



---

# OBSERVATIONS IN SITU DES AEROSOLS (ET ESPÈCES GAZEUSES RÉACTIVES) AU SIRTA - ZONE 5

---

OLIVIER FAVEZ, VALÉRIE GROS, ET AL.

[olivier.favez@ineris.fr](mailto:olivier.favez@ineris.fr)  
[valerie.gros@lsce.ipsl.fr](mailto:valerie.gros@lsce.ipsl.fr)



PROG. EU-ACTRIS



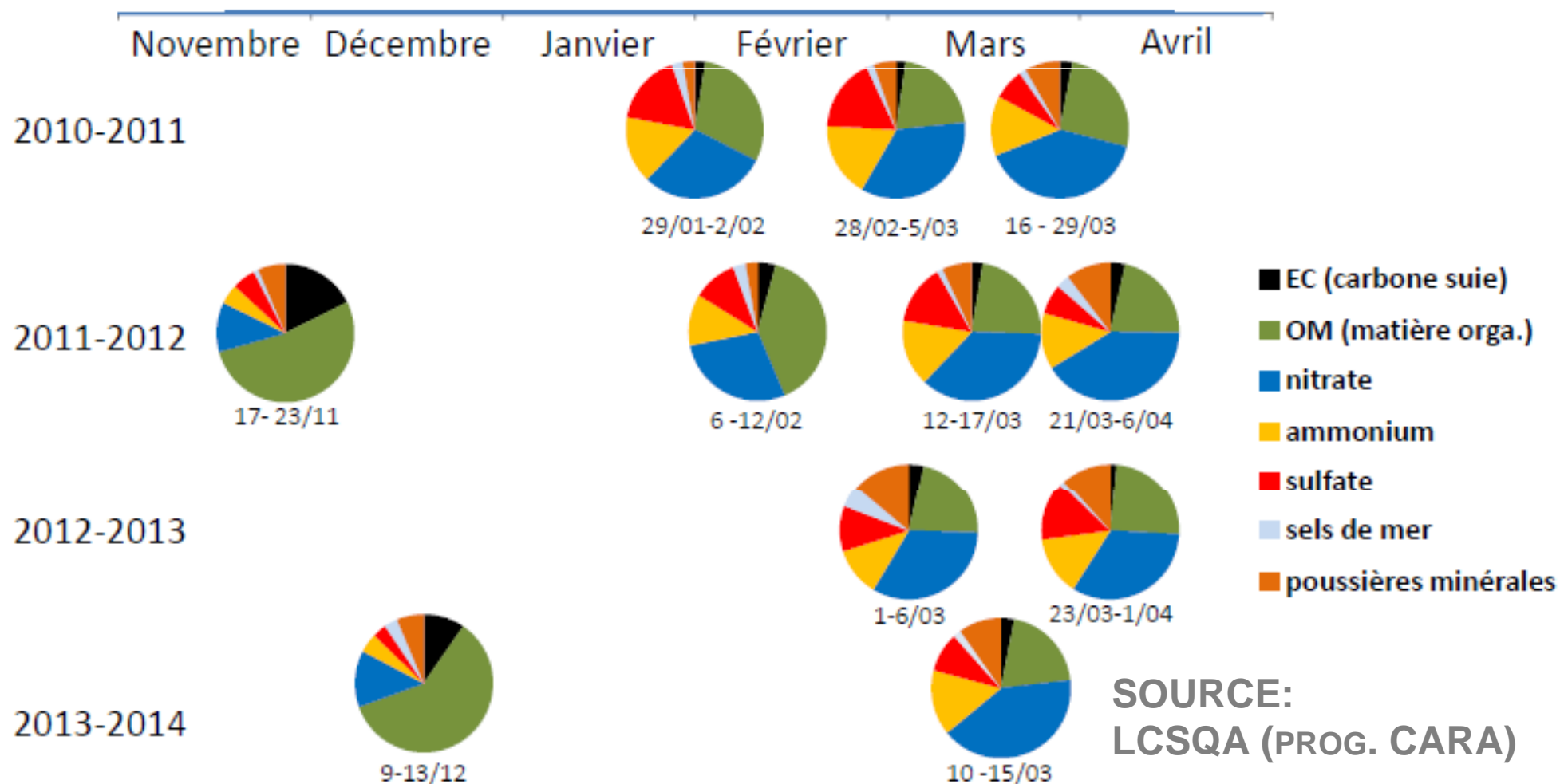
Alliance nationale de recherche  
pour l'Environnement

SOERE-ORAURE  
(→ SNO CLAP)



