



Centre for Environment and Health

**KING'S**  
*College*  
**LONDON**

# Impact of flight ban on air quality around airports

## An initial analysis



Ben Barratt, Gary Fuller, David Carslaw, Martin Williams, Sean Beevers

King's College London

# Air quality around airports

- Impacts of air pollution around airports is the subject of considerable controversy.



Photo: Evening Standard

- Issue is keenly felt at Heathrow (T5, 3rd runway) and to a lesser extent at Gatwick and other airports.



# Air quality around airports

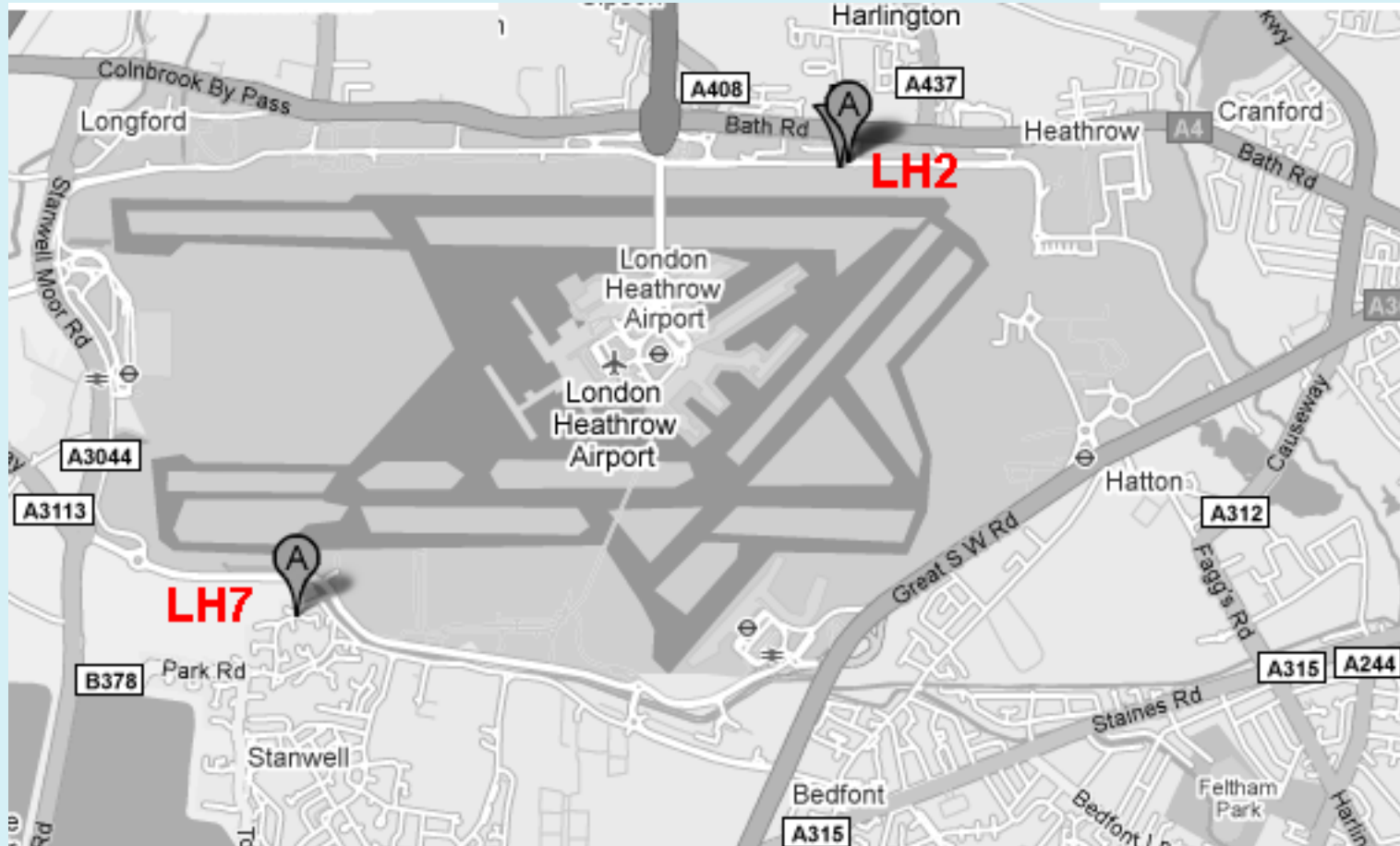
- UK airspace was closed to all flights at noon on Thursday 15th April, 2010 for six days.
- A unique natural experiment providing an opportunity to quantify aircraft and airport-related emissions on air quality surrounding airports in the UK and across Europe.
- Clearly demonstrate the impact of airports in a straightforward way without recourse to emission inventories and dispersion modelling.



