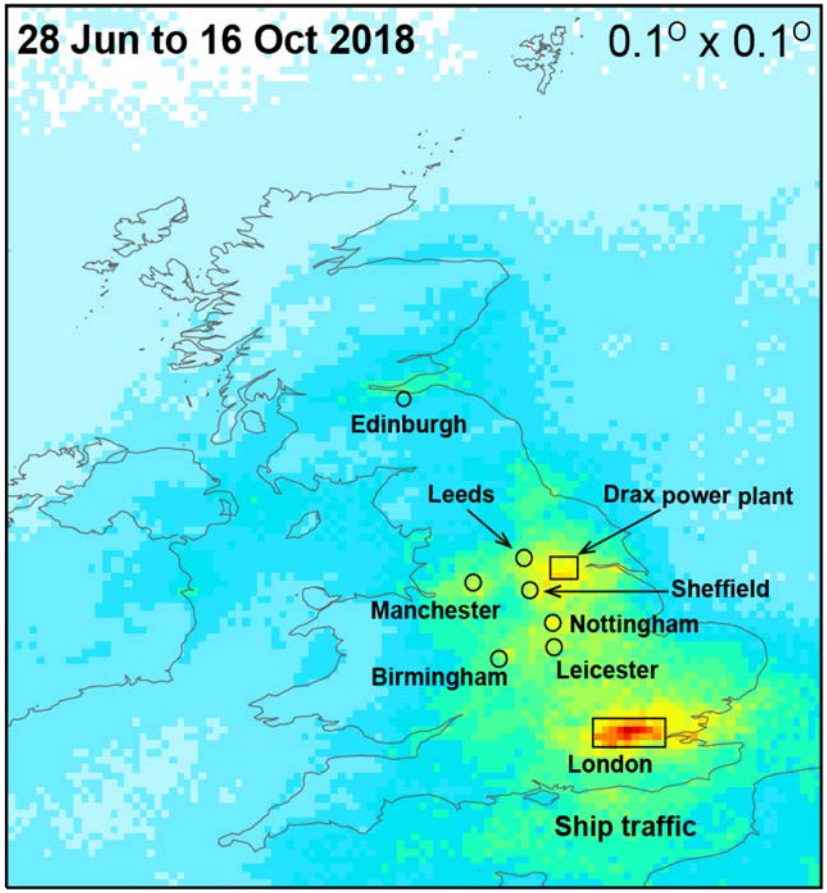
## East Africa annual mean OMI $NO_2$

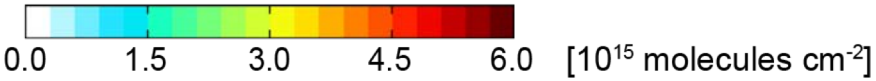



Increase in OMI $NO_2$ in cities and at ports, but column concentrations are low.