# INTRODUCTION SUR LA NATURE DES ÉPISODES DE POLLUTION

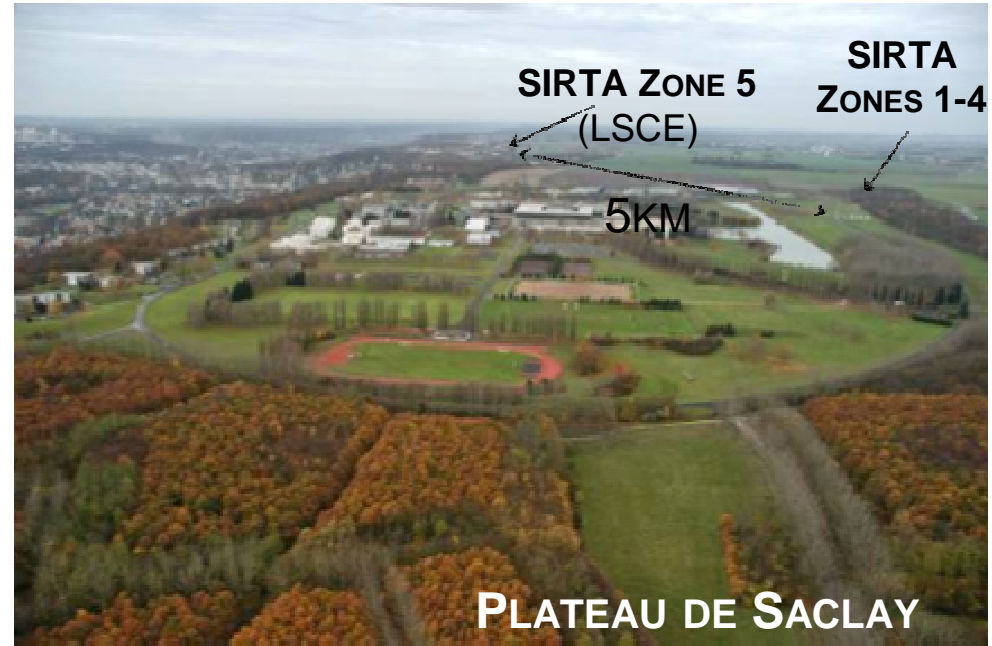
Répartition des espèces chimiques majeures lors des 10 plus importants précédents épisodes de pollution particulaire (au moins 5 jours consécutifs présentant une moyenne globale en  $PM_{10} > 50 \mu g/m^3$ ) à Petit-Quevilly (fond urbain, Air Normand):



SOURCE:  
LCSQA (PROG. CARA)

# THE SIRTA ATMOSPHERIC SUPER-SITE

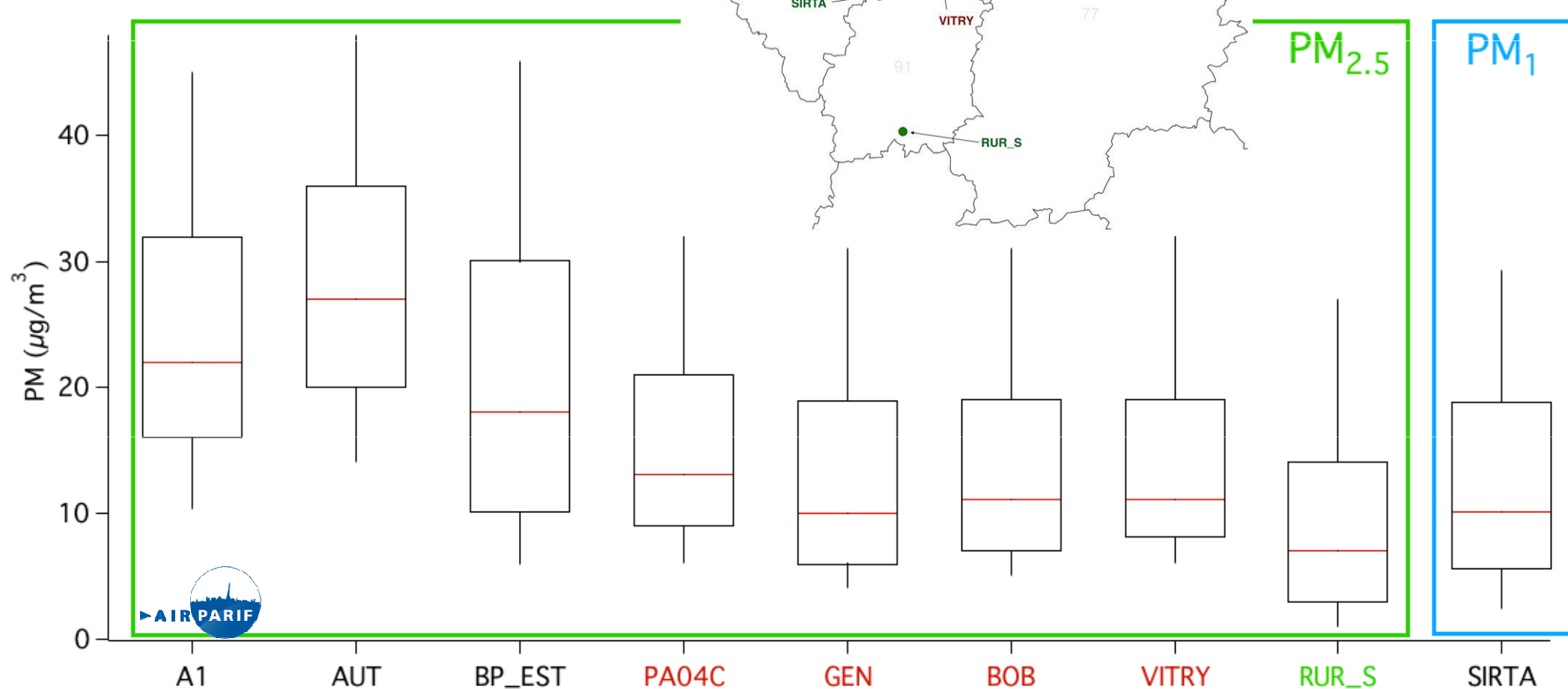
DEPUIS MI-2011:  
DÉVELOPPEMENT DE LA ZONE 5 DU SIRTA,  
DÉDIÉE À L'OBSERVATION IN SITU DE LA  
POLLUTION ATMOSPHÉRIQUE EN IDF



# THE SIRTA ATMOSPHERIC SUPER-SITE

## Spatial representativity

Distribution of hourly PM mass concentrations in various Airparif stations across IdF (2012-2014)

