Forecasting UK Air Quality: Present Day and Under a Changing Climate

Paul Agnew

23rd June 2014

Met Office Air Quality and Composition team

- Paul Agnew

- Lucy Davis

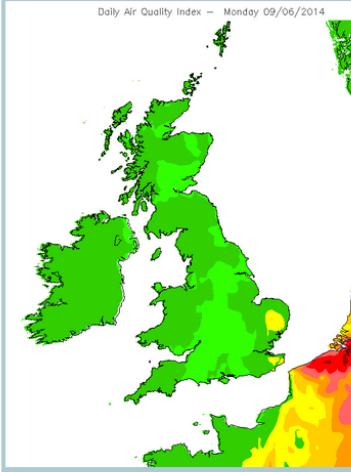- Carlos Ordonez

- Nick Savage

- Marie Tilbee

Met Office national AQ forecast for Defra

- As of 1st April 2014 the Met Office began providing the national AQ forecast for Defra

- Three elements to the service:

  - UK maps of Daily Air Quality Index

  - Descriptive text forecast for Today, Tomorrow and Outlook

  - Tweets

Forecast maps (provided by the Met Office)

Daily Air Quality Index — Monday 09/06/2014

Enter your location or postcode to see the forecast for your area:
e.g. Newcastle   Search

Index Bands
1 2 3 4 5 6 7 8 9 10
Low Moderate High Very High

» Health advice associated with air pollution
RSS Air Quality Forecast
Daily forecast tweets from @DefraUKAir

Up to 5 day forecasts are available, use the links below to step through each day.

« Prev   Next »

Today (9th June 2014)
Tuesday (10th June 2014)
Wednesday (11th June 2014)
Thursday (12th June 2014)
Friday (13th June 2014)

Latest forecast summary

The latest air pollution forecast was issued at 09/06/2014 5am

Today

Low air pollution levels are expected across much of the UK; however **Moderate** air pollution levels are forecast to affect parts of East Anglia and Kent.

Tomorrow

Low air pollution levels are expected across the UK.

Outlook

Tweets   Follow

Defra Air Quality @DefraUKAir 27m
Forecast Tue: Low air pollutions levels across the UK.
bit.ly/HbGVCK #ukair
Expand

Defra Air Quality @DefraUKAir 4h
Latest Mon 9am: Low air pollution measured across all regions of the UK. bit.ly/HN9VOK #ukair
Expand

Defra Air Quality @DefraUKAir 6 Jun
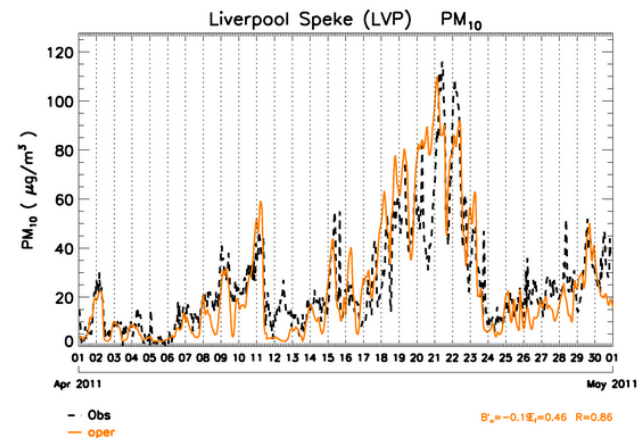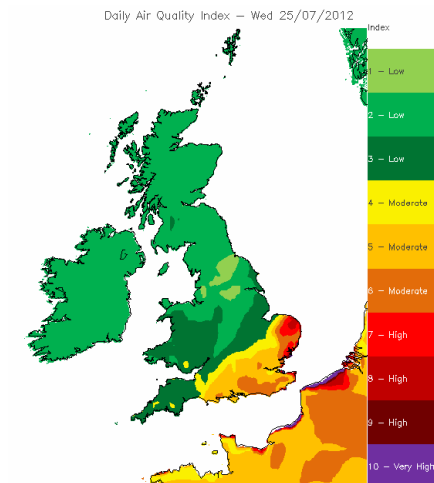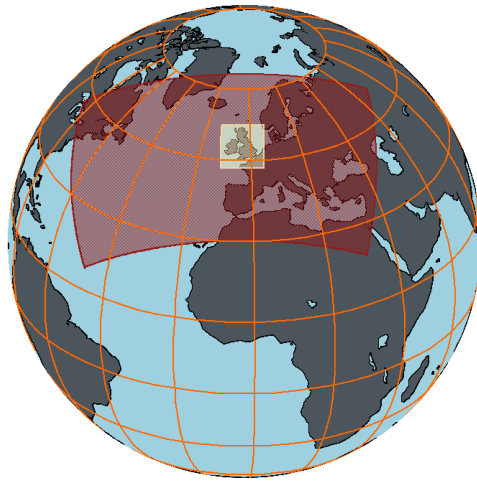Latest Fri 5pm: Moderate pollution
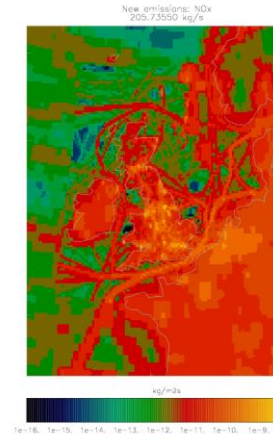
AQUM forecast system
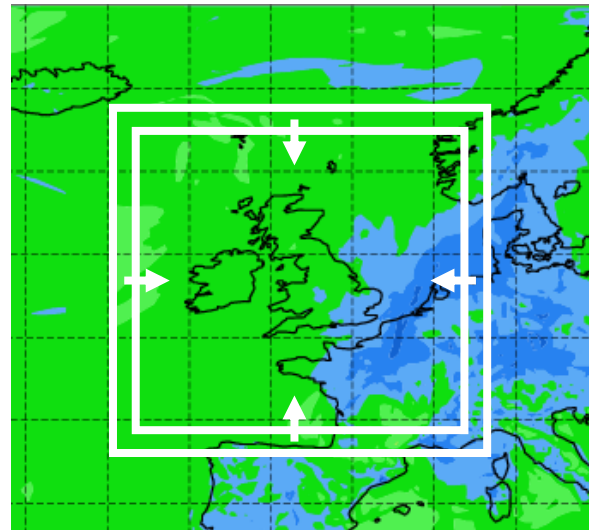

Model

Observations

Forecast

Verification

Some AQUM Features

Emissions: Synthesis of

- NAEI @ 1km over UK

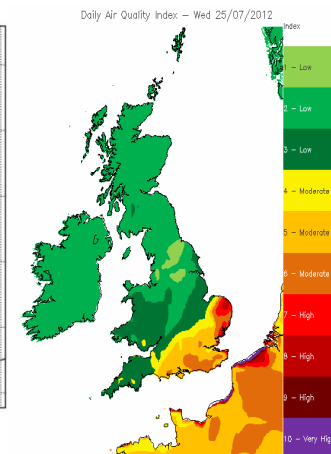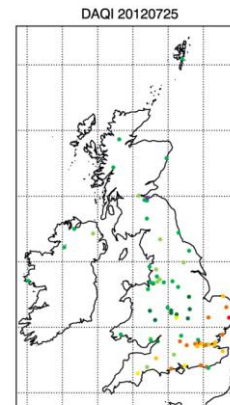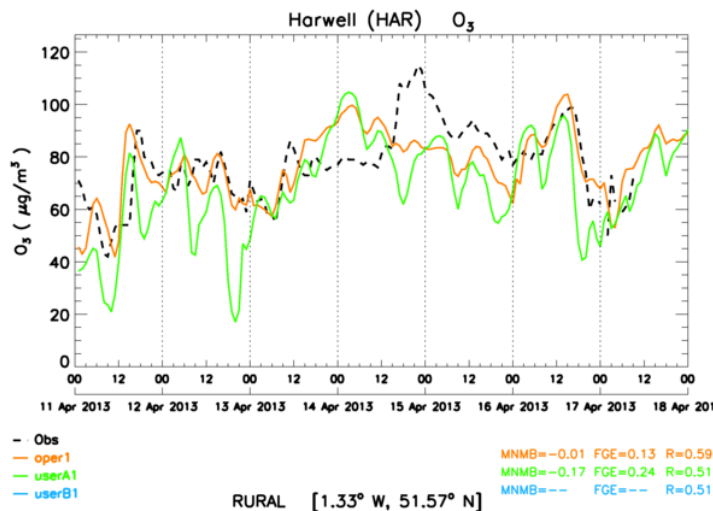- ENTEC shipping @ 5km