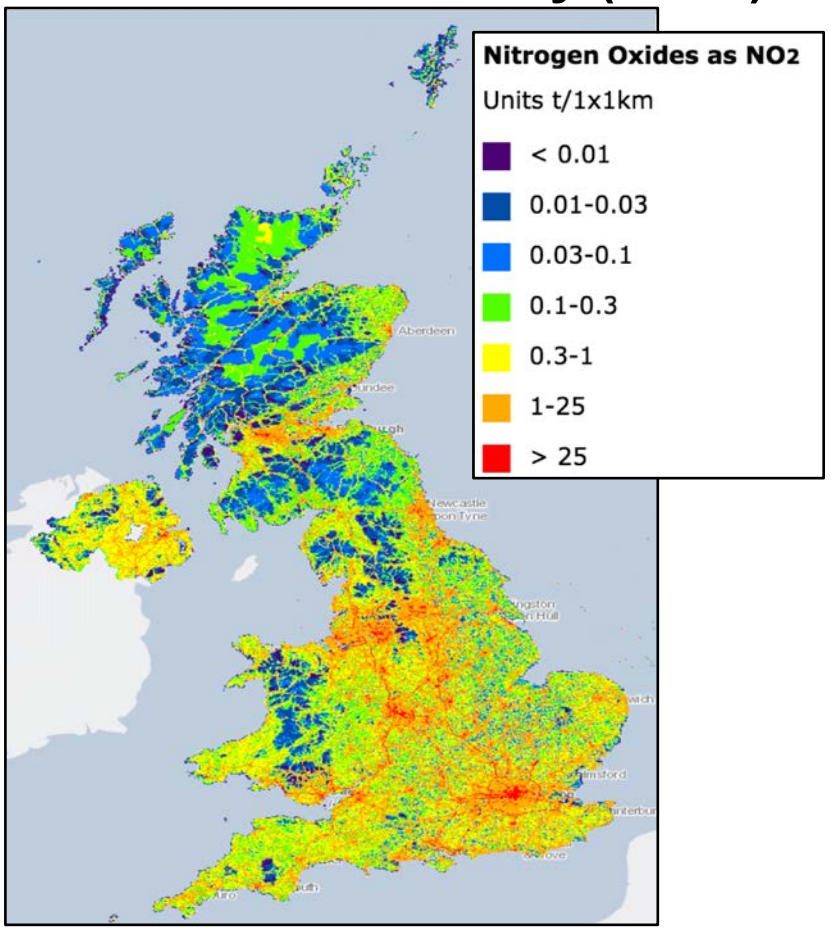
# Exploit high spatial resolution of TROPOMI