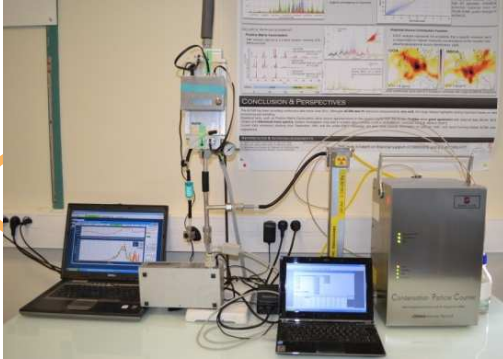


**SIRTA representative of urban background conditions for PM**



# THE SIRTA (ZONE 5) ATMOSPHERIC SUPER-SITE

## PARC INSTRUMENTAL



**SMPS + OPC**



**TEOM - FDMS EC-OC Sunset Field Inst. + PILS-IC**



**Nephelometers + Aethalometers**



**ACSM**



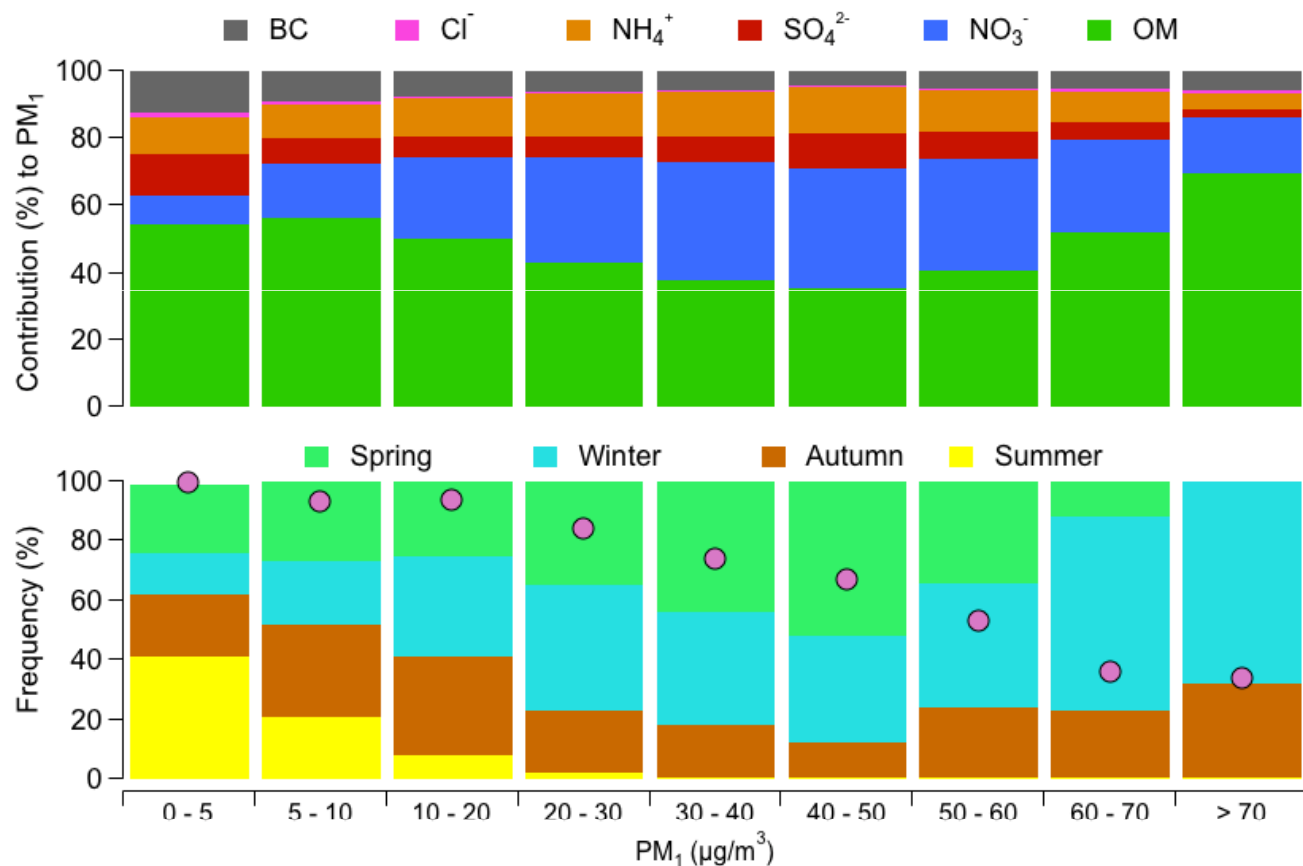
**Filter chemistry NO, NO2, O3**



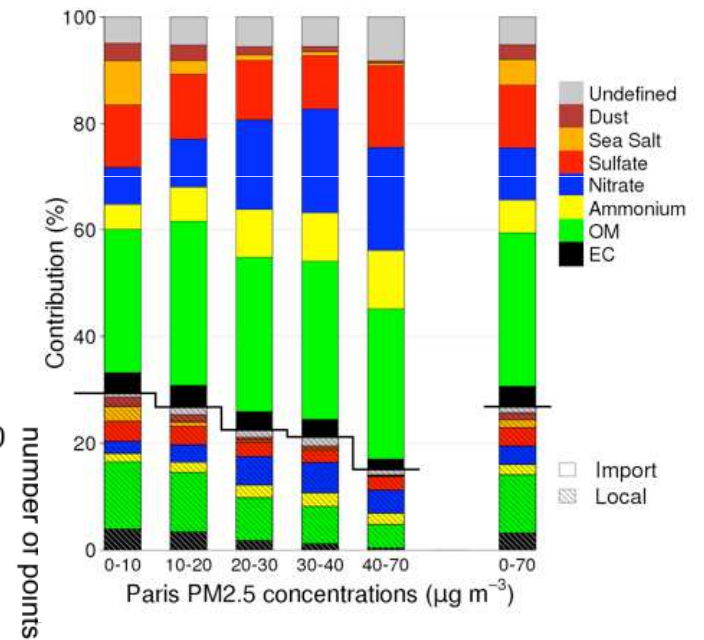
**PTR-MS & GC-FID  
+ BI-WEEKLY CARTRIDGES SAMPLING (GC-MS ANALYSIS)**