- MACC @ 5km Europe

Real-time lateral boundary fluxes of pollutants from MACC global model

Observation-based bias correction scheme

Near-real-time verification

- Routine verification against observations from the AURN

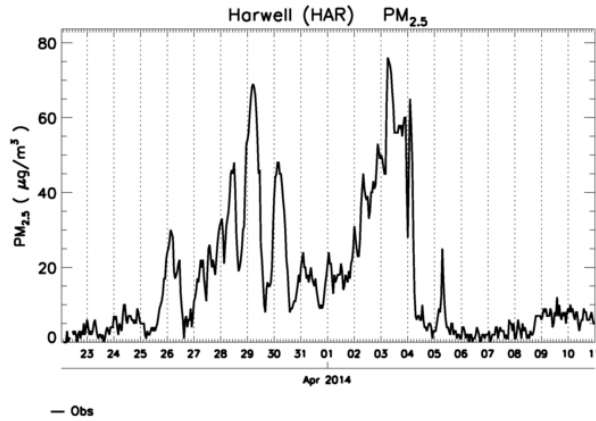- Rapid method of evaluating forecast on daily basis

- Aids model development

April 2014

- Start of the new forecast service coincided with a significant poor air quality episode

- High level of public and media interest

- A complex episode…..

(Daily Mail April 2nd 2014)

PM Time Series: South
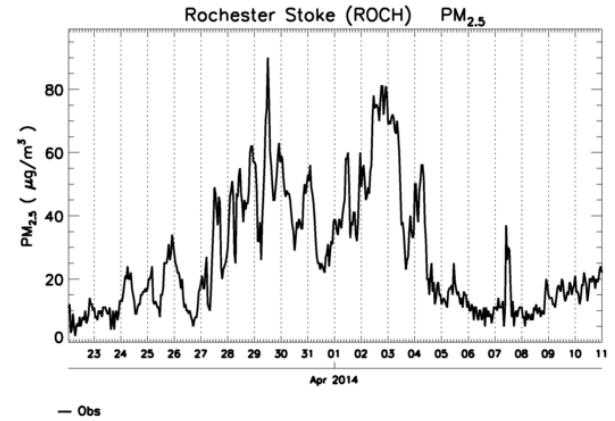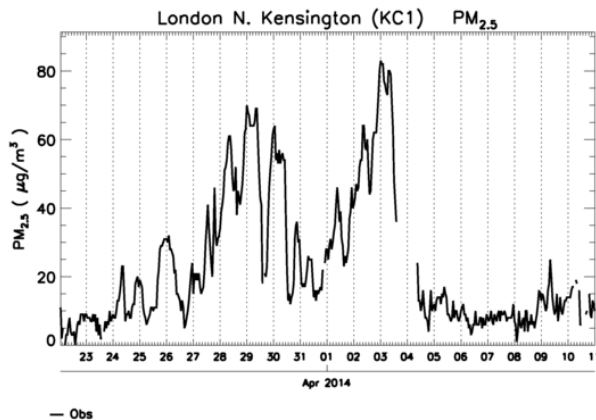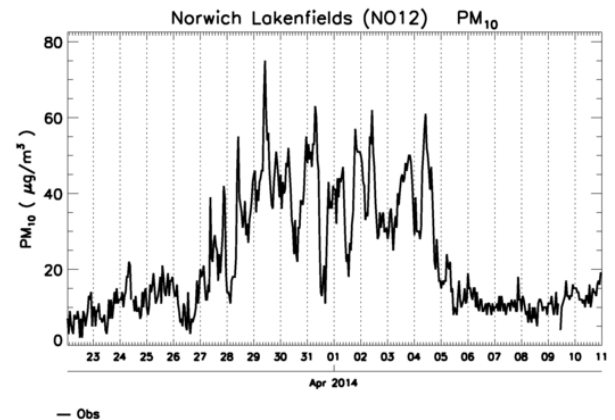
PM Time Series: North
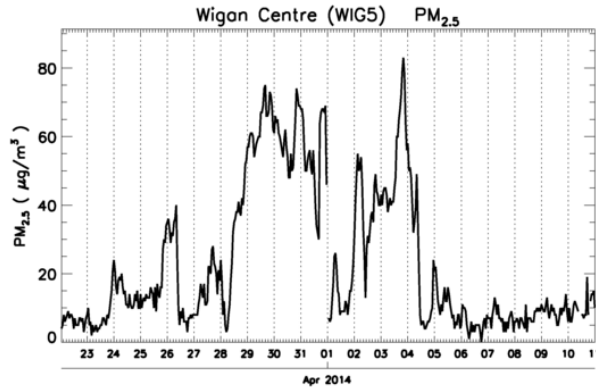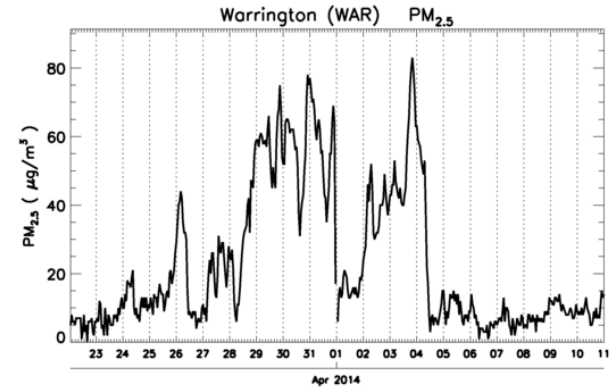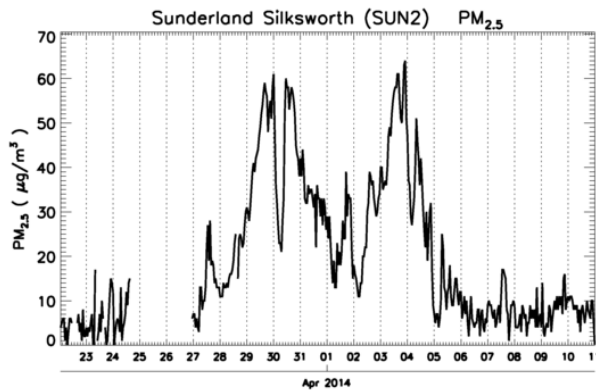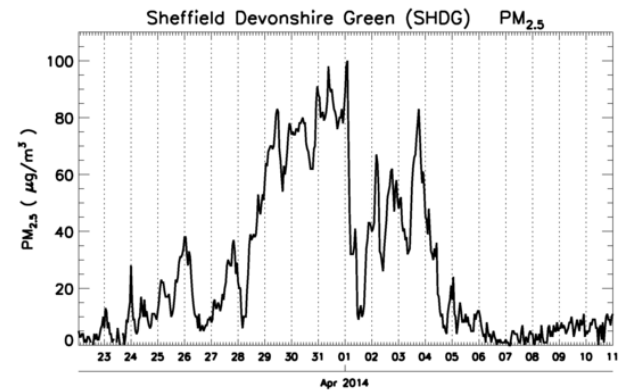
Forecast for 27th March
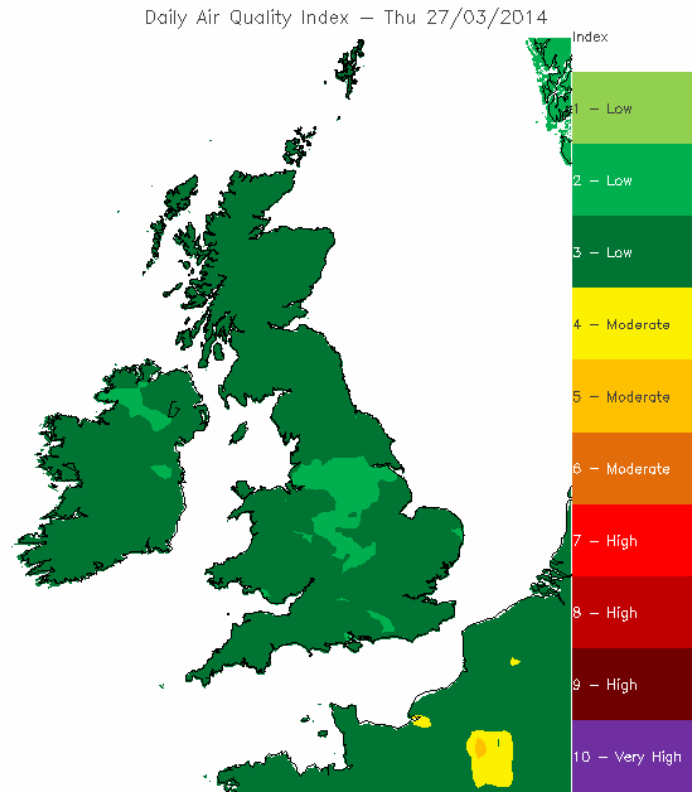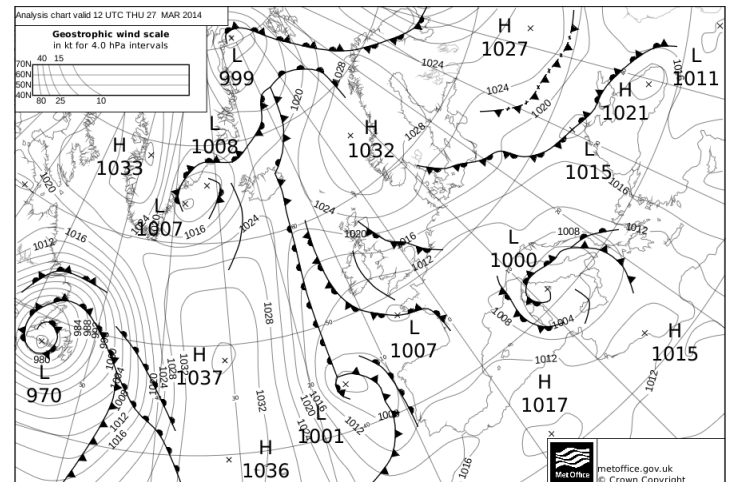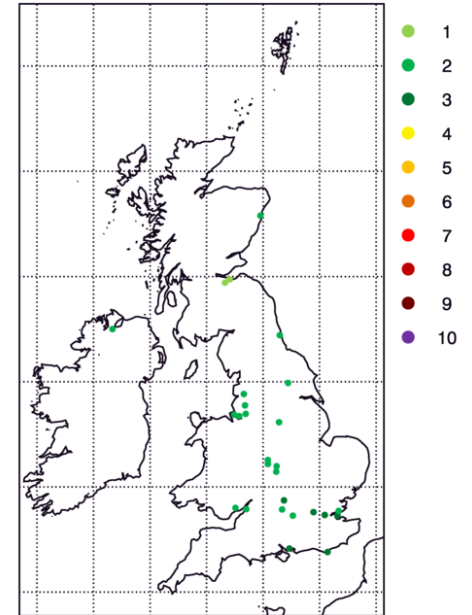
28th March

