

# Monitoring Air Pollution in Birmingham from the ground up

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UNIVERSITY OF  
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## 1. INTRODUCTION

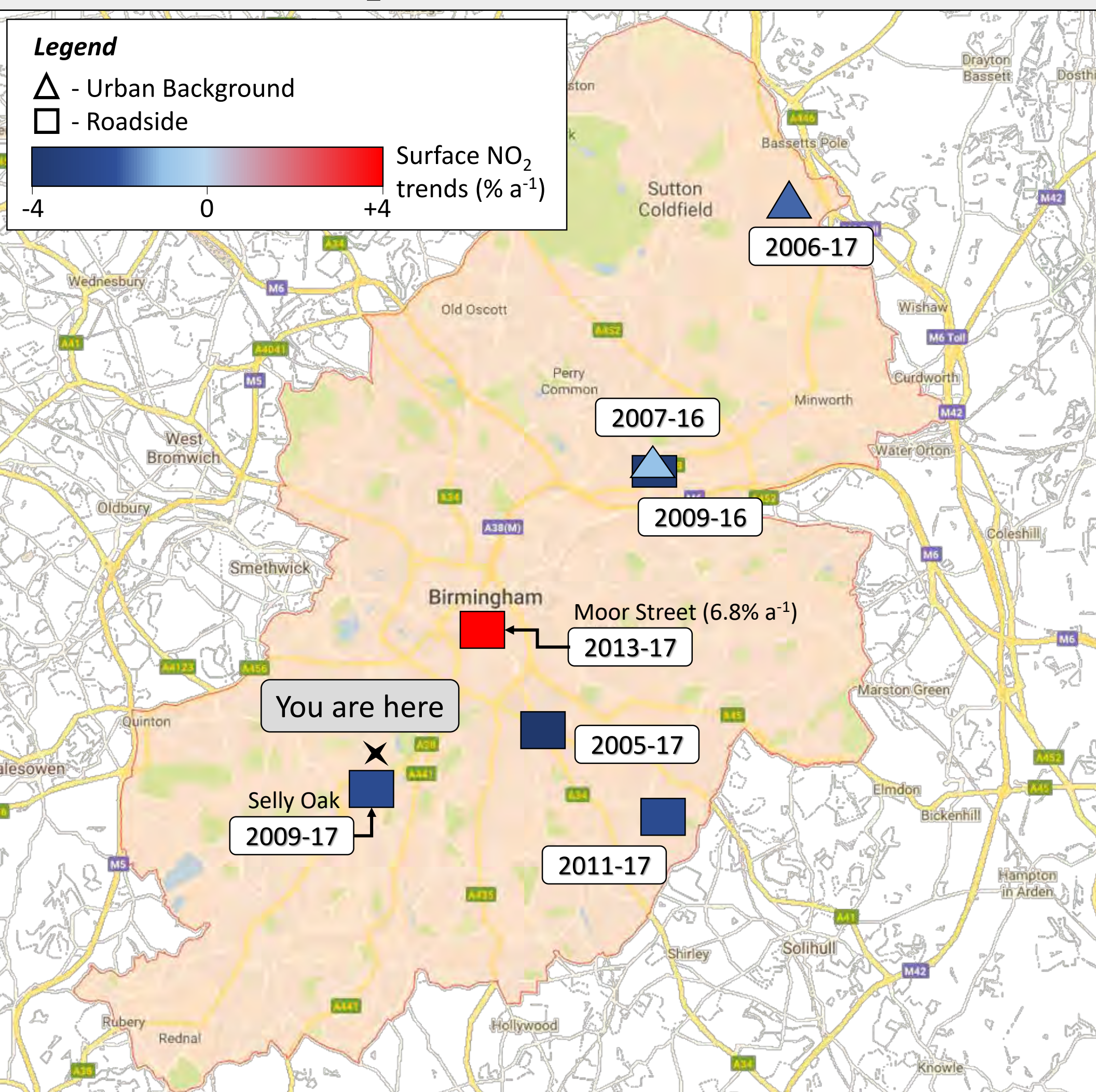
- ❑ In Birmingham, concentrations of the air pollutant **nitrogen dioxide ( $\text{NO}_2$ )** routinely exceed levels safe for our health
- ❑ Space-based instruments provide long-term (2005-2017) observations of  $\text{NO}_2$  to assess and develop prescient policy
- ❑ Here we validate and use satellite observations to assess air quality in Birmingham

## 2. METHODOLOGY

- ❑ Validate satellite observations of  $\text{NO}_2$  from the **Ozone Monitoring Instrument (OMI)** with Birmingham City Council ground-based observations
- ❑ Quantify the long-term (2005-2017) trend in OMI  $\text{NO}_2$

