# DEMONSTRATING TECHNIQUES FOR AIR-POLLUTION-SOURCE PERFORMANCE ASSESSMENT


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# Outline

- Existing air-quality data – limited exploitation
- Future air-quality data – scope for better exploitation
- Air-quality knowledge transfer to practitioner bodies
- Case study approach

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- Case study 1 – Power station (Aire Valley)
- Case study 2 – Road (M4)
- Conclusions: Measures of success

# Current air-quality data: monitoring effort

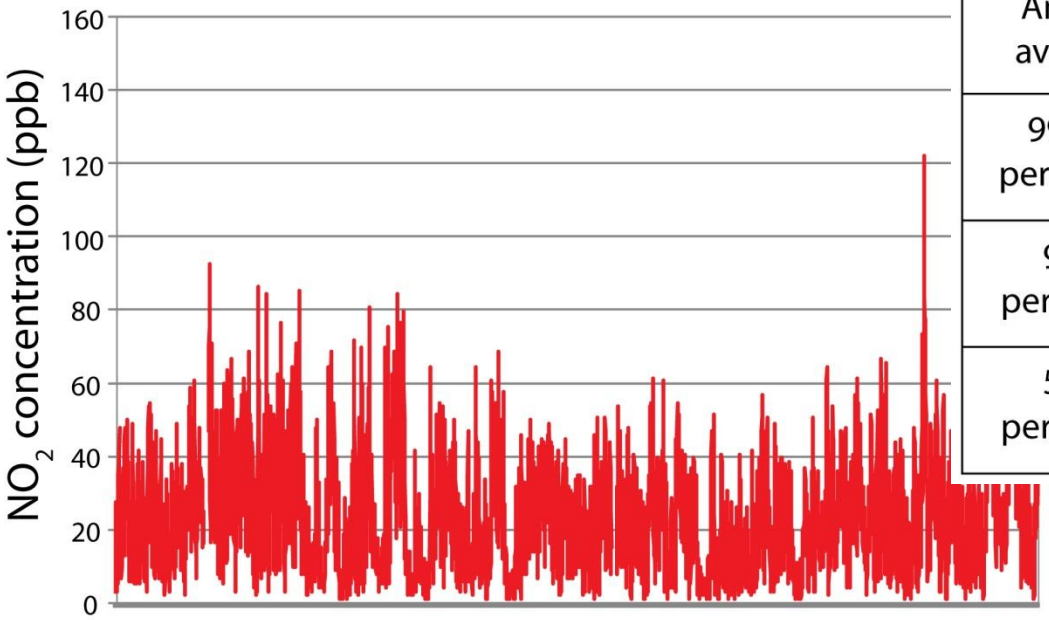
- National Air Quality Strategy 1997 ⟶
- Local authority monitoring and air-quality management
- Automatic monitoring effort for key pollutants (2005)

| ***Pollutant*** | ***Sites*** | ***Areas*** |
|---|---|---|
| $NO_2$ | 111 | ~ urban |
| $PM_{10}$ | 72 | ~ urban |
| $SO_2$ | 76 | ~ rural & urban |
| $PM_{2.5}$ | ↑ | ~ urban |

# Current air-quality data: exploitation

Informatics potential of air-quality data not exploited:

- Ambient monitoring used to plot time-series and calculate summary statistics
- Limited data 'mining' of an expensive resource
- Greater informatics potential to be exploited, e.g. source performance trends




| | |
|---|---|
| Annual average | 23.5 ppb |
| 99.9th percentile | 99.6 ppb |
| 98th percentile | 60.8 ppb |
| 50th percentile | 21.8 ppb |

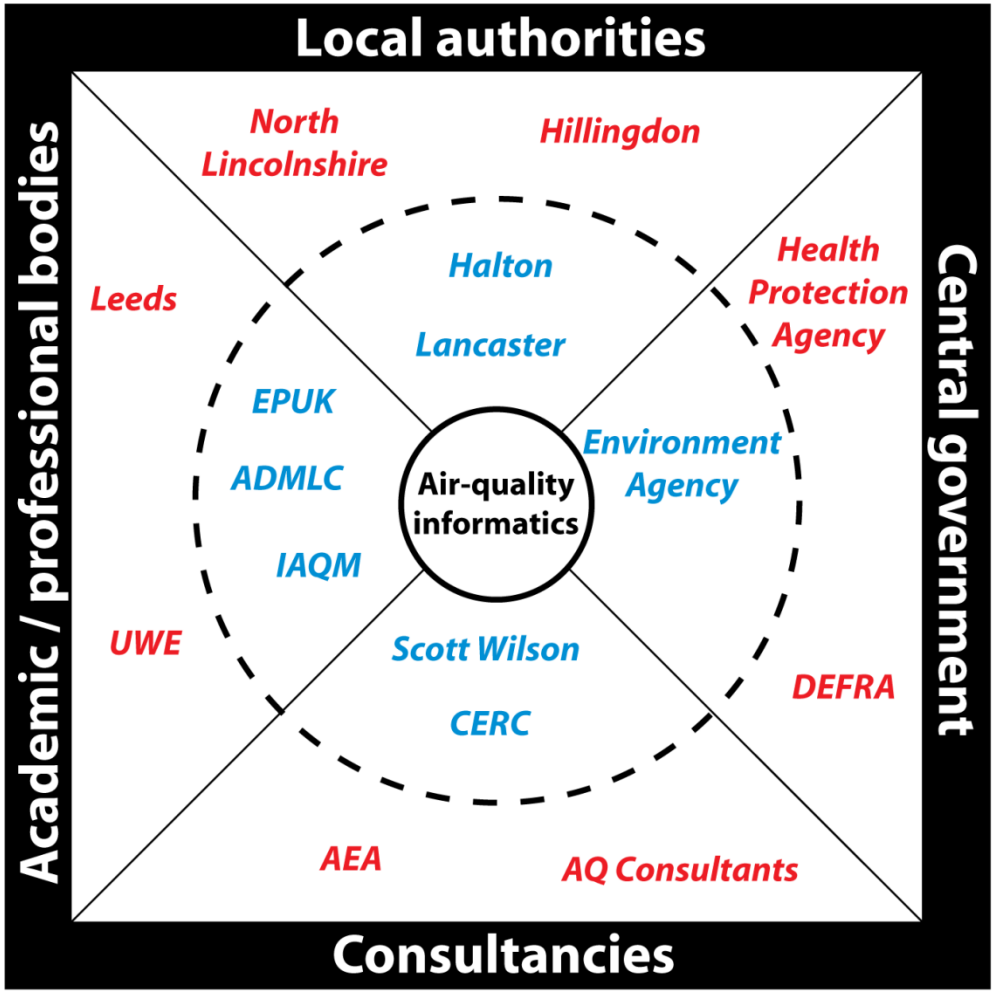
London Hillingdon (2007)