29th March

Daily Air Quality Index – Sat 29/03/2014
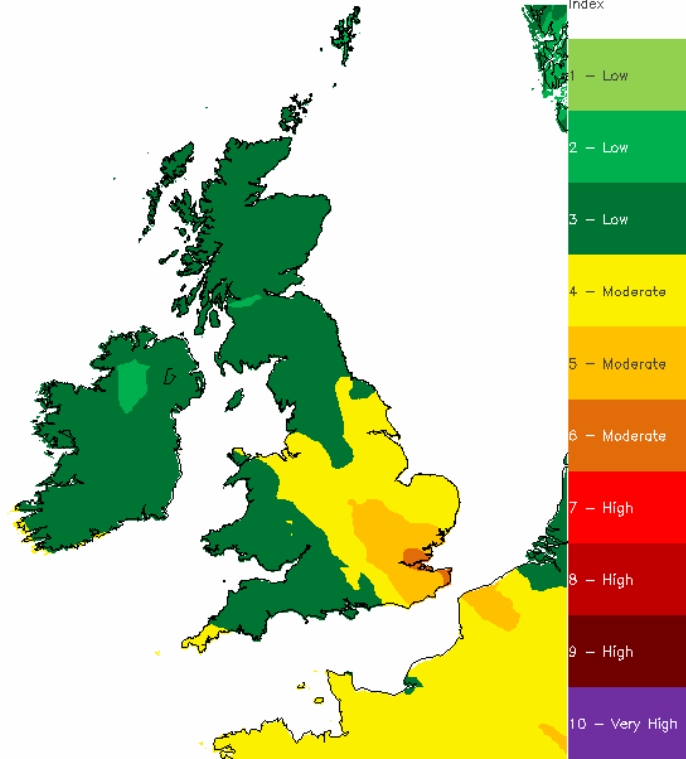
Index
1 – Low
2 – Low
3 – Low
4 – Moderate
5 – Moderate
6 – Moderate
7 – High
8 – High
9 – High
10 – Very High

Obs PM2.5 20140329

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Analysis chart valid 12 UTC SAT 29 MAR 2014

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30th March

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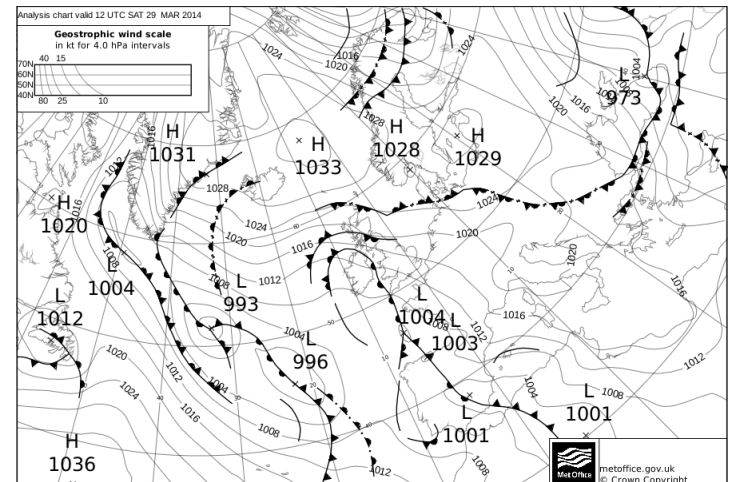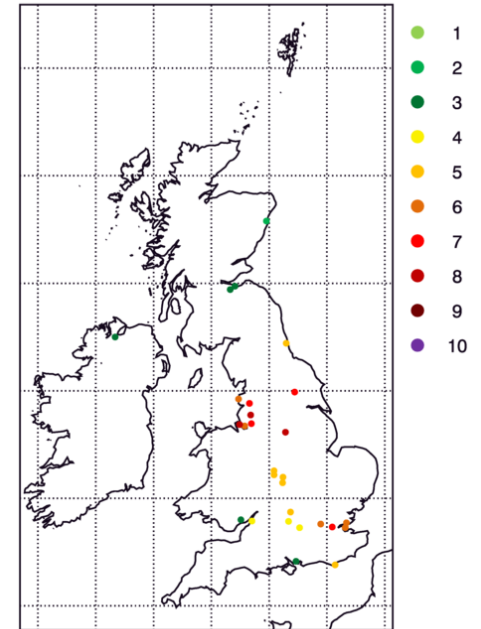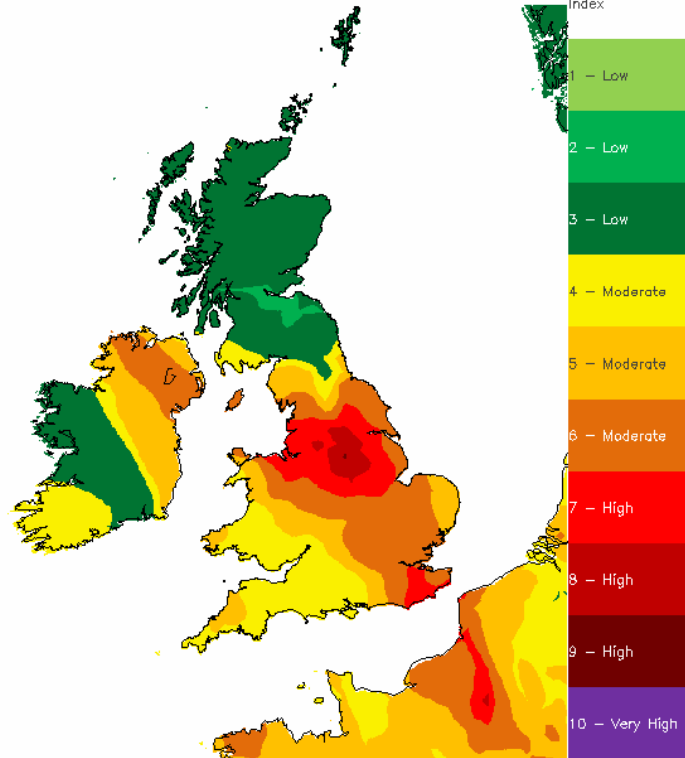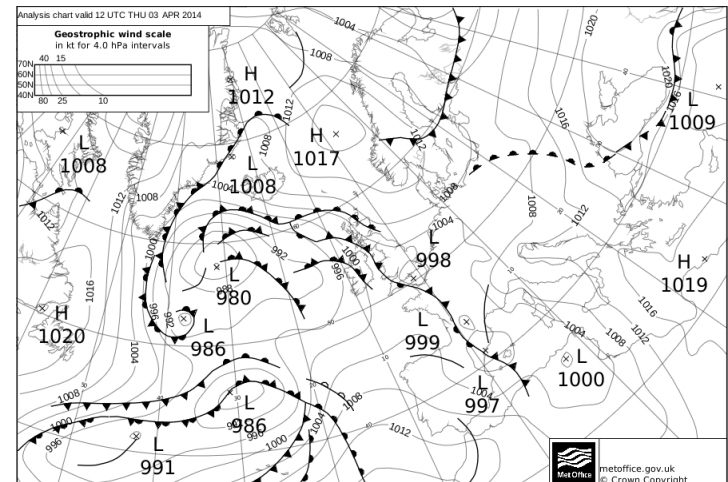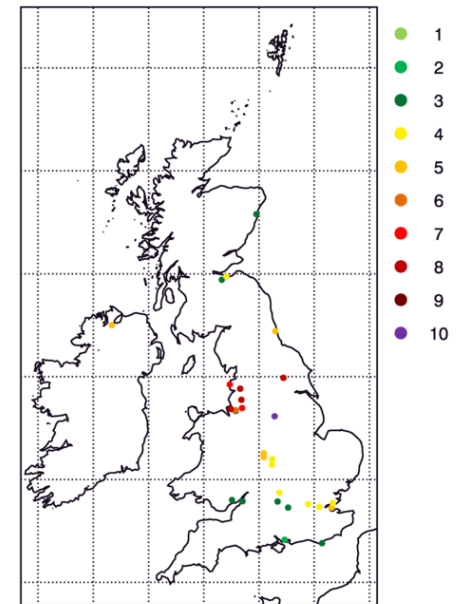
31ˢᵗ March

