DAURE

Discriminación del origen de Aerosoles Urbanos y REgionales en el NE de la Península Ibérica
Identification of the origin of atmospheric aerosols in NE Iberian Peninsula

CSIC, 13th Jan 2010

OUTLOOK:

- Variability of PM levels during the DAURE winter and summer campaigns;

- Identification of different scenarios affecting PM levels in winter and summer;

- Diurnal cycle for PM_1, $PM_{1\text{-}2.5}$, $PM_{2.5\text{-}10}$ levels, wind velocity and direction, Abs. Humidity, temperature, BC, particles number and gases at BCN and MSY for each winter and summer scenarios

- Comparison CSIC Vs AMS (Organics and SIA concentrations);

- Chemical speciated PM data for the DAURE winter campaign.

WINTERTIME:

- Specific anticyclonic conditions characterized by strong thermal inversions for few days with accumulation of highly polluted air masses from coast and valleys and subsequent transport of pollutants to the inland by mountain/sea breezes.

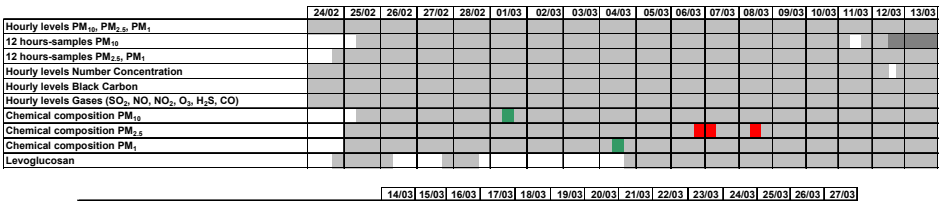
- Higher frequency of Atlantic advections.

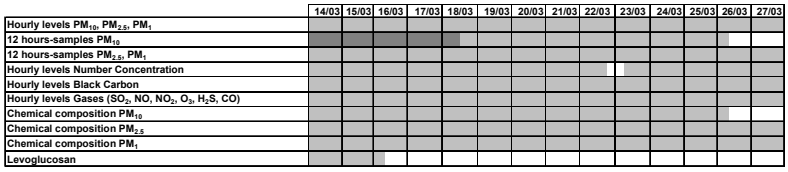
SUMMERTIME:

- Development of mesoscale flows favoured by weak synoptic forcing and induced by local orographic features; sea-land high temperature differences favouring the development of sea-land breezes; LOCAL/REGIONAL CIRCULATION DYNAMICS WITH CONSEQUENT REGIONAL ACCUMULATION OF POLLUTANTS AND FORMATION OF MULTILAYER POLLUTED AIR MASSES DRIVEN BY SEA-LAND BREEZES INTENSITY.

(Millan et al., 1997)

SUMMARY OF OUR WORK: BCN (DAURE winter campaign)





***Lost:**

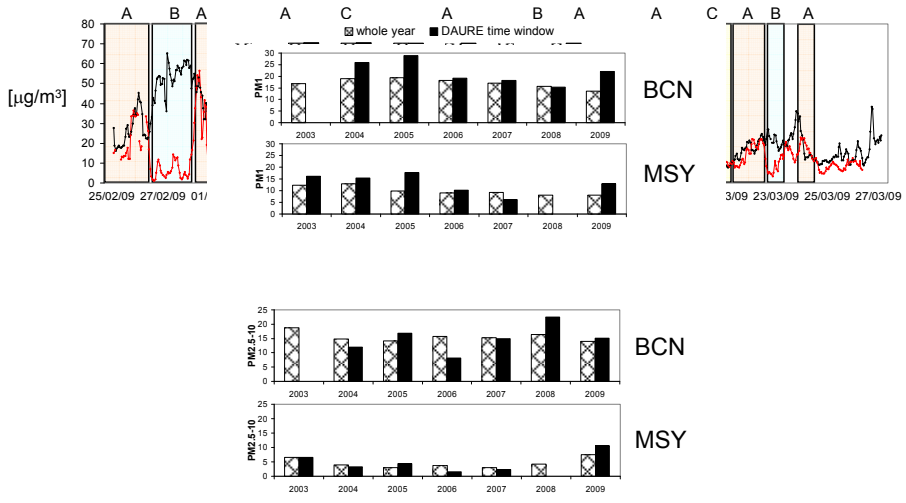
- No data
- Sampling period from12pm to 0am and from 0am to 12pm
- Anions values not avalable
- OC-EC values not available

SUMMARY OF OUR WORK: MSY (DAURE winter campaign)

	24/02	25/02	26/02	27/02	28/02	01/03	02/03	03/03	04/03	05/03	06/03	07/03	08/03	09/03	10/03	11/03
Hourly levels PM_{10}, $PM_{2.5}$, PM_1																
12 hours-samples PM_{10}																
12 hours-samples $PM_{2.5}$																
12 hours-samples PM1																
Hourly levels Number Concentration																
Hourly levels Black Carbon																
Hourly levels Gases (SO_2, NO, NO_2, O_3, H_2S, CO)																
Chemical composition PM_{10}																
Chemical composition $PM_{2.5}$																
Chemical composition PM_1																

12/03	13/03	14/03	15/03	16/03	17/03	18/03	19/03	20/03	21/03	22/03	23/03	24/03	25/03	26/03	27/03

PM time series (DAURE winter campaign) – GRIMM corrected data



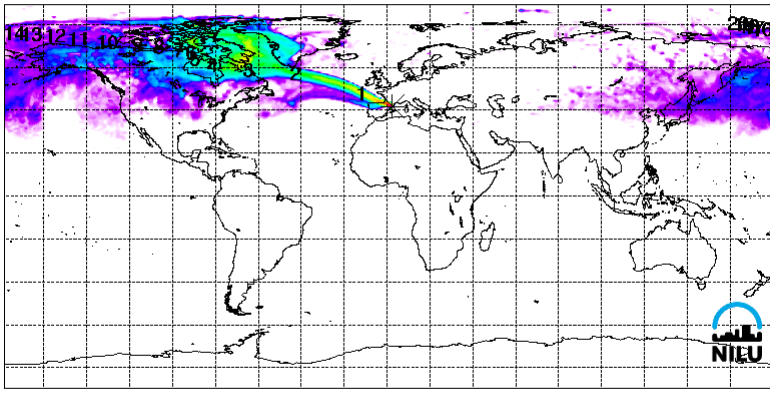
C-scenario

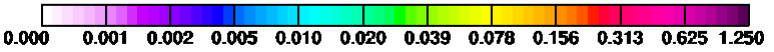
Footprint emission sensitivity in global domain for MSY_200903