# Future air-quality data exploitation

- Regular tracking of individual source impacts
- Distinguish between meteorological and source variations
- Early warning of progress on policy interventions
- ‘Smarter’ monitoring networks which are more cost effective
- Better overview for new directives, e.g. ‘exposure-reduction’

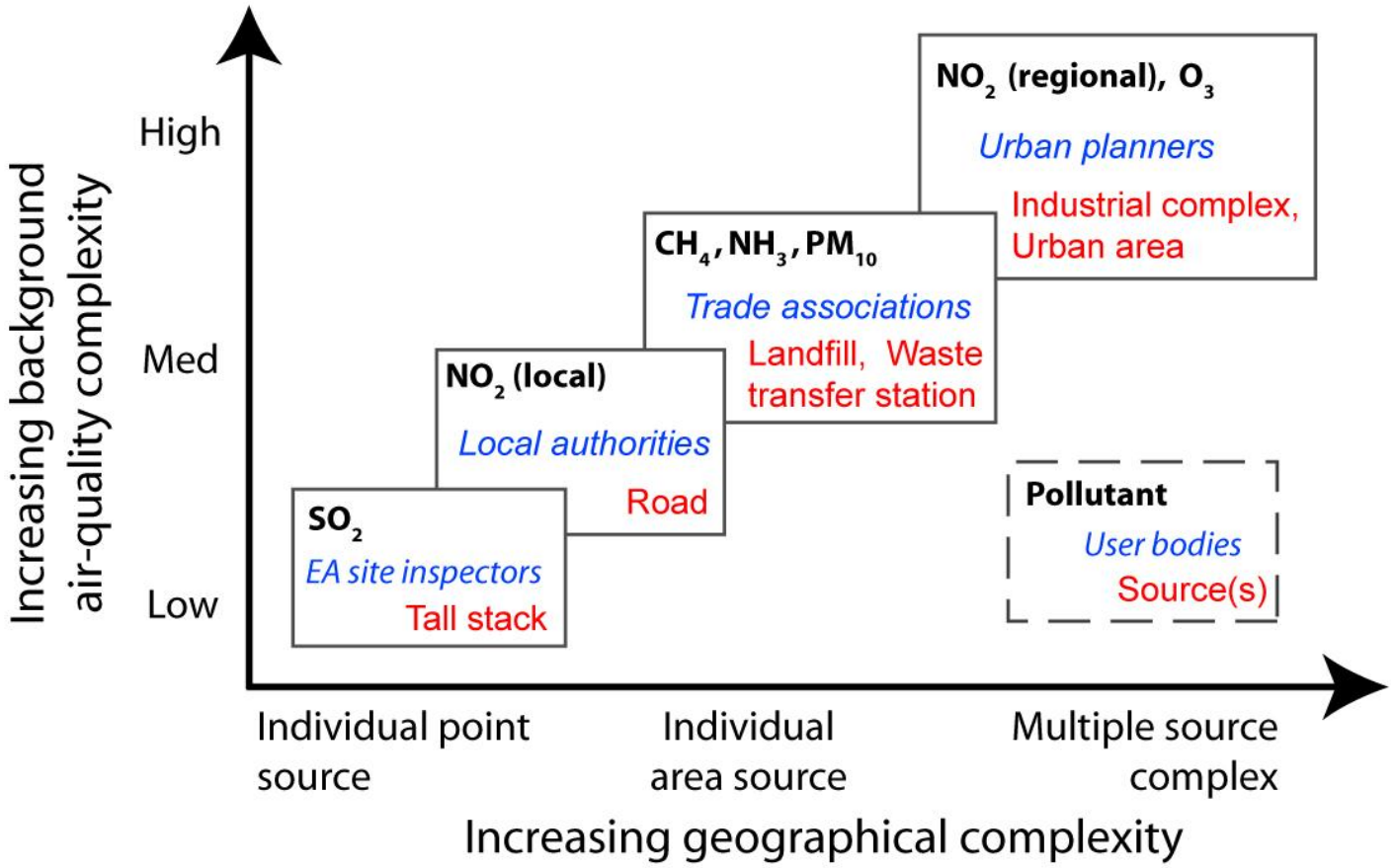
# Knowledge Transfer (1)

- Engagement with users - our approach:
- Share real-world case studies:
  - Existing portable and representative cases
  - New investigations
  - Partnerships with field teams
  - More informed air-quality management decisions
- Disseminate through:
  - existing user-group networks
  - a designated website