Daily Air Quality Index — Mon 31/03/2014
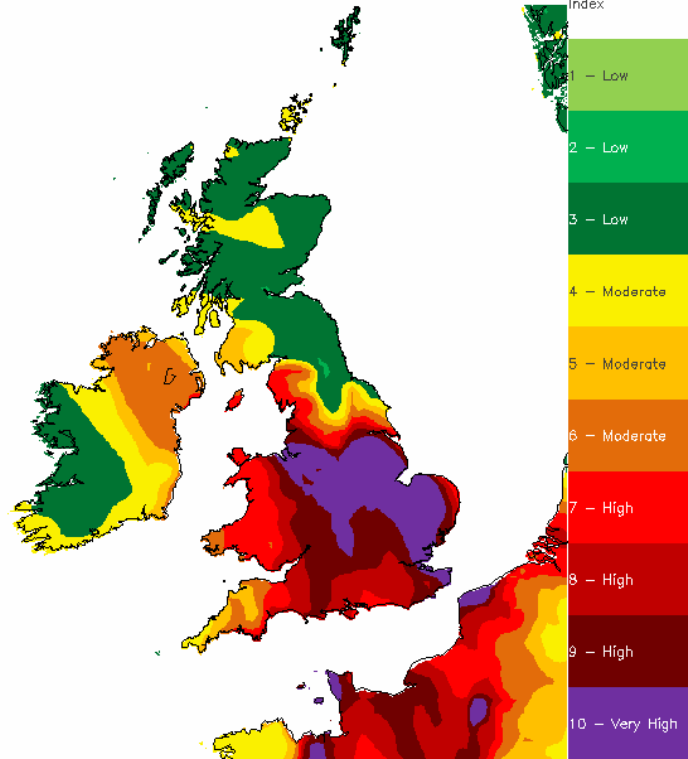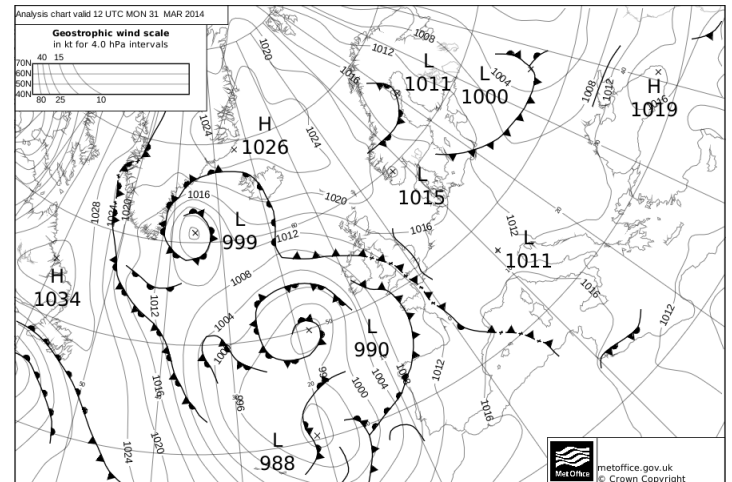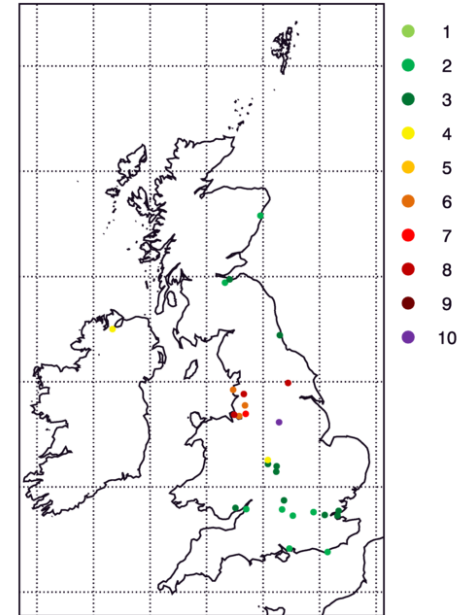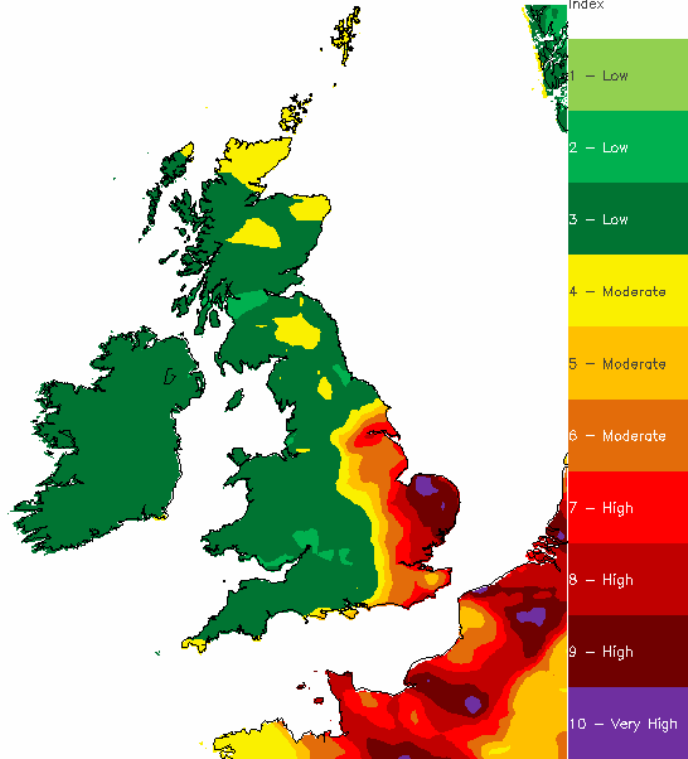
Index

1 – Low
2 – Low
3 – Low
4 – Moderate
5 – Moderate
6 – Moderate
7 – High
8 – High
9 – High
10 – Very High

Obs PM2.5 20140331

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Analysis chart valid 12 UTC MON 31 MAR 2014