Start time of sampling 20090304.210000 End time of sampling 20090305. 0

Lower release height 720 m Upper release height 720 m

Meteorological data used are from ECMWF





ns / kg

Maximum value 0.499E+00 ns / kg

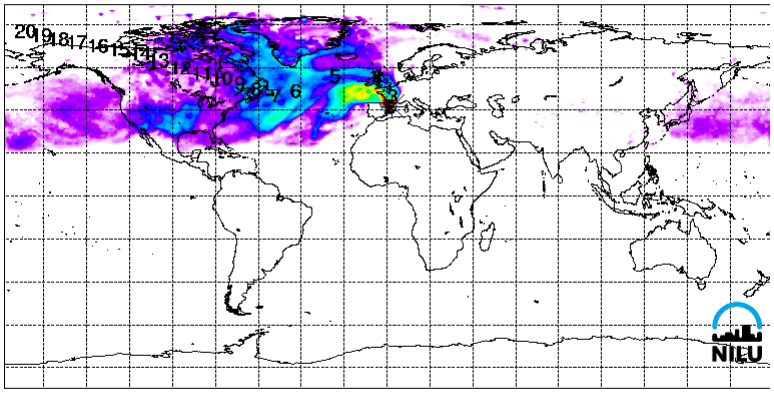
A-scenario

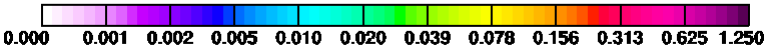
Footprint emission sensitivity in global domain for MSY_200902

