

# Global Challenge Network on Ozone

## Ozone in Leicester, European ozone trends and Weybourne trends

Zoë Fleming, Paul Monks

Edinburgh, 1<sup>st</sup> May 2013



## Our experience

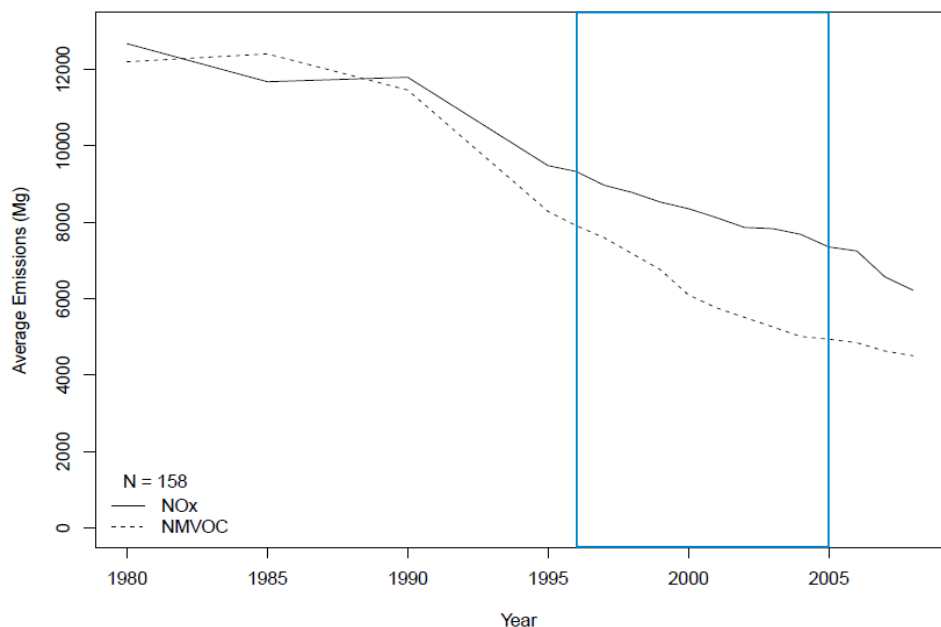
- European trends
- AQEG and EU Air Quality Review (Monks)
- Weybourne Atmospheric observatory
- Leicester city (AURN) (JOAQUIN project)
- London (ClearfLo)
- Source –receptor links with dispersion modelling (NAME)
- Cape Verde

# European Projects

Atmos. Chem. Phys., 12, 437–454, 2012

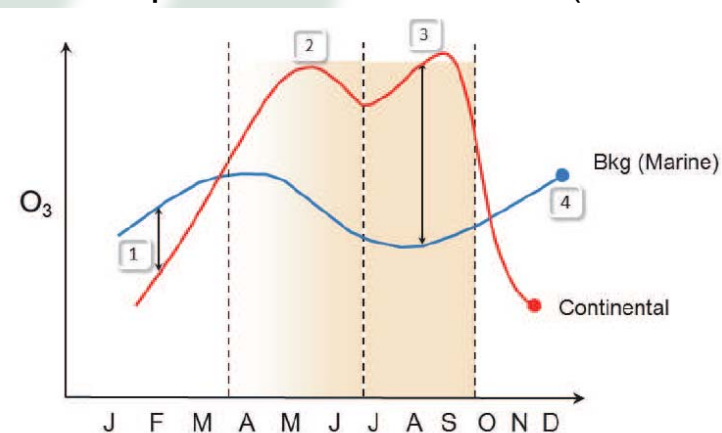
## Have primary emission reduction measures reduced ozone across Europe? An analysis of European rural background ozone trends 1996–2005

R. C. Wilson<sup>1</sup>, Z. L. Fleming<sup>2</sup>, P. S. Monks<sup>1</sup>, G. Clain<sup>3,4</sup>, S. Henne<sup>5</sup>, I. B. Konovalov<sup>6,7</sup>, S. Szopa<sup>4</sup>, and L. Menut<sup>3</sup>



- National and European legislation over the past 20 years, and the modernisation or removal of industrial sources, have significantly **reduced European ozone precursor emissions**

- This study details observed and modelled regional European ozone trends from a constant time period of a decade (1996–2005)

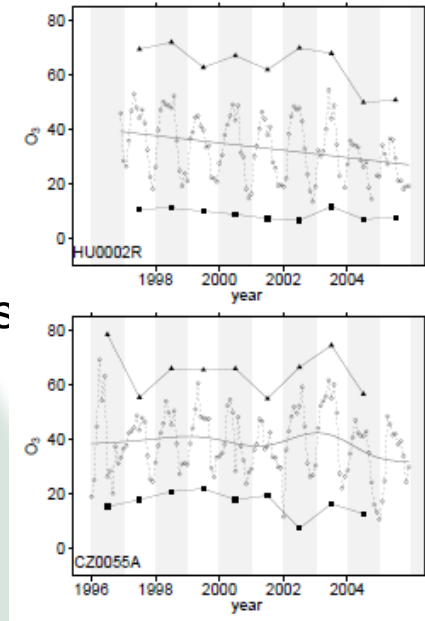


- 1 Winter O<sub>3</sub> decrement, reduce NO<sub>x</sub> increase O<sub>3</sub>
- 2 Spring Ozone Maximum (see e.g. Monks, 2000)
- 3 Summer O<sub>3</sub> photochemical increment, reduce NO<sub>x</sub>, decrease O<sub>3</sub>
- 4 Background O<sub>3</sub> seasonal gradient (+<sup>ve</sup> O<sub>3</sub> trend)