1ˢᵗ April

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2ⁿᵈ April

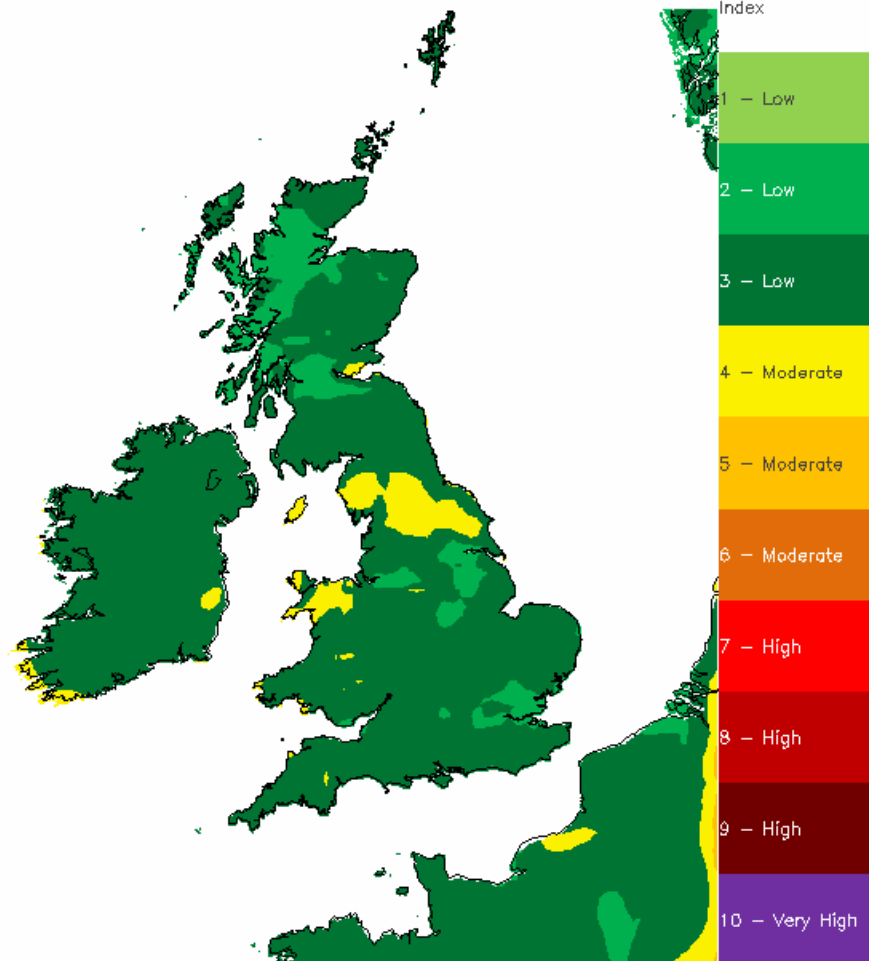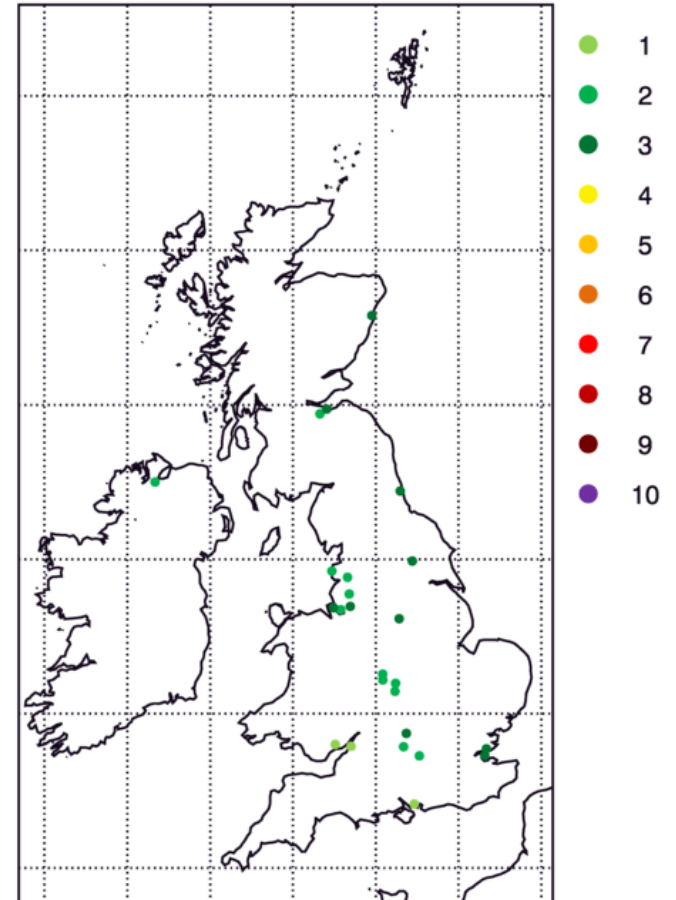# 3rd April

