

# Initial EMEP intensive results from 2012 and 2013 experiments Auchencorth and Harwell

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# European Measurement and evaluation programme

## 313 sites

- Acidifying and eutrophying pollutants
- Particulate matter
- Ground-level ozone
- Heavy metals
- Volatile organic compounds
- Persistent organic pollutant:

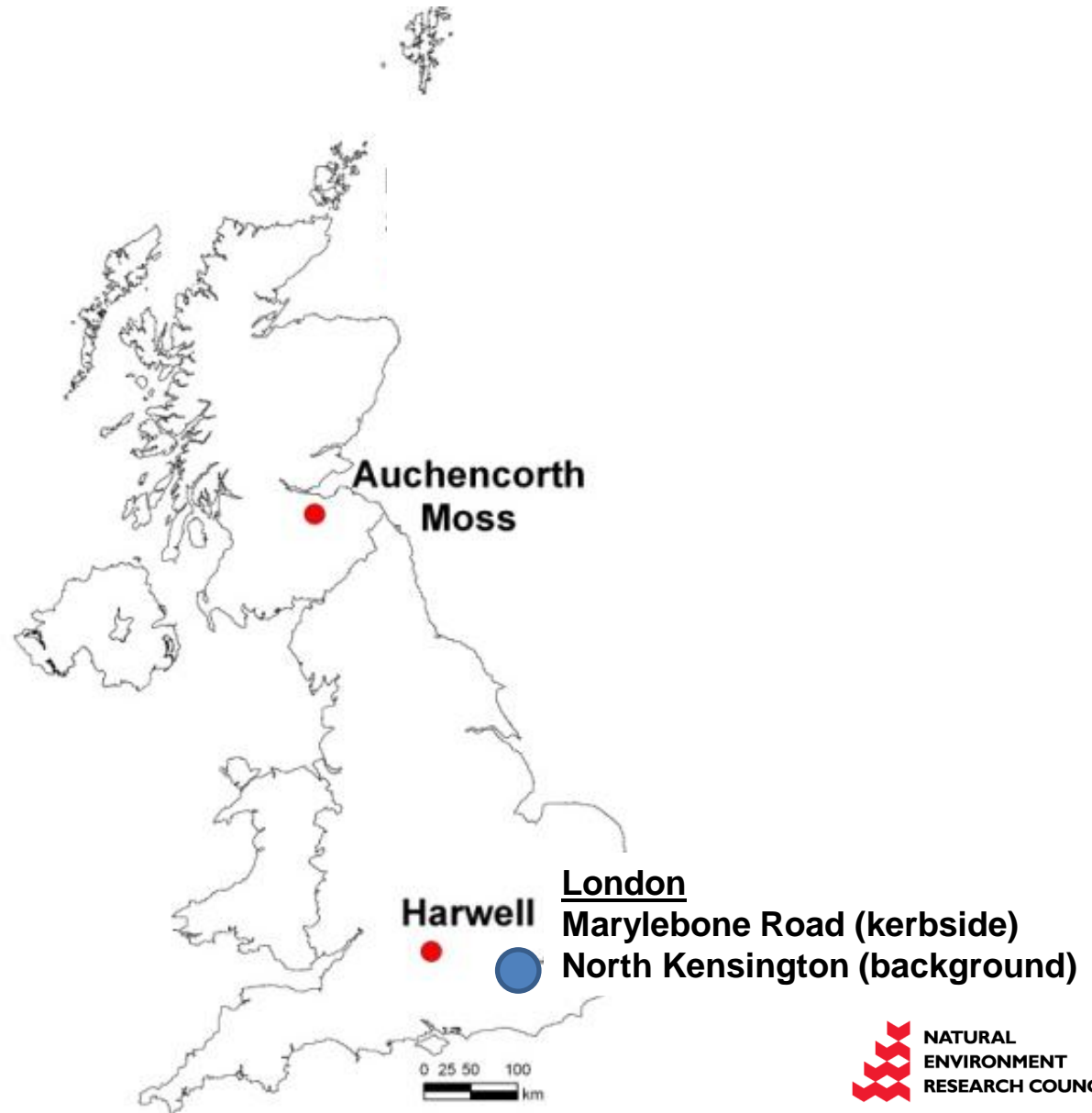
Level 2 Sites

Located in areas thought to have “minimal local emissions”

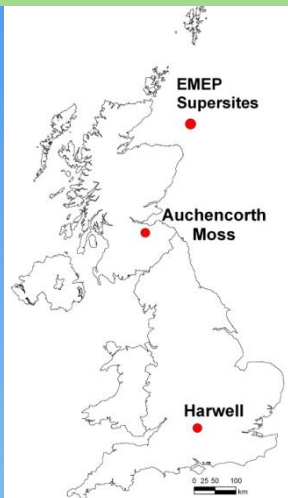
## 31 UK Sites



# Measurement Sites



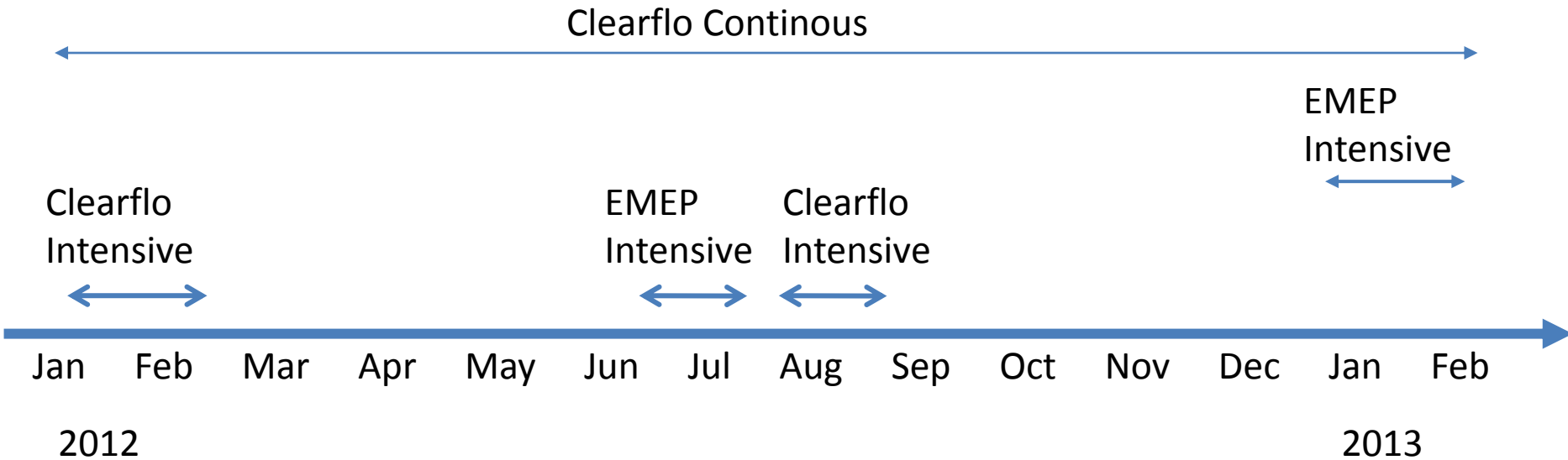
# 2 UK EMEP supersites - Auchencorth Moss and Harwell



