



Farther

The influence of long-range transport in recent UK air pollution events

Claire Witham, Air Quality Forecasting Seminar, 14 May 2008



Collaborators

- AEA AQ forecasters
- Met Office
 - Atmospheric Dispersion Group
 - Press Office
 - Public Weather Service Advisors



Contents

This presentation covers the following areas

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- General pollution
- Fires
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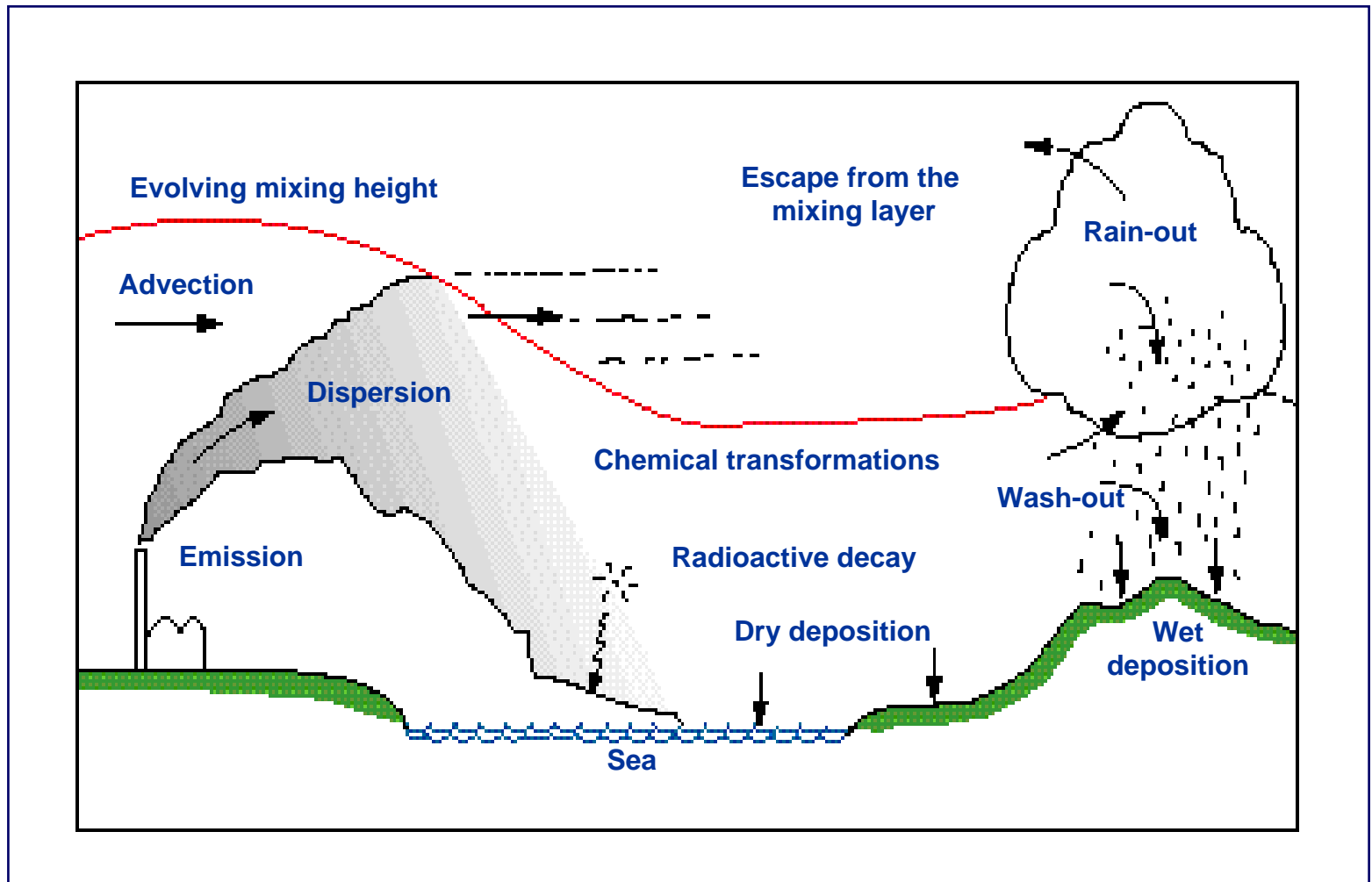


Introduction

What is long-range transport?

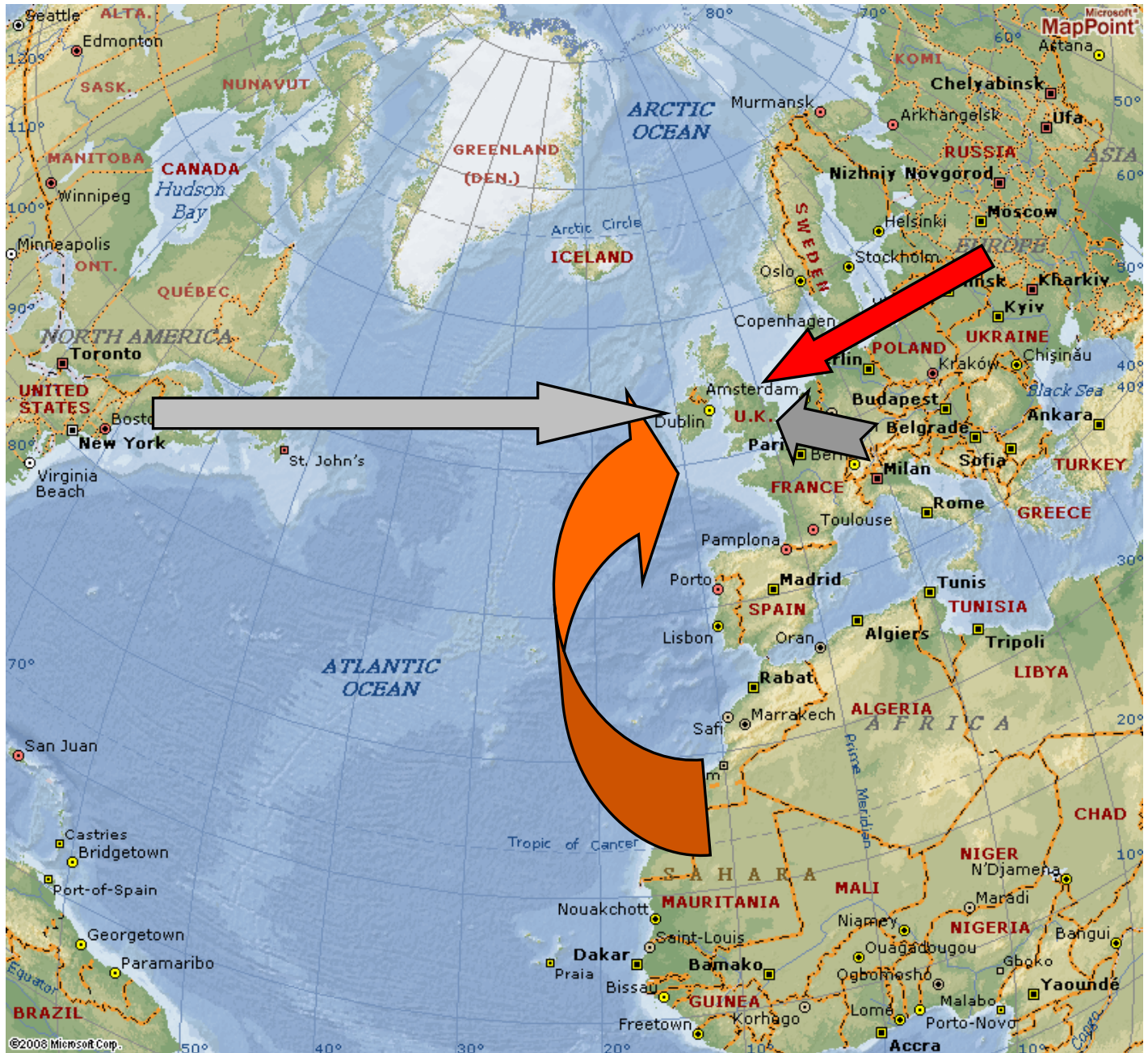
- **10km to 1000's km**
- **Releases can continue for days**
- **Meteorology varies with time leading to complicated plumes**
- **Transport throughout the lower atmosphere**
- **Deposition processes are important**
- **Time for chemical reactions to occur**