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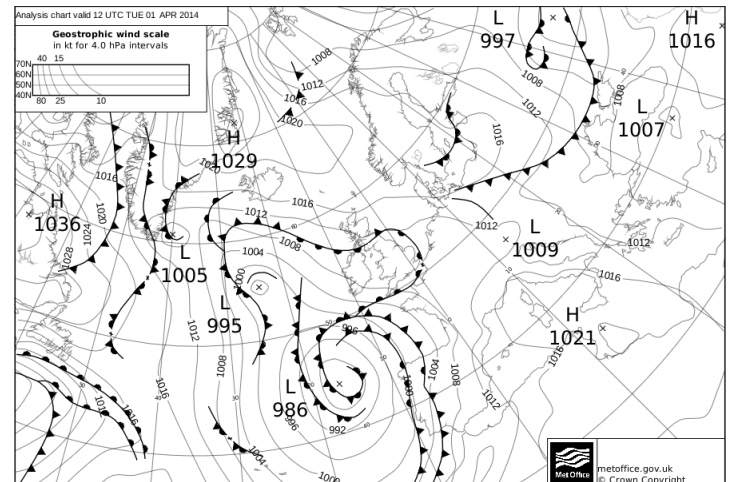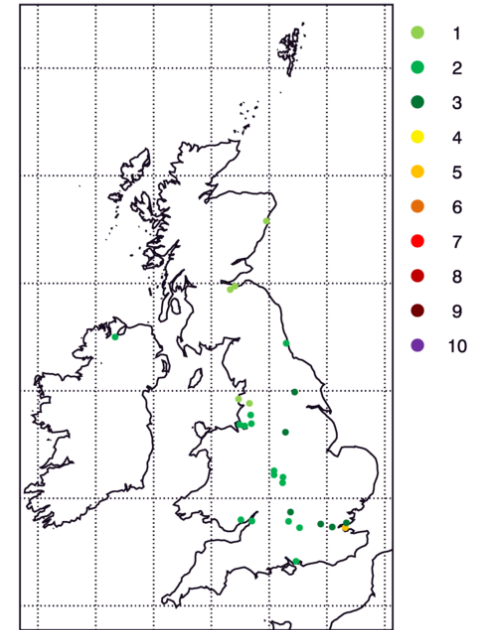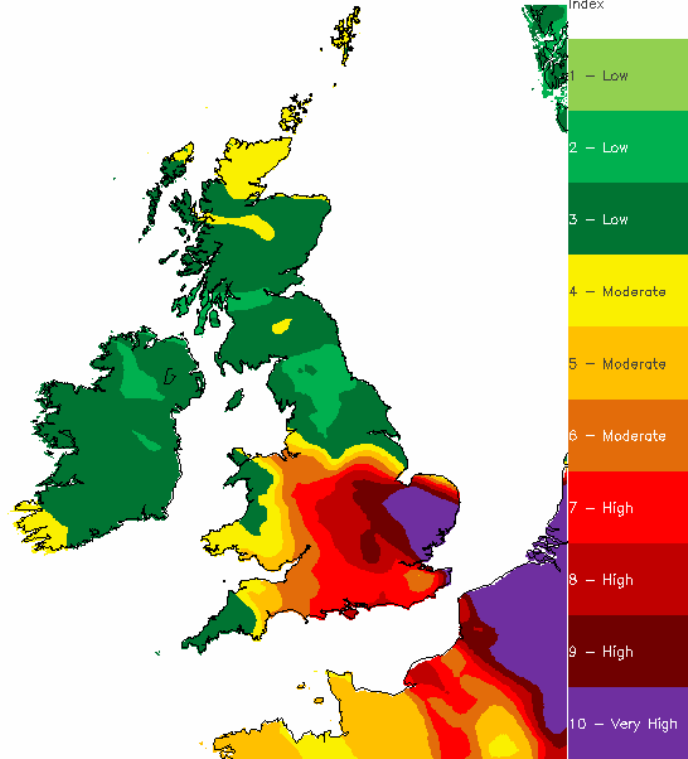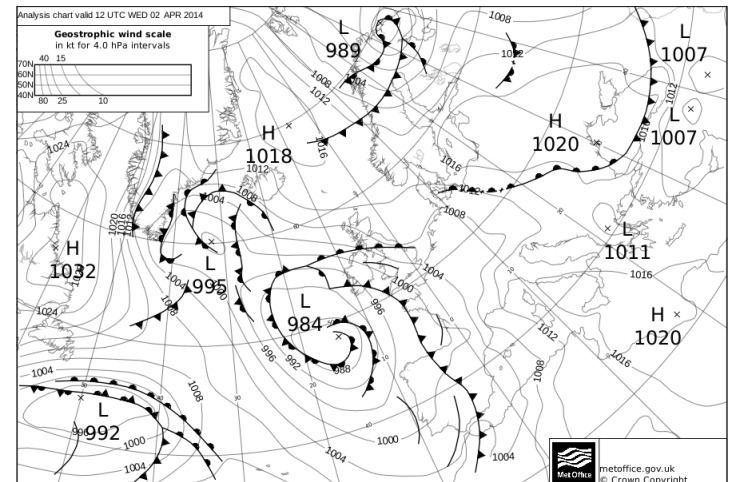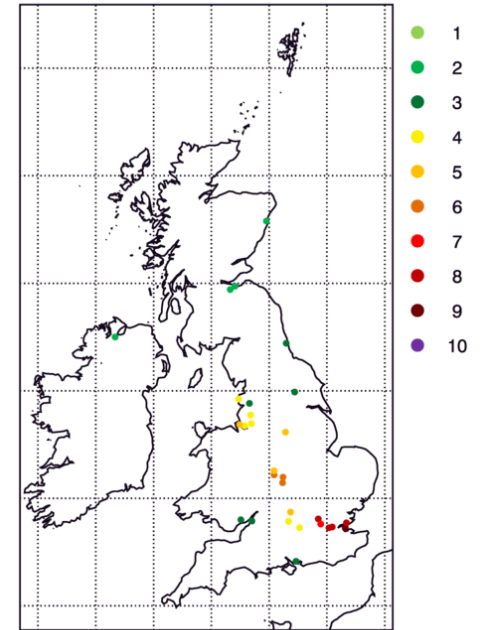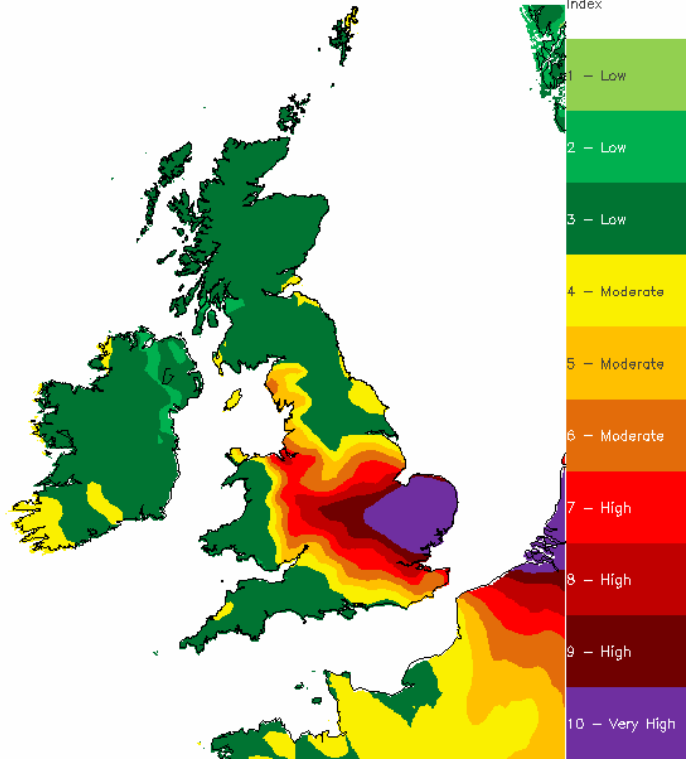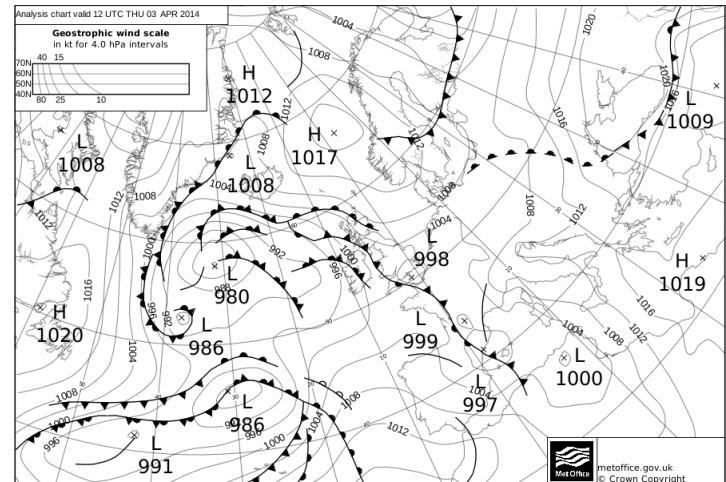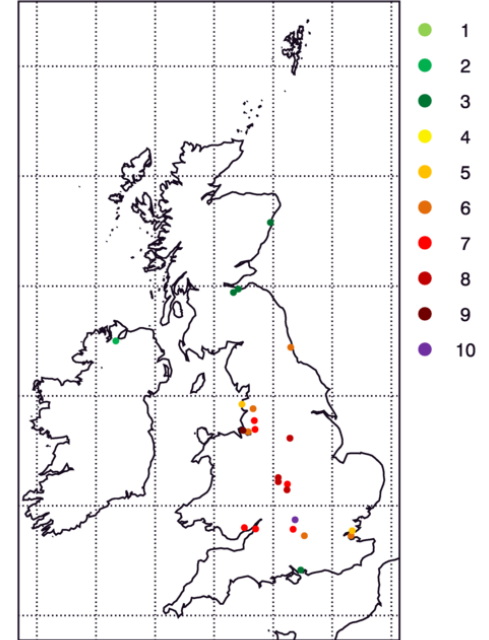
Termination of episode: Friday 4th April
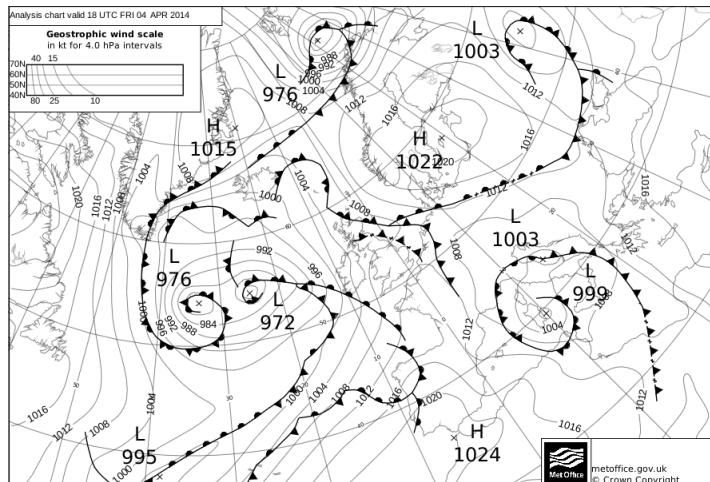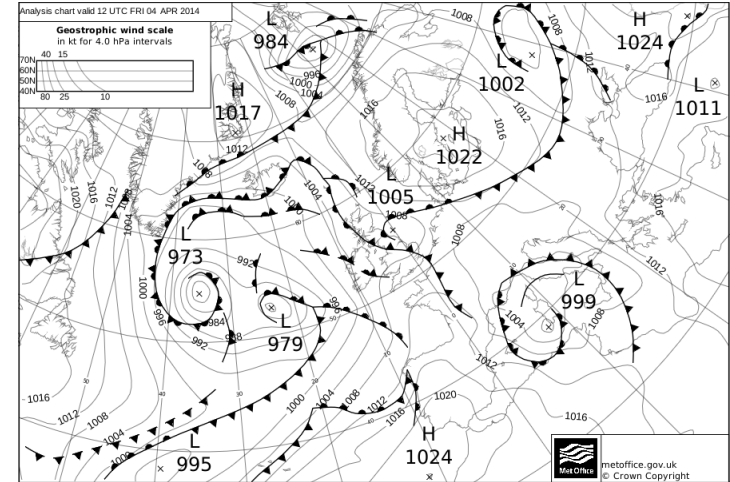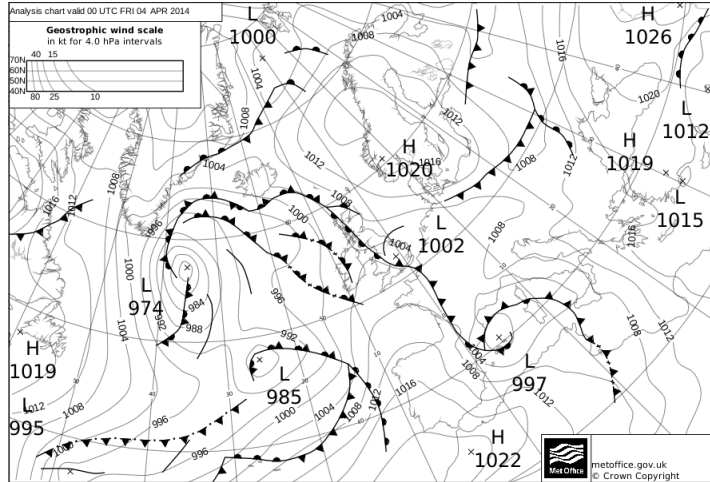
4ᵗʰ April: Episode termination