Measurement	Method
Water-soluble gases + particles at PM2.5 & PM10	MARGA
Black carbon PM2.5	Aethalometer
NO/NO2	Photolytic converter
Meteorology (wind speed, dir'n., temp., RH, precip'n)	Automated met station
Ozone	UV photometer
PM2.5 and PM10 mass (daily)	Filter (gravimetric)
PM2.5 and PM10 mass (hourly)	TEOM/FDMS
PAH (vapour and particle)	Digitel hi-vol
PAH (precipitation)	Bulk sampler
TOMPS (air)	Hi-vol
Hydrocarbons (C <sub>2</sub> – C <sub>8</sub> )	Online GC-FID
Particle size and number	SMPS
Mercury (elemental) in air	CVAF
Mercury (speciated) in air	CVAF
Mercury (precipitation)	CVAF
Heavy metals PM10 (air)	ICP-MS
Heavy metals (precip'n)	ICP-MS
Ozone, NO <sub>x</sub> , SO <sub>2</sub> fluxes	Automated analyzers
Trace gas fluxes	CoTAG
ECOC (weekly)	Filter

<http://pollutantdeposition.defra.gov.uk/emep>

# 2012-2013: Many intensive activities in UK...



# Measurements of interest ( in addition to routine):

## Harwell

Aerosol mass spectrometer present for **Clearflo intensives** and **EMEP intensive 2013**

Daily mineral dust **EMEP winter intensive 2013**

Daily EC/OC **EMEP winter intensive 2013**:

## Marylebone Road, London:

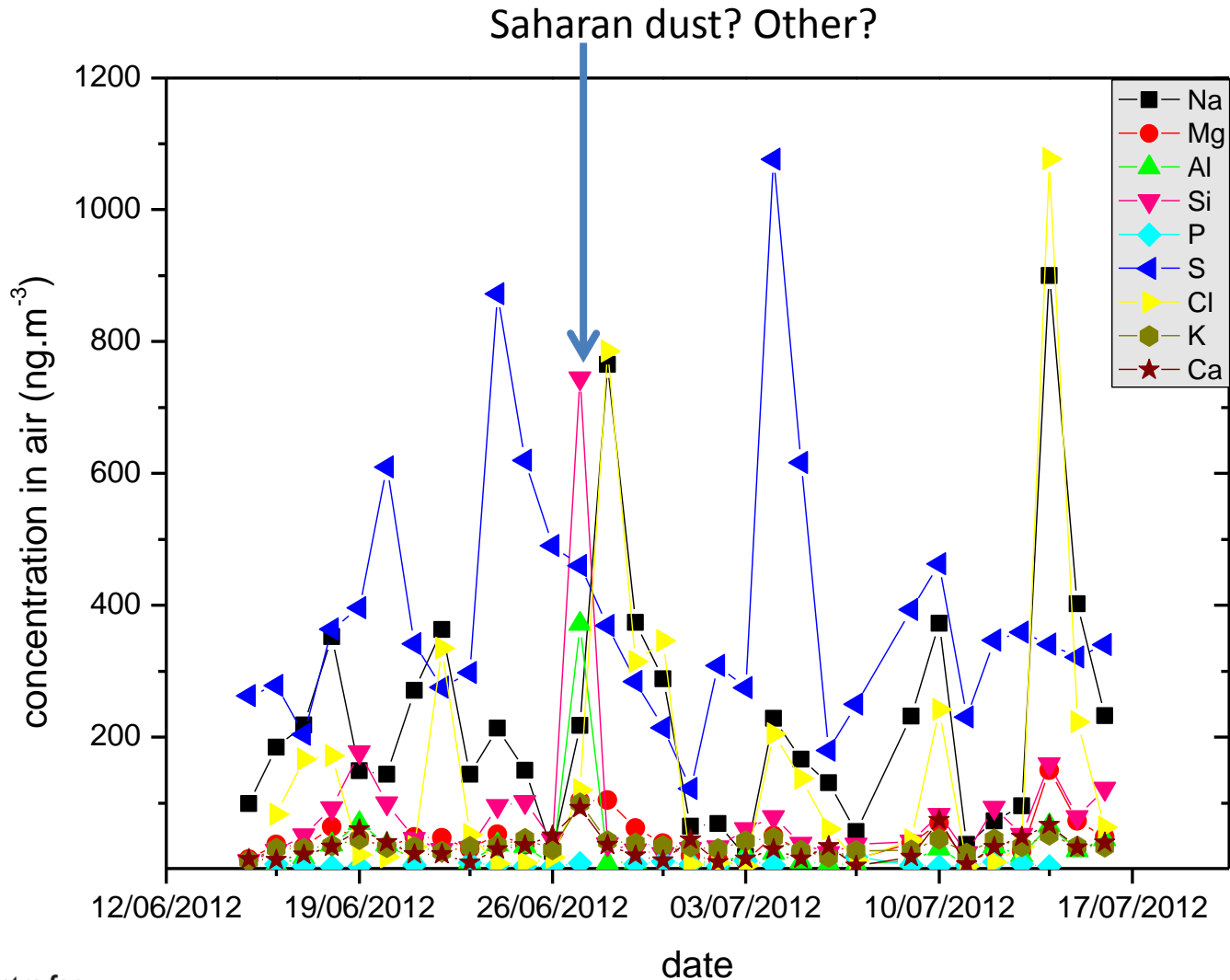
Aerosol mass spectrometer operational Jan 2012-Feb 2013 (i.e. **whole period**)