# SEASONALITY (JUNE 2011 – MAY 2013)

## Concentration size boxes



*Petit et al., ACP, 2015*

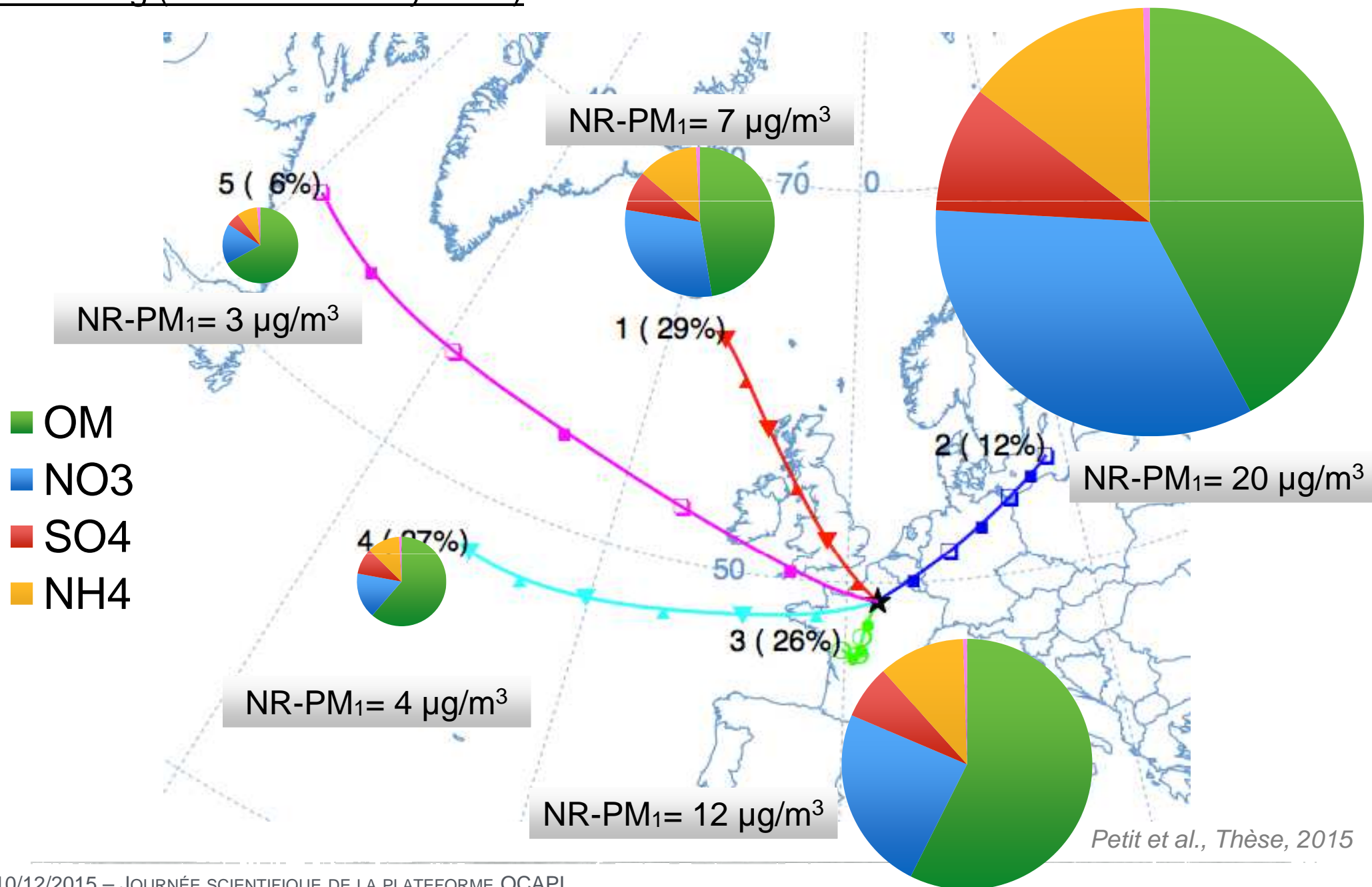


*Beekmann et al., Megapoli*

- Increasing contribution of ammonium nitrate along with springtime data until 50  $\mu\text{g}/\text{m}^3$
- Beyond, highest concentrations measured mostly in winter, with a strong contribution of OM (mainly due to residential wood burning)

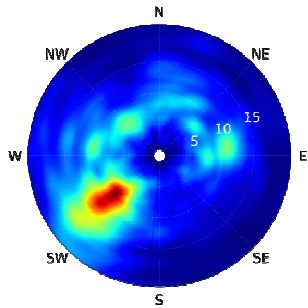
# GEOGRAPHICAL ORIGINS OF MAJOR PM COMPONENTS

Clustering (June 2011 - May 2013)

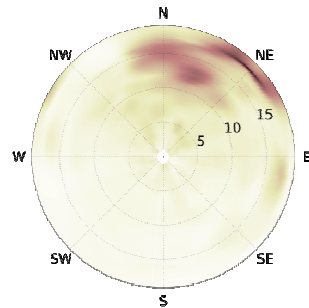


# GEOGRAPHICAL ORIGINS OF PM COMPONENTS

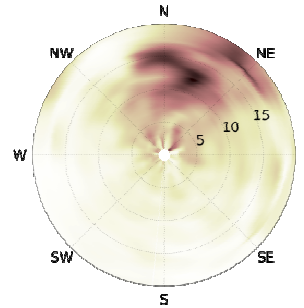
wind rose



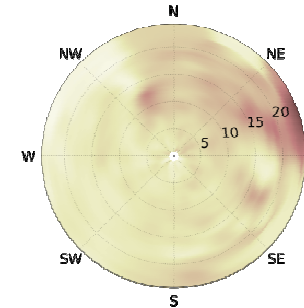
$\text{SO}_4^{2-}$



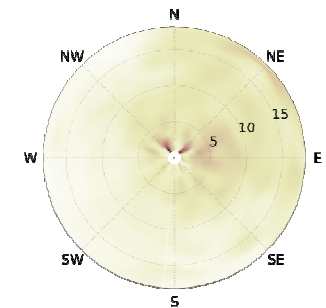
$\text{NO}_3^-$



$\text{NH}_3$



OM



From June 2011 to May 2013:

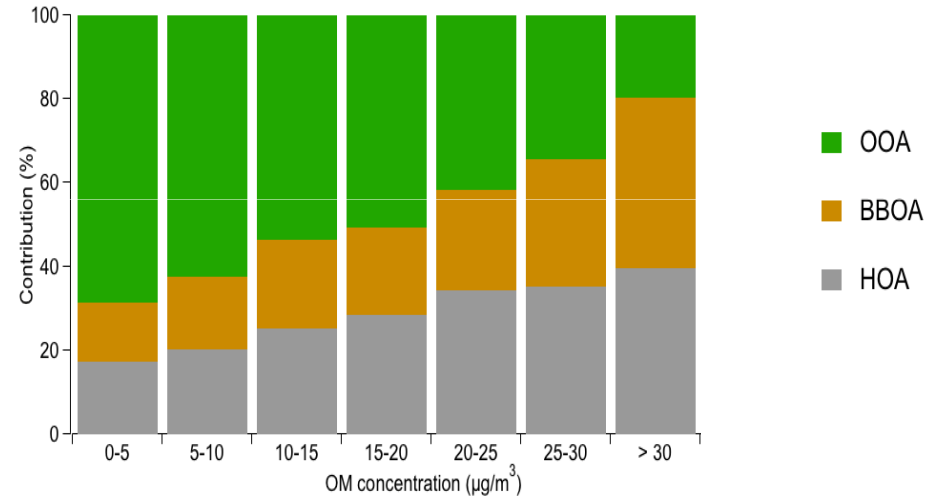
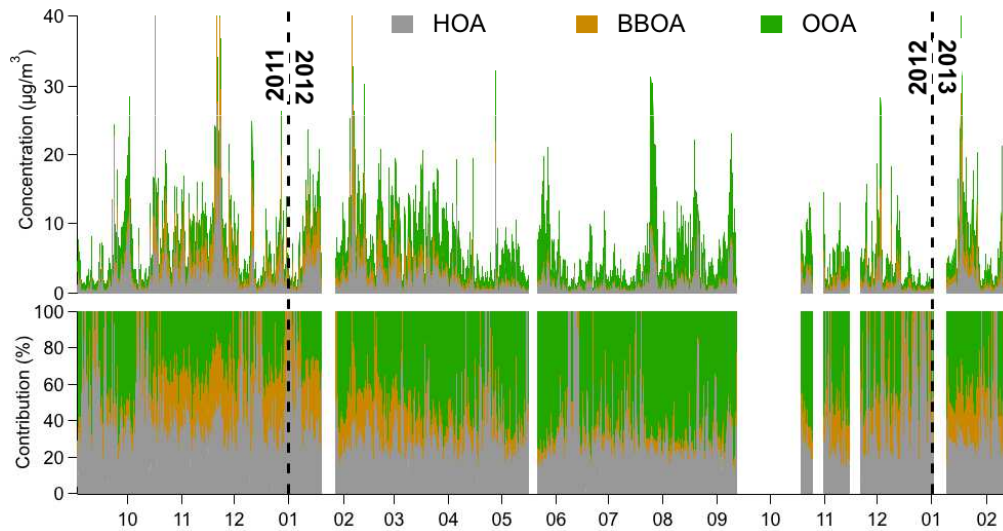
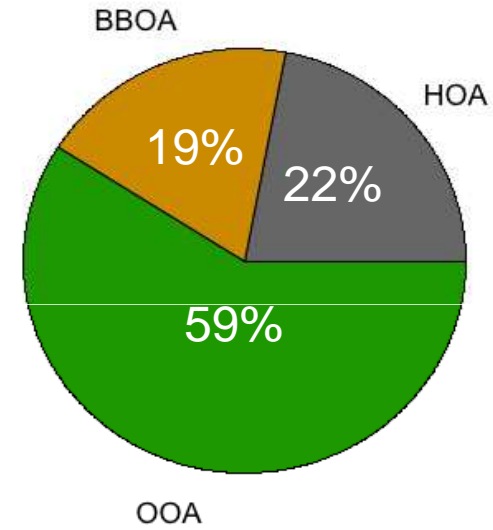
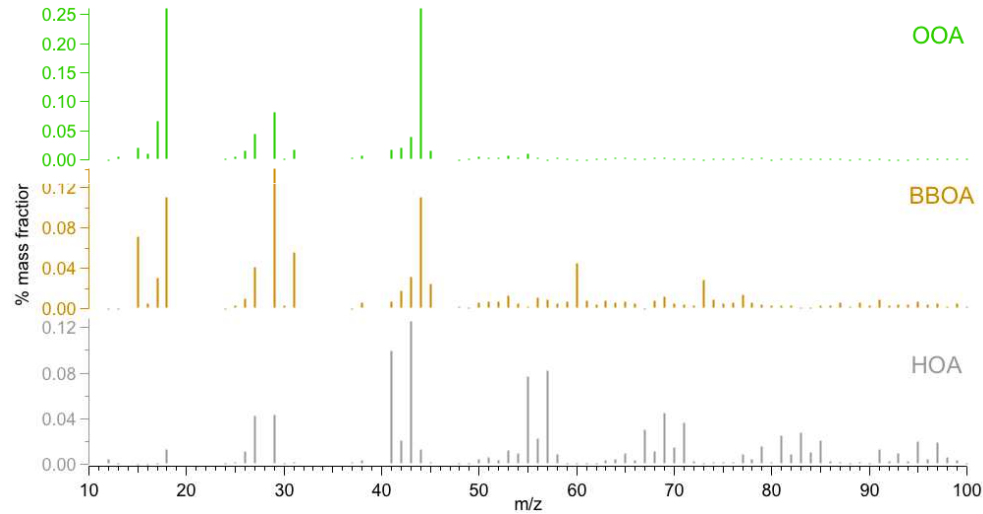
- IdF mainly influenced by SW winds are moderate speed
- $\text{SO}_4^{2-}$  : high conc. at direction between N & NE, only speed > 12 km/h → advected
- $\text{NO}_3^-$  : advected + Paris city plume
- $\text{NH}_3$  : Insignificant impact of  $\text{NH}_3$  emissions from Brittany, significant regional background
- OM : highest OM conc. at very low speeds: local emissions  
significant regional background