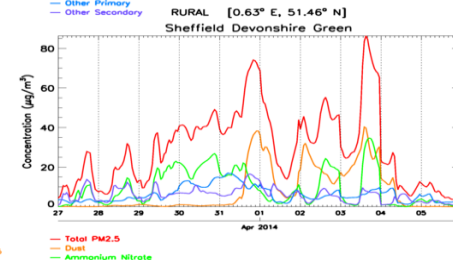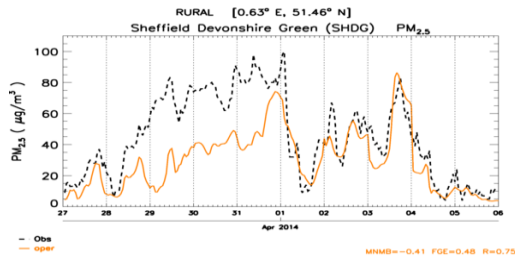Daily Air Quality Index — Fri 04/04/2014
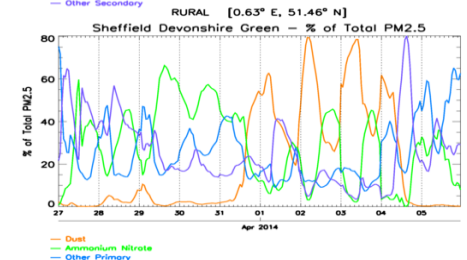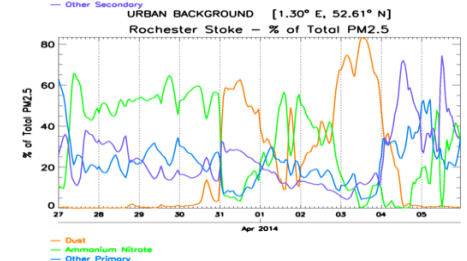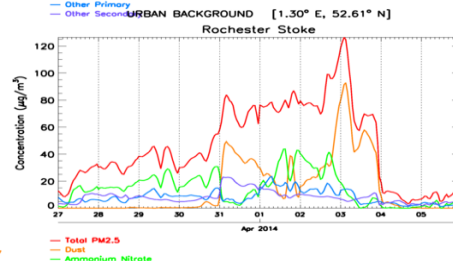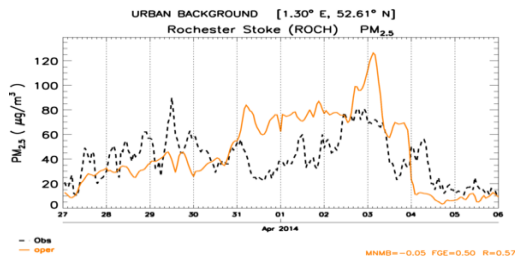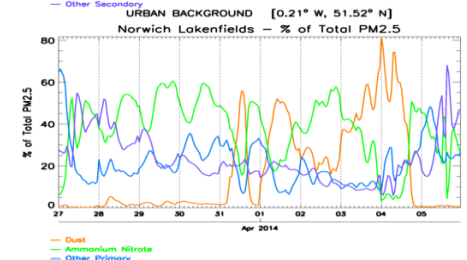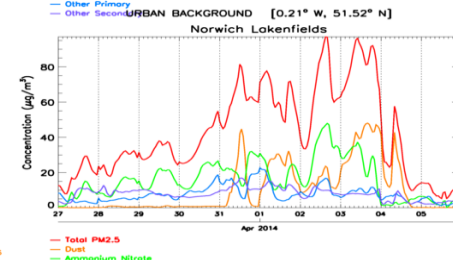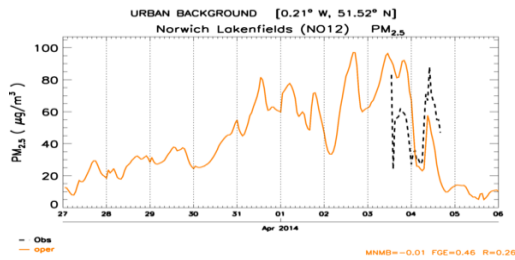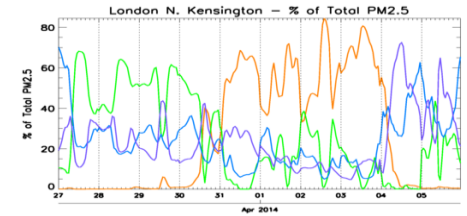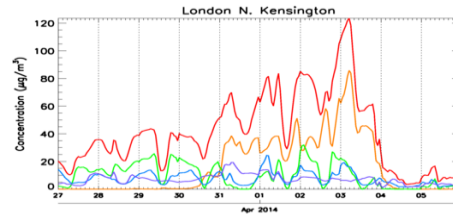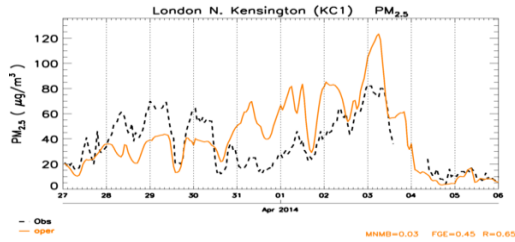
Index
1 – Low
2 – Low
3 – Low
4 – Moderate
5 – Moderate
6 – Moderate
7 – High
8 – High
9 – High
10 – Very High