## Auchencorth Moss

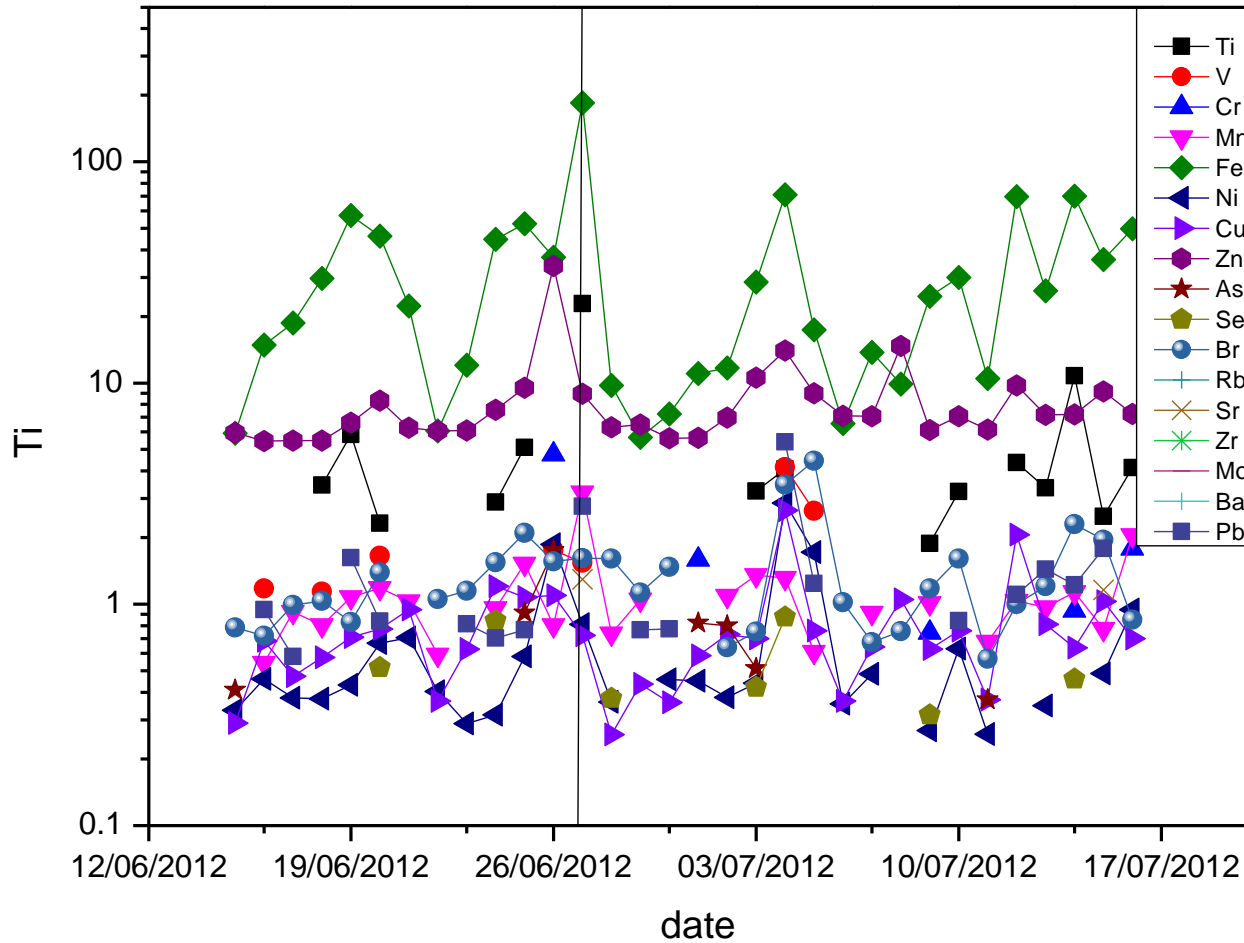
Daily particulate for mineral dust **EMEP Summer 2012** and **EMEP winter intensive 2013**

