

City Sustainability with Satellites



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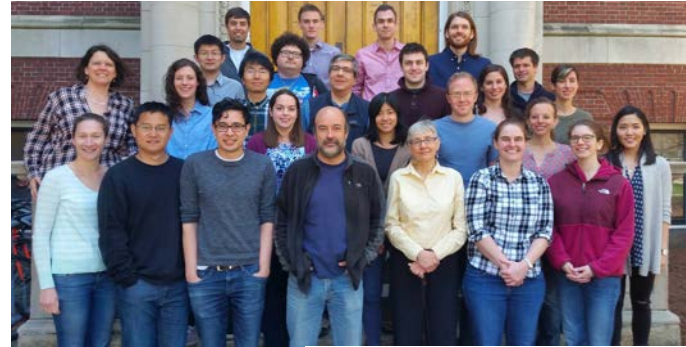
Satellite Applications Catapult Brown Bag

12 April 2018

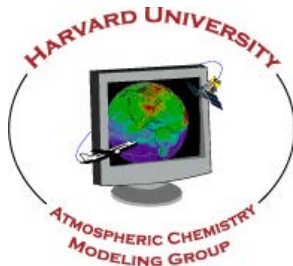
Education and Training



Undergraduate



Postdoc Research Fellow



Graduate School



**UNIVERSITY OF
BIRMINGHAM**

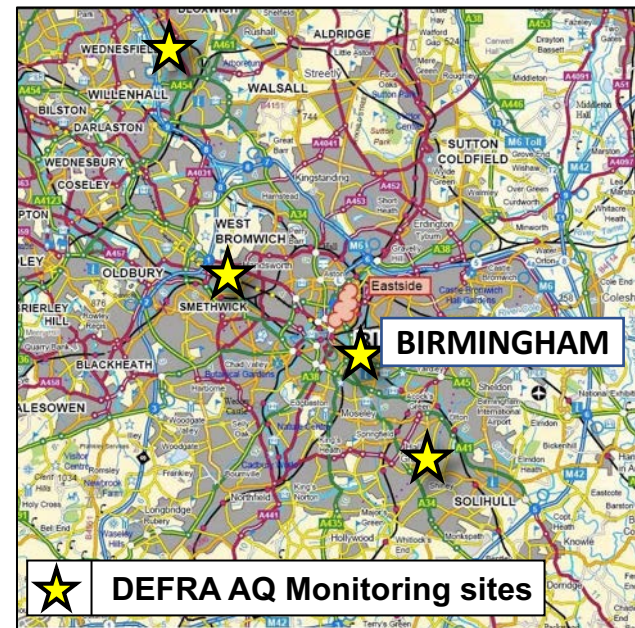
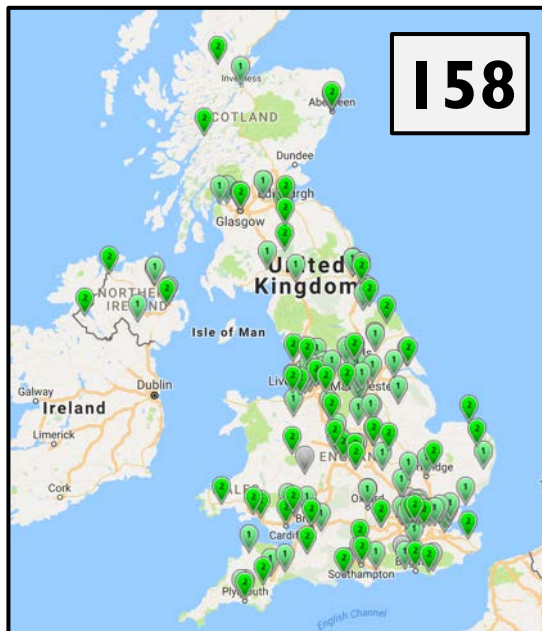
Tenure-Track Research Scientist

Air Pollution and Green Space Monitoring in Cities

Current Approach (air quality)