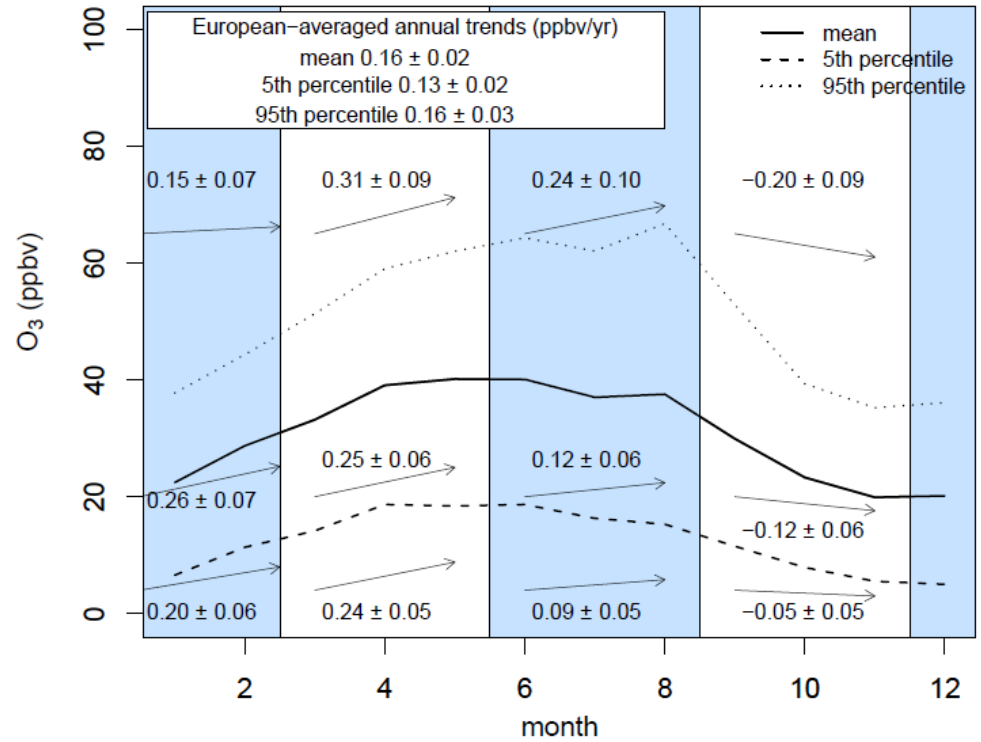


# European (continued)

- 158 rural stations
- Overall there is a positive ozone trend in observed ozone mean ( $0.16 \pm 0.02$  ppbv/yr), 5<sup>th</sup> ( $0.13 \pm 0.02$  ppbv/yr) and 95<sup>th</sup> percentiles ( $0.16 \pm 0.03$  ppbv/yr), representative of positive trends in mean, baseline and peak ozone
- Sensitivity of trends to 2003 heatwave and 1998 El Niño show the masking effect of inter-annual variability on decadal based trends
- CHIMERE model predicts a decrease in 95<sup>th</sup> percentile ozone which is not seen in measurements



Excluded Year	Trend Mean	N (+)	N (-)	Trend			Trend		
				5th Percentile	N (+)	N (-)	95th Percentile	N (+)	N (-)
1996	$0.14 \pm 0.02$	64	18	$0.08 \pm 0.02$	56	21	$0.18 \pm 0.03$	65	17
1997	$0.27 \pm 0.02$	104	15	$0.24 \pm 0.02$	104	19	$0.36 \pm 0.03$	101	11
1998	$0.31 \pm 0.02$	109	4	$0.26 \pm 0.02$	104	8	$0.36 \pm 0.03$	96	4
1999	$0.26 \pm 0.02$	107	11	$0.20 \pm 0.02$	97	13	$0.30 \pm 0.03$	95	6
2000	$0.19 \pm 0.02$	86	15	$0.16 \pm 0.02$	84	16	$0.21 \pm 0.03$	68	14
2001	$0.14 \pm 0.02$	67	17	$0.12 \pm 0.02$	72	22	$0.13 \pm 0.03$	51	19
2002	$0.09 \pm 0.02$	53	19	$0.08 \pm 0.02$	62	23	$0.05 \pm 0.03$	34	24
2003	$-0.04 \pm 0.02$	25	28	$0.00 \pm 0.02$	38	33	$-0.14 \pm 0.03$	13	44
2004	$0.02 \pm 0.02$	41	25	$0.03 \pm 0.02$	45	31	$-0.07 \pm 0.03$	23	37
2005	$0.20 \pm 0.02$	91	16	$0.16 \pm 0.02$	82	13	$0.19 \pm 0.03$	16	17
none	$0.16 \pm 0.02$	85	18	$0.13 \pm 0.02$	82	19	$0.16 \pm 0.03$	71	19