Daily EC/OC **EMEP winter intensive 2013**

# Auchencorth 2012: Mineral dust measurements

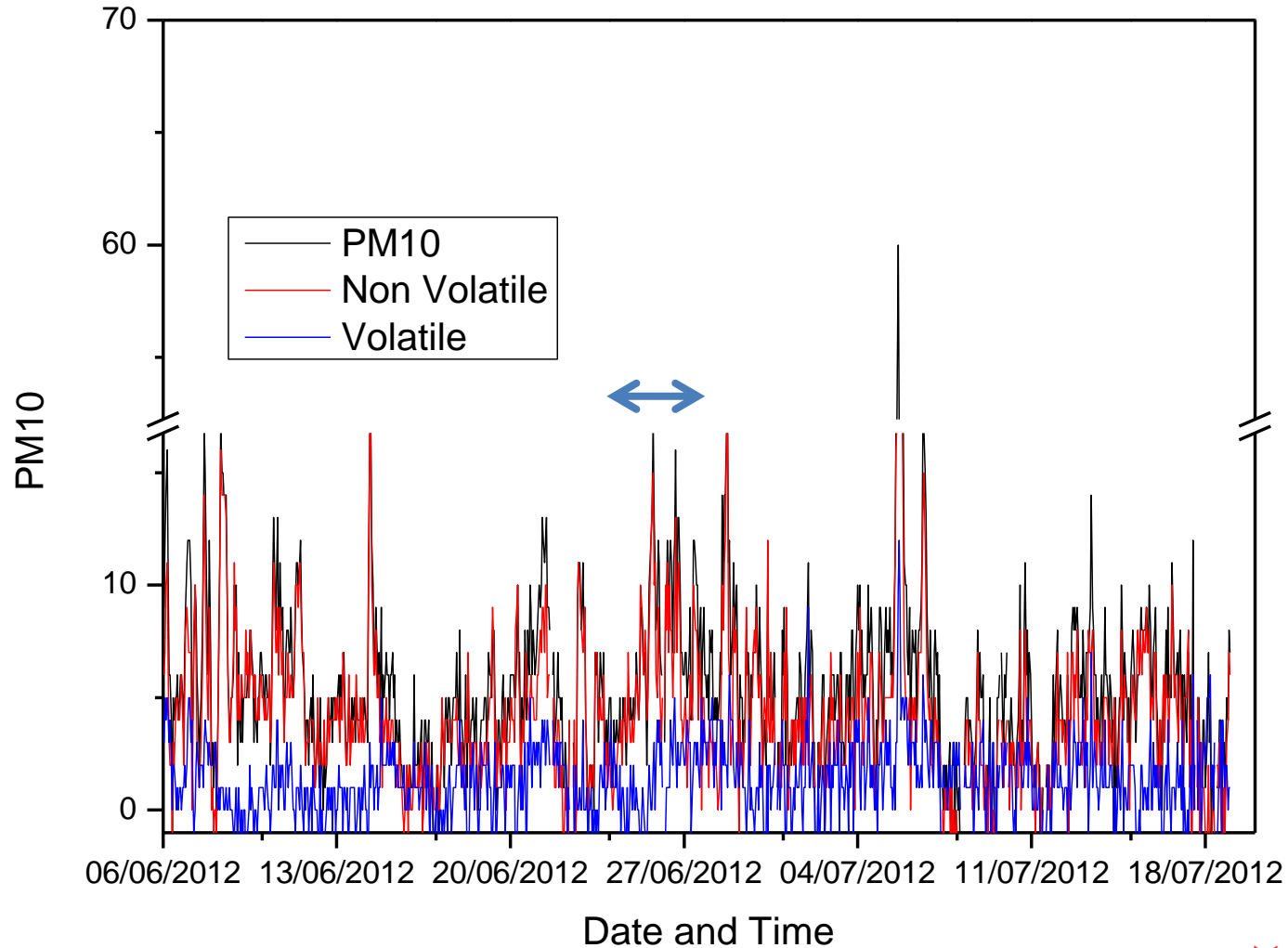


# Saharan dust? Other?





# TEOM FDMS results



# The next stages of analysis....

1. More detailed look at the mineral dust composition in collaboration with Franco Lucarelli, in particular in relation to

Nava et al. (2012)\*:

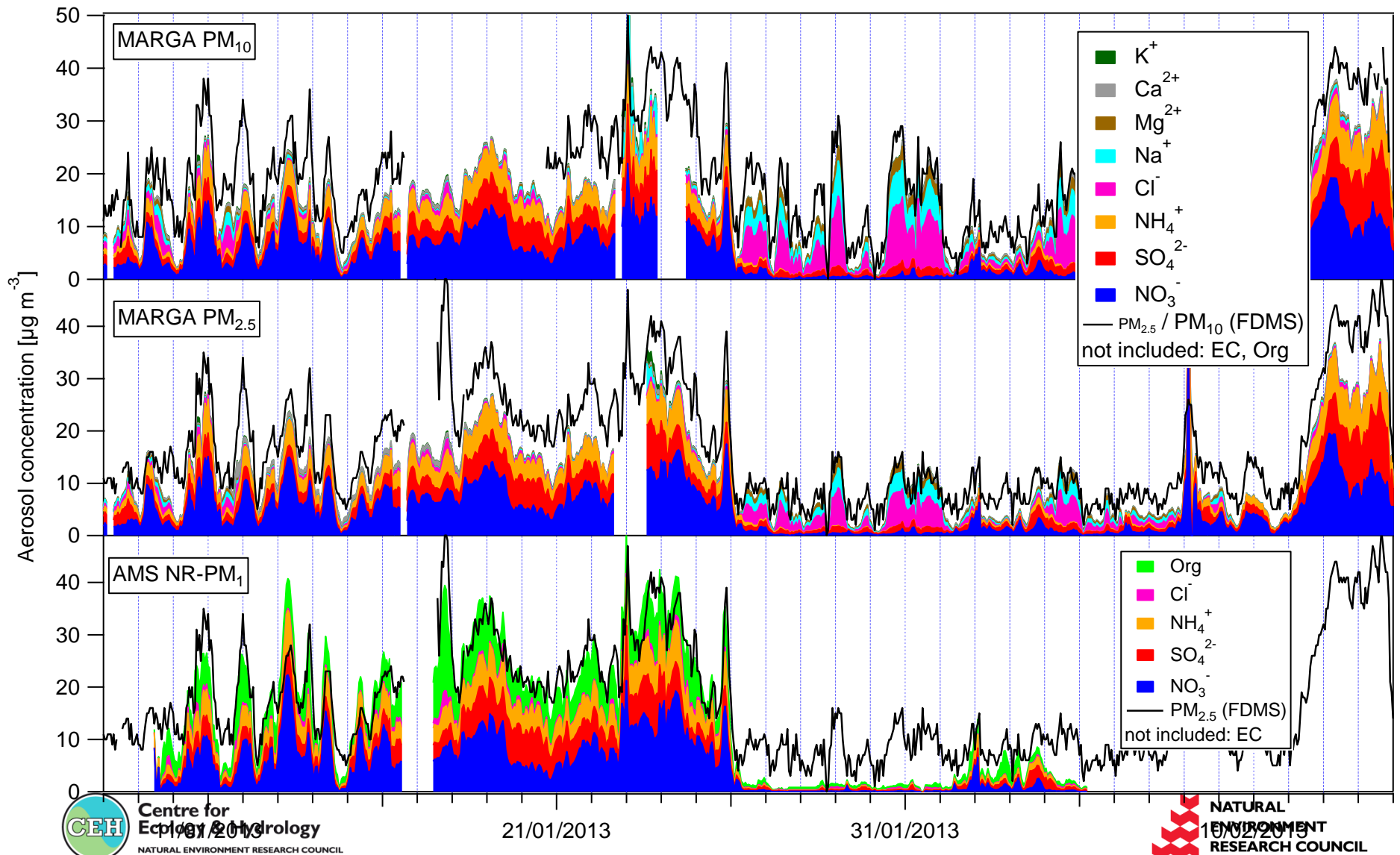
during Saharan intrusions the Al/Ca, Si/Ca, Ti/Ca, Al/Fe, Si/Fe and Ti/Fe ratios increase, while the Si/Al, Ti/Al and Ti/Si ratios decrease; conversely, the Ca/Fe ratio does not show a well defined trend