COSTLY to MONITOR

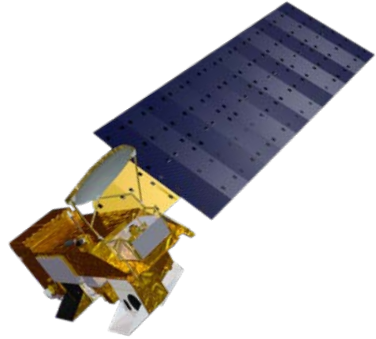
£52,000-£173,000 per monitor



LARGE GAPS

Air Pollution and Green Space Monitoring in Cities

Solution



TRACE



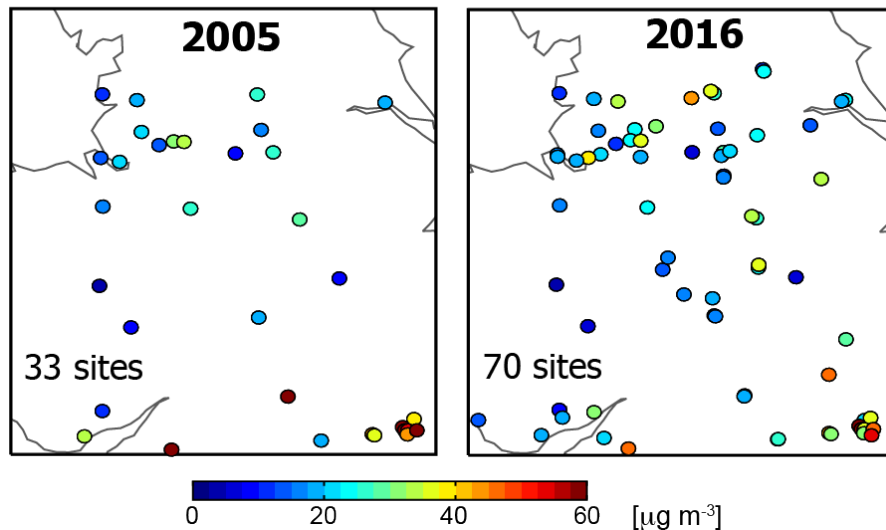
(Tool for Recording and Assessing the City Environment)

**Online database of air pollution concentrations
and vegetation dynamics from EO to evaluate
AQ and green space at the city level**