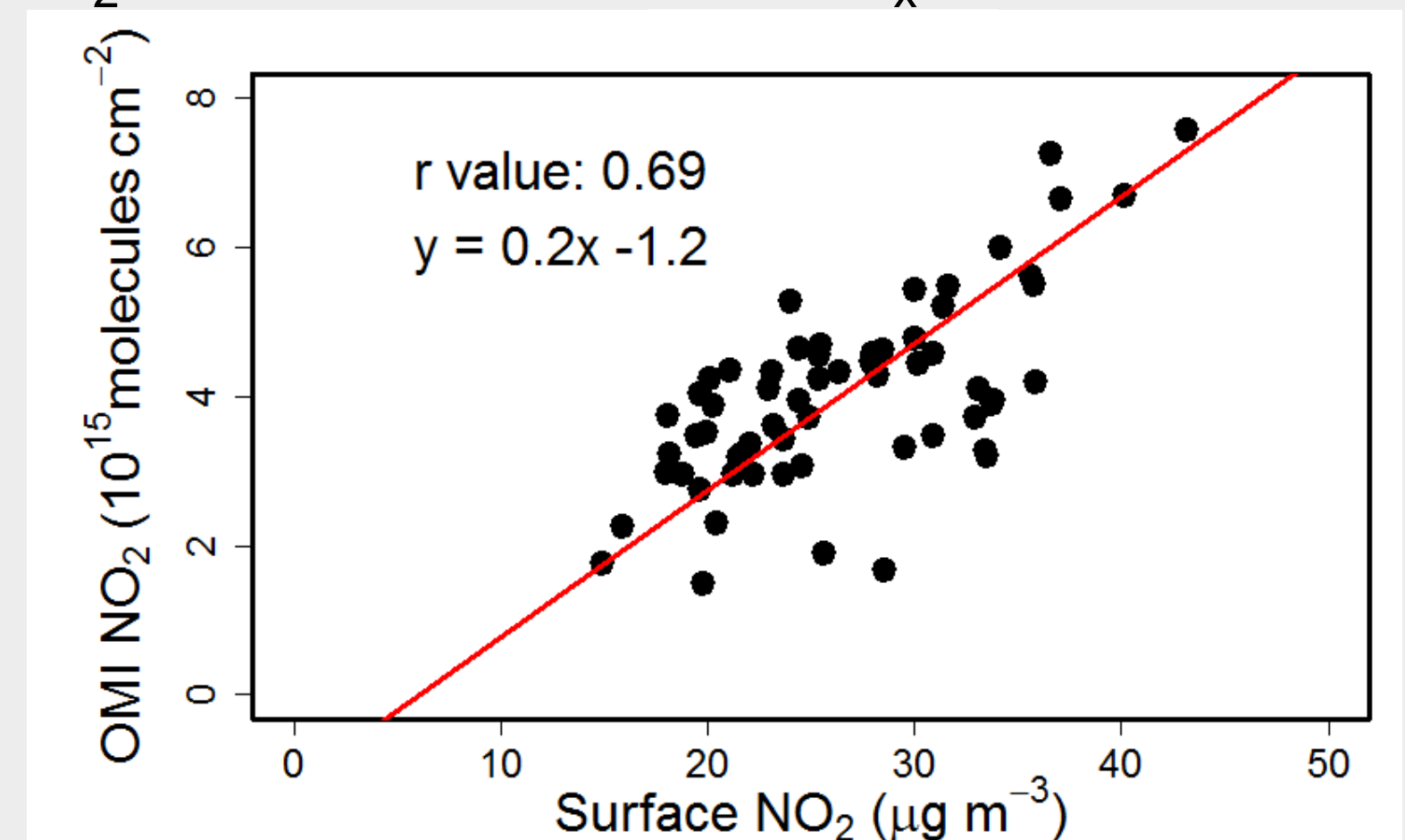
## 3. SURFACE MONITORING OF $\text{NO}_2$

- ❑ Sites are spatially correlated and so can be used to obtain a city-wide average  $\text{NO}_2$  concentration to validate OMI  $\text{NO}_2$