Start time of sampling 20090226.120000 End time of sampling 20090226.150000

Lower release height 720 m Upper release height 720 m

Meteorological data used are from ECMWF

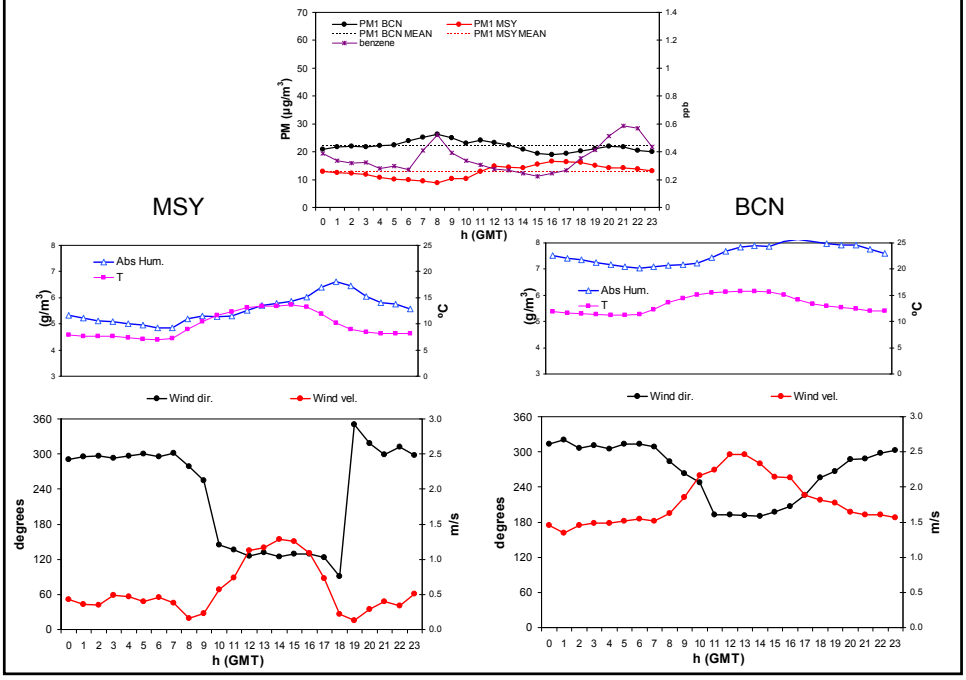




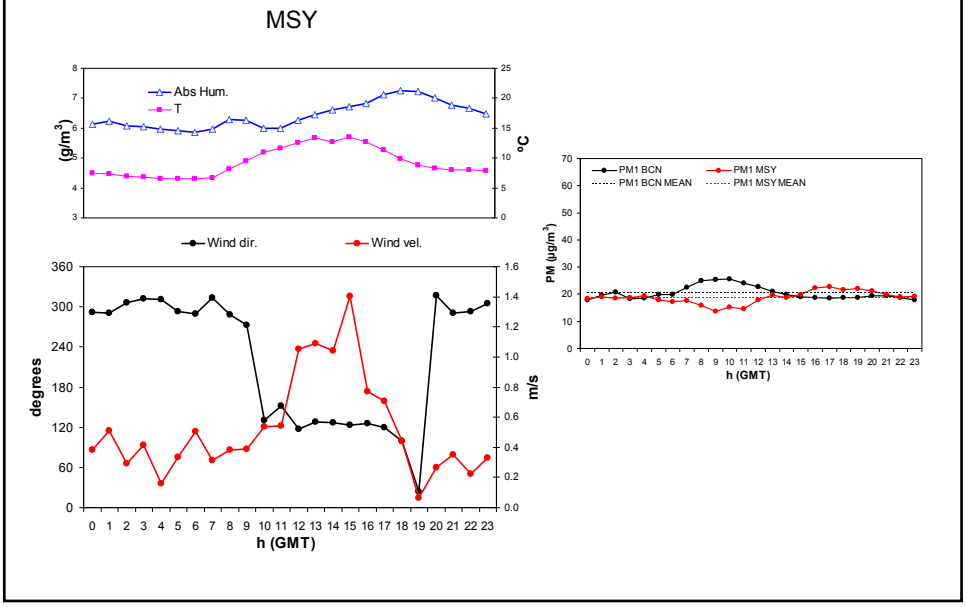
ns / kg

Maximum value 0.341E+01 ns / kg

Whole DAURE winter period

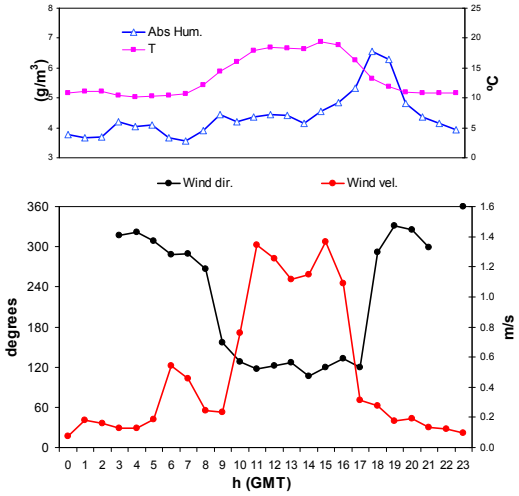


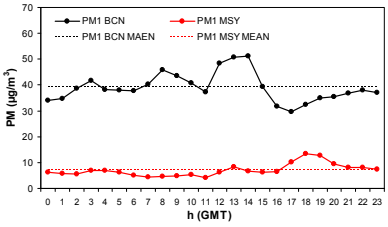
A-scenario



B-scenario

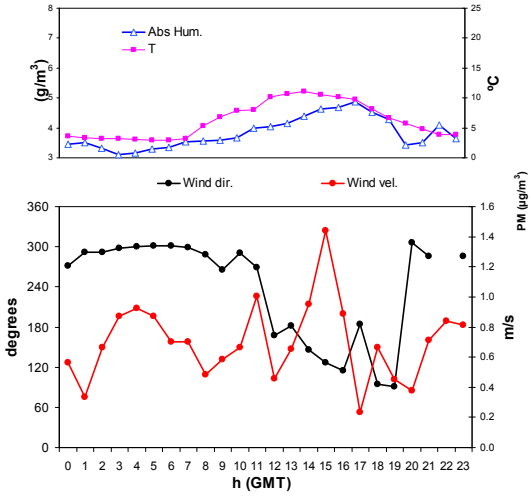
MSY

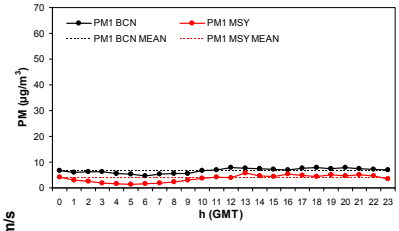




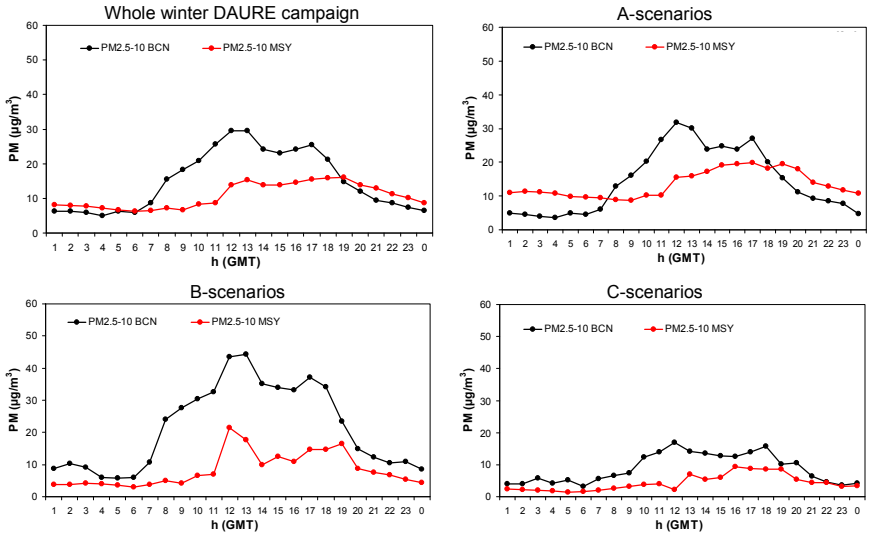
C-scenario

MSY



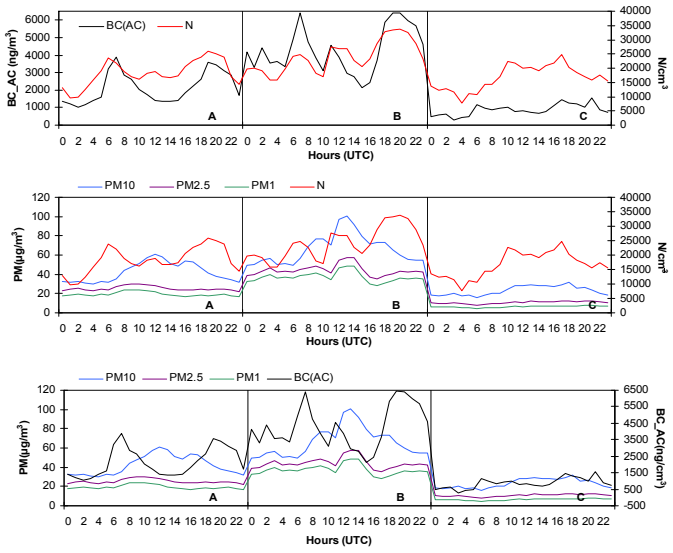


Mean hourly levels of $PM_{2.5-10}$ at Barcelona (BCN – black line) and Montseny (MSY – red line) for: (a) whole DAURE winter campaign period, (b) A-scenarios, (c) B-scenarios, (d) C-scenarios.



