CAN SATELLITES AID IN IMPROVING AIR QUALITY IN YOUR CITY ???

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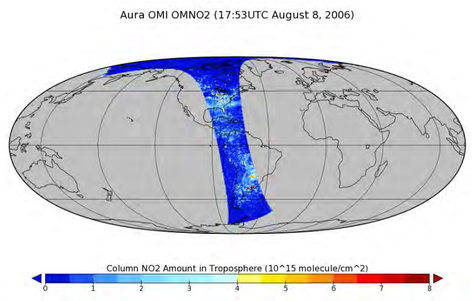
OMI/Aura NO2 Cloud-Screened Tropospheric Column L2 Global 13 km x 24 km V3



30 SECOND SUMMARY

Surface observations are sparse and inconsistent + Satellites provide long-term global observations + Validation of satellite observations with surface observations = Apply satellite observations to monitor air quality

REFERENCES

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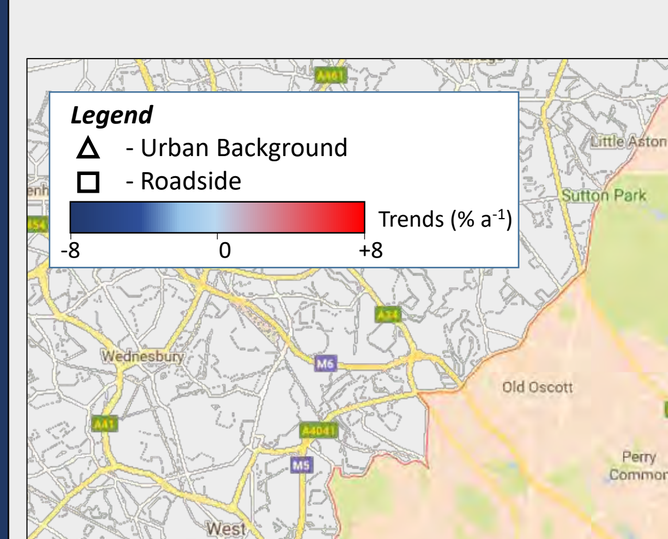
- Celarier et al., JGR, doi:10.1029/2007JD008908, 2008
- Geddes et al., EHP, doi:10.1289/ehp.1409567, 2016
- Birmingham City Council https://bit.ly/2KbBNTI
- Pope et al., ASL, doi:10.1002/asl.817, 2018
- DEFRA report https://bit.ly/2HU4cPI



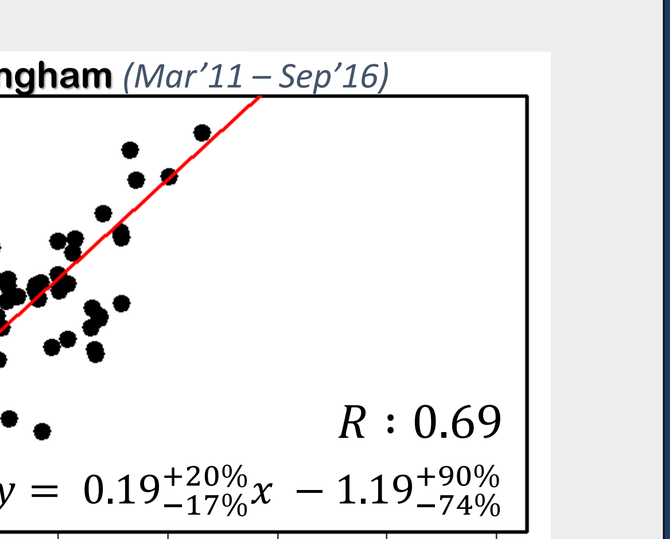
A sunny winter's day in Birmingham (smoke from Tyseley Energy from Waste plant)

1. INTRODUCTION

- **40,000** early deaths each year in UK are attributed to fine particles and **NO_2** pollution; Associated health cost: **£6 billion**
- Space-based instruments provide long-term (2005-2017) observations of NO_2 to assess and develop prescient policy
- Here we validate and use satellite observations to assess air quality in **Birmingham**

2. METHODOLOGY

- Validate satellite observations of NO_2 from the ***Ozone Monitoring Instrument (OMI)*** on-board **NASA's Aura satellite** with **DEFRA** and **Birmingham City Council** ground-based observations
- Quantify the long-term (2005-2017) trend in OMI NO_2



3. SURFACE MONITORING OF NO_2

- Sites are spatially correlated and so can be used to obtain a city-wide average NO_2 concentration to validate OMI NO_2

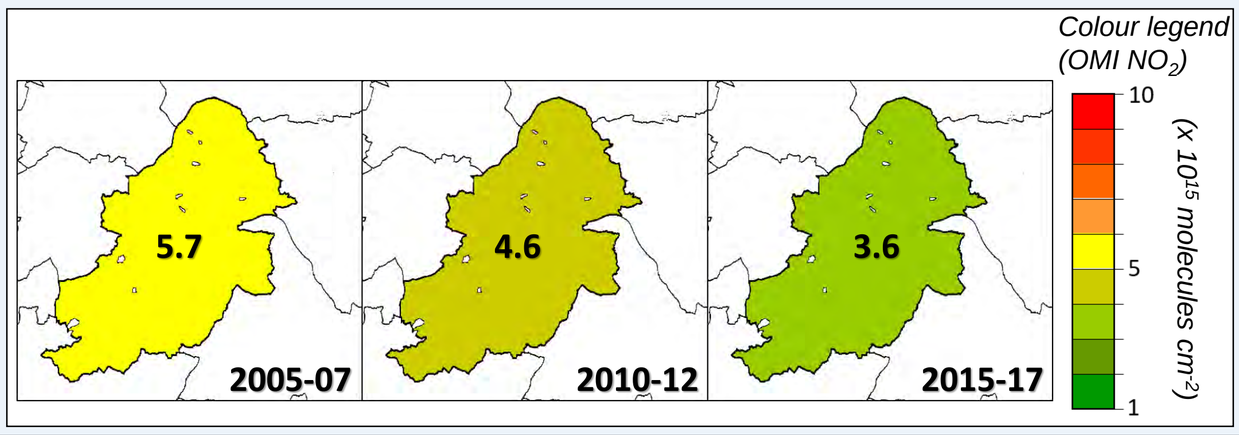
Trends and locations of NO_2 monitoring sites in Birmingham

4. VALIDATION OF SATELLITE OBSERVATIONS

- Surface and OMI NO_2 are temporally correlated (R = 0.69)
- OMI NO_2 can be used to infer NO_x trends in Birmingham

5. OMI NO_2 TRENDS IN BIRMINGHAM

- OMI NO_2 has decreased at 3.2% a^{-1} for 2005-2017
- NO_2 is short lived, significant decline in OMI NO_2 indicates a significant decline in NO_X emissions



6. DISCUSSION

- Surface sites provide detailed information about spatial variability in NO_2
- Consistent satellite and ground-based NO_2 give us confidence to apply satellite observations to monitor air quality in Birmingham
- We find from OMI that NO_2 has declined by 3.2% a^{-1} (Birmingham) from 2005 to 2017, similar to the UK-wide decrease in NO_x emissions (3.9% a^{-1}) and more than the decline in London (1.8% a^{-1}) determined with surface NO_2 observations

7. NEXT STEPS

- Similar validation to be completed for satellite observations of other air pollutants (sulphur dioxide, particulate matter and formaldehyde)
- Apply this approach to monitor rapidly developing cities like **New Delhi**, **Kathmandu**, **Jakarta**, **Ontisha**, **Johannesburg** and **Sao Paulo**