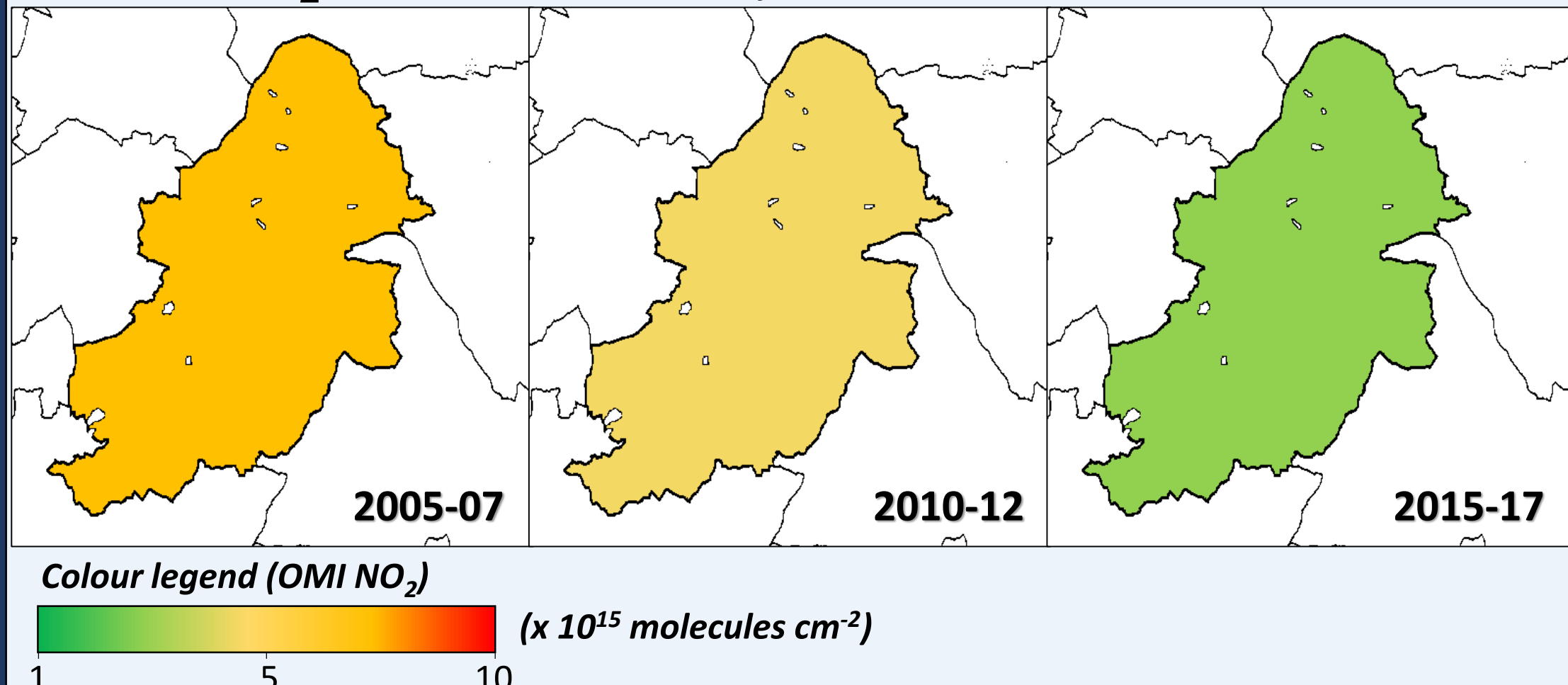
## 4. VALIDATION OF SATELLITE OBSERVATIONS

- ❑ Surface and OMI  $\text{NO}_2$  are temporally correlated ( $R = 0.69$ )
- ❑ OMI  $\text{NO}_2$  can be used to infer  $\text{NO}_x$  trends in Birmingham



## 5. OMI $\text{NO}_2$ TRENDS IN BIRMINGHAM

- ❑ OMI  $\text{NO}_2$  has decreased by 39% over the last decade



## 6. DISCUSSION

- ❑ Surface sites provide detailed information about spatial variability in  $\text{NO}_2$ , but are sparse and periodic
- ❑ Consistent satellite and ground-based  $\text{NO}_2$  during a short period of overlap (2011-2016) give us confidence to apply satellite observations to monitor air quality in Birmingham
- ❑ We find from OMI that  $\text{NO}_2$  has declined by  $3.4\% \text{ a}^{-1}$  from 2005 to 2017, similar to the UK-wide decrease in  $\text{NO}_x$  emissions ( $3.9\% \text{ a}^{-1}$ ) and more than the decline in London ( $1.4\% \text{ a}^{-1}$ ), Glasgow ( $0.9\% \text{ a}^{-1}$ ) and Cambridge ( $2.3\% \text{ a}^{-1}$ ) for 2005-2016 determined with surface  $\text{NO}_2$  observations

## 7. NEXT STEPS

- ❑ Similar validation to be completed for satellite observations of other air pollutants namely ozone, sulfur dioxide, carbon monoxide and particulate matter in Birmingham
- ❑ Apply this approach to monitor rapidly developing cities like **New Delhi**, **Kathmandu**, **Jakarta**, **Ontisha**, **Johannesburg** and **Sao Paulo**



## 30 SECOND SUMMARY



## REFERENCES

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