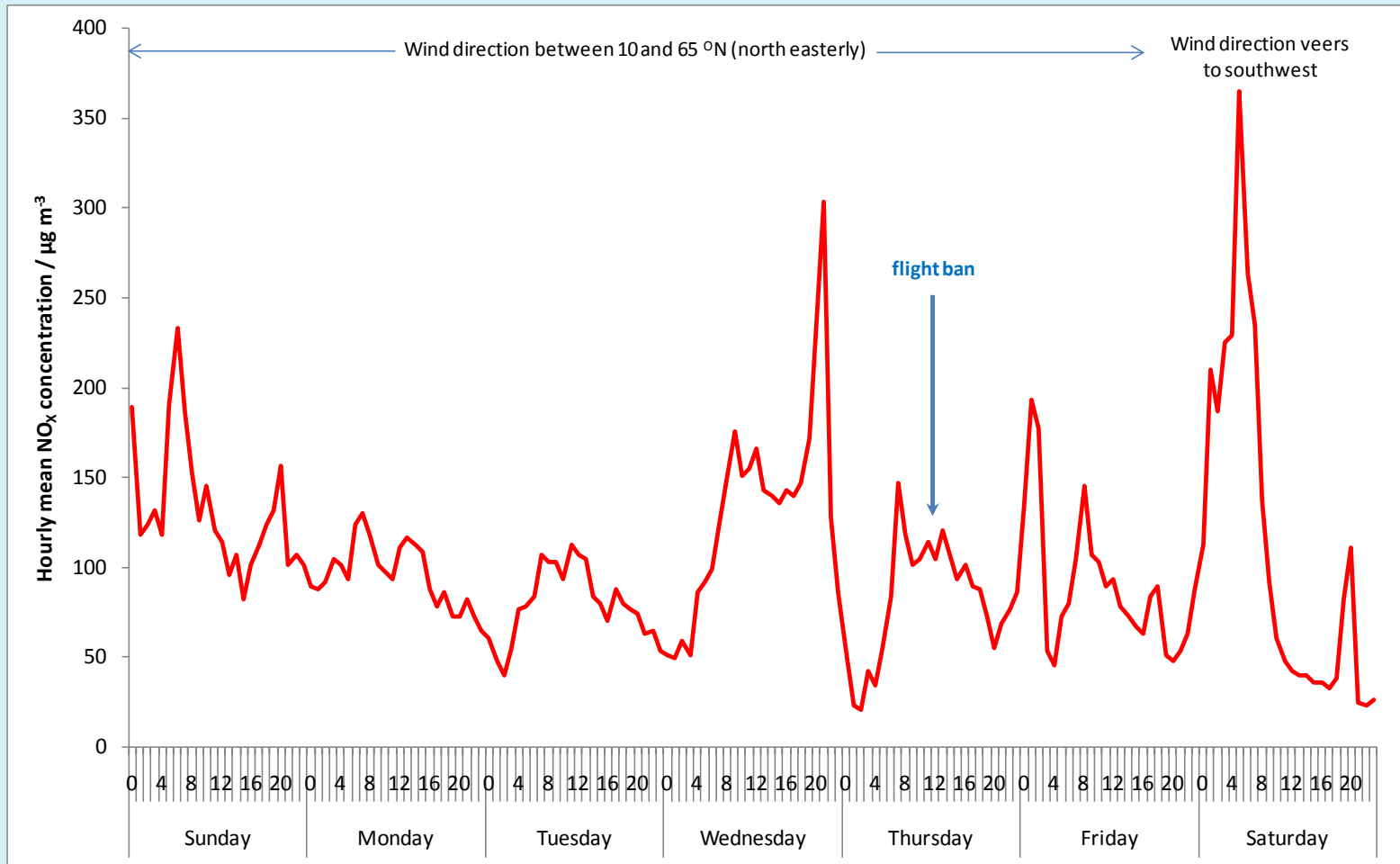
# Initial cross-sectional study

- Rapid straightforward analysis in response to enquiries
- Easily interpretable
- Scientifically sound to avoid misrepresentation