# EU Air Quality Review Process

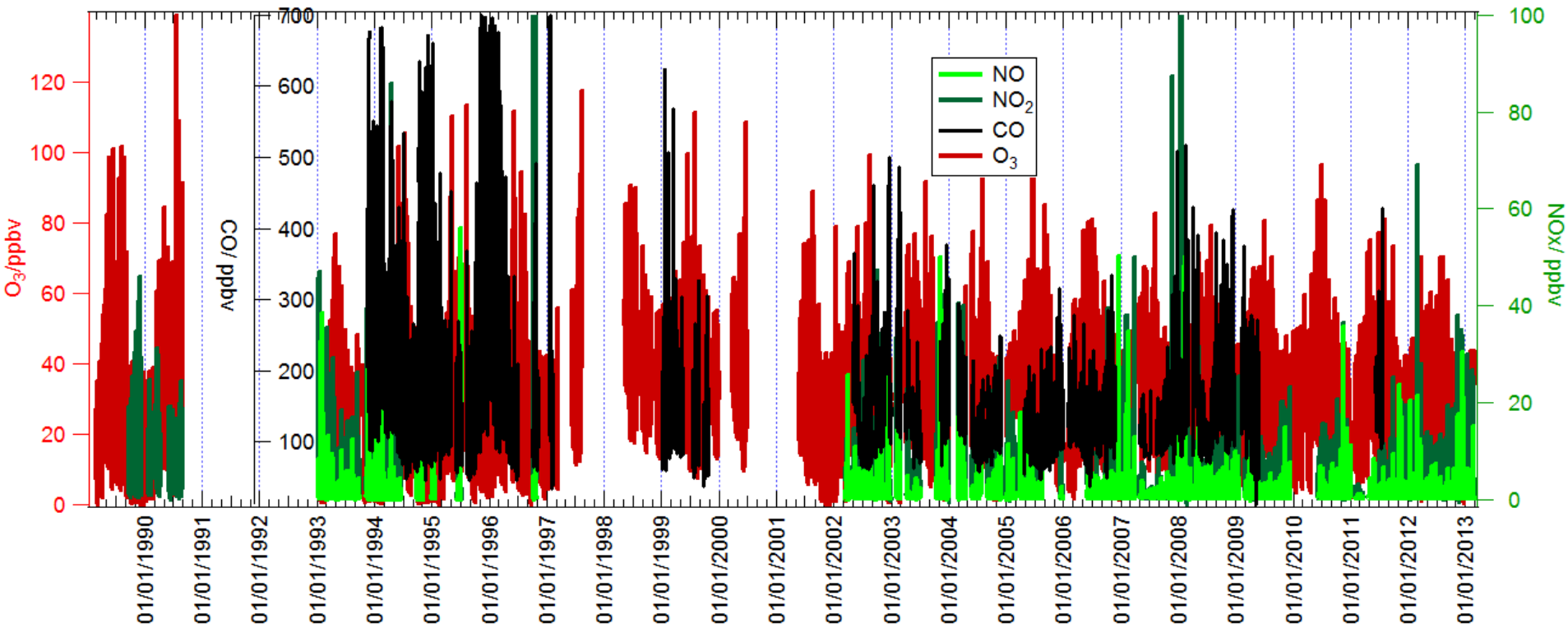
**Paul S. Monks**, University of Leicester, UK, **Augustin Colette** (Ineris, Fr), **Dick Derwent** (UK), **Claire Granier** (LATMOS/IPSL, Fr) ,**David Stevenson** (School of GeoSciences, The University of Edinburgh, UK) , **Oksana Tarasova** (WMO), **Valerie Thouret** (LA/OMP-CNRS, Fr), **Oliver Wild** (Univ. Lancaster, UK).

- 1) How and can the background contribution to human health and environmental thresholds be quantified?
- 2) What is the contribution of background ozone to effects on human health and ecosystems?
- 3) What is the relationship between control of NO<sub>x</sub> and VOC sources in Europe and changes in ozone exposure, and effects?
- 4) How much benefit would control of methane deliver in mitigating ozone effects in Europe?
- 5) Can the control of ozone precursors in Europe be regulated to maximise the benefits for health and climate effects?

**AIR QUALITY EXPERT GROUP (AQEG)**

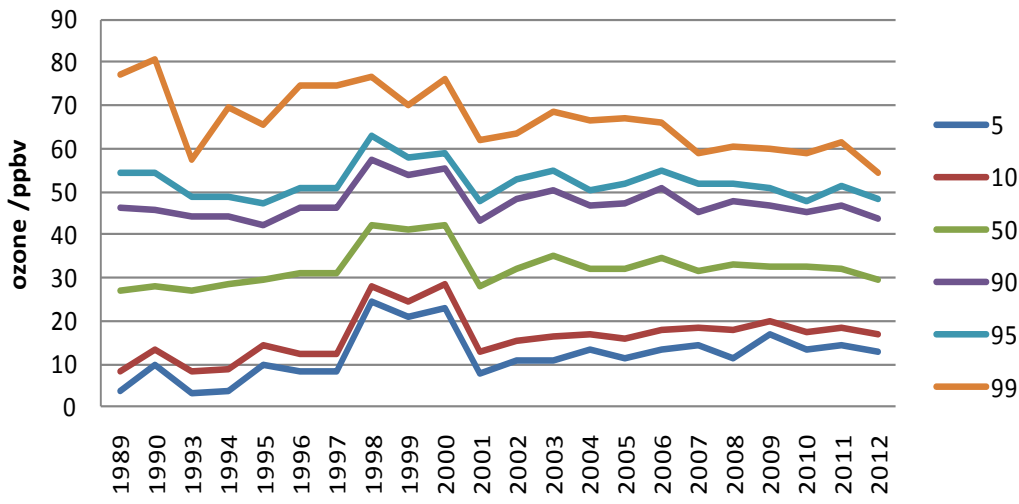


- 24 years of data (ozone and other related species)
- Linked with DEFRA monitoring network