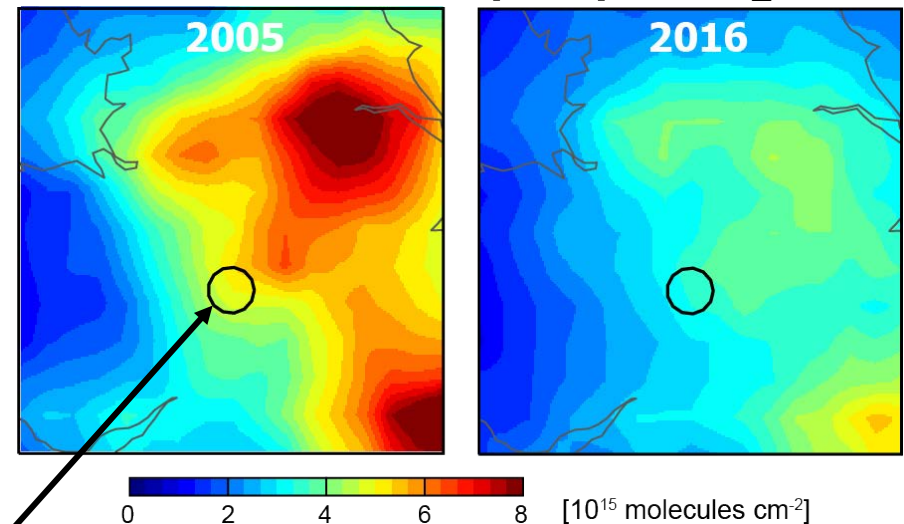
Complete coverage achieved with EO

NO₂ is a precursor of ozone and fine particles

DEFRA (surface) NO₂



Aura OMI (EO) NO₂



Birmingham: 3% per year decline in NO₂

Long record of diverse observations

12+ years of air pollutants and vegetation dynamics
from NASA and ESA satellites

NASA Aura

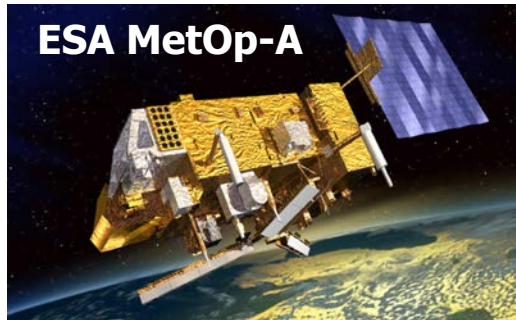


HCHO

NO₂

SO₂

ESA MetOp-A



NH₃

NASA Terra



CO

AOD

LAI

EVI

○ Air pollutants regulated by EU

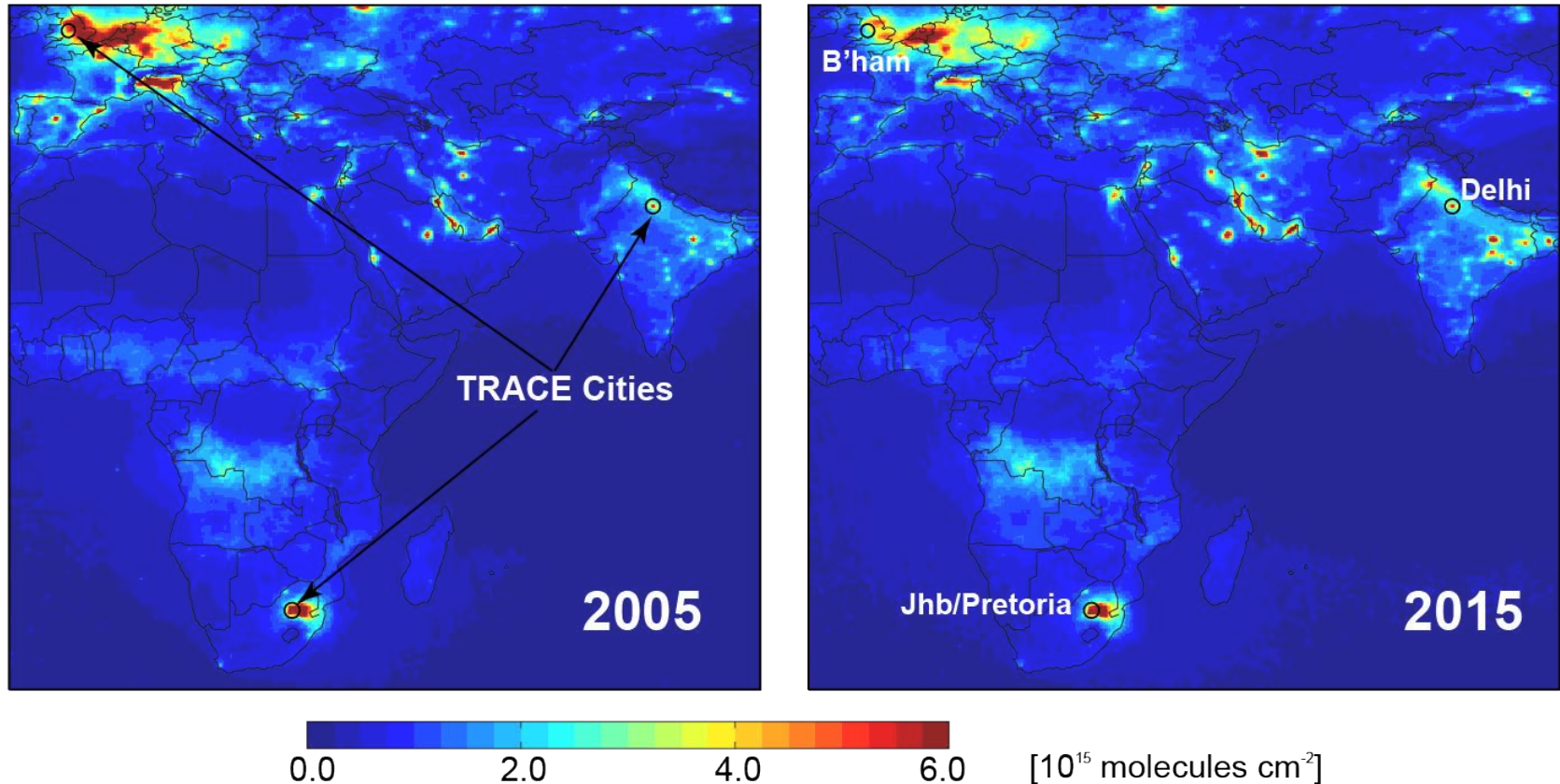
○ Constraints on regulated air pollutants