## TROPOMI $NO_2$ over the UK



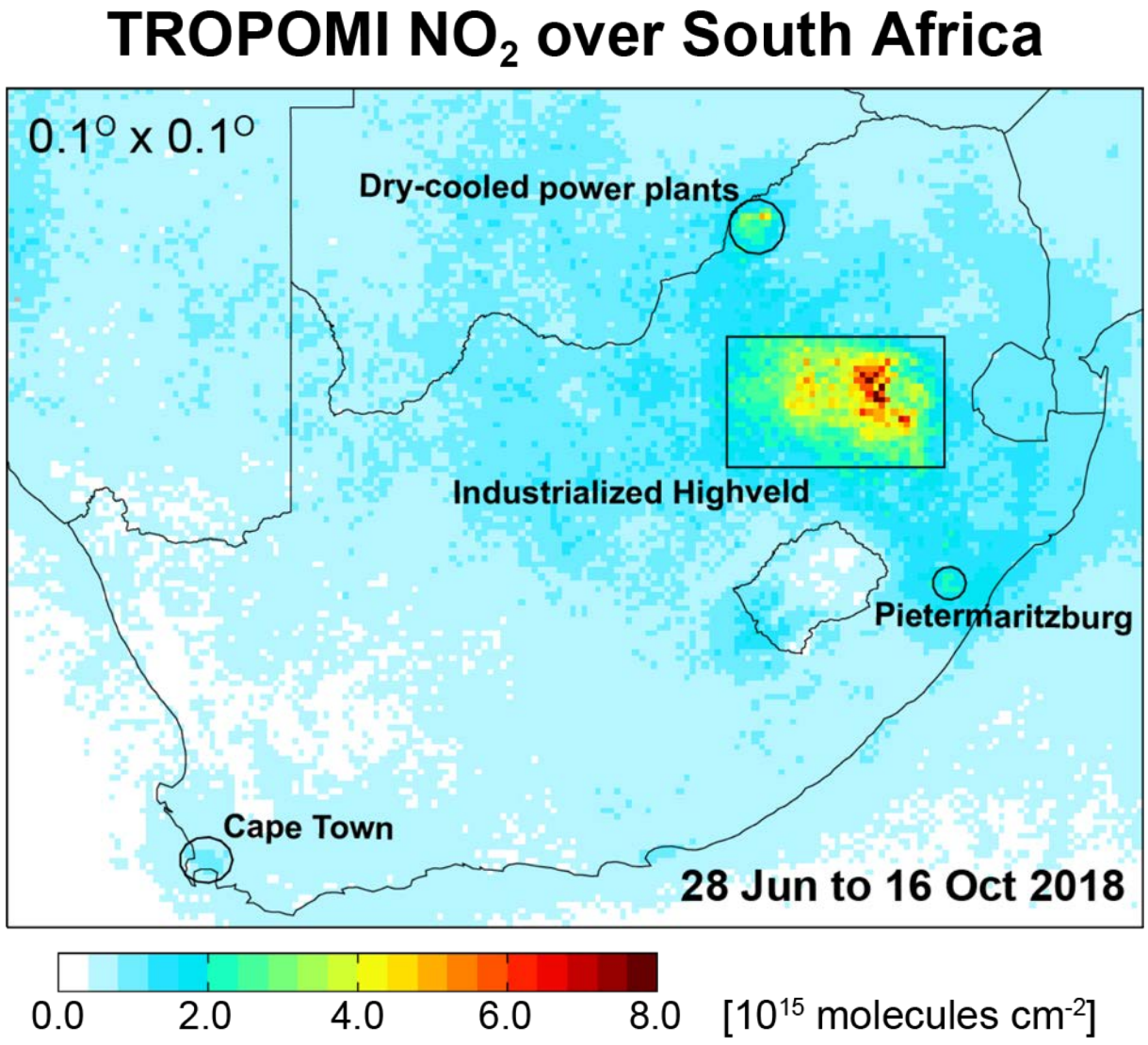




## National Atmospheric Emission Inventory (NAEI)




Evaluate high-resolution emission inventory and air quality models

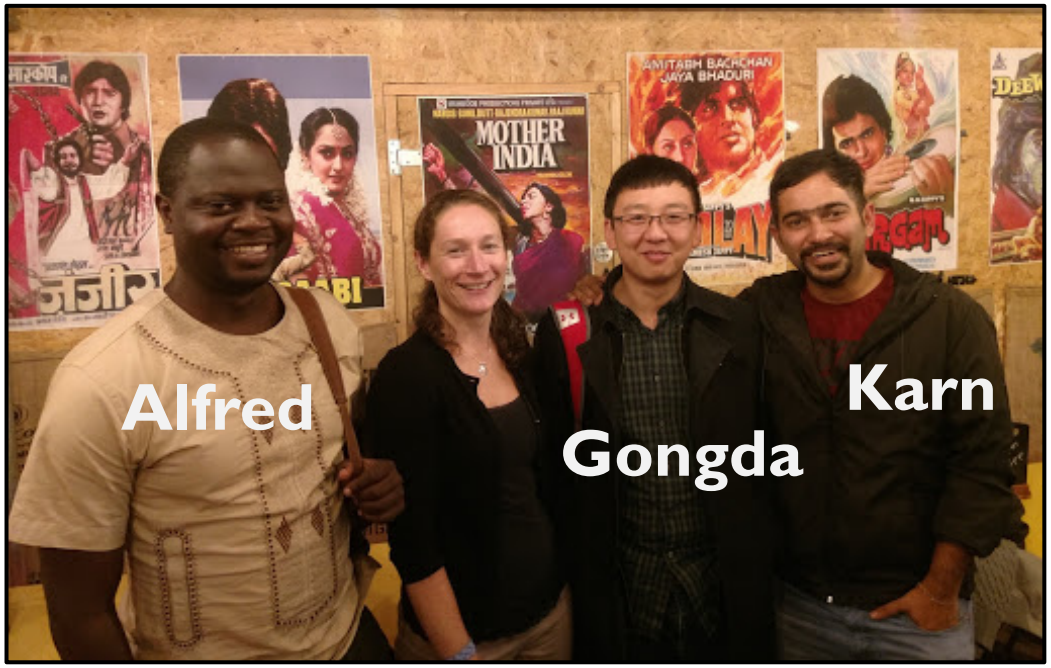
# Exploit high spatial resolution of TROPOMI




Resolves cities and point sources not possible with OMI

# Acknowledgements

## Graduate Students




## Collaborators / Support

CATAPULT Satellite Applications

CATAPULT Future Cities

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RICARDO

## UK Funding Agencies

NERC SCIENCE OF THE ENVIRONMENT

EPSRC Engineering and Physical Sciences Research Council