Transport Processes



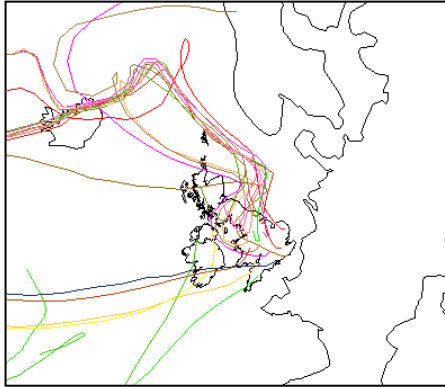


Sources:

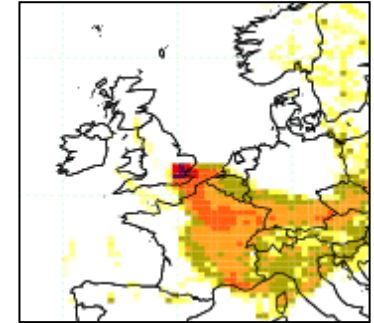




Tools for investigating events



Back trajectories



NAME model

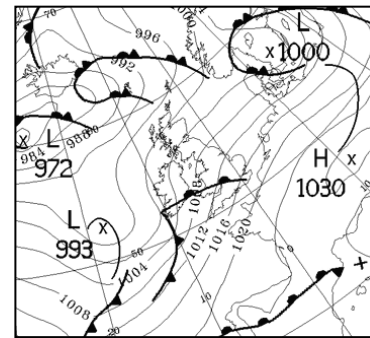
Press and public reports

AURN and local observations

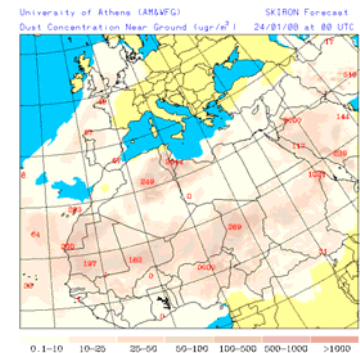
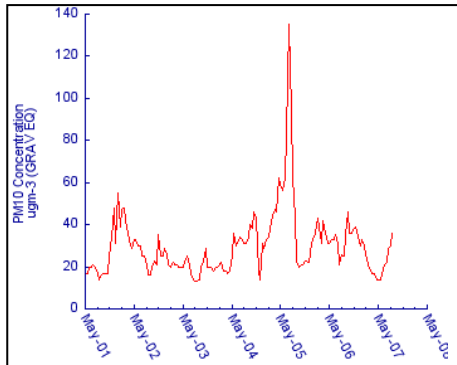