○ Vegetation extent/cover

○ Vegetation greenness

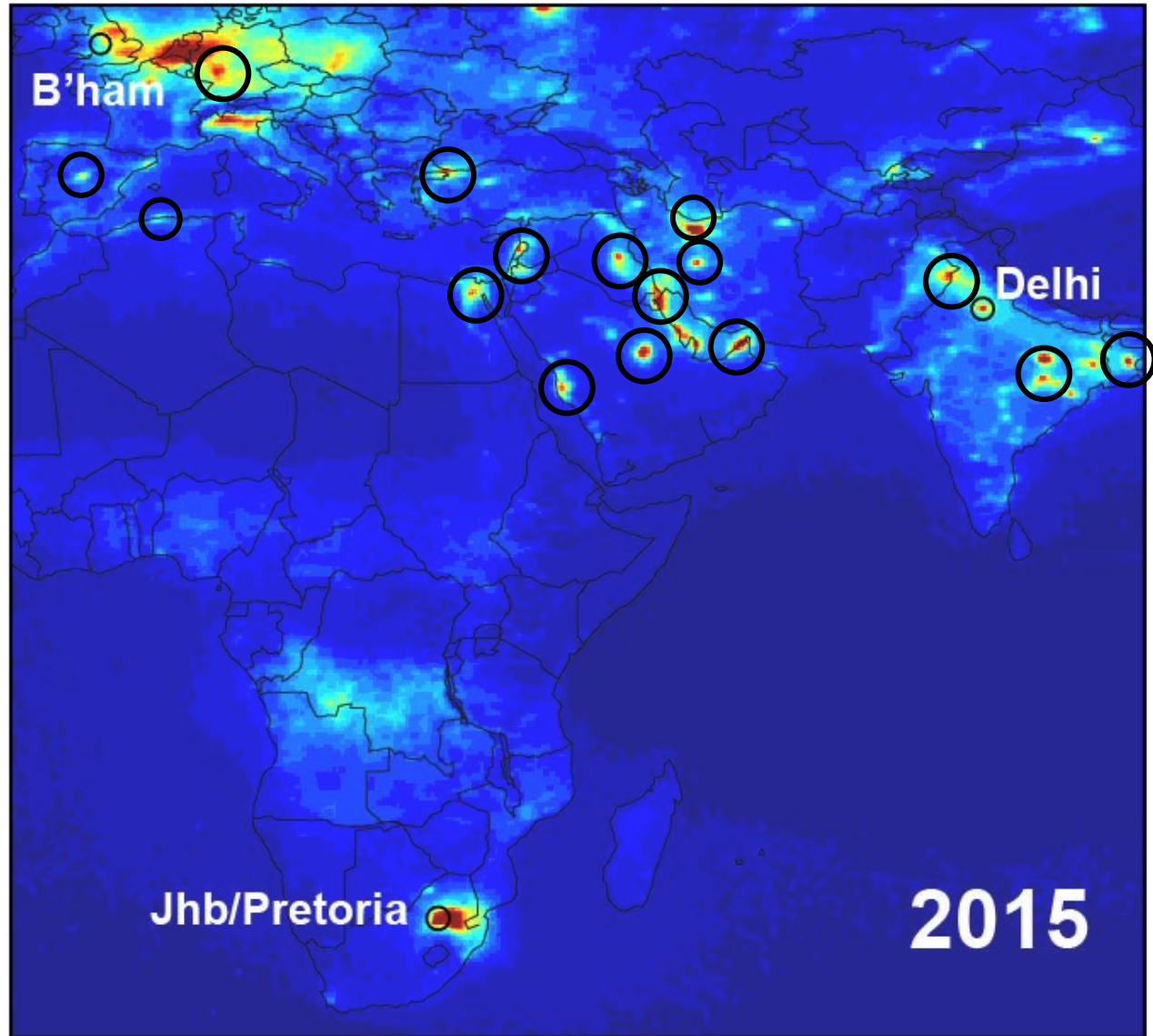
Apply to cities at different development stages