*Petit et al., ACP, 2015*



# ORGANIC AEROSOL SOURCE APPORTIONMENT

## PMF ANALYSIS - 3 FACTORS JUNE 2011 - MARCH 2013

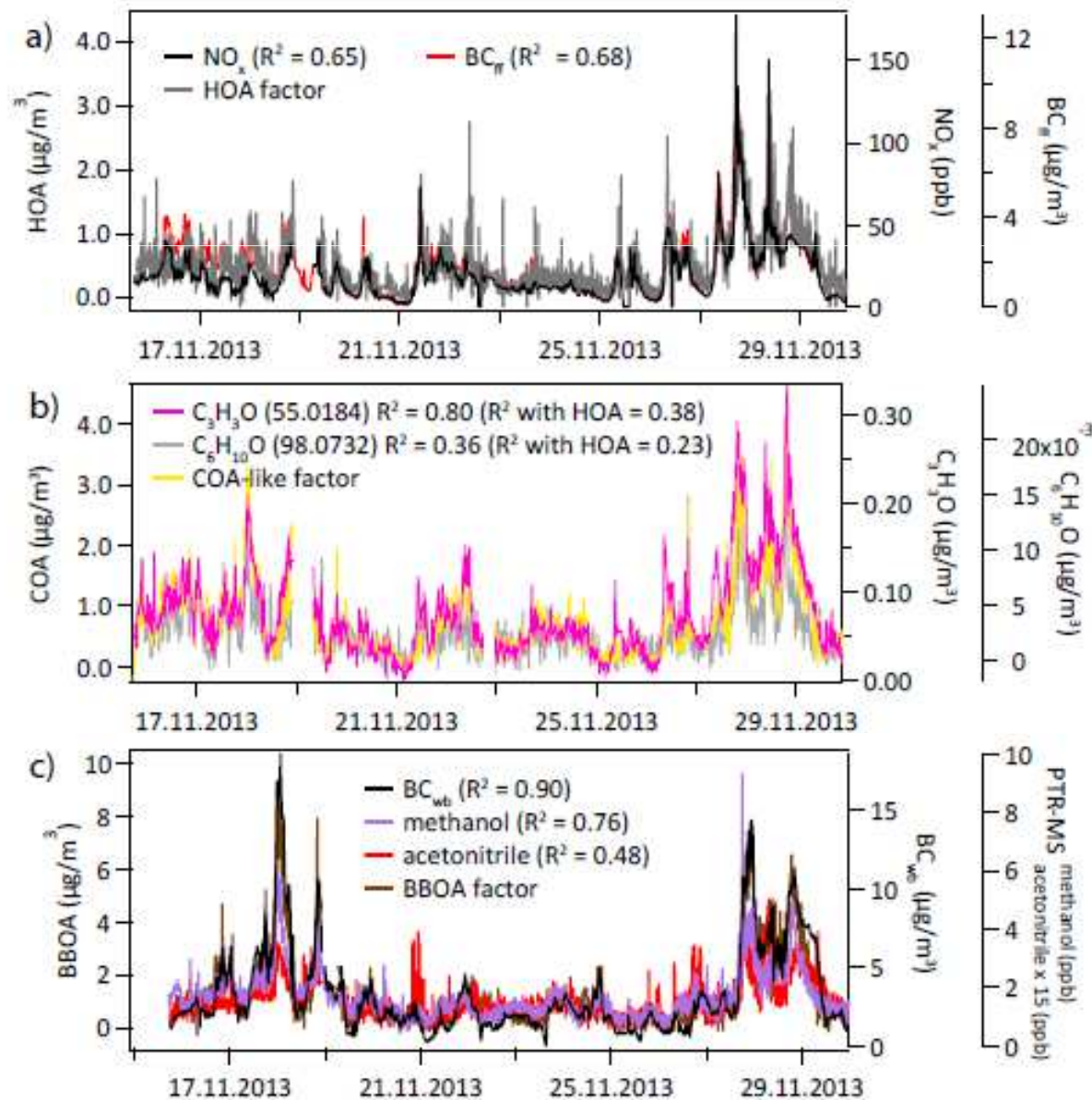


*Petit et al., Thèse, 2015*

# ORGANIC AEROSOL SOURCE APPORTIONMENT

EXTERNAL TRACERS (BC FRACTIONS, GASEOUS COMPOUNDS, ...)