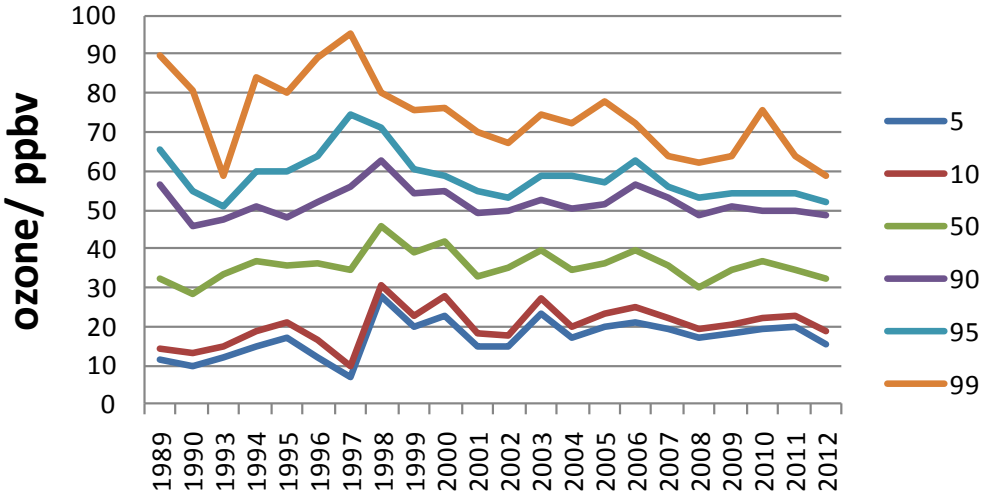


# Weybourne ozone trends

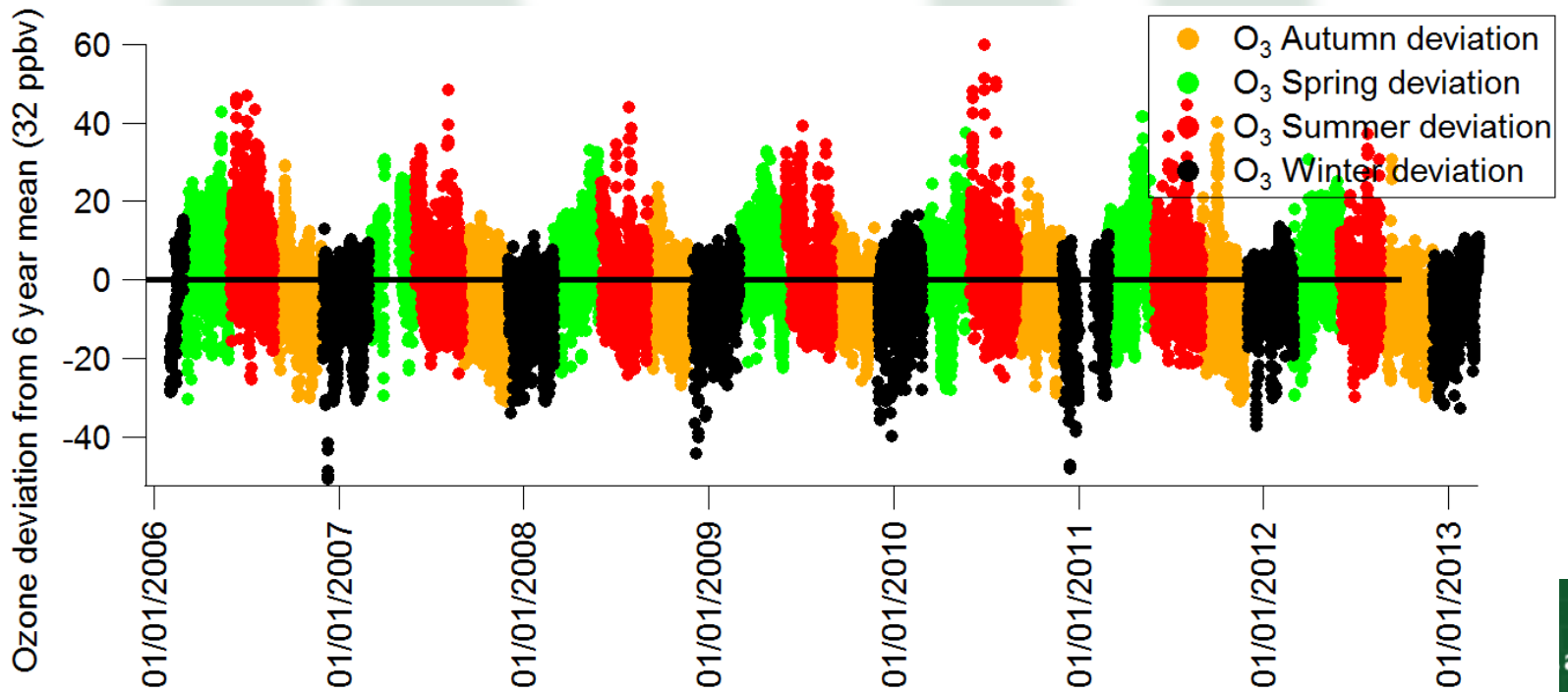
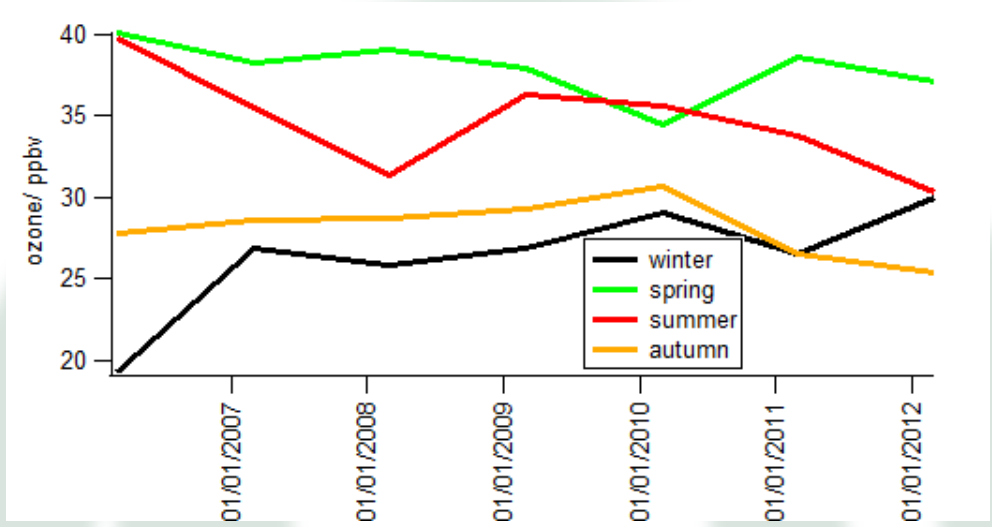
## Weybourne all months percentiles