2. Comparison with the inorganic ion composition and air mass back trajectories

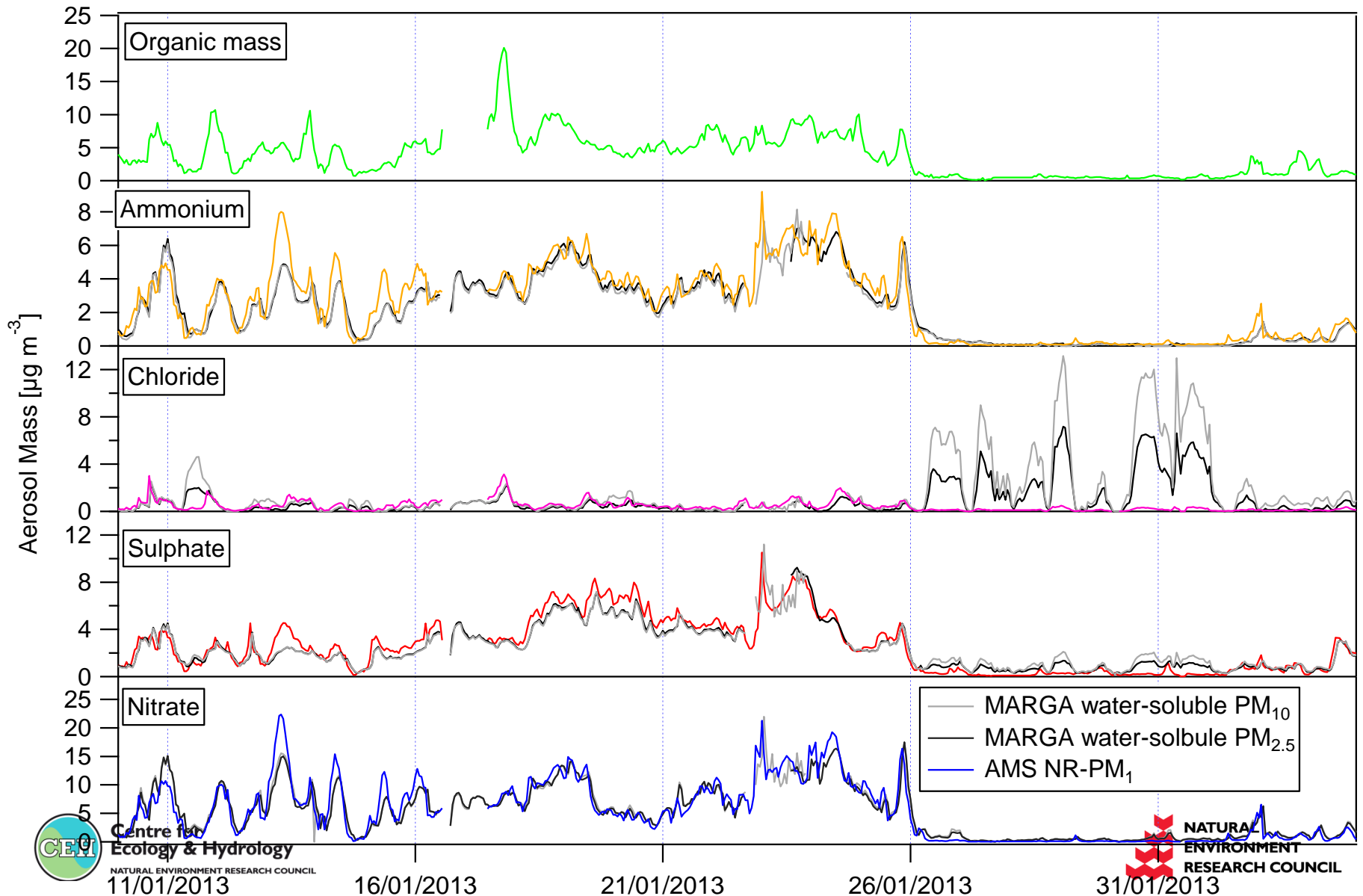
\*Atmospheric Environment 60 (2012) 444e452

- Two different conditions:
  - Anthropogenic secondary aerosol
    - 9- to 26-Jan & 2- to 4-Feb & from 8-Feb
    - Dominated by  $\text{NH}_4\text{NO}_3$
    - Good closure between total AMS NR- $\text{PM}_{10}$  and  $\text{PM}_{2.5}$
    - MARGA underestimating total  $\text{PM}_{2.5}$  /  $\text{PM}_{10}$  (contribution of organic aerosol)
  - Natural seasalt aerosol
    - 9-Jan & 26-Jan to 2-Feb & 4- to 8-Feb
    - Good closure between MARGA and  $\text{PM}_{2.5}$  /  $\text{PM}_{10}$
    - AMS NR- $\text{PM}_{10}$  underestimates total  $\text{PM}_{2.5}$  (NaCl refractory &  $> 1 \mu\text{m}$ )
    - MARGA  $\text{SO}_4^{2-} > \text{AMS SO}_4^{2-}$  due to SS- $\text{SO}_4^{2-}$