Obs PM2.5 20140404

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PM 2.5 model speciation

PM10 model speciation
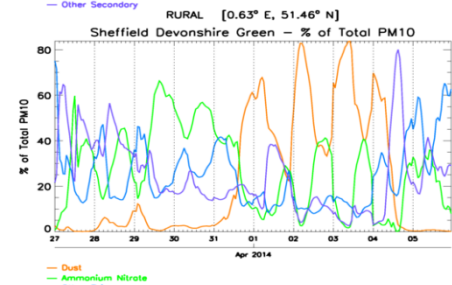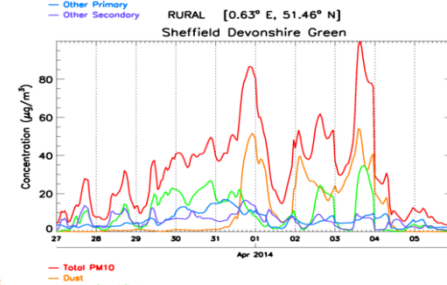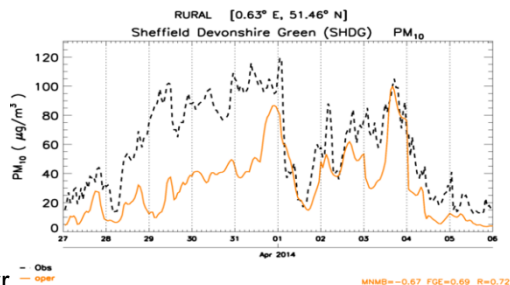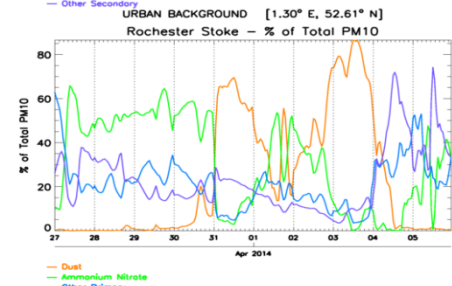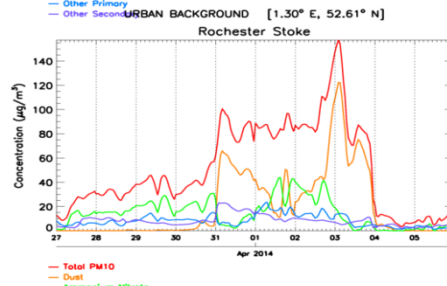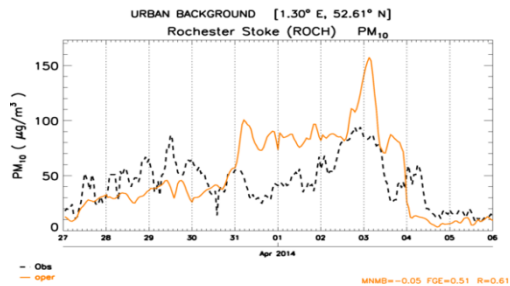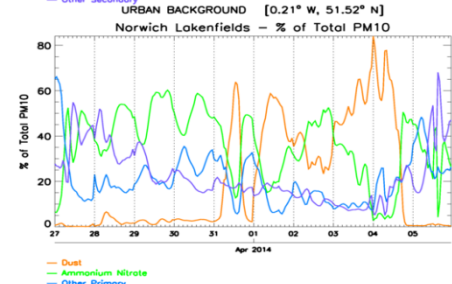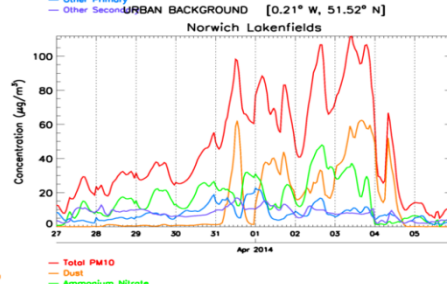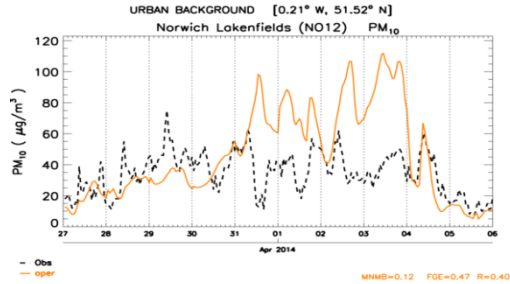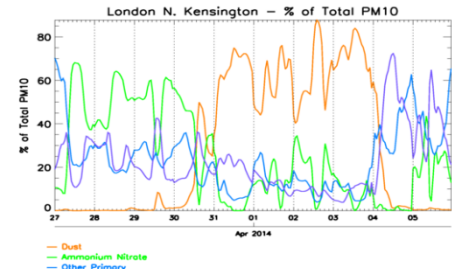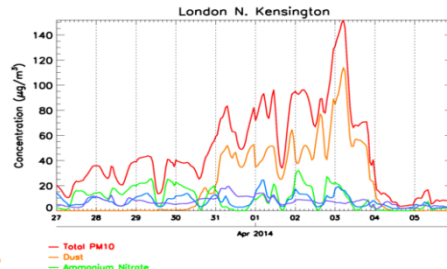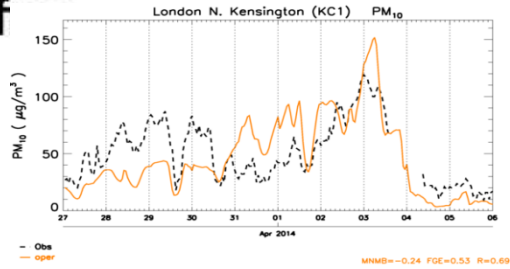
Summary of episode

- An extended and complex episode

    - Complex synoptic evolution

    - Significant contributions of Saharan dust, ammonium nitrate and local primary emissions

- A useful case study, worthy of further investigation……

- Highlights the desirability of better PM2.5 monitoring coverage

- Speciated PM measurements seem hard to access…..

UK Air Quality under a Future Climate

- HealthAir Project:
  http://www.gla.ac.uk/research/az/airpollution/

  - Collaboration between Met Office and Universities of Southampton, Glasgow

  - Bayesian spatio-temporal modelling of chronic health impacts of air quality in UK

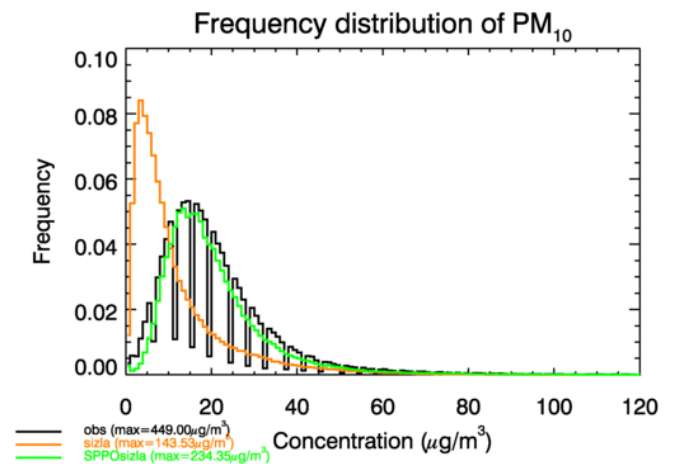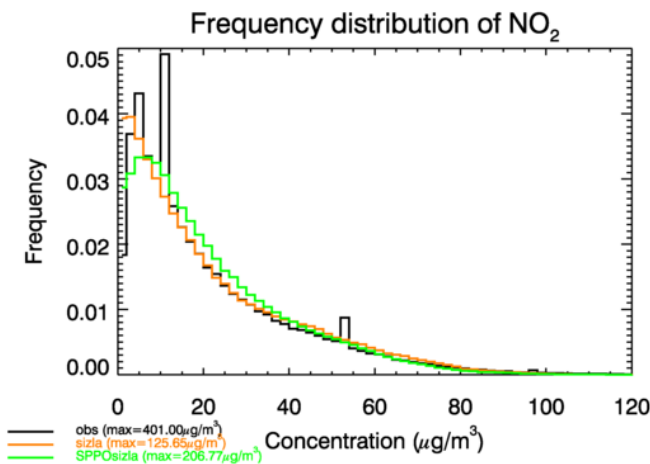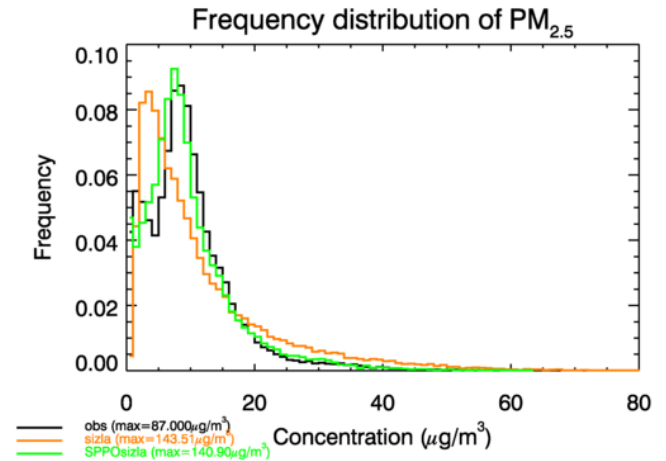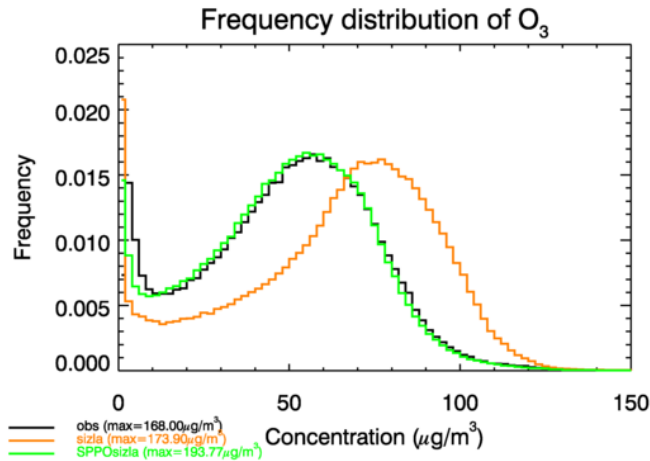 - Present day and future climate modelling

  - 5-year (2007-2011) reanalysis dataset giving hourly UK pollutant fields at 12km resolution over UK

- We are developing a new capability to improve the internal consistency of estimates of future climate air quality

Impact of reanalysis on present day AQ datasets: 2007

Future Climate Simulations

- Aim to maintain as much consistency between present day and future climate runs

- Climate runs employ 3-level nesting:

  - Global Climate Model

    - Regional Climate Model

      - UK air quality model

- Final dataset generated by identical model set-up to present day runs