Weather charts

Other models



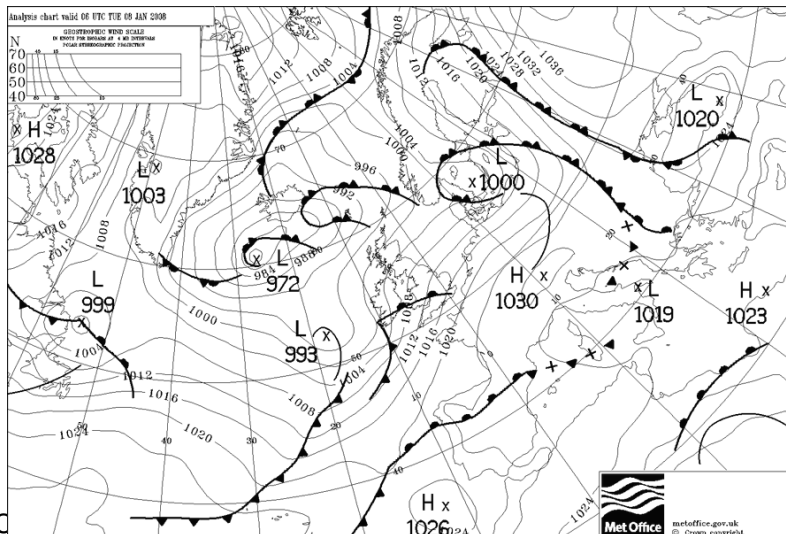
Satellite data



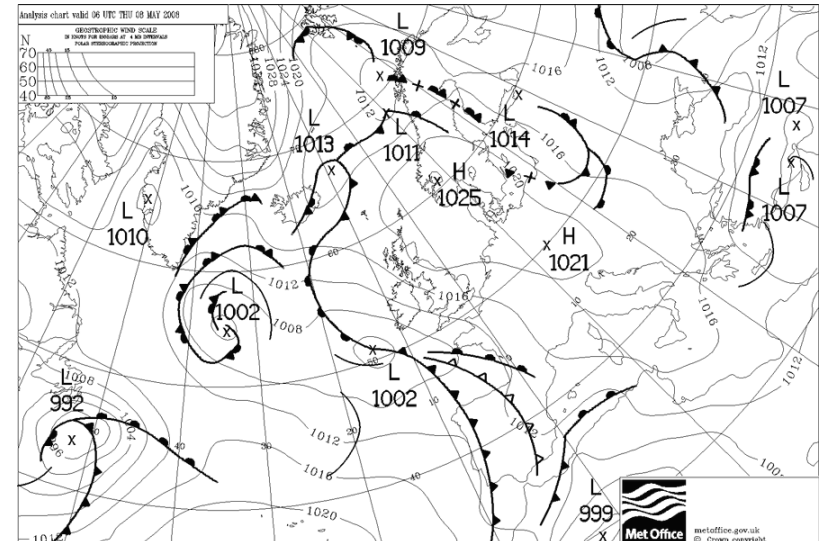
General Pollution

- Comes from factory, vehicle and power station emissions on the continent
- Strongly influenced by the weather
 - Pressure systems, wind direction, temperature
- Seasonal differences

Winter



Summer

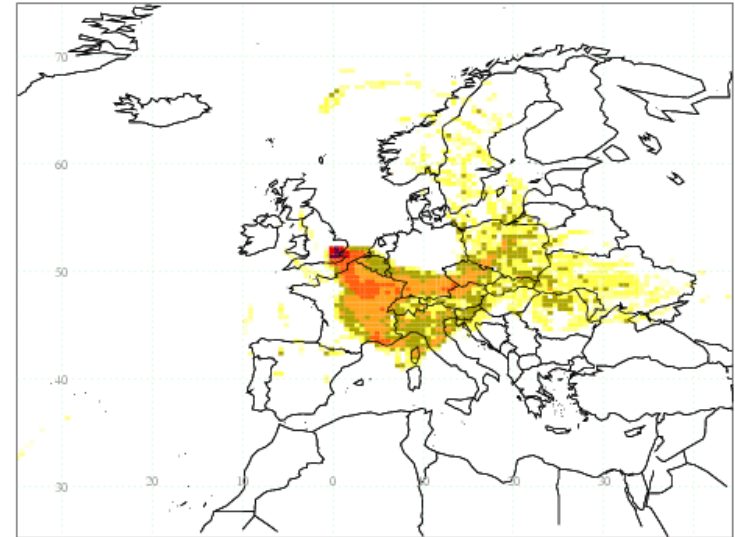




Ozone Episode

- Ozone precursors brought to UK from Europe over last weekend, coupled with high temperatures (28 C) led to widespread **Moderate** and **High** ozone

History of air reaching London at midday on Sat 10 May



SITE	Hourly Mean <u>Ozone</u> ($\mu\text{g}\text{m}^{-3}$)
Blackpool Marton	150 (Moderate 5)
Carlisle Roadside	N/M
Glazebury	196 (High 7)
Great Dun Fell	150 (Moderate 5)
Preston	168 (Moderate 6)
Wigan Centre	204 (High 7)
Wirral Tranmere	122 (Moderate 4)



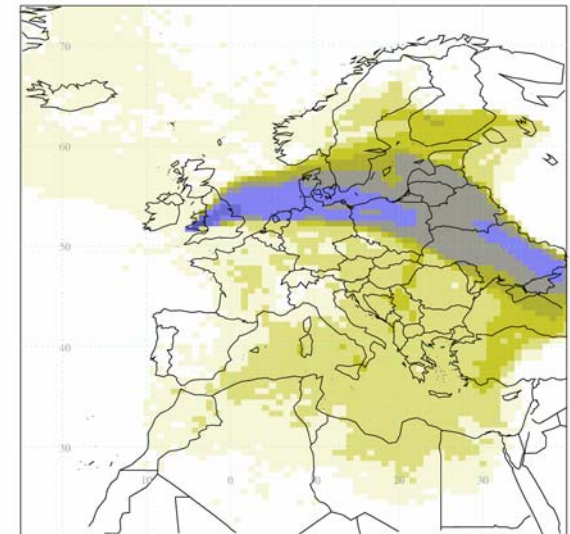
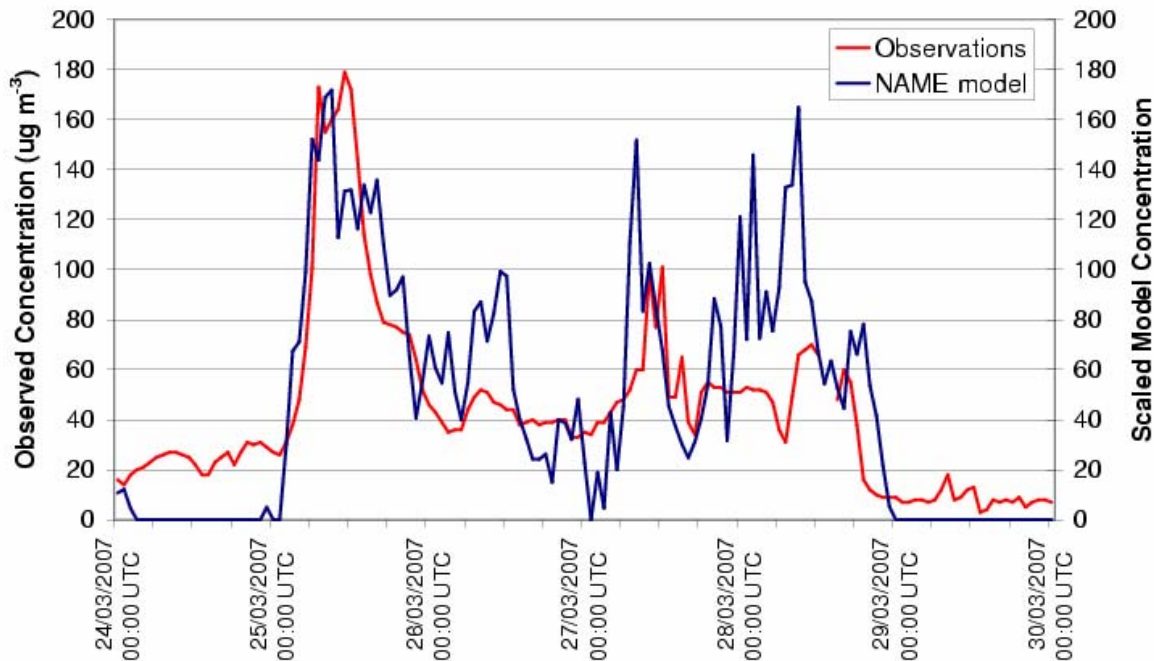
Fires