## Weybourne summer only percentiles



# Weybourne seasonality





# London and ClearfLo

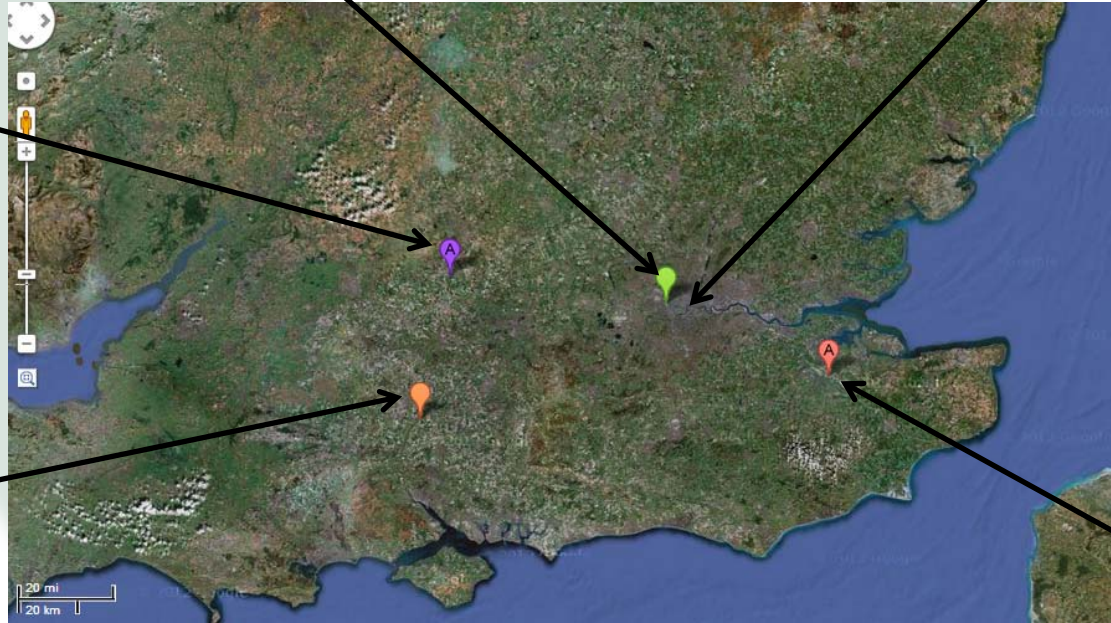


North Kensington  
(linked to air  
quality network)