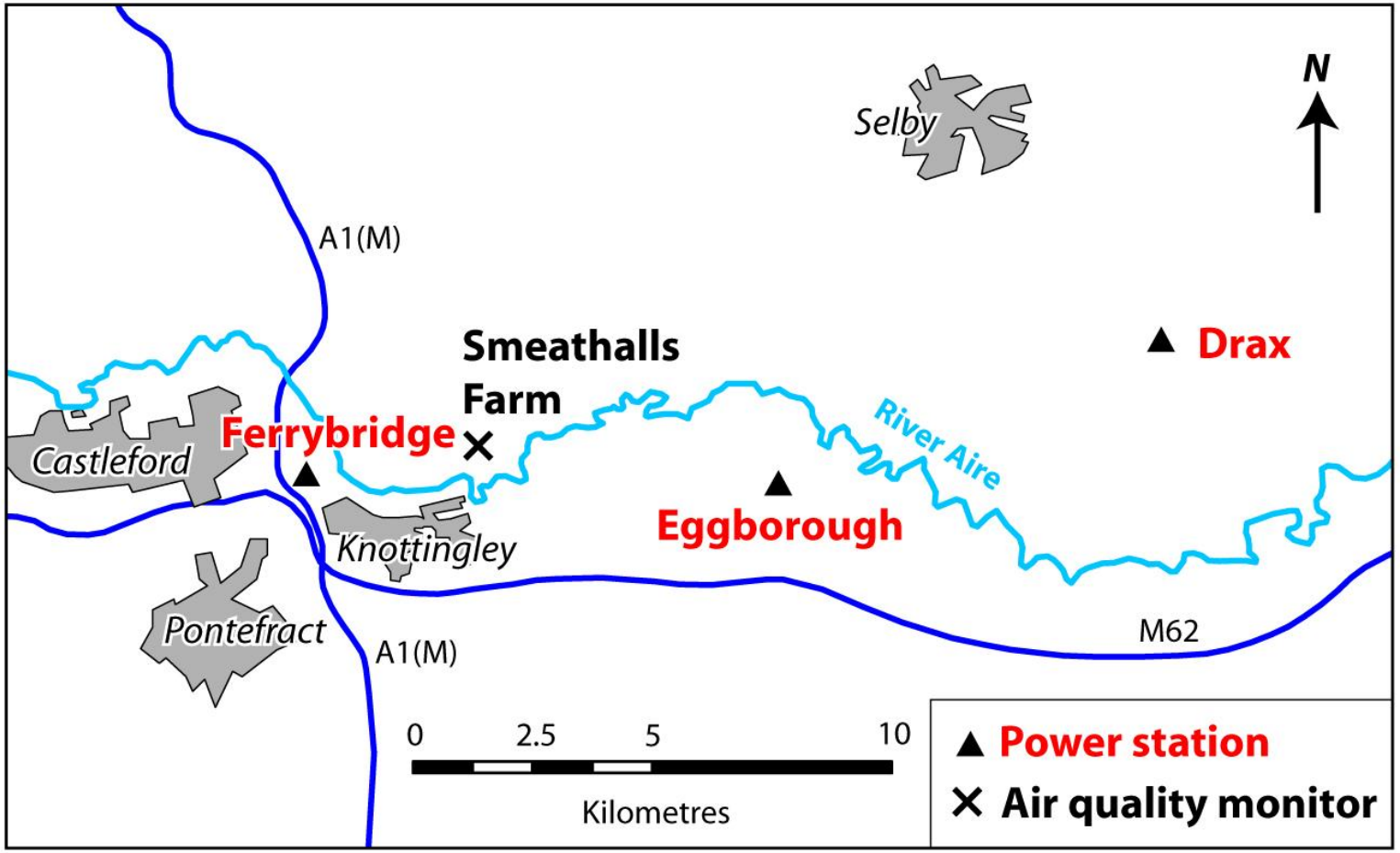


# Knowledge Transfer (2)

- Better aerometric analysis: simple ⟶ complex cases:

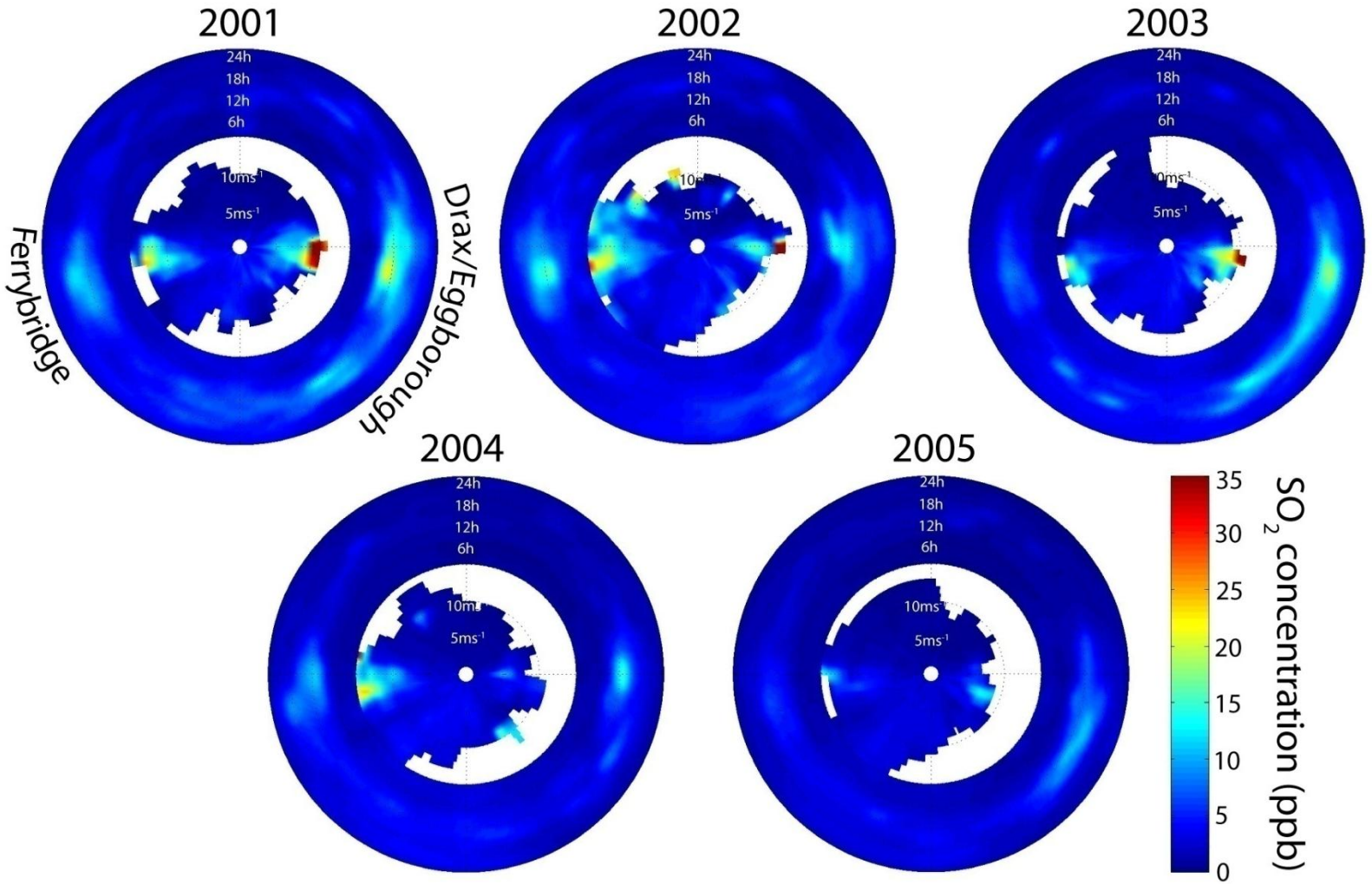


# Case Study 1:
## Ferrybridge Power Station

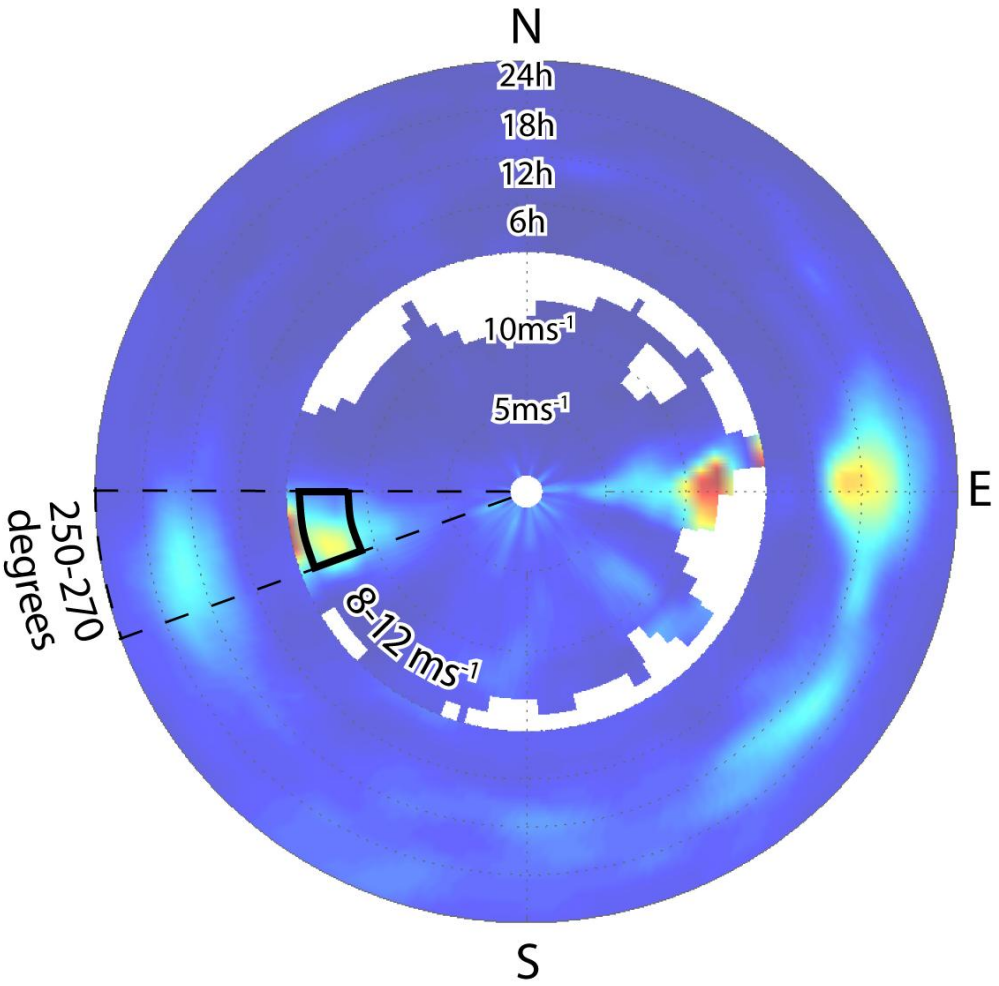


# Case Study 1:

## Ferrybridge Power Station: Smeathalls Farm monitor



# Case Study 1:
## Ferrybridge Power Station: Smeathalls Farm $SO_2$




Conditional 'window' defined by:

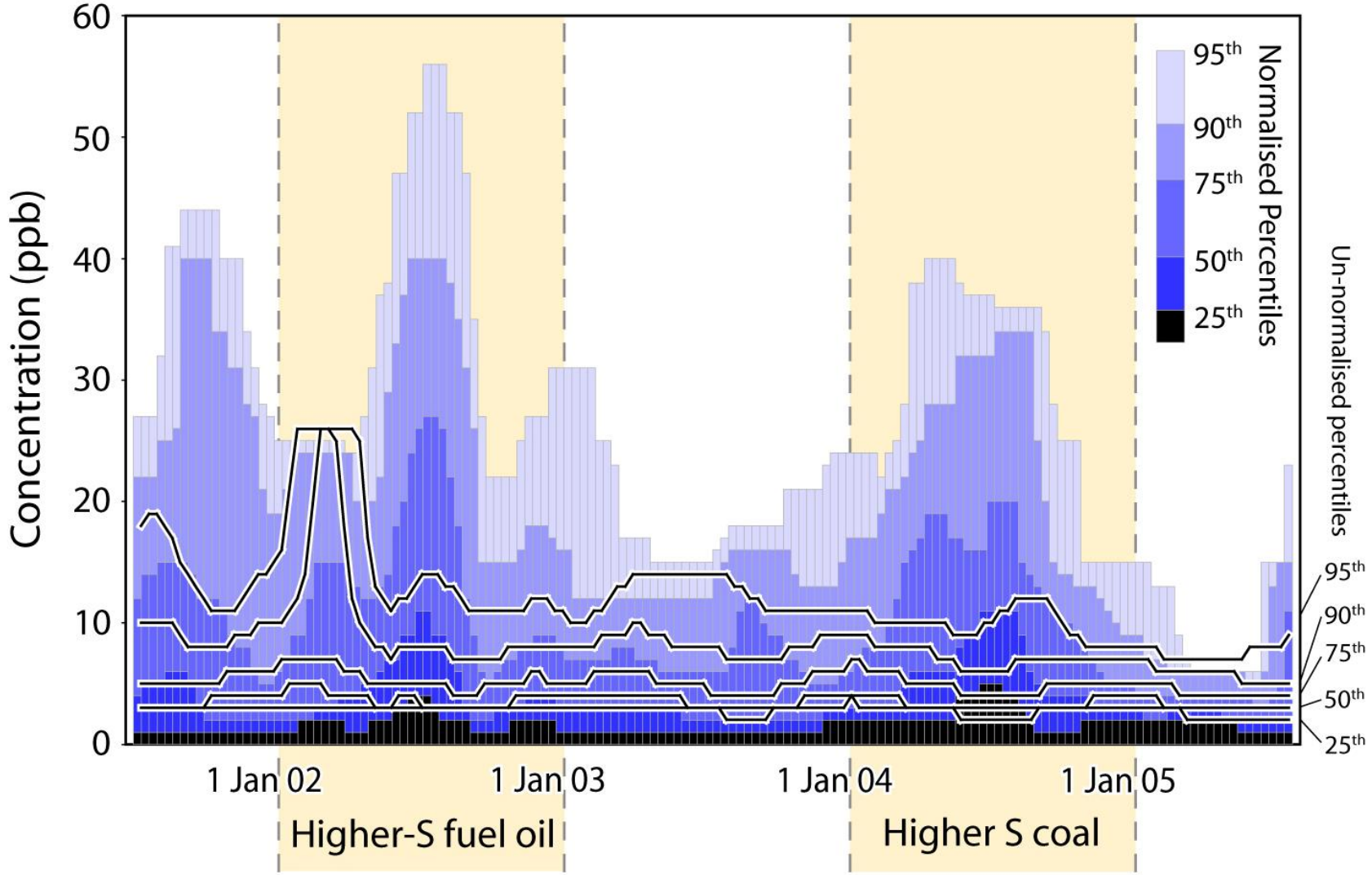
***a) wind direction***

(250-270 degrees)