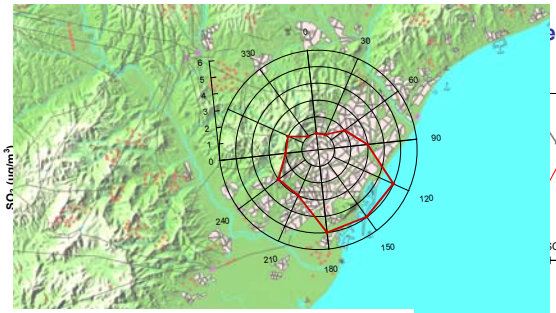
DAILY CICLES FOR EACH EPISODE

BCN

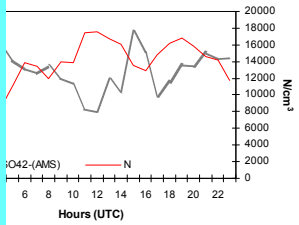


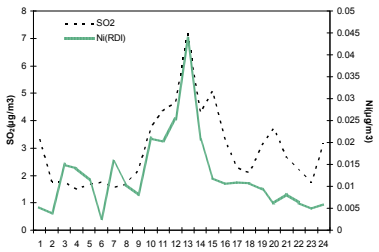
BCN

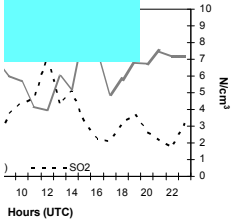
DAILY CICLES FOR EACH EPISODE



er of particles at midday?