Target cities on maps of OMI NO₂ in 2005 and 2015



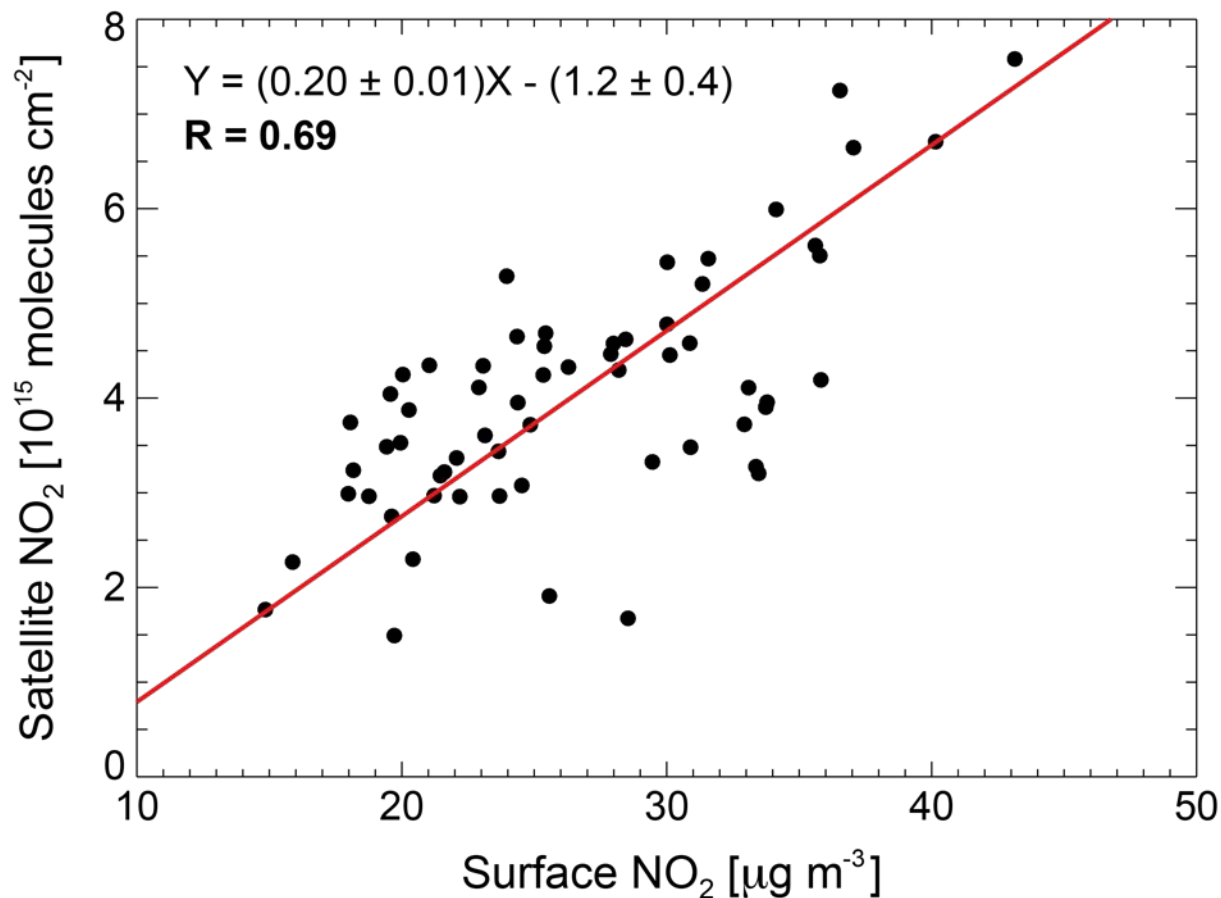
Develop an approach that can be flexibly applied to any city