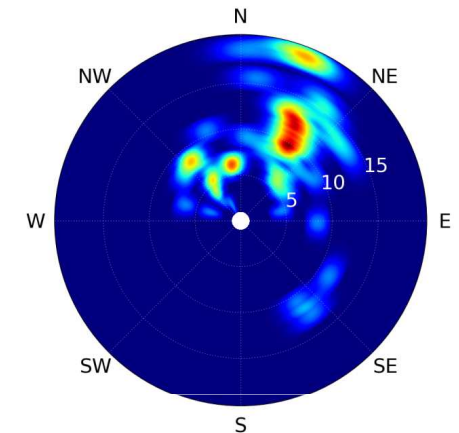
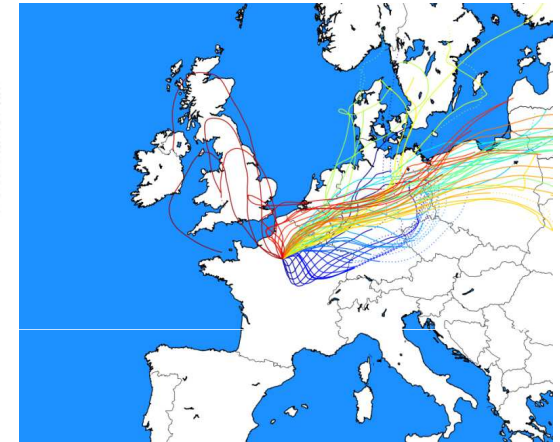
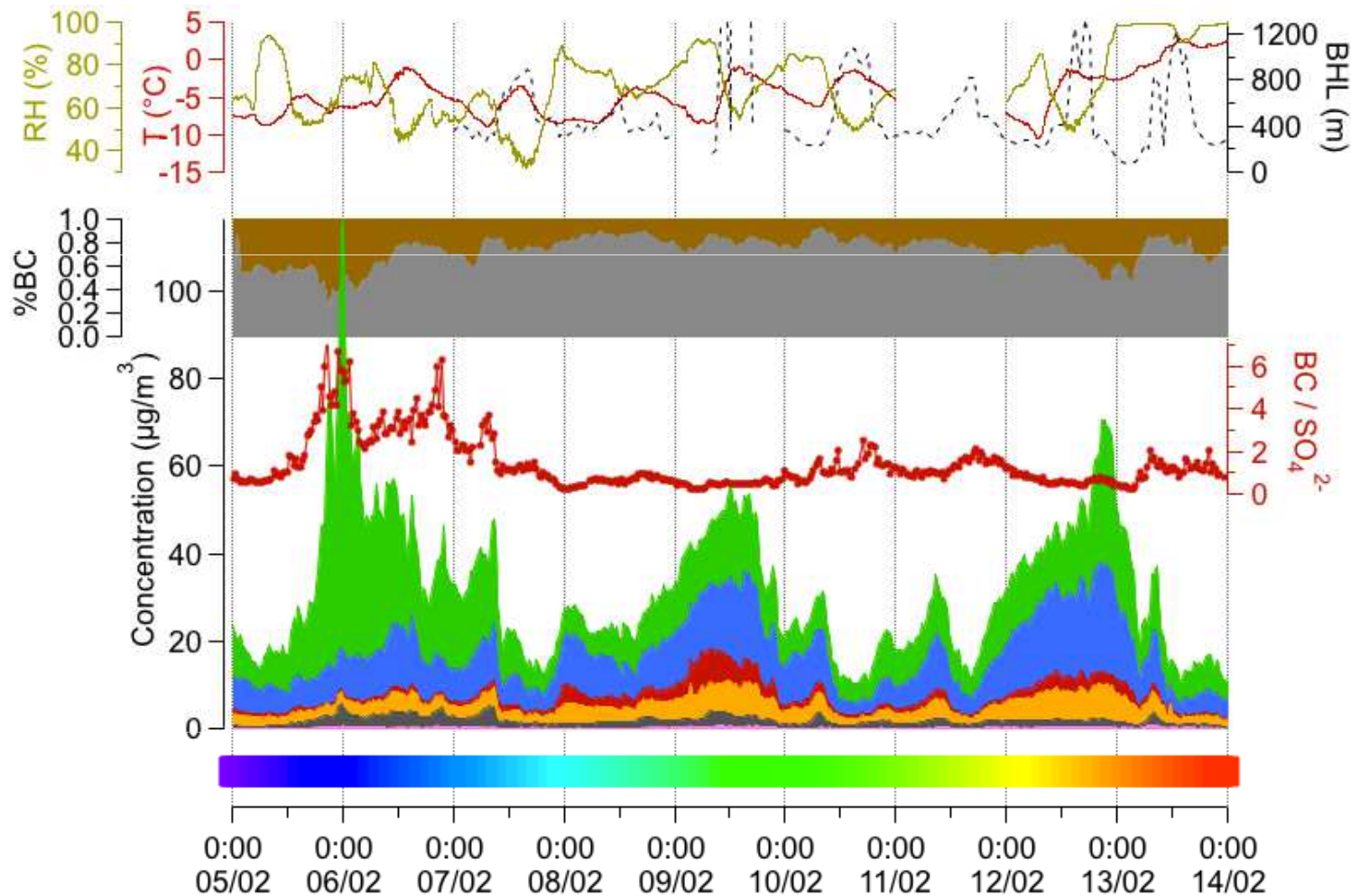
Nov. 2013



Fröhlich et al., AMT, 2015

# POLLUTION EPISODES (example)

FEB. 2012



## 1st phase

low temperatures, high OM, BC, %BC<sub>wb</sub>, BC/SO<sub>4</sub> ratio  
local wood burning emissions