- Biomass burning in western Russia and Eastern Europe contributes to elevated PM10 and other combustion products
- Recent examples:
 - May 2006
 - Mar 2007
- Impacts on AQ are European-wide due to winds from east



Fire Example

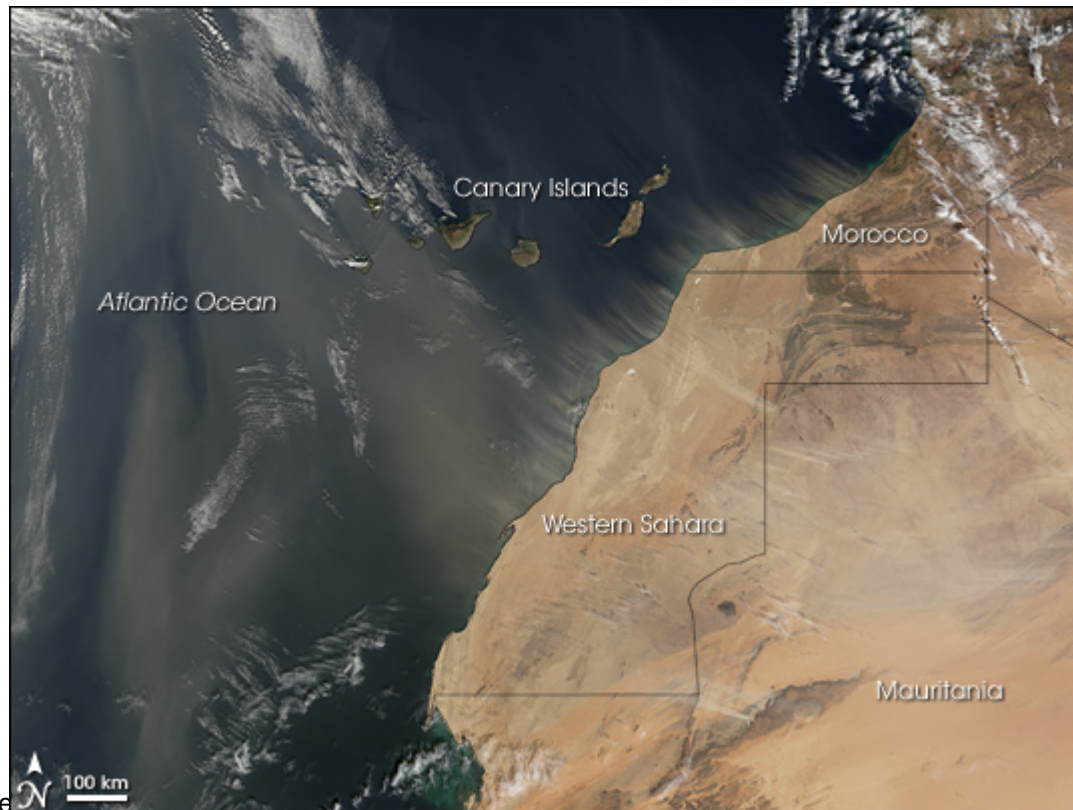
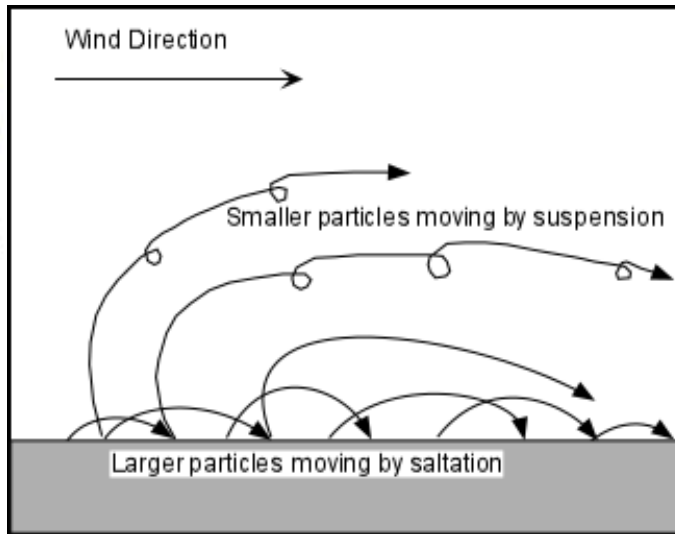
- Mar 2007 - fires in the Ukraine (possibly together with dust) led to elevated PM10 over much of UK



Dust



- Saharan dust frequently seen in spring
- Recent events on 23 Jan and 4 May
- Many reports of dust seen on cars
- 4 May event caused concern in Scotland as coincident with Grangemouth oil refinery start-up
- Can cause moderate or high PM10 levels across the UK