- Independent of airport operators and other interest groups
- Prelude to a more detailed analysis
- Unexpected level of media exposure

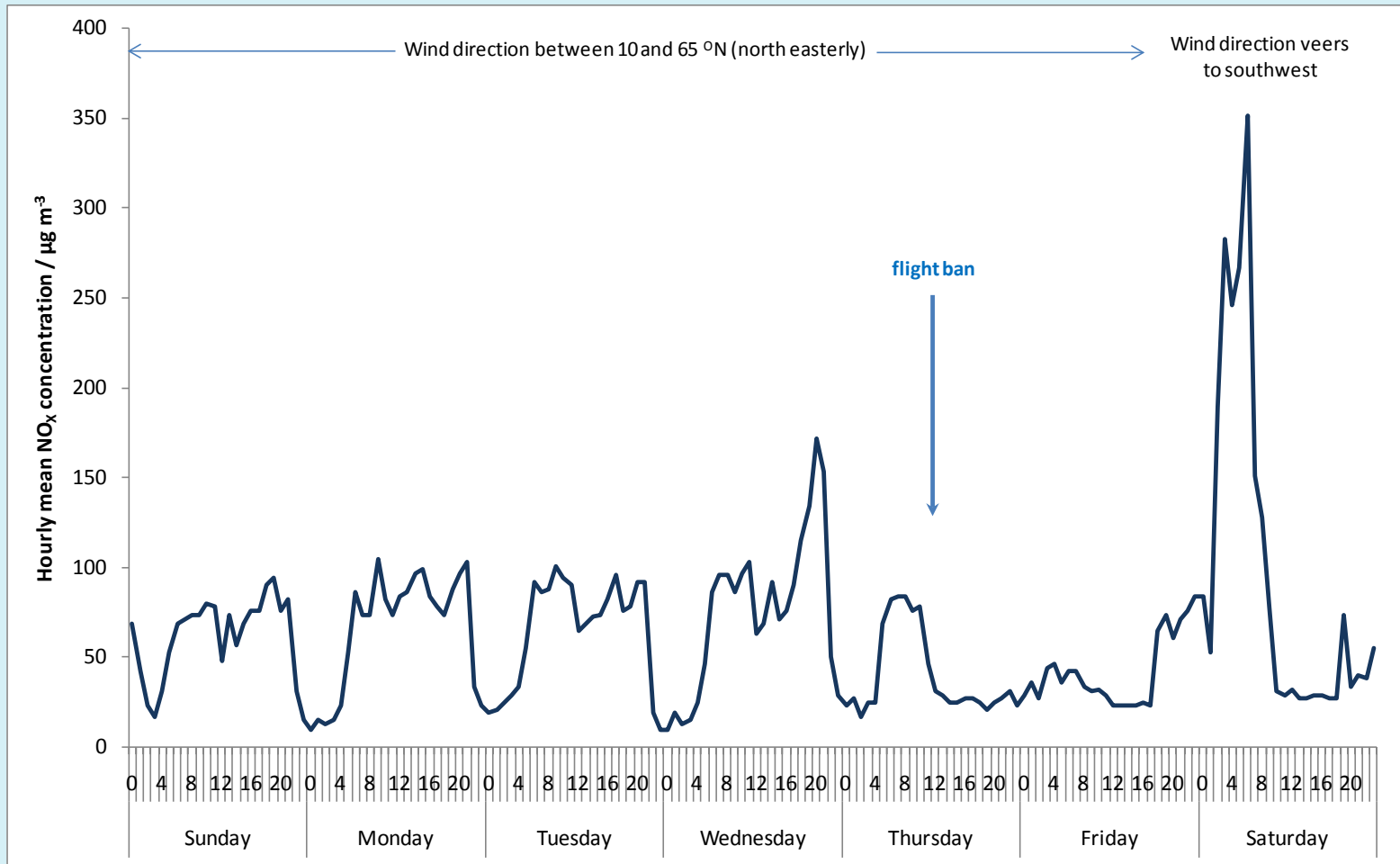
# Over simplistic approach...