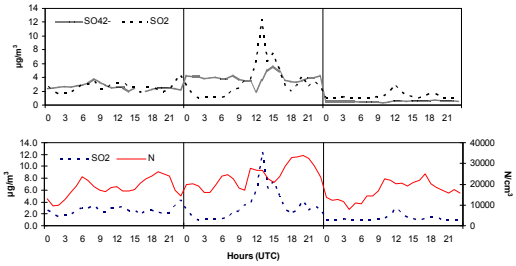


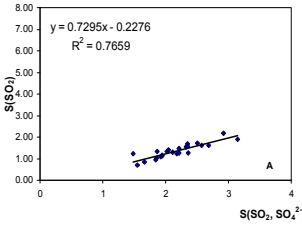


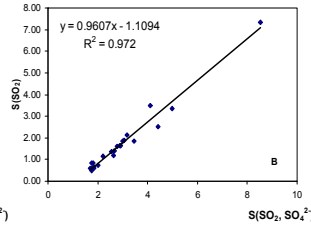
BCN

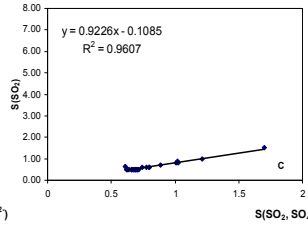
DAILY CICLES FOR EACH EPISODE

A B C



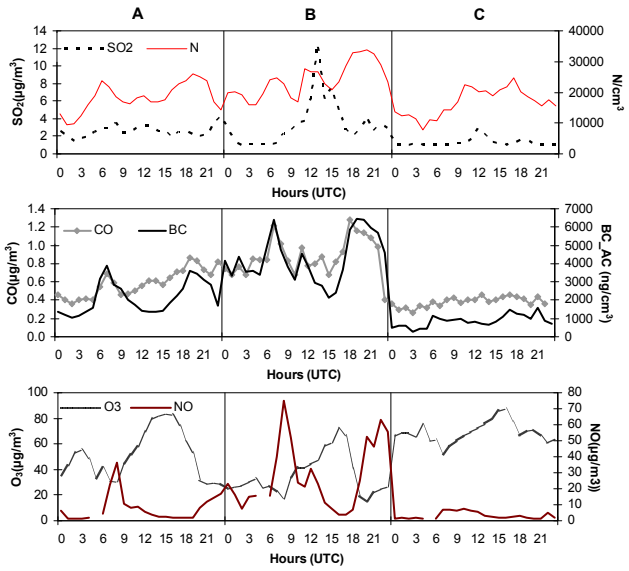




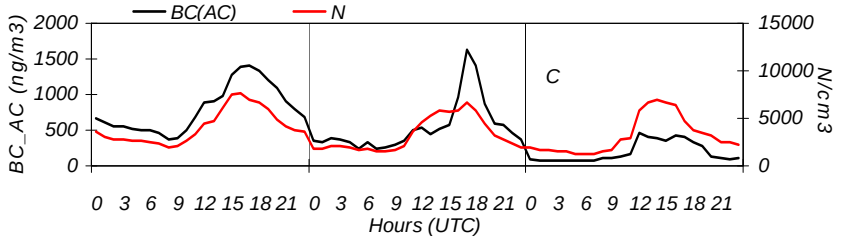


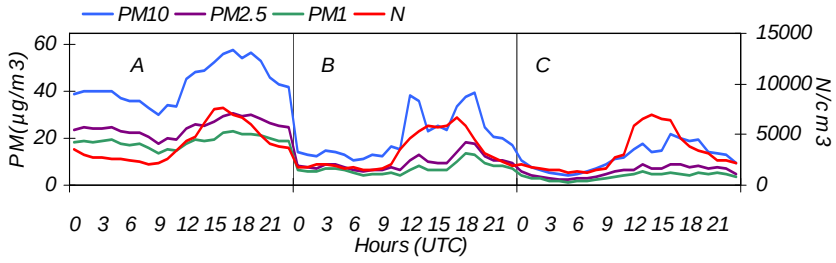
BCN

DAILY CICLES FOR EACH EPISODE

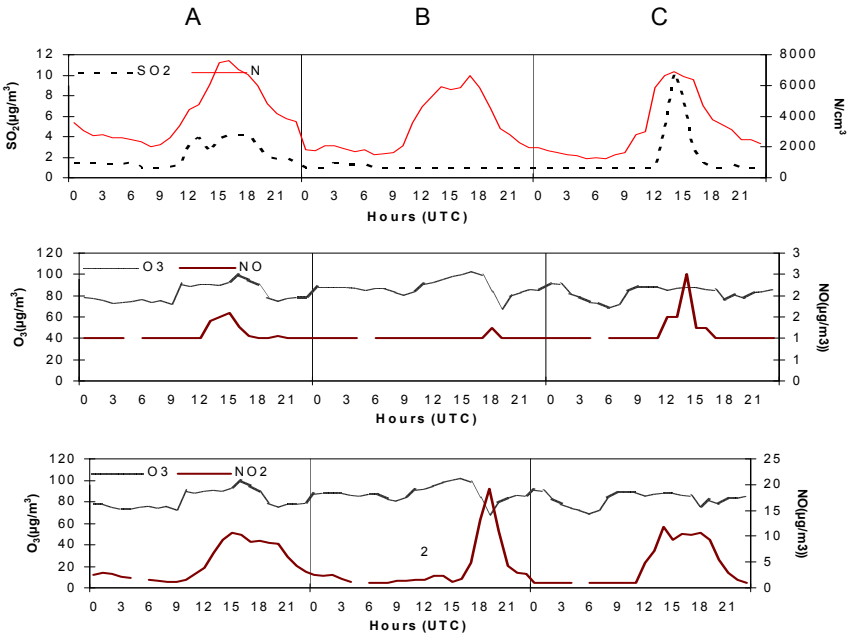


MSY



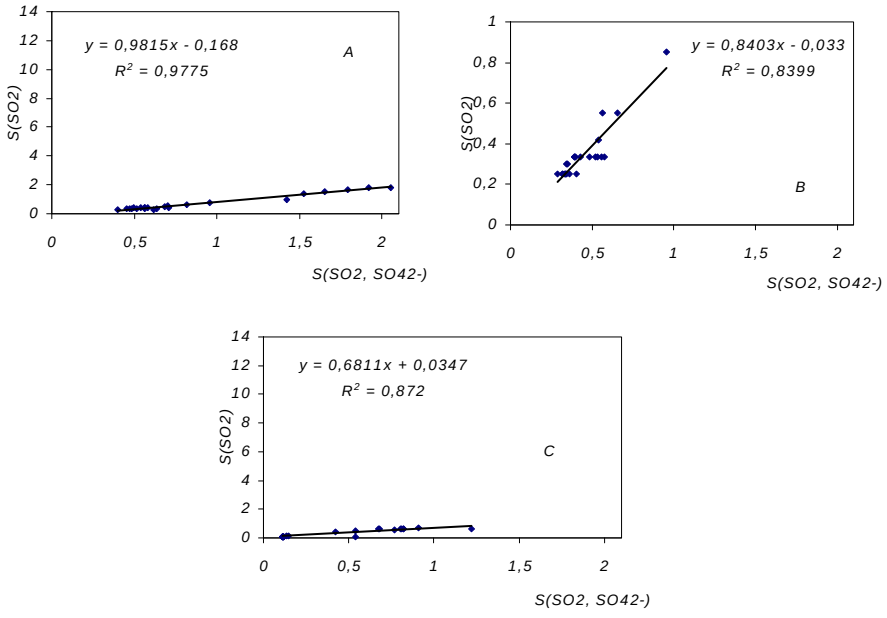


MSY

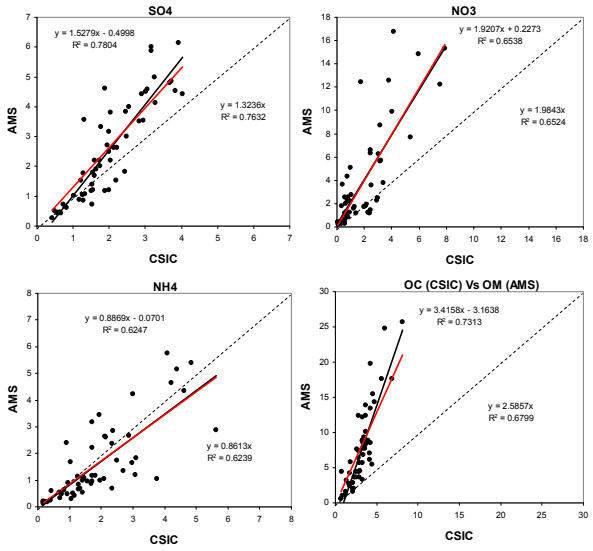


Gases per episode

MSY



BCN



Comparison between secondary aerosols (SO_4^{2-}, NO_3^-, NH_4^+) and organics (OM) concentrations in PM_1 at BCN as measured by HR-ToF-AMS by PSI and conventional chemical procedure by CSIC.

CSIC:

~ 12h PM_1 samples collected on quartz micro-fibre filters;

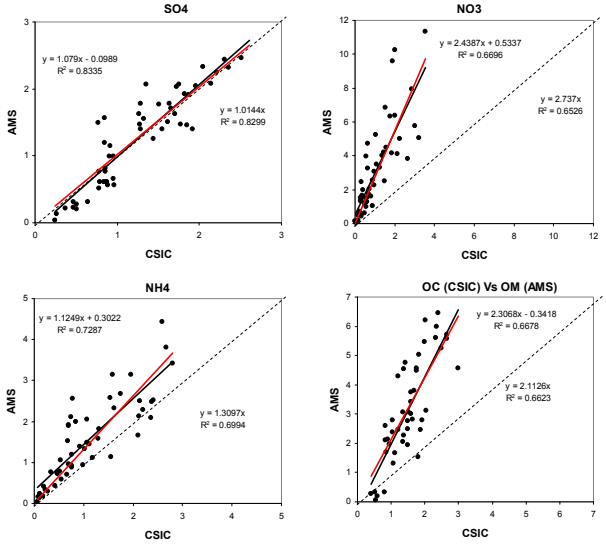
~ ICP-MS and ICP-AES (major and trace element)

~ Ionic Chromatography HPLC for Cl^-, SO_4^{2-} and NO_3^-

~ Selective Electrode for NH_4^+

~ TOT technique for OC and EC

MSY



Comparison between secondary aerosols (SO_4^{2-}, NO_3^-, NH_4^+) and organics (OM) concentrations in PM_1 at MSY as measured by HR-ToF-AMS by Univ. of Colorado/CEH and conventional chemical procedure by CSIC.