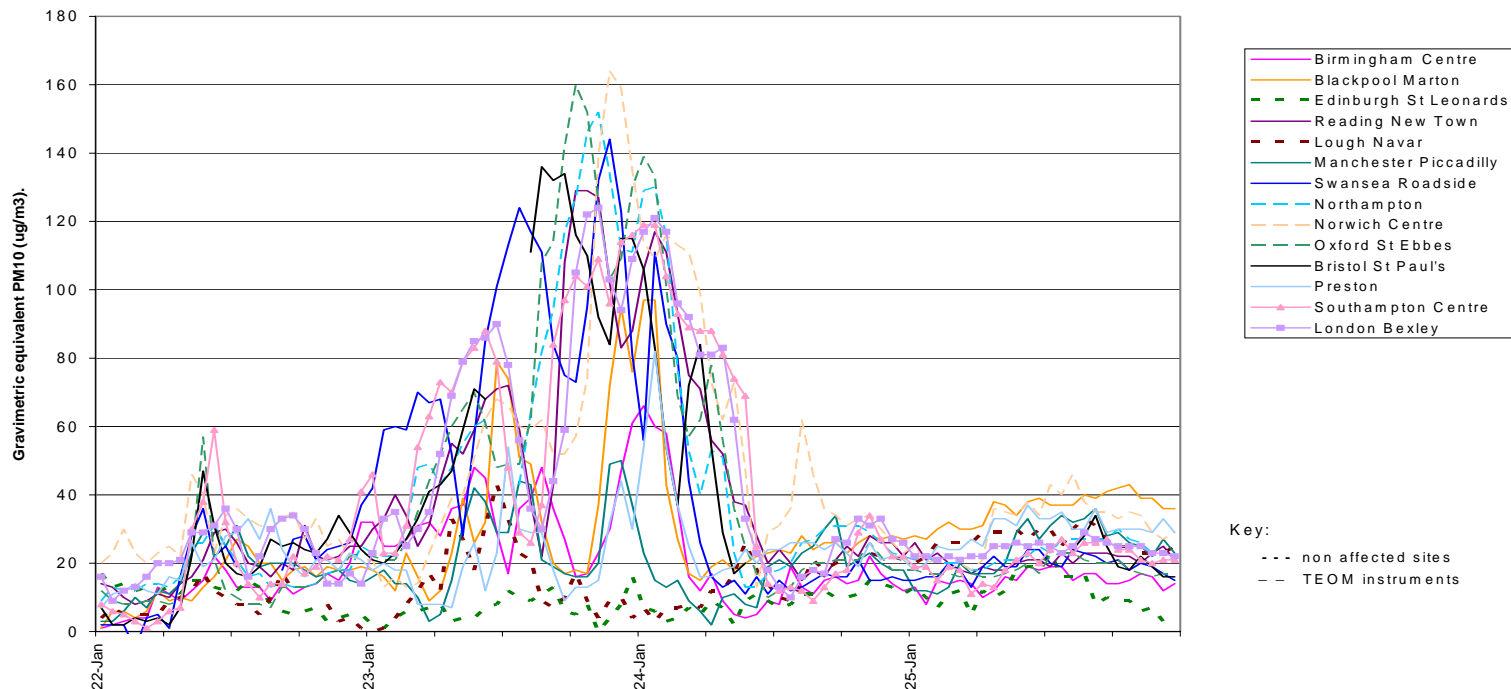


20 Jan 2008
dust storm
seen by
MODIS

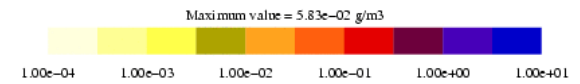
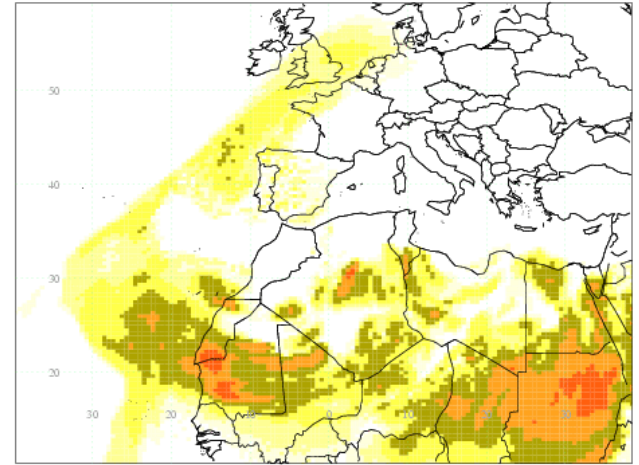
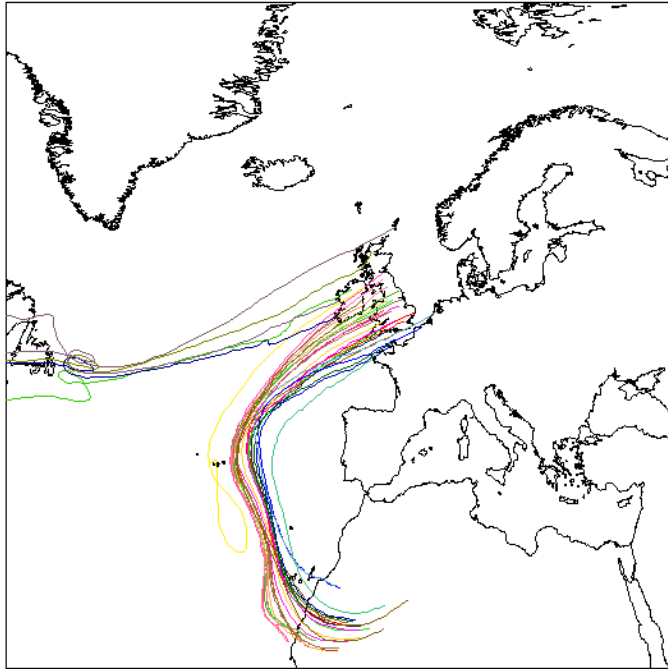


23 Jan 08 event

- PM10 levels were in the moderate and high range across southern England and Wales
- Satellite shows dust storm on 20 Jan

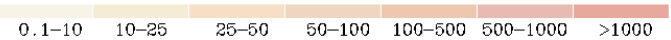
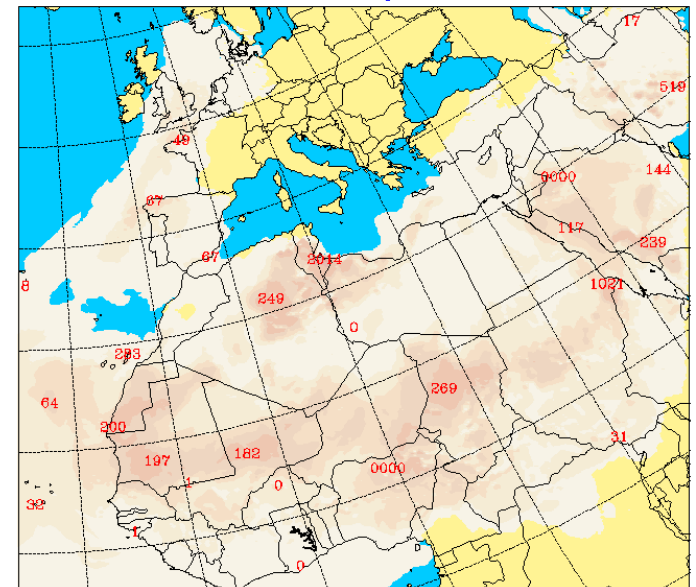
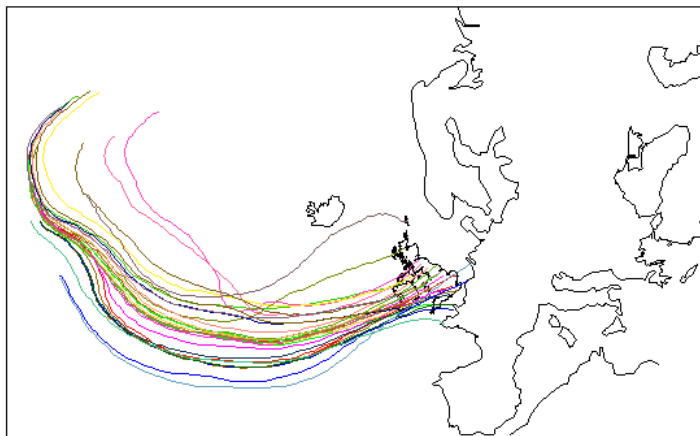


