

An example of long-range odour transport

Helen Smethurst^(1,2), Claire Witham⁽³⁾, Alan Robins⁽²⁾ and Virginia Murray⁽¹⁾

1. Chemical Hazards and Poisons Division, Health Protection Agency, London.
2. School of Engineering, University of Surrey, UK
3. Met Office, UK

Introduction

Odour pollution and public health

- Incidents of odour pollution
- usually arise from local sources
- long range transport of odours is rare

Described here is an example of a long-range odour incident which has been investigated in order to locate the source and investigate the health consequences

Incident

Incident summary

- On the morning of Friday 18 April 2008, unusual odours/smells were reported from many locations in England and Wales (Figure 1).
- Individuals were concerned about exposure and possible health effects

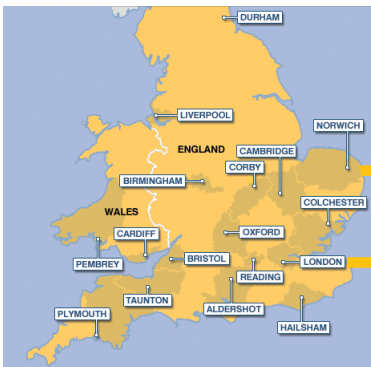


Figure 1. The location of odour reports (Source © BBC)

Weather situation

- During 17-22 April winds were blowing from an easterly direction
- Analysis of charts show relatively tight near-surface isobars over northern France and southern England
- Any pollution would have been rapidly transported from the continent to the UK at this time (Figure 2)

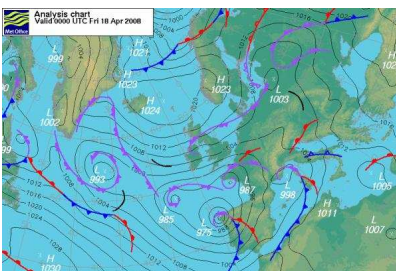


Figure 2. Met Office surface pressure chart for 00:00UTC on 18 April 2008 (© www.metoffice.gov.uk)

Investigation & Research

Back trajectories

- The Met Office's NAME model (Jones et al., 2007) produces both forward and back trajectories
- Back trajectories produced for SE England (Figure 3) show that air had come from Belgium, the Netherlands and Germany
- Air spent time over Germany in relatively slack winds, where pollutants could have accumulated

Acknowledgements

This paper is part of a research project under the Engineering Doctorate (EngD) programme jointly run by the University of Surrey and Brunel University and is funded by the Engineering and Physical Sciences Research Council (EPSRC) and the Health Protection Agency.

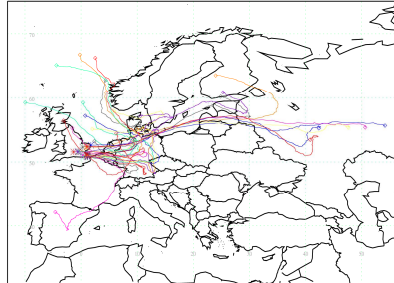


Figure 3. Back trajectory plots showing the transport of air prior to the incident from 6 sites in SE UK at 11:00 BST on 18 April 2008 (© www.metoffice.gov.uk)

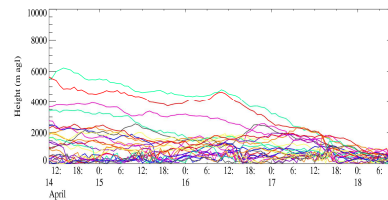


Figure 4. The height plots indicate that much of the transport from the east was in the boundary layer, as these trajectories remain below 2km.

Back trajectories

- Backward runs from London and Norwich (Figures 5 & 6) prior to 08:00UTC show air originated from different parts of Europe
- At 24 hours similarity appears, with both sites receiving air that had come from north Germany
- The data suggests (1) the odour source was widespread and occurred overnight on 17-18 April or (2) the source was located in northern Germany and occurred during the day on 17 April or before.

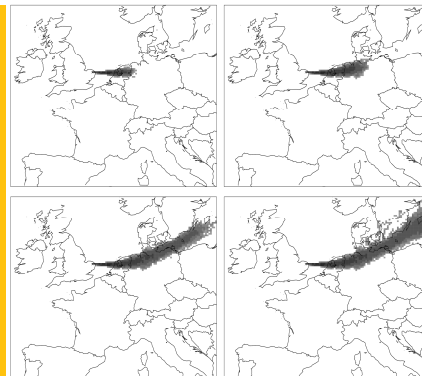


Figure 5. Maps of the source regions of air contributing to Norwich within the (a) 6, (b) 12, (c) 24 and (d) 48 hours leading up to 08:00UTC 18 April.

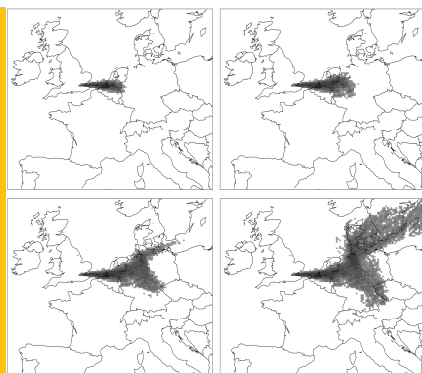


Figure 6. Maps of the source regions of air contributing to London within the (a) 6, (b) 12, (c) 24 and (d) 48 hours leading up to 08:00UTC 18 April.

- Back trajectories for Birmingham on 18 April (am) suggest air travel-time was between 6-12 hours from northern Holland
- This reduces the likelihood of an overnight source being the cause
- The combined back-maps for the 3 cities pinpoint that there was a limited concurrent source region (Figure 7(a))
- whereas 24 to 12 hours prior to the incident there was a large common source region over northern Germany (Figure 7(b))
- Prior to 08:00UTC on 17 April much of the common source region is over the Baltic Sea. These findings favour the hypothesis for an earlier German source.



Figure 7a. The source regions of air between 20:00UTC on 17 April and 08:00 on 18 April

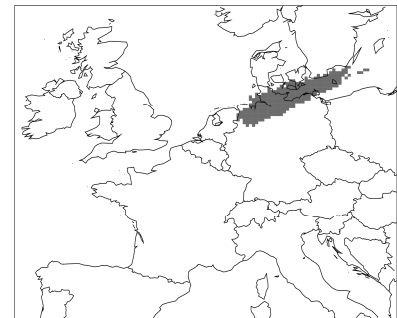


Figure 7b. The source regions of air between 08:00UTC and 20:00UTC on 17 April that simultaneously reached Birmingham, London and Nottingham between 08:00UTC and 11:00UTC on 18 April.

Conclusions

The perception of odour in multiple locations in England ruled out a localised source of odour. Although the precise source of the smell has not been determined yet, the current evidence strongly suggests that the cause was wide-spread agricultural slurry-spreading in Belgium, the Netherlands and in particular northern Germany. Odorous emissions associated with these activities were rapidly transported by fast easterly wind speeds to the south-east of the UK, where its arrival coincided with thousands of people's commute to work on 18 April.

Trace amounts of odorants were sufficient to trigger perception at receptors and fortunately in this incident no reports of health effects were recorded

References

Jones, J. A. (1981) A model for long range atmospheric dispersion of radionuclides released over a short period. The fourth report of a working group on atmospheric dispersion. National Radiological Protection Board, Report NRPB-R124.

Other work of relevance

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Copies of papers can be found at: <http://www.hpa.org.uk/Publications/ChemicalsPoisons/ChemicalHazardsAndPoisonsReports/>