# Heathrow northern perimeter NO<sub>x</sub>



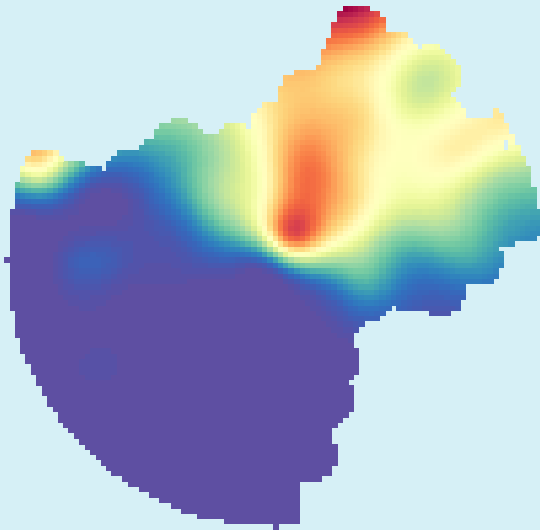
# Heathrow southern perimeter NO<sub>x</sub>



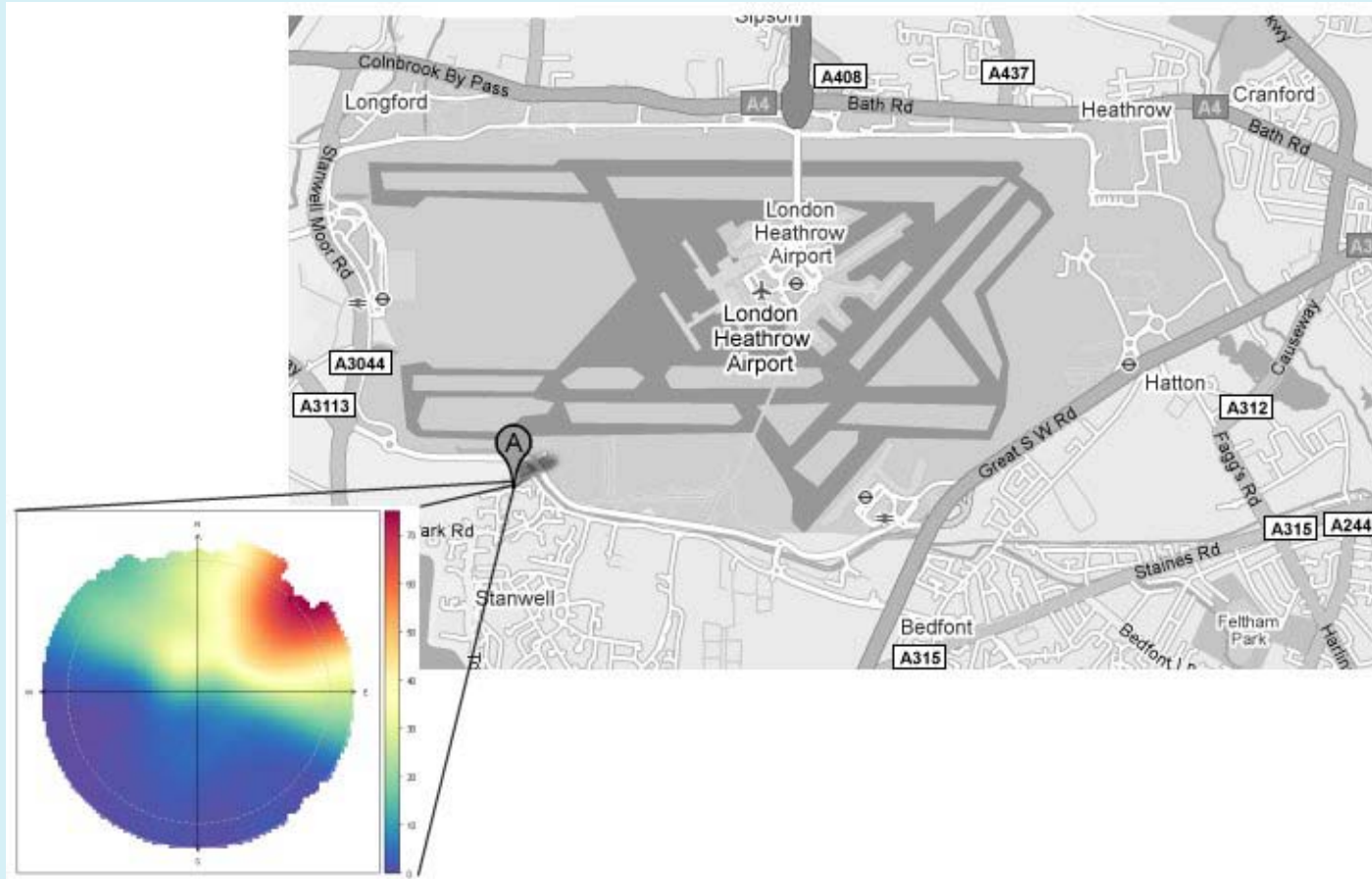
# Initial cross-sectional study

- Analysed NO<sub>x</sub> and NO<sub>2</sub> concentrations surrounding Gatwick and Heathrow 15<sup>th</sup> to 17<sup>th</sup> April 2010.
- Method relies on:
  - Paired upwind and downwind sites
  - Stable wind direction
  - Long historical dataset
- Does not account for:
  - Changes in emissions outside of airport (traffic)
  - Meteorological conditions other than wind
  - Continued activities within the airport perimeter