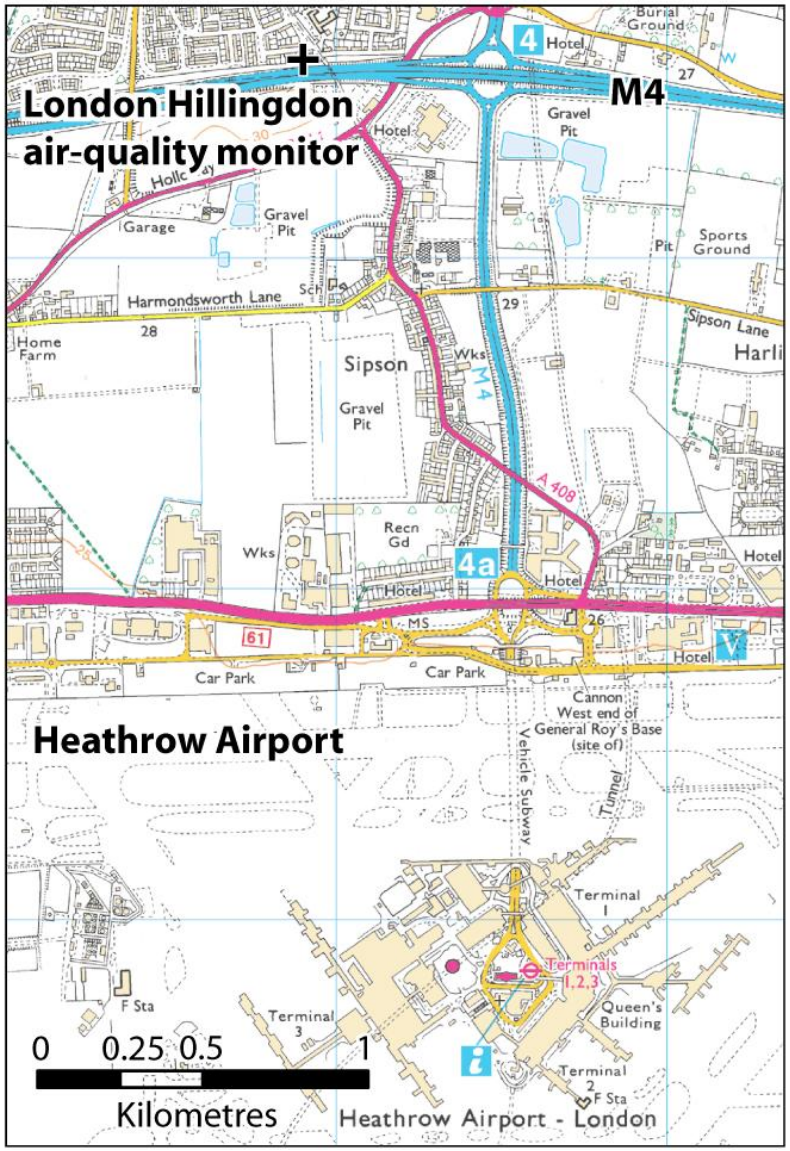
***b) wind speed***

(8-12ms$^{-1}$)

# Case Study 1:
## Ferrybridge Power Station

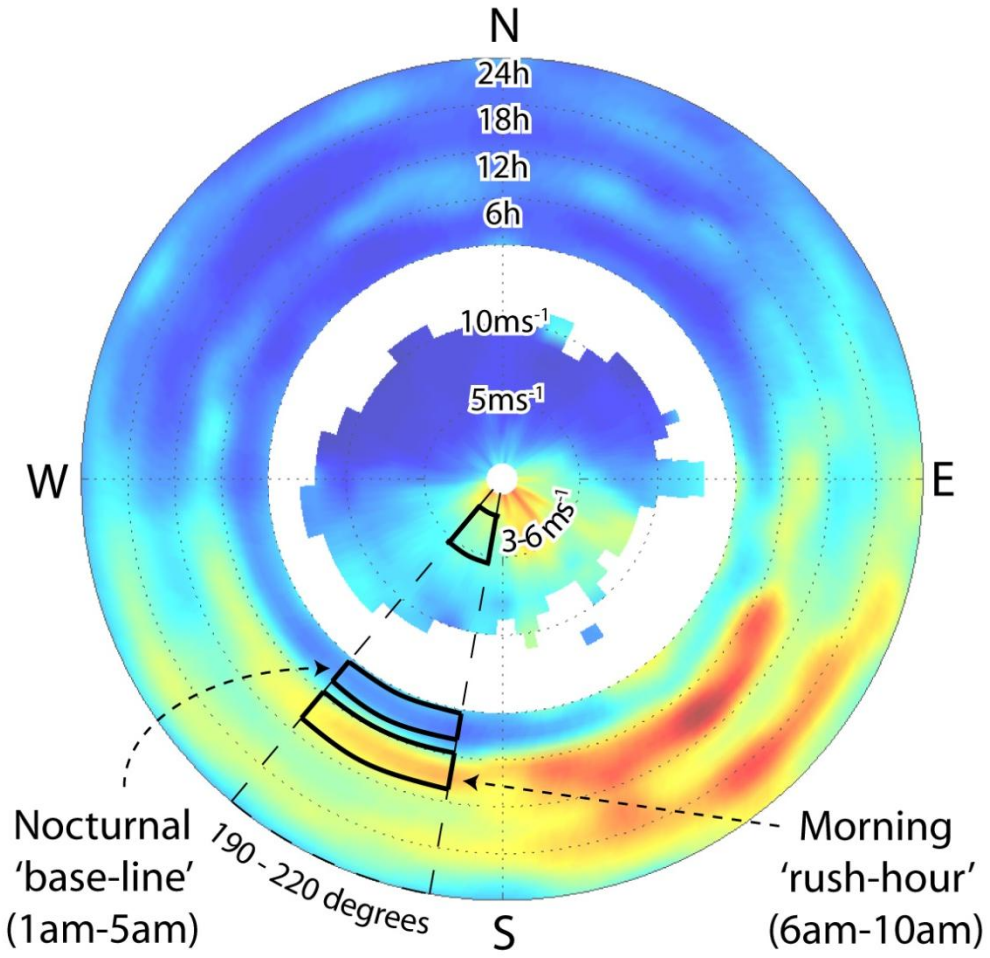


# Case Study 2: M4 traffic




NOx and $NO_2$ near the M4 motorway, London Hillingdon

# Case Study 2: M4 traffic:
## London Hillingdon $NO_2$




Conditional 'window' defined by:

***a) Time-of-day***

(nocturnal 'base-line' 1-5am)

(morning 'rush-hour' 6-10am)

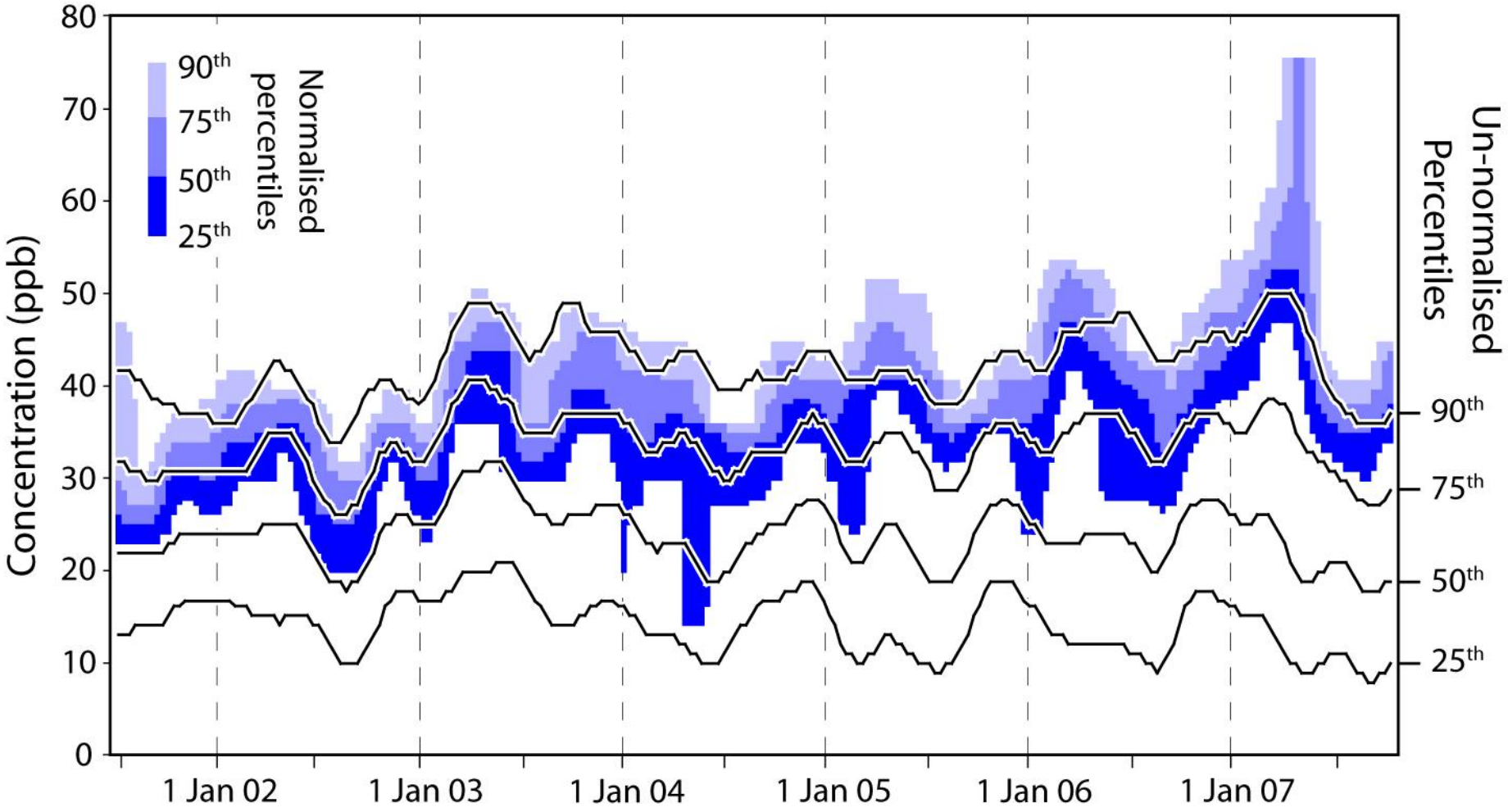
***b) Wind direction***

(190-220 degrees)

***c) Wind speed***

(3-6 $ms^{-1}$)