CSIC:

~ 12h PM_1 samples collected on quartz micro-fibre filters;

~ ICP-MS and ICP-AES (major and trace element)

~ Ionic Chromatography HPLC for Cl^-, SO_4^{2-} and NO_3^-

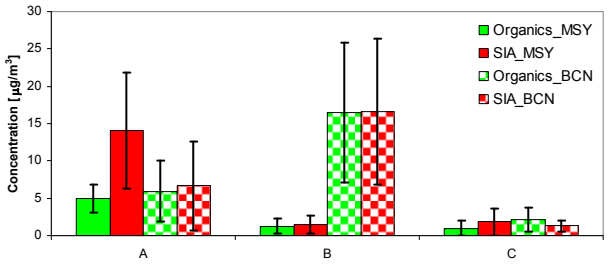
~ Selective Electrode for NH_4^+

~ TOT technique for OC and EC

AMS	A		B		C	
%	BCN	MSY	BCN	MSY	BCN	MSY
NO_3^-	44	56	55	50	33	46
SO_4^{2-}	36	18	25	22	47	27
NH_4^+	20	27	20	28	20	27

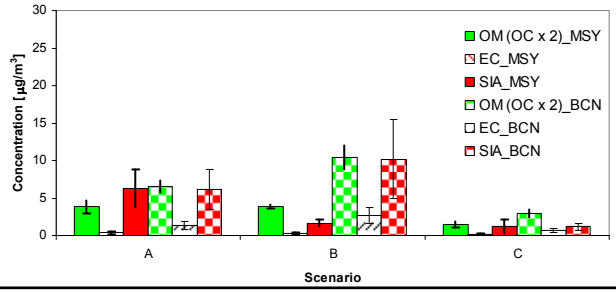
PM1	A		B		C	
%	BCN	MSY	BCN	MSY	BCN	MSY
NO_3^-	28	37	38	27	16	23
SO_4^{2-}	38	33	29	48	57	49
NH_4^+	34	30	33	25	27	28

AMS



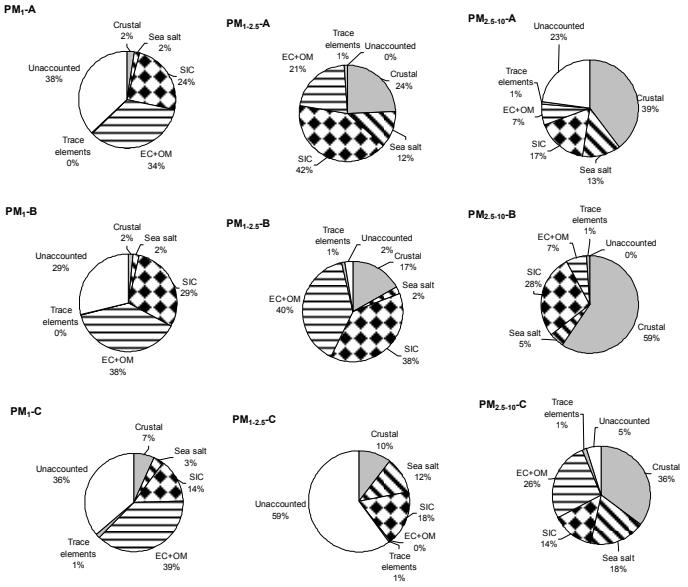
CSIC

(PM_1)



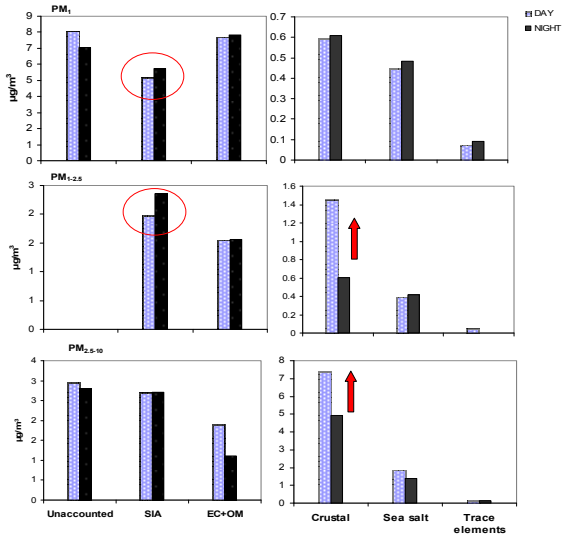
BCN

CHEMISTRY RESULTS



BCN

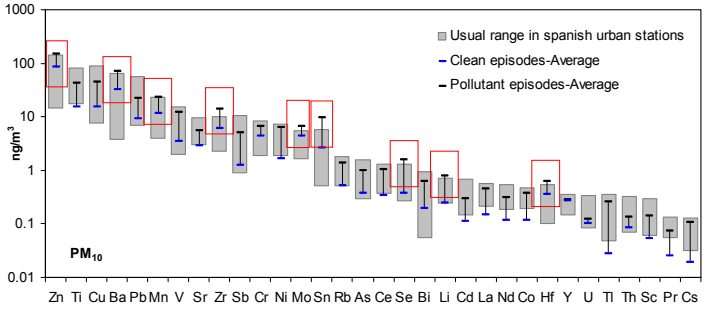
CHEMISTRY RESULTS FOR THE WHOLE PERIOD

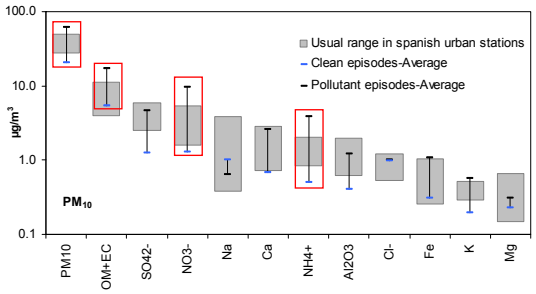


Crustal elements are resuspended at midday due to breeze.