## 2nd phase

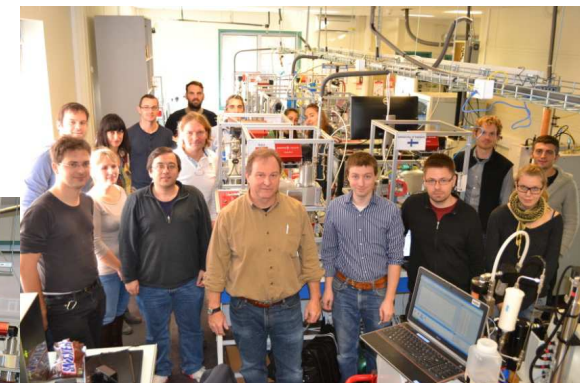
air masses coming from the NNE, high NH<sub>4</sub>NO<sub>3</sub>  
mid- to long-range transport

*Petit et al., ACP, 2015*

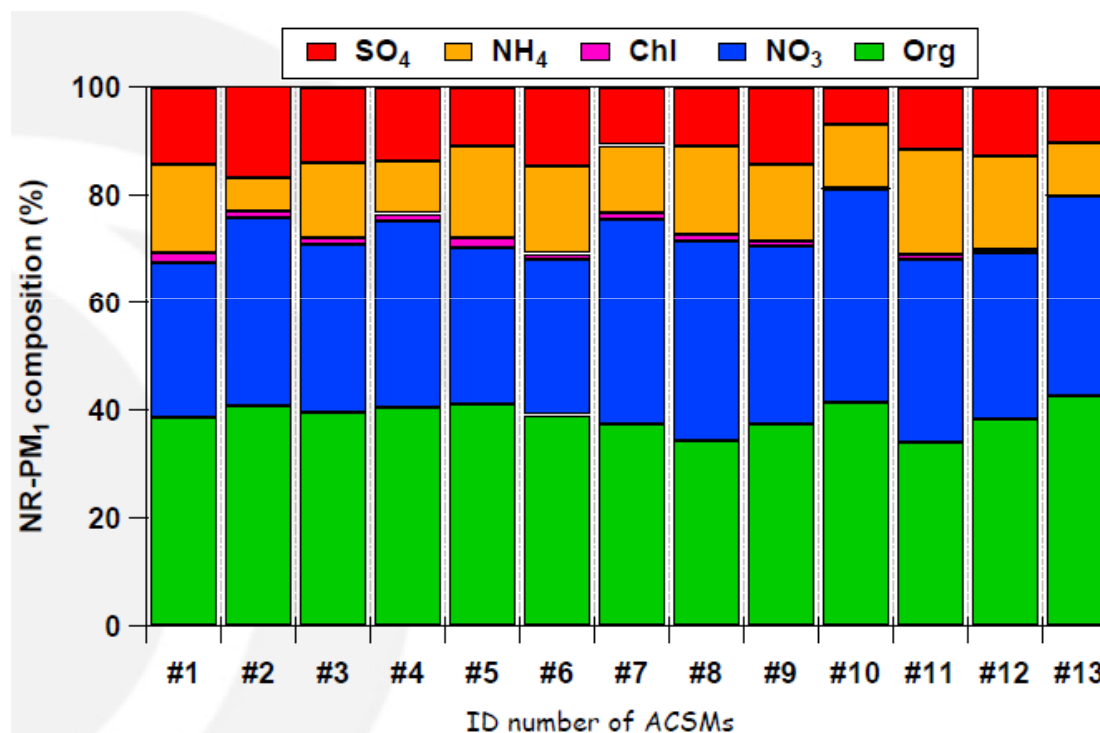
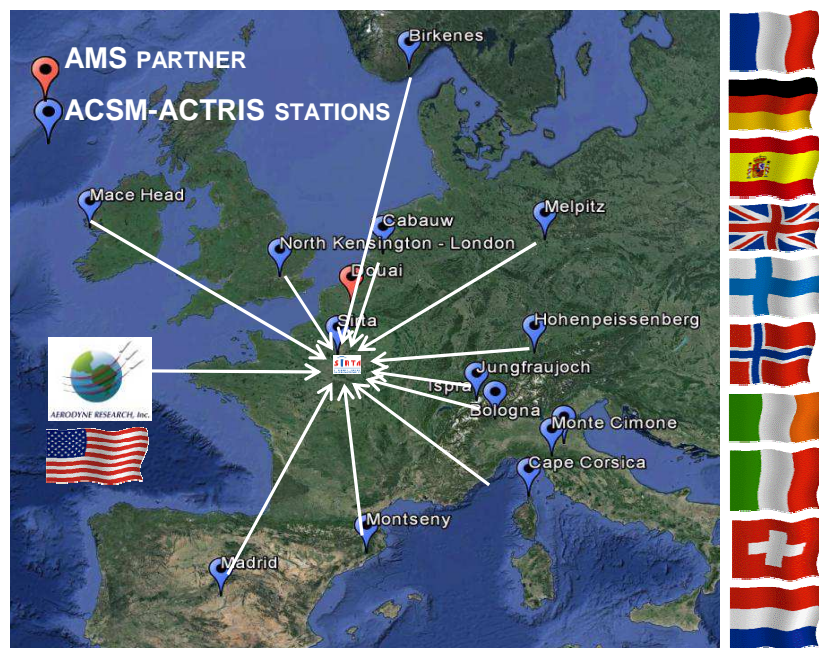


# AEROSOL CHEMICAL MONITOR CALIBRATION CENTRE (ACMCC)

## Nov-Dec 2013: Première campagne internationale d'intercomparaison ACSM



10 PAYS EUROPÉENS PARTICIPANT  
15 SPECTRO. DE MASSE COMPARÉS



+ Sept. 2014: intercomp. AE33  
(LCSQA/AASQA)

+ Mars-Avril 2016: intercomp.  
ACSM (ACTRIS-2)



MERCI

---