# Case Study 2: M4 traffic



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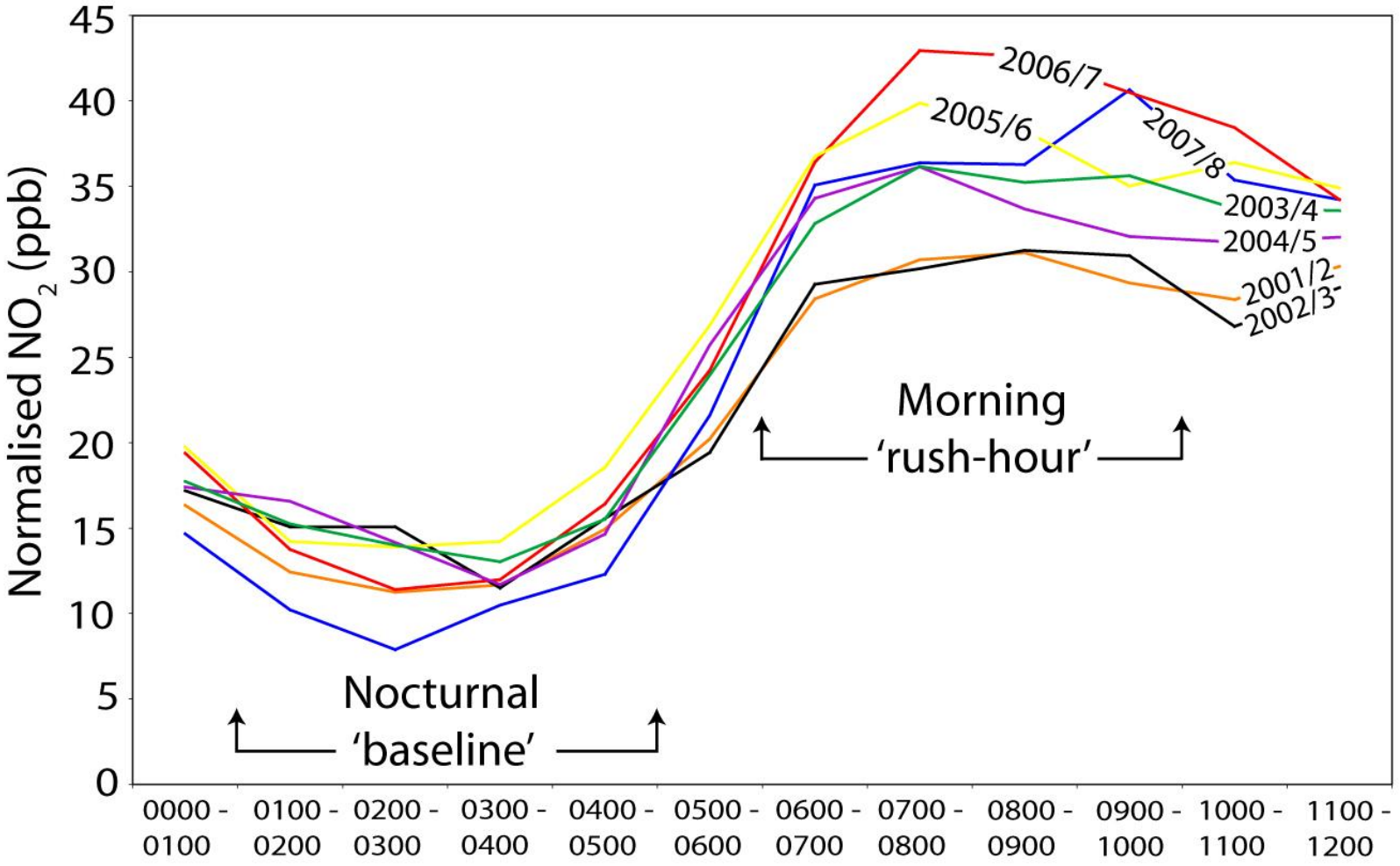
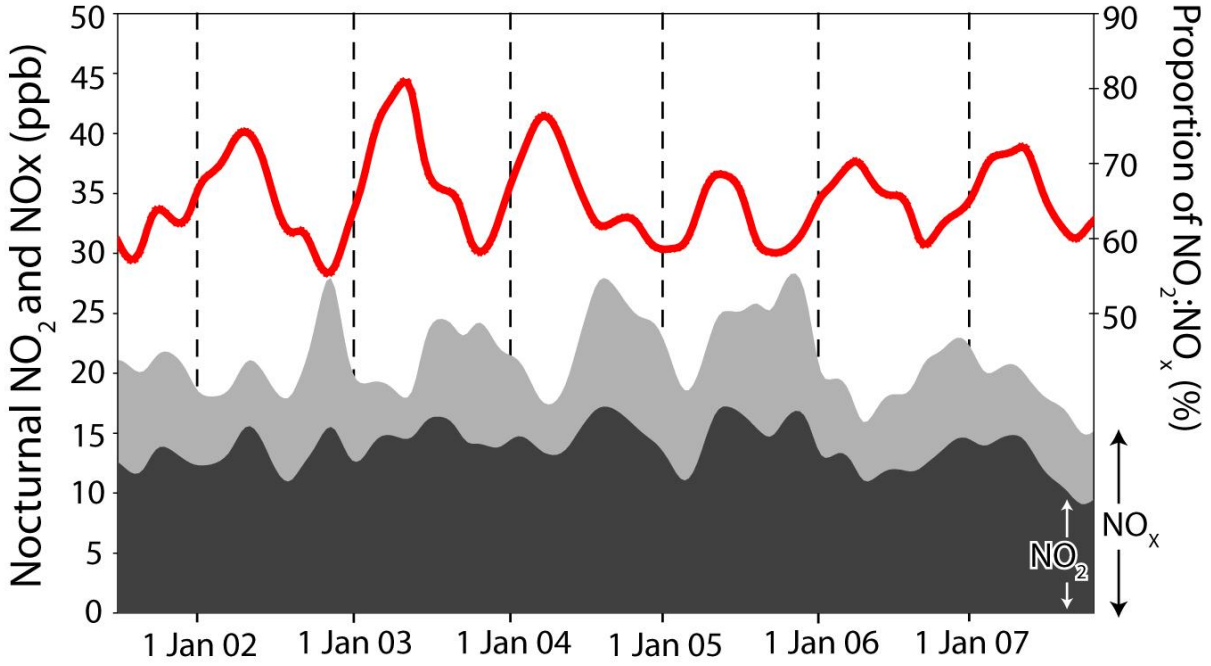
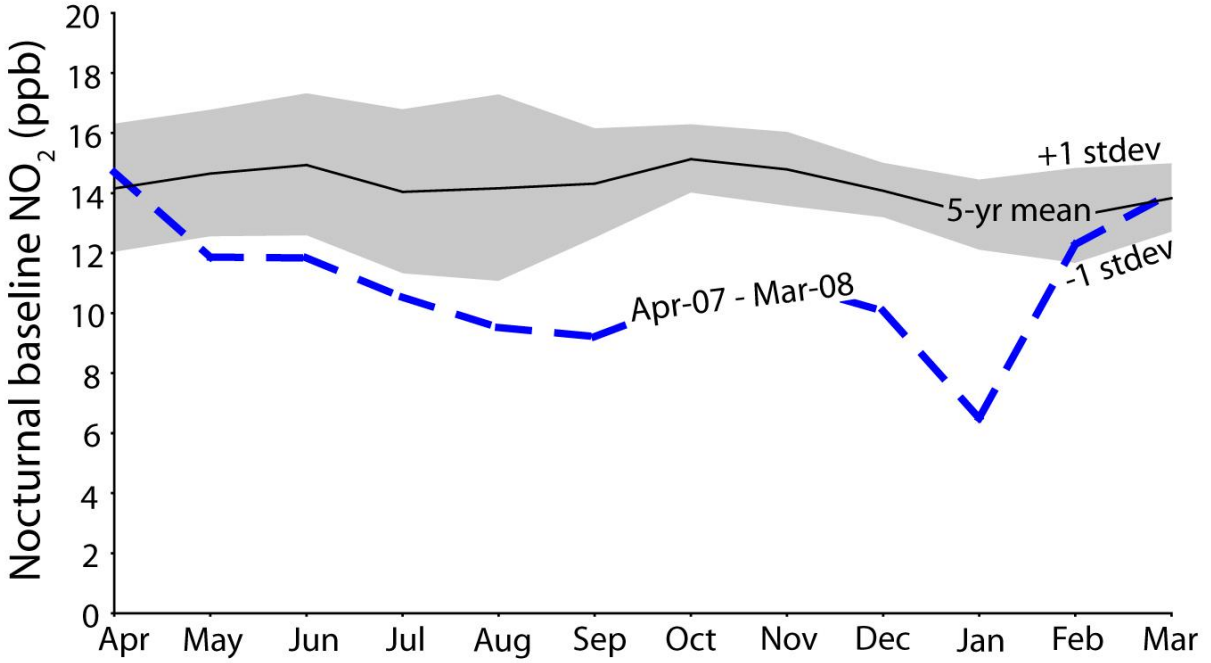
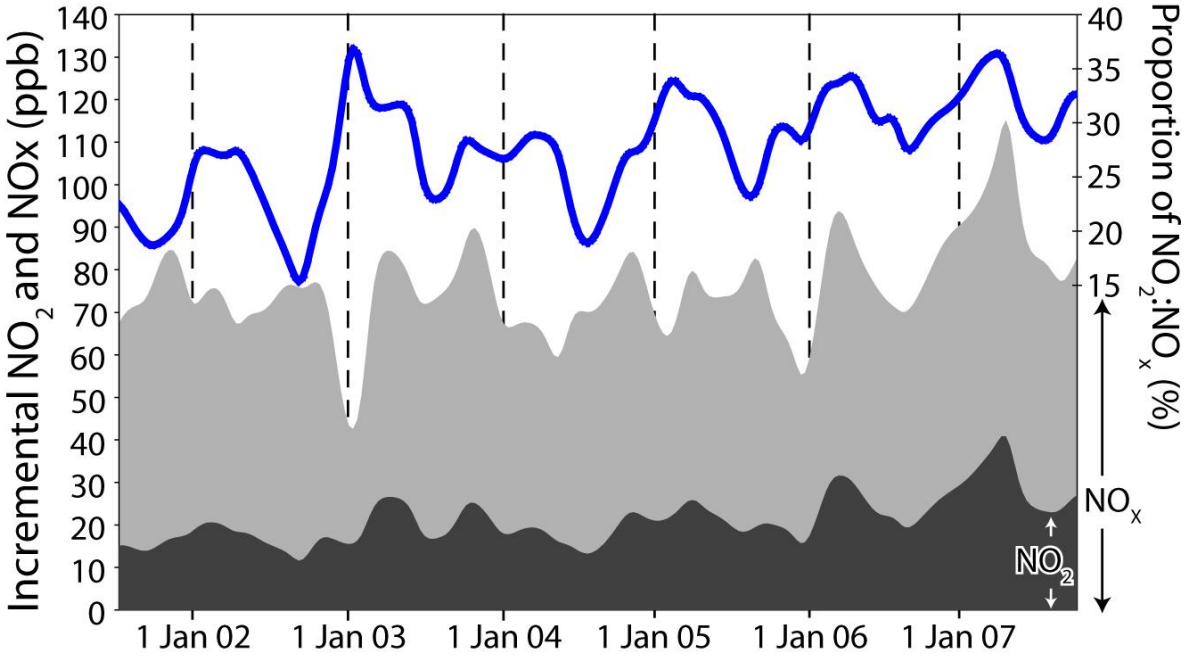