Air mass back trajectories for 96 hours
upto 12:00 23-01-2008



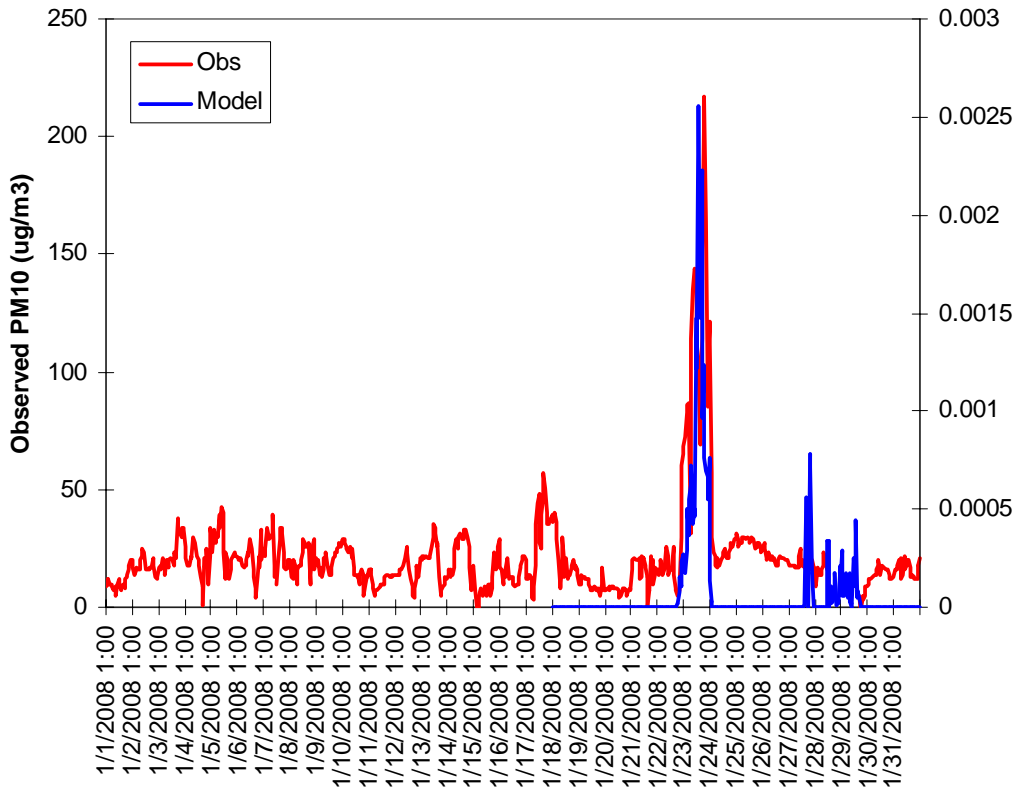
University of Athens (AM&WFG) SKIRON Forecast
Dust Concentration Near Ground ($\mu\text{g}/\text{m}^3$) 24/01/08 at 00 UTC