Potential to apply to many other cities



Validate over Birmingham

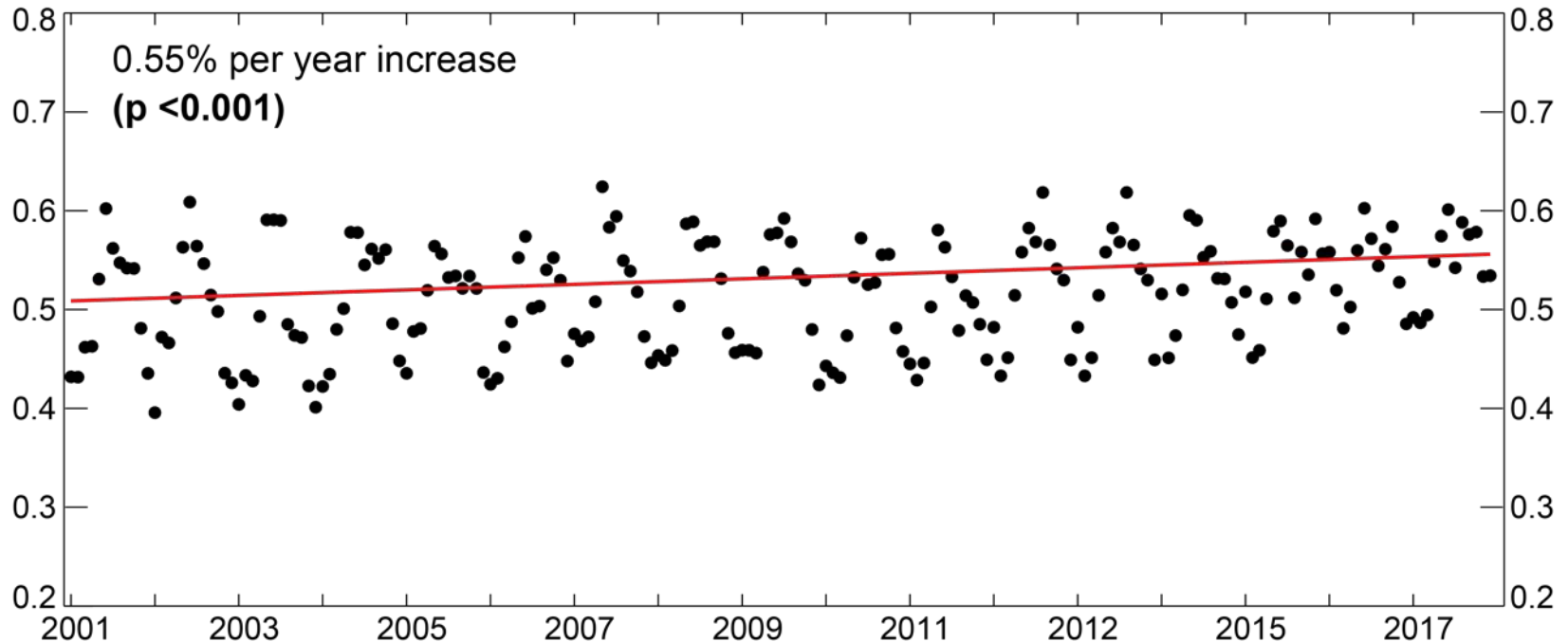
Consistency between surface and satellite NO₂:



Validate over Birmingham

Vegetation greenness and productivity trends:

Time series of monthly mean MODIS NDVI (vegetation greenness)



Significant seasonal trends: **1.1%** per year (**winter**), **0.61%** per year (**autumn**)

Implications for health of green spaces and ability to sequester carbon
(climate change)

Still to compare to green space inventory data from Birmingham City Council