BCN

CHEMISTRY RESULTS





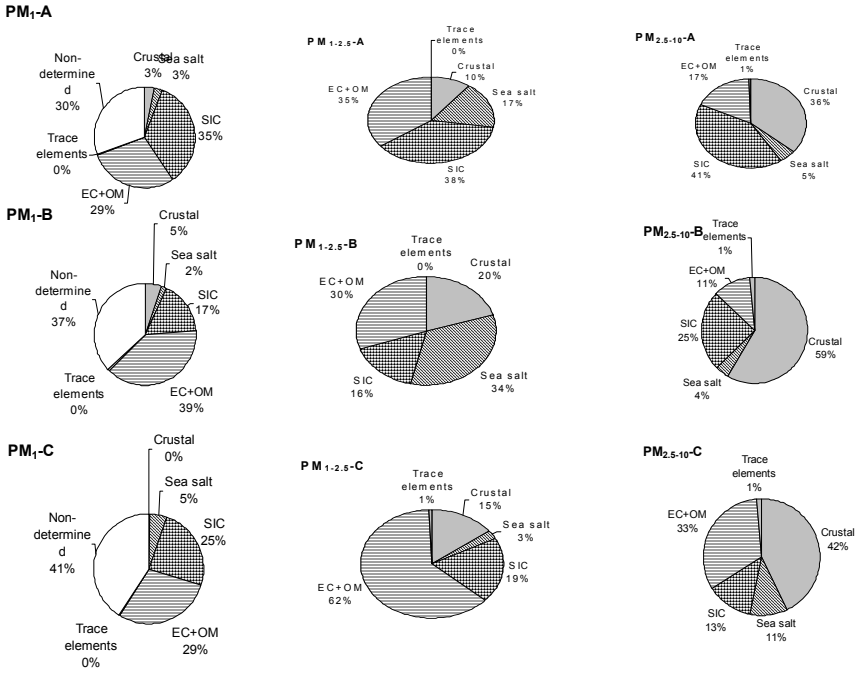
Usual Range exceeded during polluted episodes:

crustal elements,

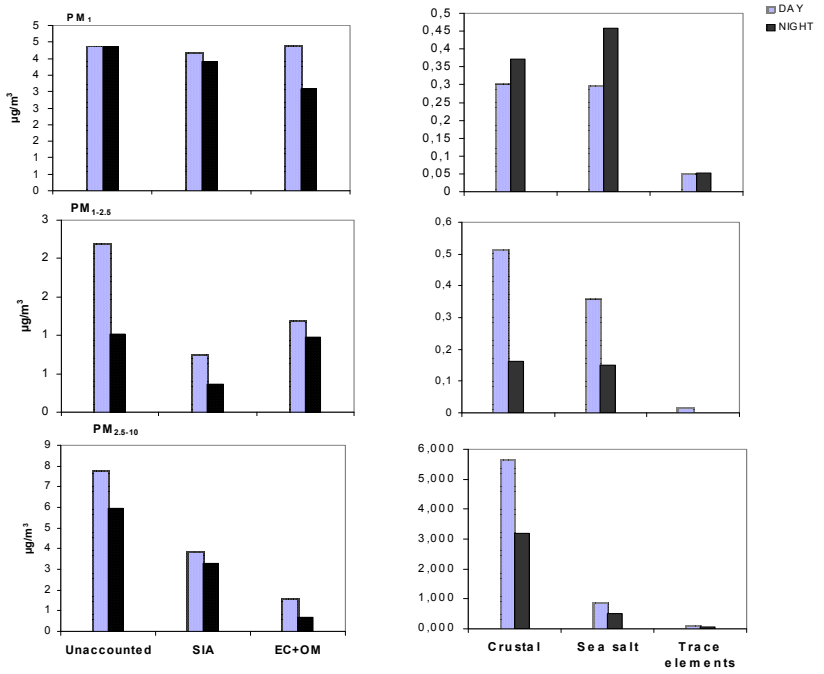
secondary compounds,

OM+EC.

MSY


PM1-A
Non-determined 30%
Crustal 3%
Sea salt 3%
SIC 35%
Trace elements 0%
EC+OM 29%
PM1-B
Crustal 5%
Sea salt 2%
SIC 17%
Non-determined 37%
Trace elements 0%
EC+OM 39%
PM1-C
Crustal 0%
Sea salt 5%
SIC 25%
Non-determined 41%
Trace elements 0%
EC+OM 29%
PM1-2.5-A
Trace elements 0%
Crustal 10%
Sea salt 17%
EC+OM 35%
SIC 38%
PM1-2.5-B
Trace elements 0%
Crustal 20%
EC+OM 30%
SIC 16%
Sea salt 34%
PM1-2.5-C
Trace elements 1%
Crustal 15%
Sea salt 3%
SIC 19%
EC+OM 62%
PM2.5-10-A
Trace elements 1%
EC+OM 17%
Crustal 36%
SIC 41%
Sea salt 5%
PM2.5-10-B
Trace elements 1%
EC+OM 11%
SIC 25%
Crustal 59%
Sea salt 4%
PM2.5-10-C
Trace elements 1%
EC+OM 33%
Crustal 42%
SIC 13%
Sea salt 11%

MSY


PM1
PM1-2.5
PM2.5-10
µg/m3
Unaccounted
SIA
EC+OM
DAY
NIGHT
Crustal
Sea salt
Trace elements