# Air quality around airports - Gatwick

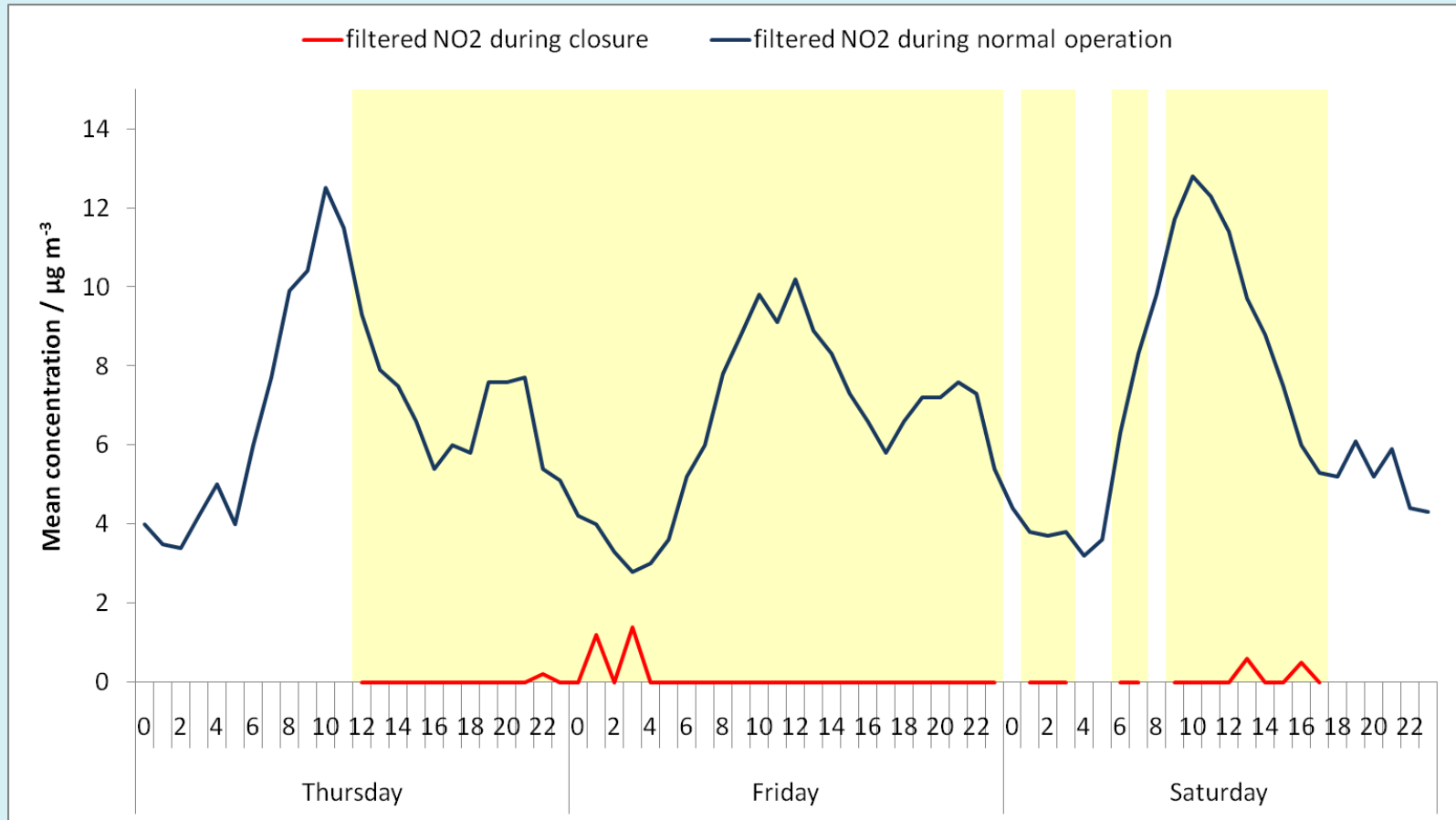


# Air quality around airports - Heathrow



# Air quality around airports – Gatwick

0600 to 2200 wind direction filtered



# Air quality without the airports

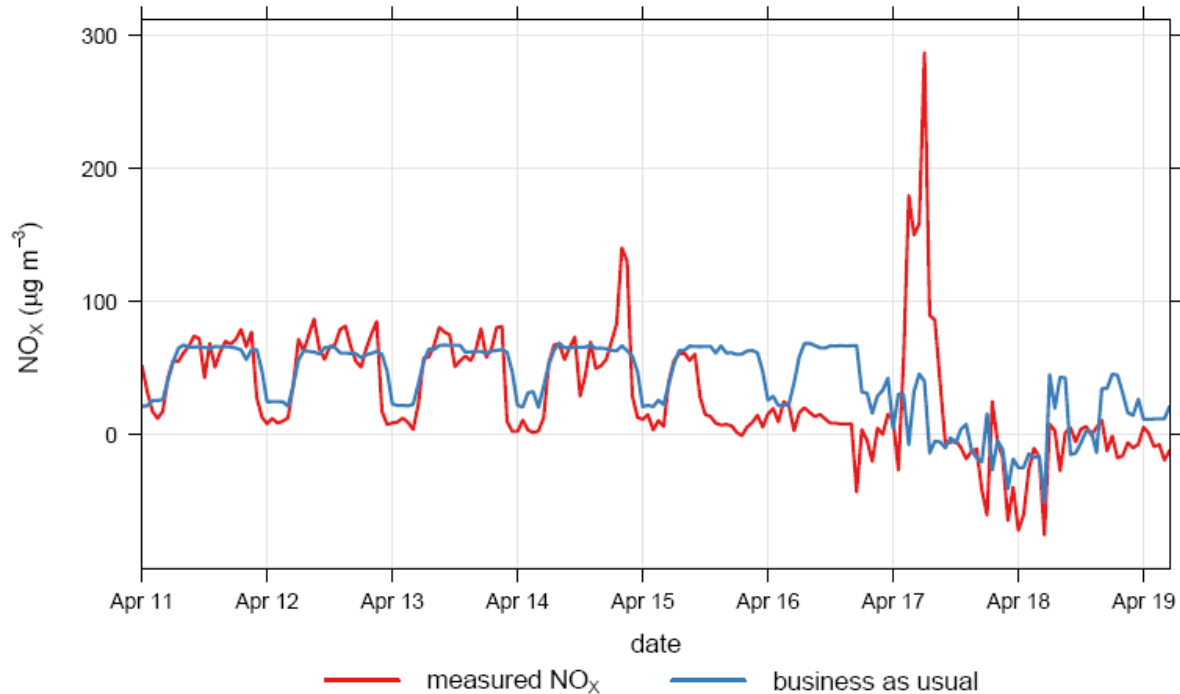
- Measured annual mean NO<sub>2</sub> (2009) to the south west:
  - Gatwick - would decrease from 18  $\mu\text{g m}^{-3}$  to approximately 16  $\mu\text{g m}^{-3}$ .
  - Heathrow – would decrease from 33  $\mu\text{g m}^{-3}$  to approximately 30  $\mu\text{g m}^{-3}$ .
  - Greater effects to the north west due to wind frequency.

# Ongoing detailed analysis

- Use and develop several techniques that King's has available specifically for this type of analysis:
  - Airport transect analysis.
  - Other airports in UK and Europe.
  - Accounting for meteorology when assessing trends using statistical models.
  - The use of King's College/University of Leeds openair tools ([www.openair-project.org](http://www.openair-project.org)) to characterise the changes e.g. polar plots.

# Ongoing detailed analysis

(Carslaw and Taylor 2009)



**Figure 2:** Increment of NO<sub>x</sub> above background at Oaks Road before and during the flight ban. The measured NO<sub>x</sub> shows what actually happened to concentrations of NO<sub>x</sub> and the “business as usual” shows the predicted concentrations if activity had continued as normal.

# Detailed analysis outputs

- Quantitatively, what was the effect of the ban on the estimated contribution to concentrations of  $\text{NO}_x/\text{NO}_2/\text{PM}$  by source type e.g. aircraft/airport activities/road transport?
- Spatially, where can the flight ban be detected?
- What would be the effect of a flight ban expressed as annual means?
- Is it possible to comment on the nature of aviation emissions/dispersion that have hitherto been impossible e.g. plume dispersion, jet buoyancy effects?
- Do these answers agree with or contradict existing knowledge with respect to the main source contributions, and what are the air quality management implications?

# Conclusions

- The flight ban did have an identifiable effect on air quality surrounding airports.
- More detailed analysis is required for policy advice.
- Timely but simple analysis outputs can generate a huge amount of media interest.
- Outputs must be robust and show their limitations.
- Don't underestimate the power of a web site news item – the media bandwagon is self propagating.
- You will be misquoted!
- There is not an even playing field in the public vs. private sector.



Thank you  
[benjamin.barratt@kcl.ac.uk](mailto:benjamin.barratt@kcl.ac.uk)