Air mass back trajectories for 96 hours
upto 12:00 24-01-2008

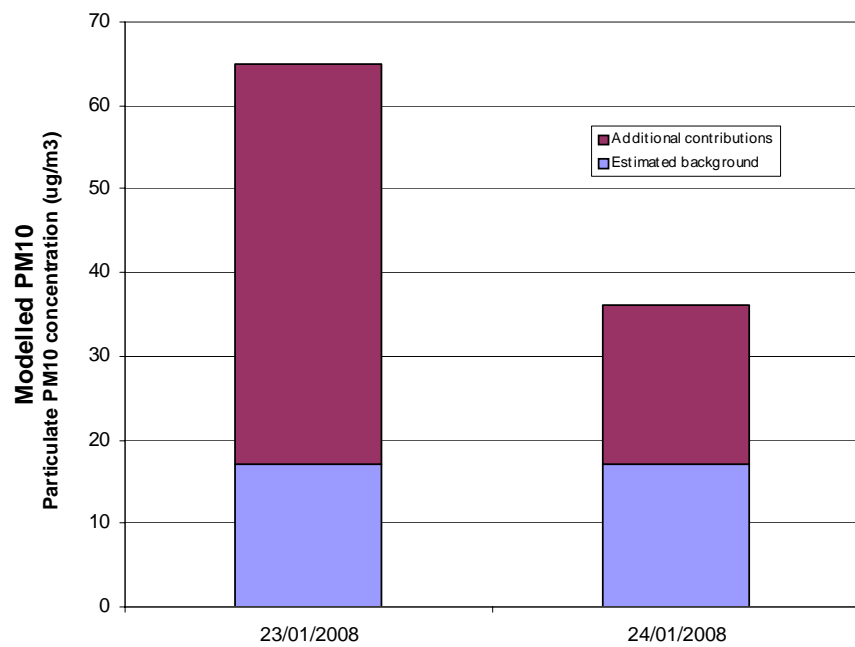




NAME dust model vs PM10 observations at Narberth

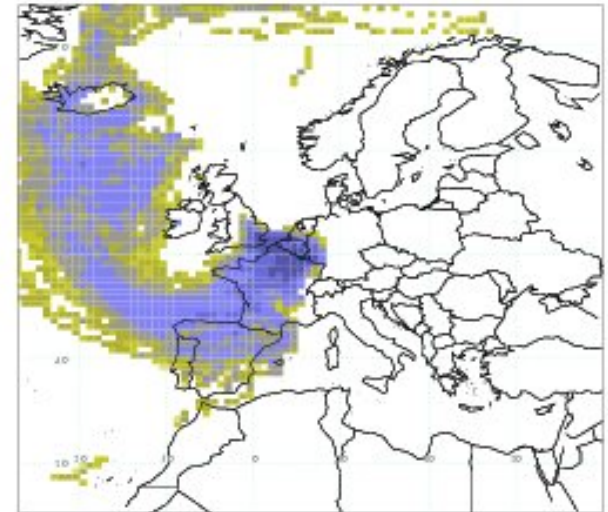
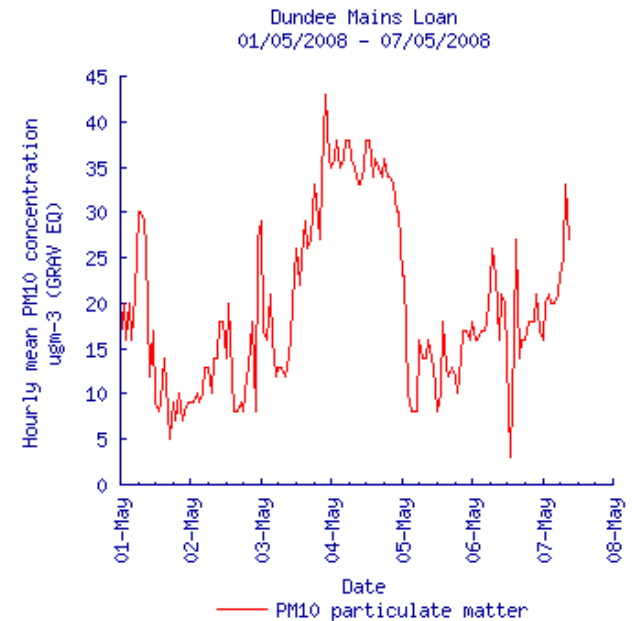


Estimated additional contributions of particulate PM10 at Cardiff Centre



4 May 08 event

- Observations of dust across eastern Scotland, south-west England and other parts of England
- Slight increase in measured PM10
- Overnight there was also light rainfall in these areas
- More complex case as trajectories and back-runs do not show a clear Saharan source

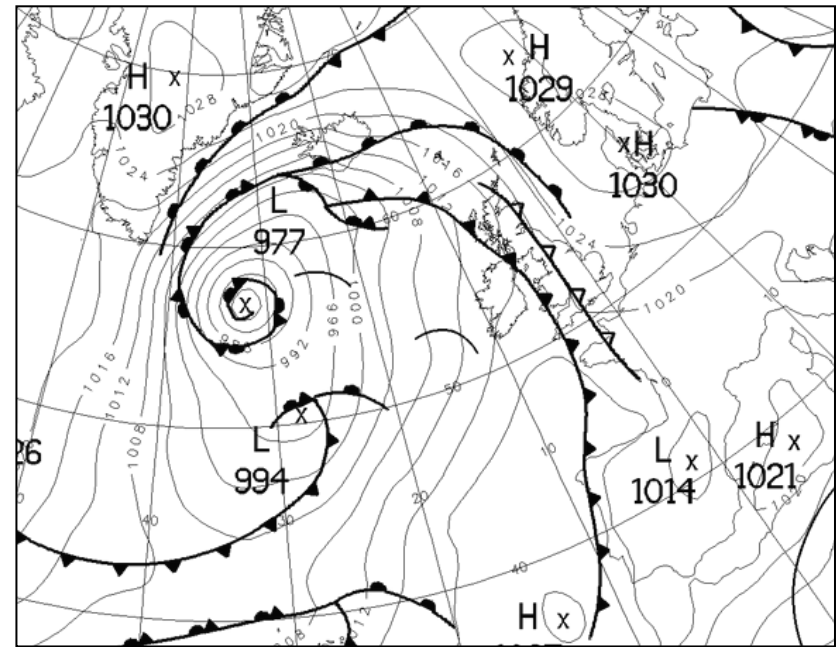
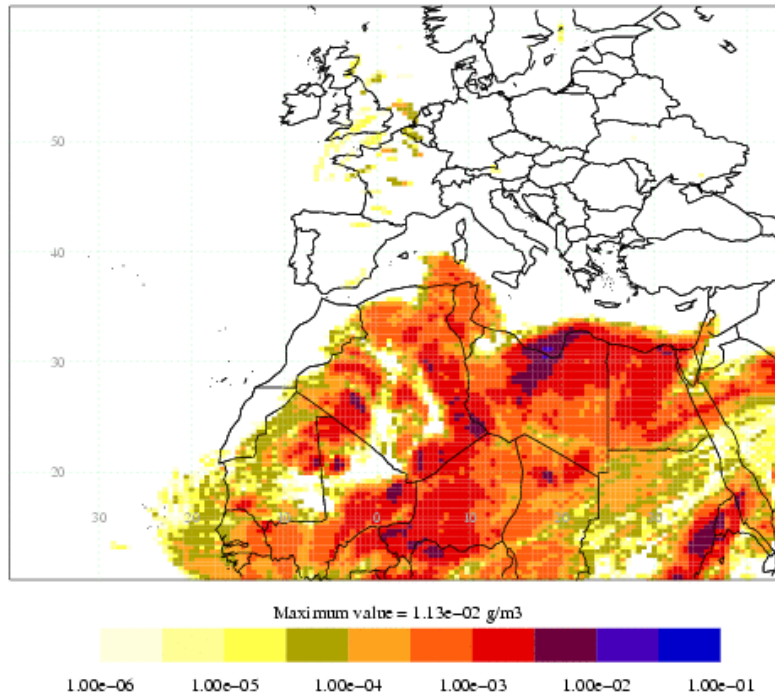


Falkirk near-surface air at
12UTC on 4 May

- Dust run shows Saharan dust contribution at high levels in atmosphere

Valid at 0600UTC 04/05/2008

From 4000 – 5000m agl Air concentration



- Rainfall associated with frontal activity washed this dust out causing it to be observed at the surface

Public Interest

- Met Office Press Office receives many calls following such events
- They are often picked up in the national and local media



BBC NEWS OPEN BBC News in video and audio

Last Updated: Thursday, 24 January 2008, 16:46 GMT

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Sahara sand surprise over Wales

People in parts of south Wales woke to find their cars and houses covered in dust which has come all the way from the Sahara Desert.



A number of people were concerned it could be hazardous but experts say there is nothing to be worried about.

Dust from Sahara coating a car at Milford Haven in Pembrokeshire



BBC NEWS LIVE BBC NEWS CHANNEL

Page last updated at 21:27 GMT, Wednesday, 7 May 2008 22:27 UK

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Sepa probing 'desert' dust cloud

Dust which covered cars and property in the Grangemouth area may have come from the Sahara, the Scottish Environment Protection Agency (Sepa) have said.