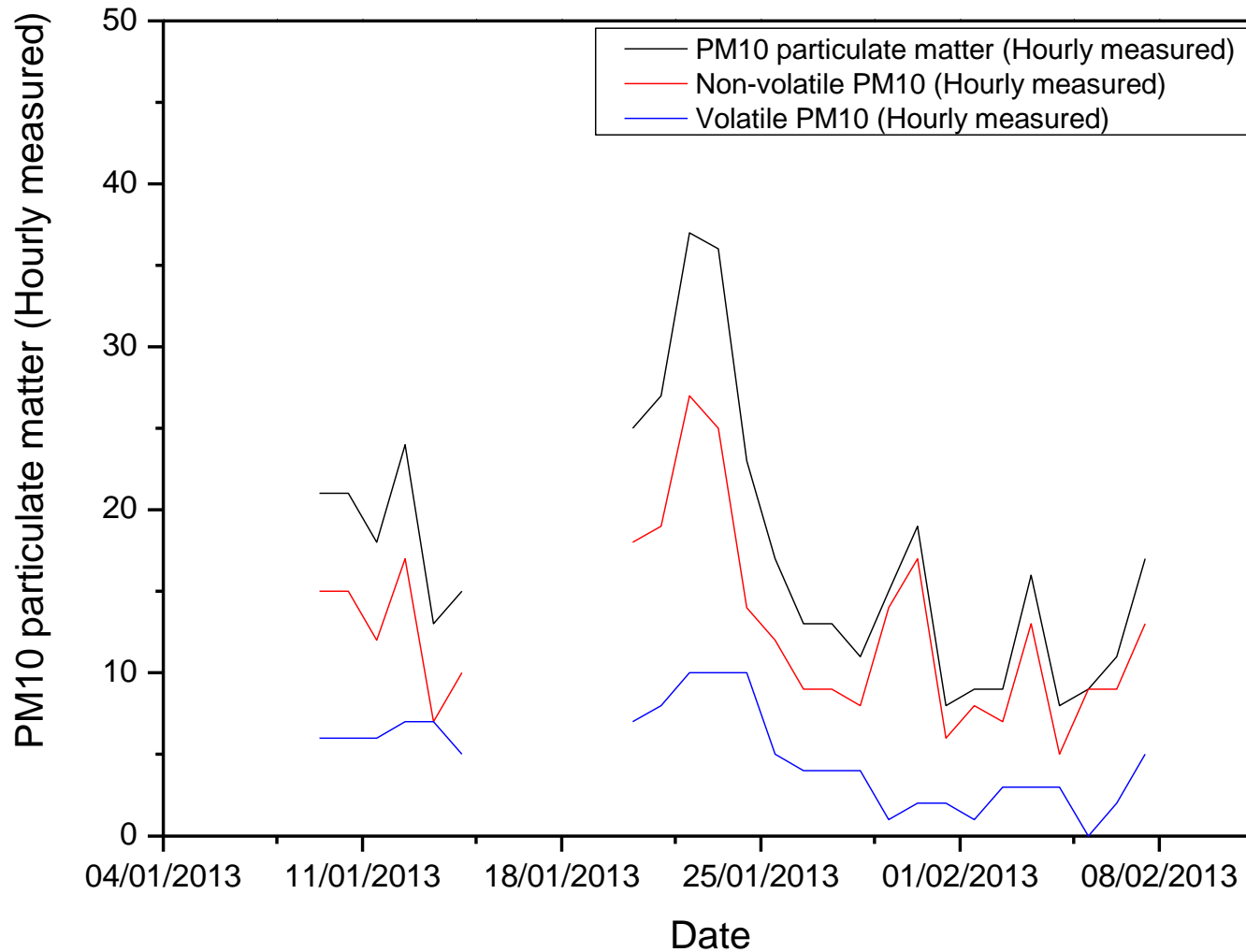
# Mass closure



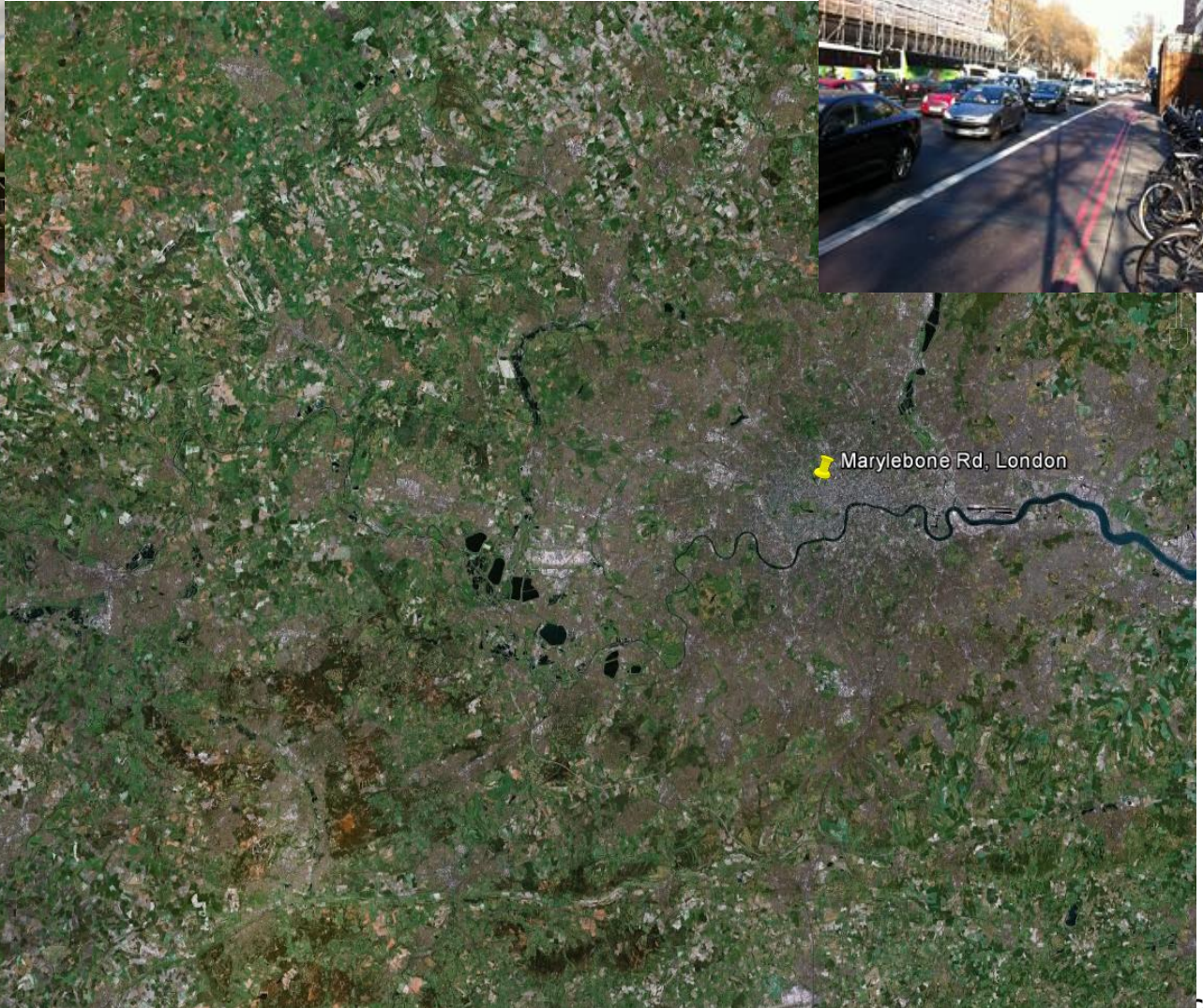
# Comparison AMS vs MARGA



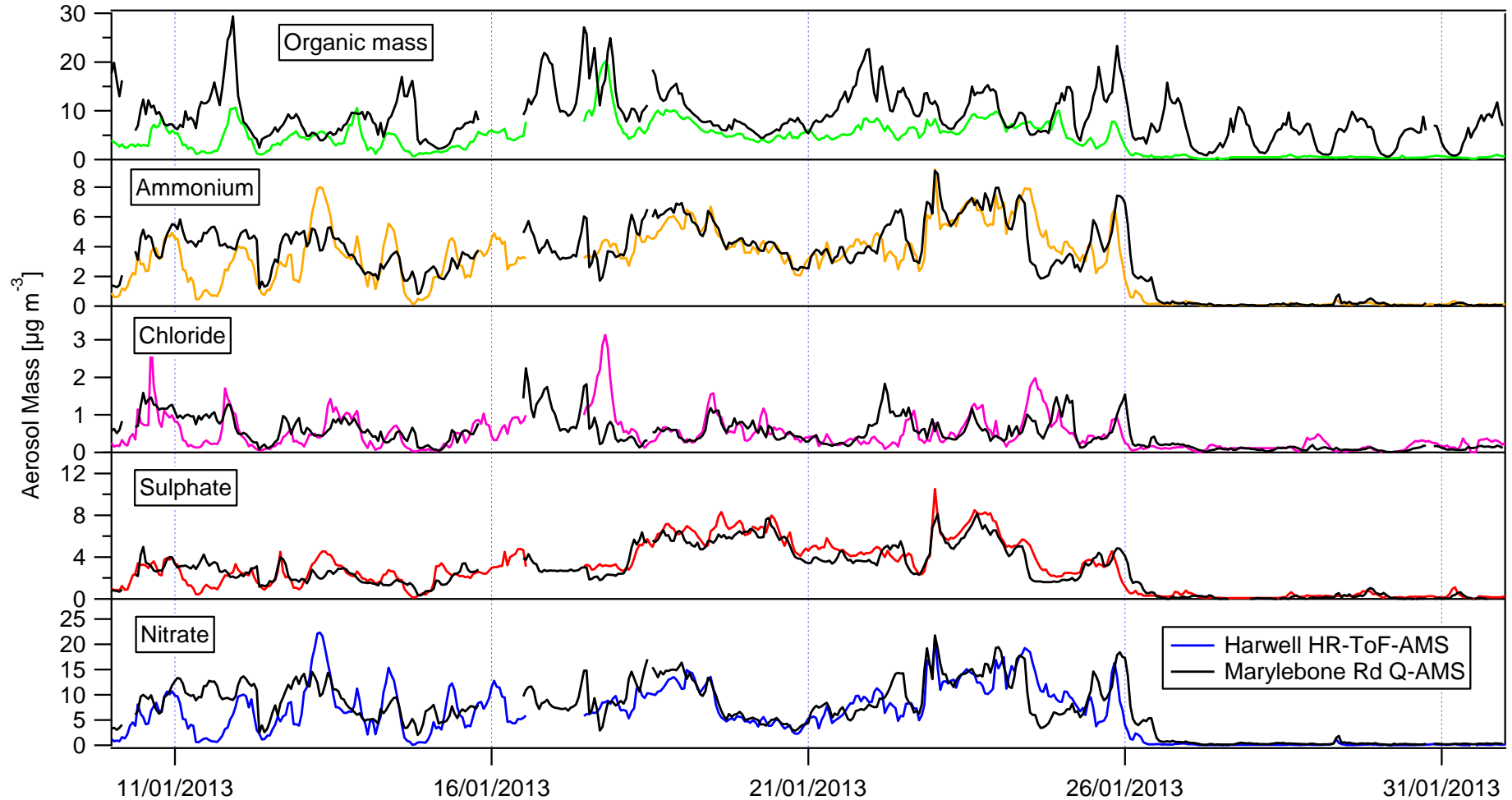
# TEOM-FDMS



# Comparison roadside vs rural

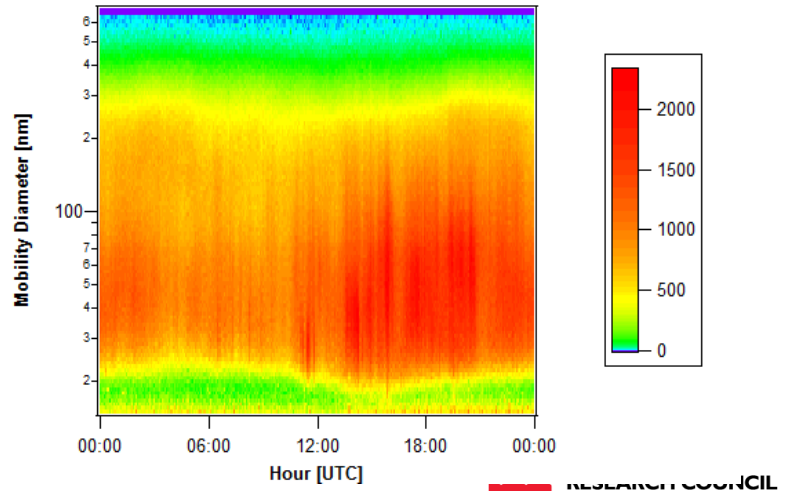
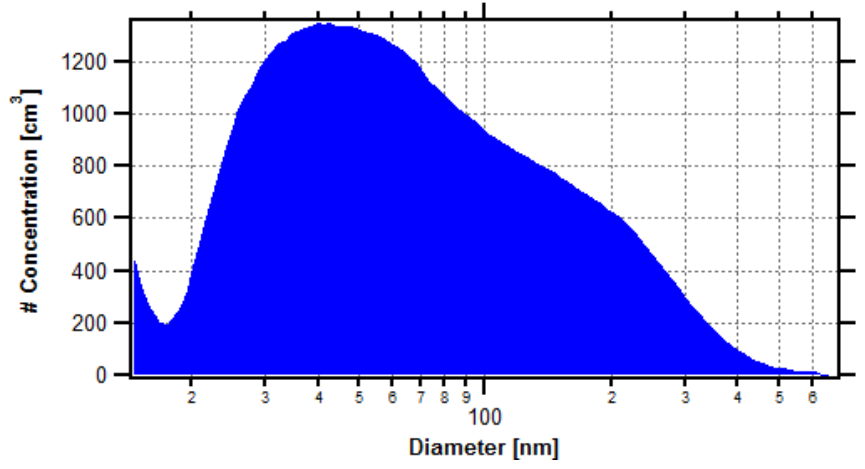
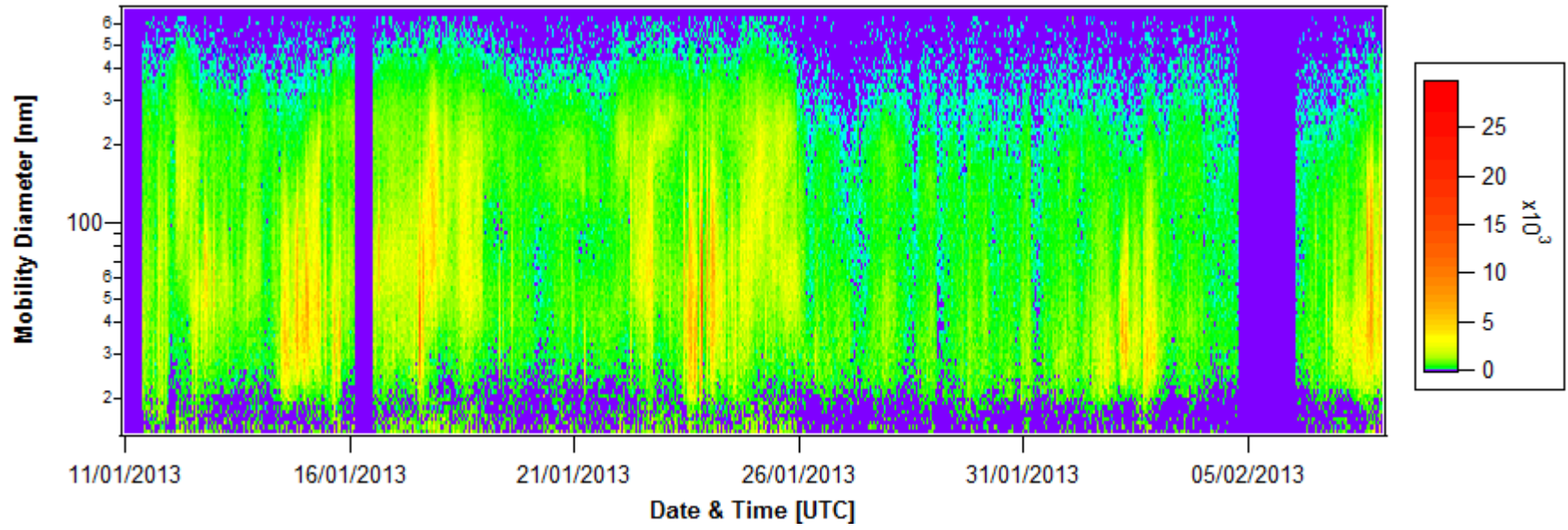


# Quantification of urban / road-side increment





# New Auchencorth SMPS 11/01/2013 – 08/02/2012



# Summary

- Mineral dust analyses assessed in conjunction with all other measurements at Auchencorth for the summer EMEP intensive should lead to some understanding of the sources of the dust