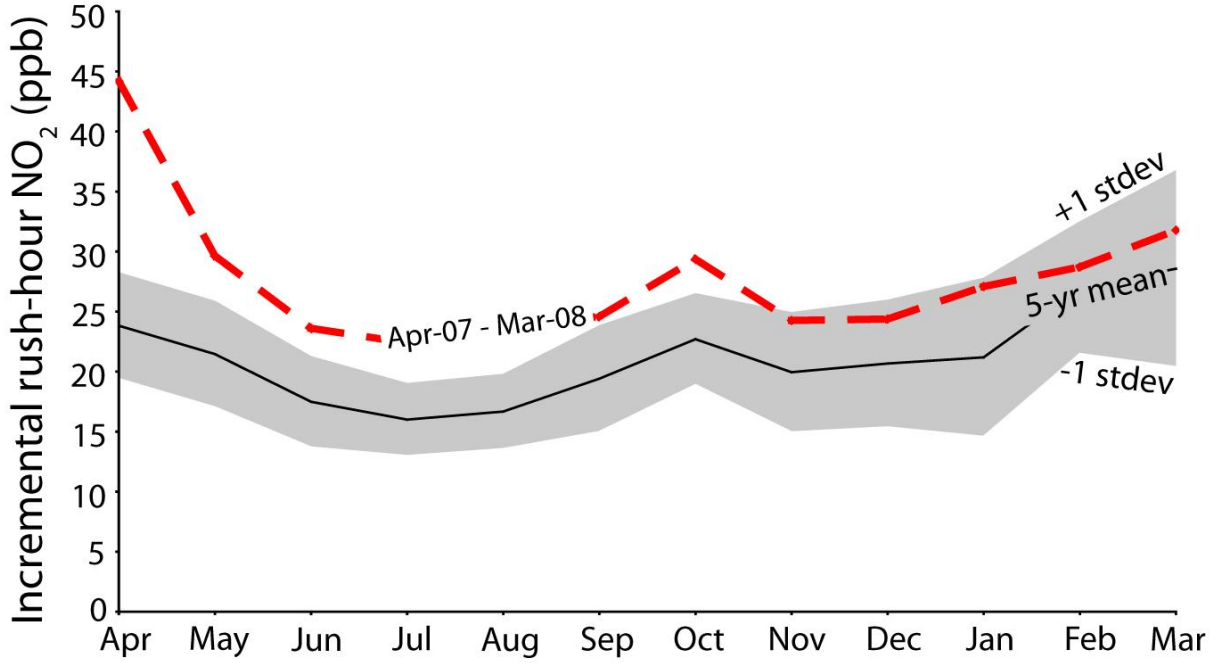

Trends in normalised (absolute) nocturnal 'base-line' NOx, $NO_2$ and $NO_2$:NOx ratio




Monthly variation and performance tracking of nocturnal $NO_2$




Trends in normalised incremental 'base-line' NOx, $NO_2$ and $NO_2$:NOx ratio




Monthly variation and performance tracking of incremental $NO_2$

# Other case studies:

- BT Tower – platform surveillance
- Landfills – inferred emissions
- Shipping – air quality in ports
- CMAQ – conditional validation of new ‘one-atmosphere’ models

# Conclusions: Measures of success

- Practioners aware
- Example archive
- Explanatory documentation
- Professional bodies engaged
- Systematic informatics
- Users take ownership
- Services under development
- Routine adoption
- Optimised networks
- Disseminated to user-communities
- Embedded into ‘best-practise’ guidance
- Extension to EU

# Acknowledgements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