BT tower,  
central  
London

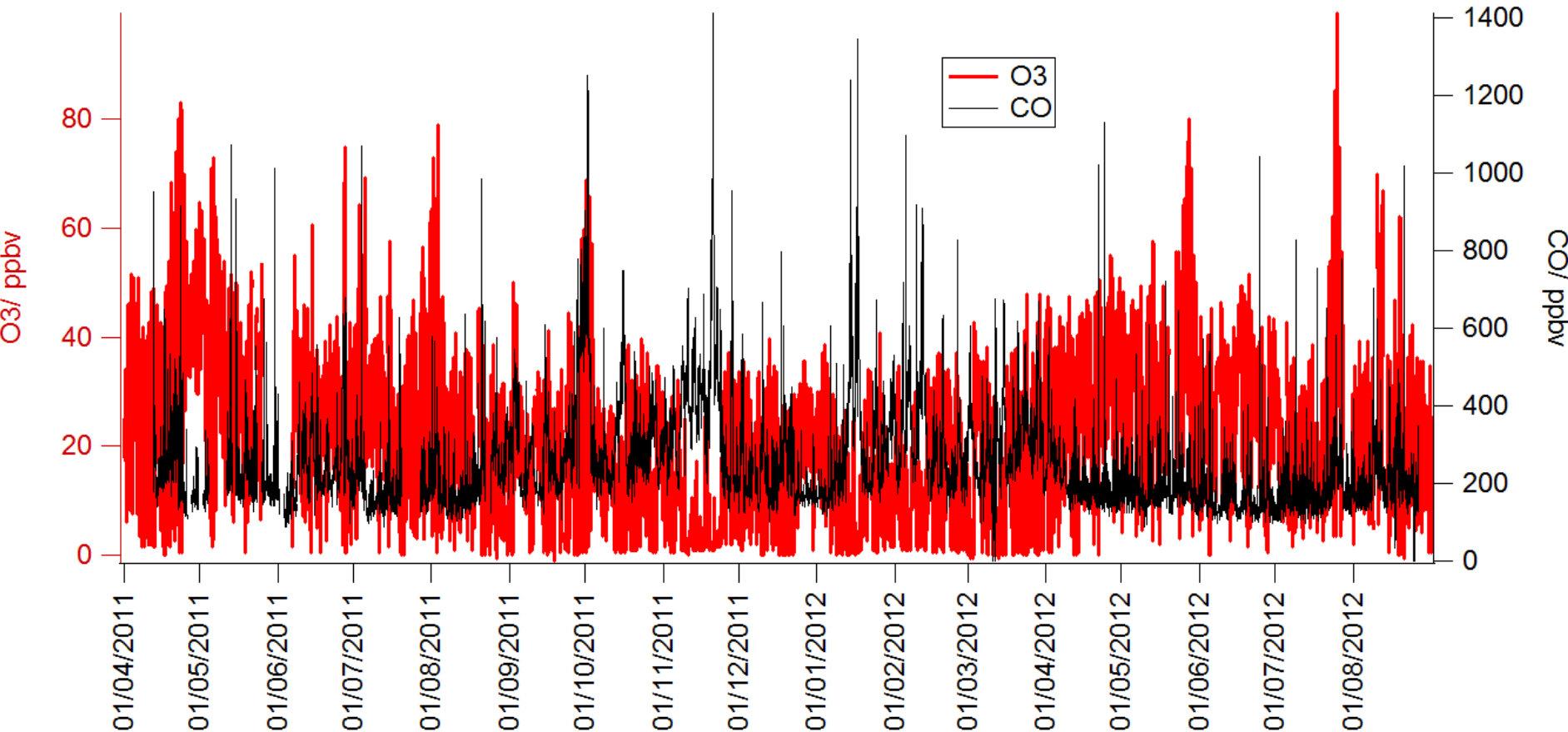
Harwell



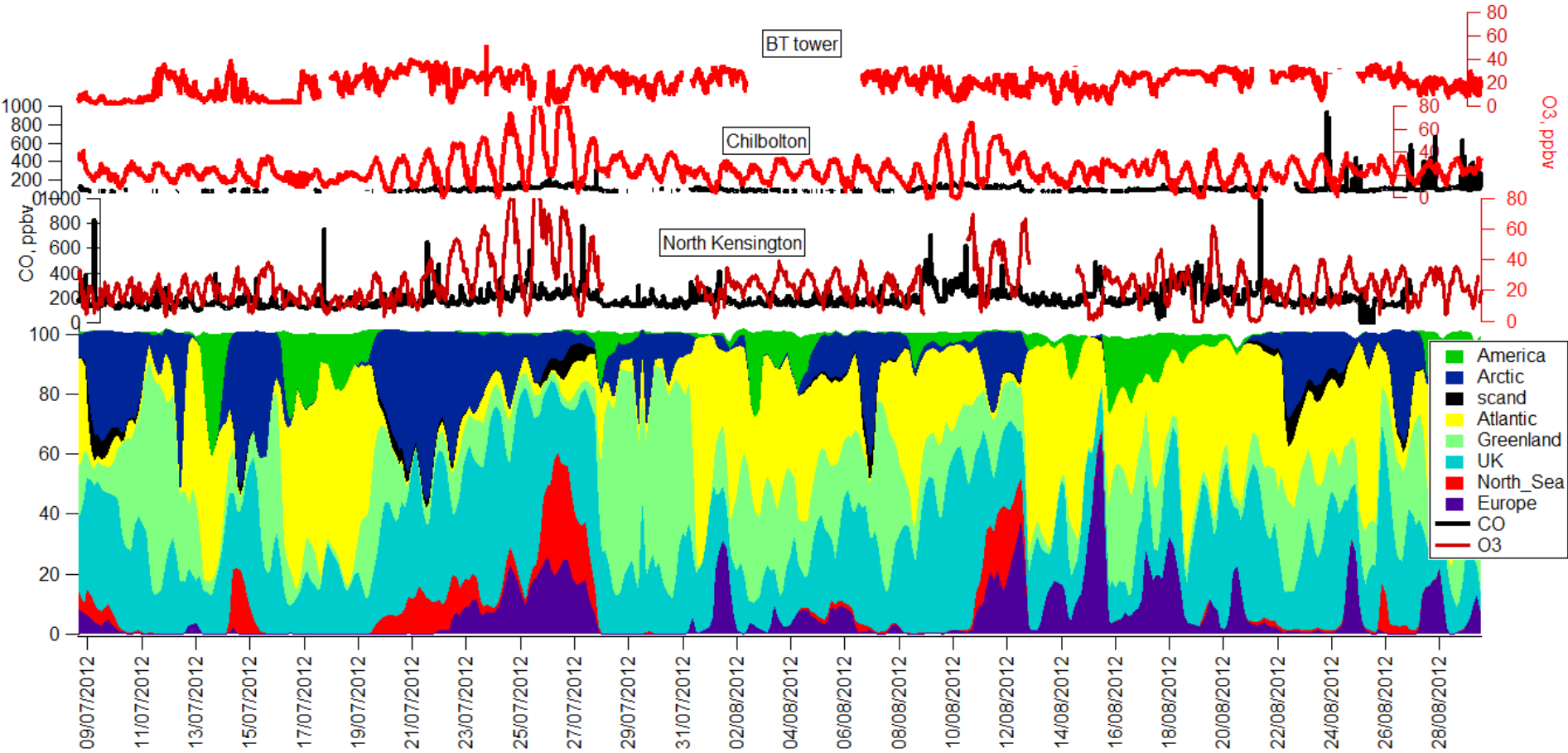
Detling, Kent



# London long term measurements



# London and