- The more extensive measurements of the EMEP Winter campaign at Harwell and Auchencorth should lead to further PM closure particularly at Harwell with the AMS
- Full year or AMS data and the EMEP and Clearflo campaigns gives a really useful dataset for modellers and atmospheric scientists to work with



**Defra for funding the UKEAP network**  
**UKEAP Local Site Operators**  
**CEH colleagues**  
**Supporting funds from NERC**

<http://pollutantdeposition.defra.gov.uk/ukeap>  
<http://uk-air.defra.gov.uk>  
<http://www.rotap.ceh.ac.uk/home>

**UKEAP LSO and Stakeholder Meeting,**  
**CEH Lancaster**  
**10 -11<sup>th</sup> October 2013**  
*Includes tour of CEH Laboratories! ☺*

# Where to get UKEAP data....

<http://uk-air.defra.gov.uk>

<http://pollutantdeposition.defra.gov.uk/>

[http://www.ceh.ac.uk/sci\\_programmes/UKEAP-Project.html](http://www.ceh.ac.uk/sci_programmes/UKEAP-Project.html)

<http://cldm.defra.gov.uk/index.htm>

<http://uk-air.defra.gov.uk/research/air-quality-modelling>

Email: [ukeap@ceh.ac.uk](mailto:ukeap@ceh.ac.uk)