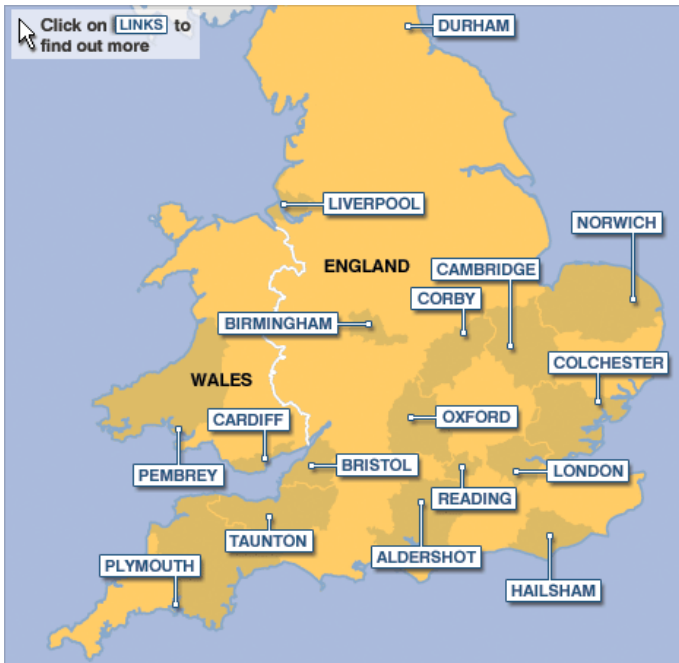
Residents complained about the dust to Sepa and Ineos after it appeared on 4 May, questioning whether it was caused by restarting the town's oil refinery.

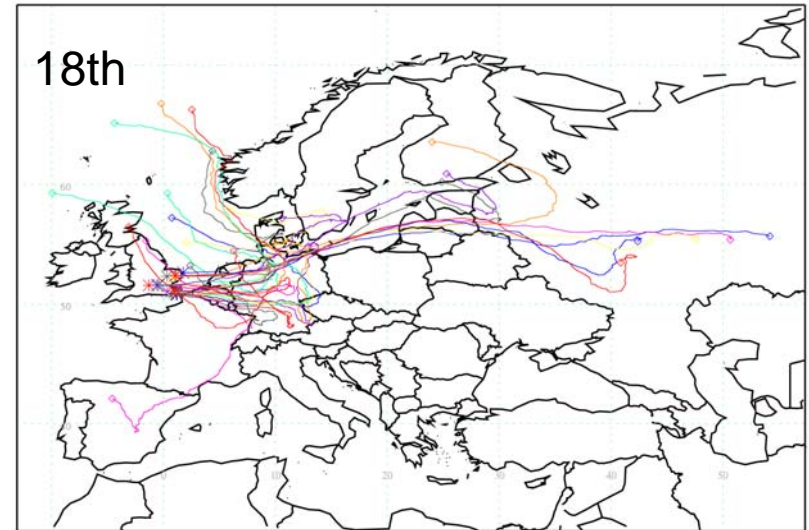
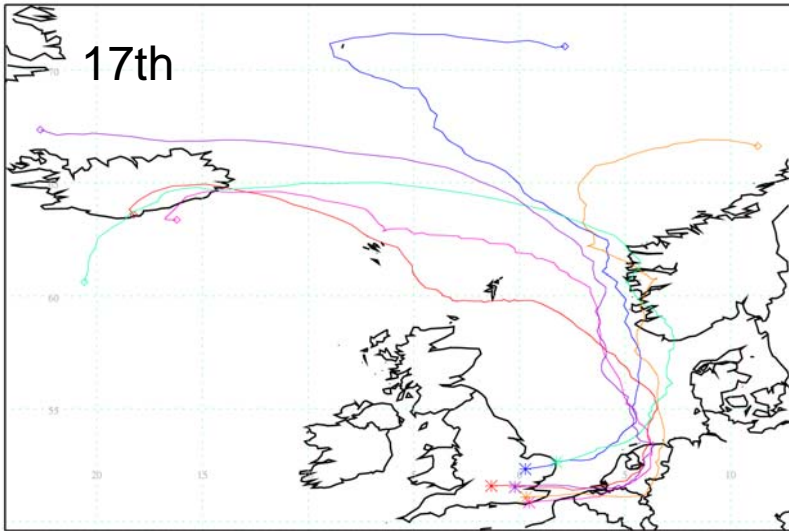
Residents questioned whether the dust was coming from the refinery



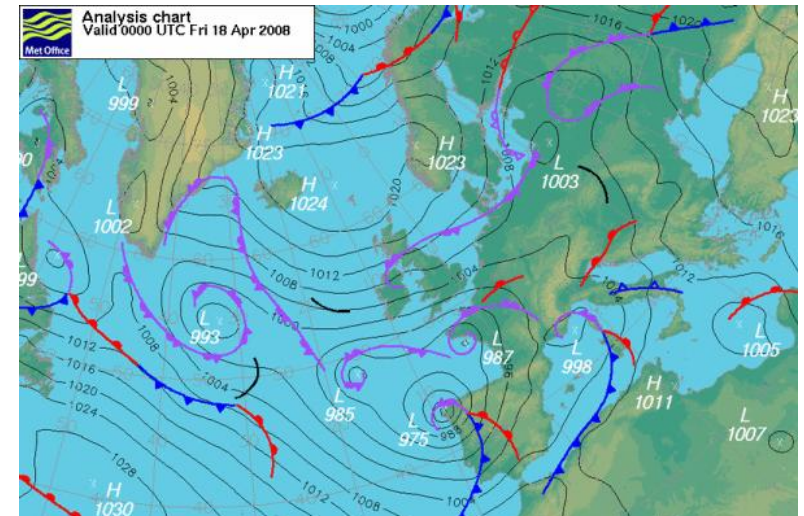
Euro-whiff/Le Stink/Der stink

- On 18 April a manure-like smell was reported from many locations in UK, particularly in the south-east
- This got widespread press coverage





- No observed increases in any measured AQ pollutants
- EU Nitrate Vulnerable Zone Directive applied in Europe





Summary

- Air pollution events in the UK can be caused by long-range transport of many different pollutants
- Such events can be difficult to forecast and are impossible to control
- Each event is different and can cause concern in the public
- Impacts range from the relatively benign - unusual smells, dust on cars - to high levels of health-damaging pollutants such as ozone and particulate



Questions and answers