ClearfLo





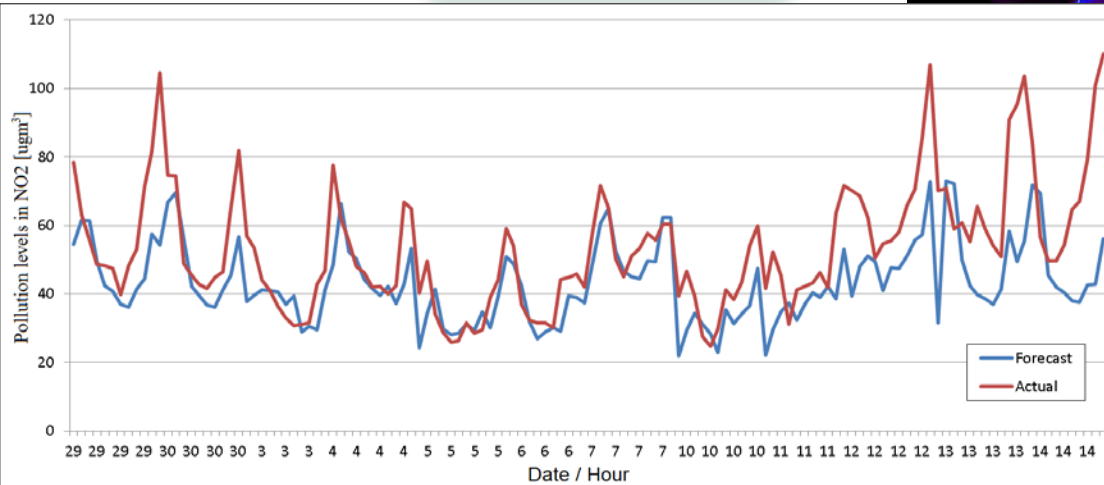
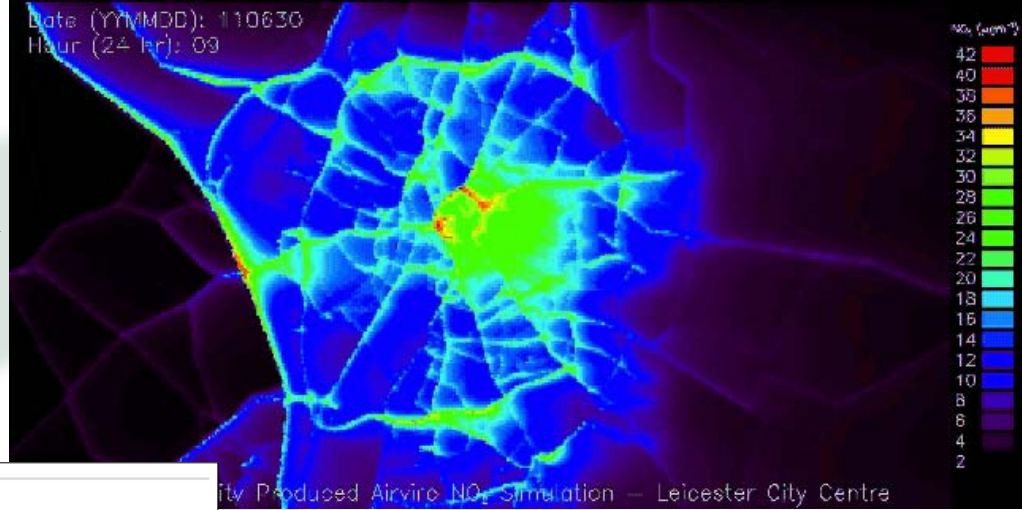
Facilitate the development of health relevant air quality policies in the NW European hotspot region:

1. provide policy makers with the necessary evidence on their current local/regional situation - what does this mean for us/them?
  2. provide policy makers best-practices on how to deal best with the current local/regional situation - what can we do about it?
  3. motivate policy makers to adapt current policies by creating a support base with stakeholders and the general public
- Setting up of atmospheric monitoring instruments in Netherlands and UK
  - Transnational mobile monitoring campaign
  - Data gathering and availability centre (website): to analyse the interlinkages between the currently used and newly identified health pertinent air pollution parameters



# Leicester city initiatives

- New city monitoring station to be opened on University campus this summer

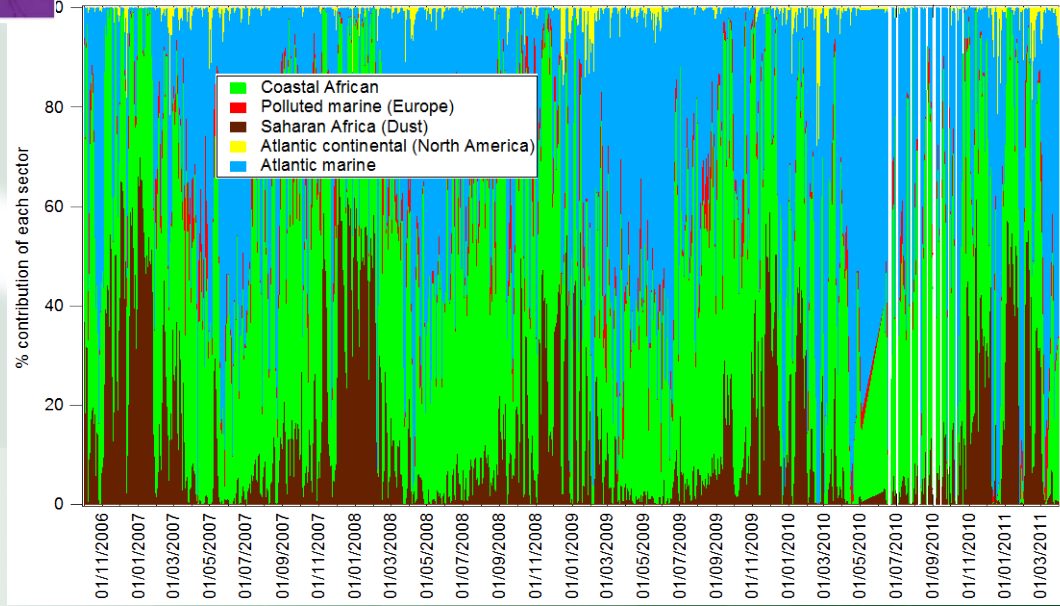
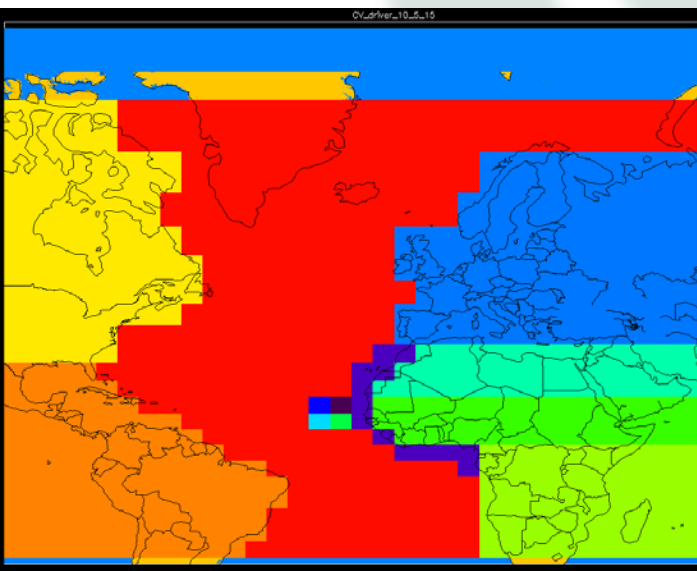
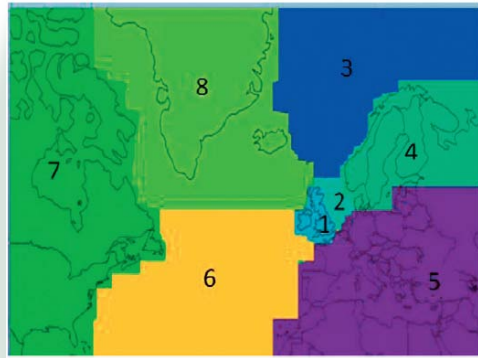


# iTRAQ

INTEGRATING TRAFFIC CONTROL & AIR QUALITY

# Dispersion modelling: Source receptor links with trends

- Met Office' NAME dispersion model
- Produce footprints of station 10 days backwards- which regions did the air pass over?



# Cape Verde (>7 years data)