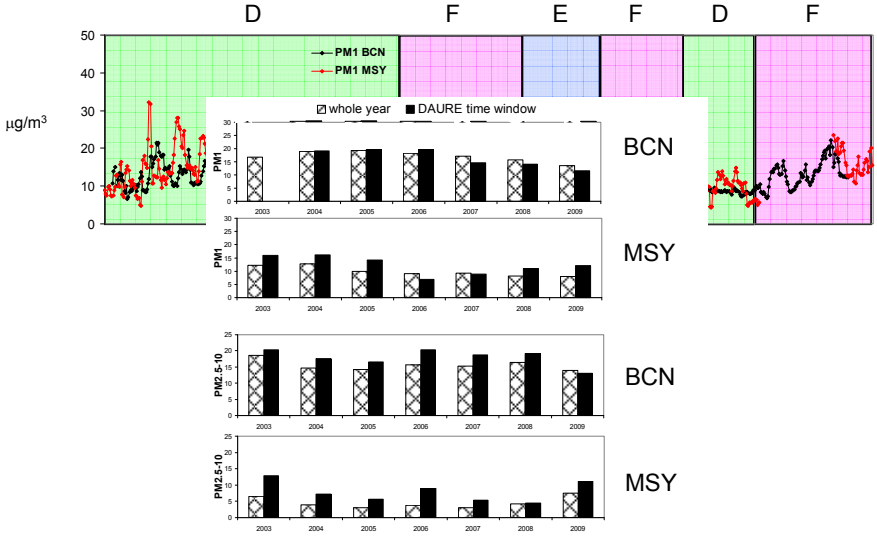
SUMMARY OF OUR WORK: BCN and MSY (DAURE summer campaign

	01/07	02/07	03/07	04/07	05/07	06/07	07/07	08/07	09/07	10/07	11/07	12/07	13/07	14/07	15/07	16/07
Hourly levels PM_{10}, $PM_{2.5}$, PM_1																
12 hours-samples PM_{10}																
12 hours-samples $PM_{2.5}$																
24 hours samples PM_1																
Hourly levels Number Concentration																
Hourly levels Black Carbon																
Hourly levels Gases (SO_2, NO, NO_2, O_3, H_2S, CO)																
Chemical composition PM_{10}																
Chemical composition $PM_{2.5}$																
Chemical composition PM_1																

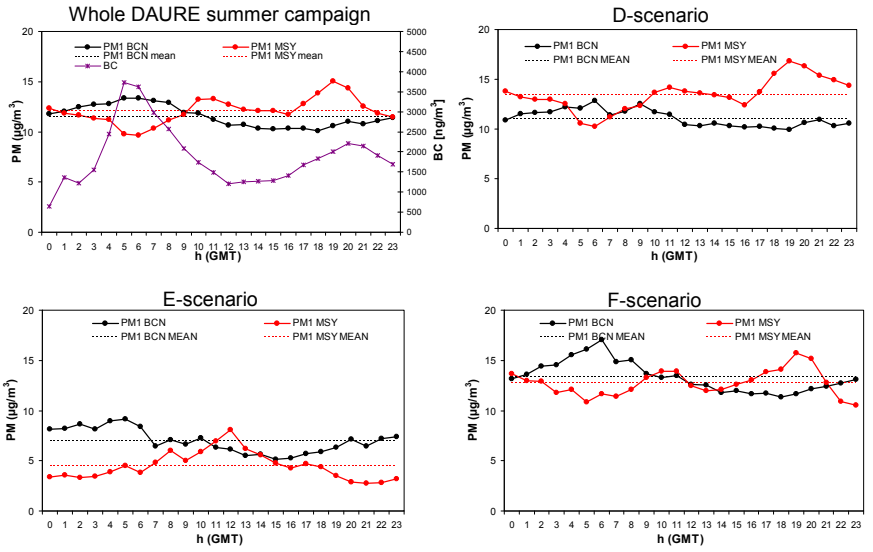
	17/07	18/07	19/07	20/07	21/07	22/07	23/07	24/07	25/07	26/07	27/07	28/07	29/07	30/07	31/07
Hourly levels PM_{10}, $PM_{2.5}$, PM_1															
12 hours-samples PM_{10}															
12 hours-samples $PM_{2.5}$															
24 hours samples PM_1															
Hourly levels Number Concentration															
Hourly levels Black Carbon															
Hourly levels Gases (SO_2, NO, NO_2, O_3, H_2S, CO)															
Chemical composition PM_{10}															
Chemical composition $PM_{2.5}$															
Chemical composition PM_1															

□ **No data**

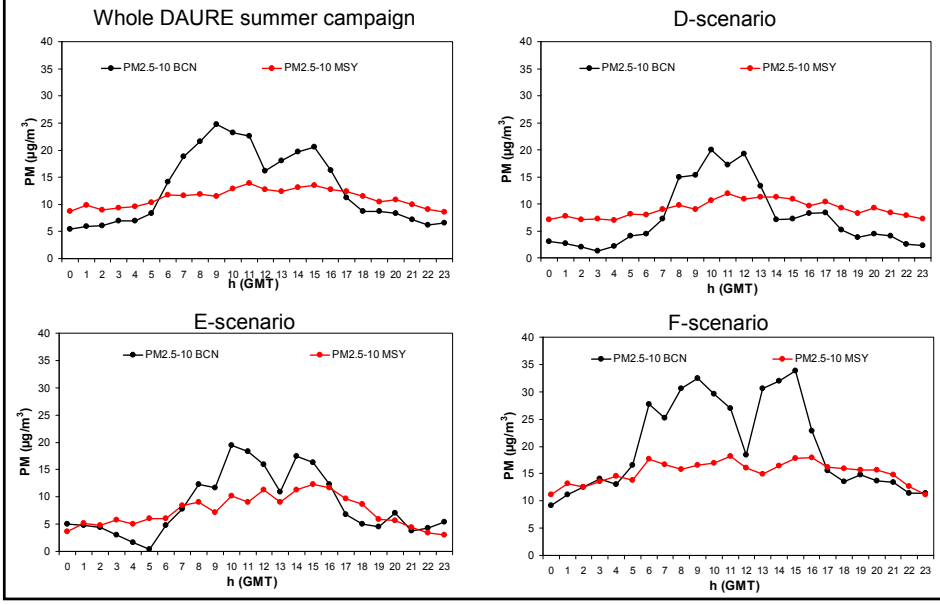
PM time series (DAURE summer campaign) – GRIMM corrected data



Mean hourly levels of **PM1** at Barcelona (BCN – black line) and Montseny (MSY – red line) for: (a) whole DAURE summer campaign period, (b) D-scenarios, (c) E-scenarios, (d) F-scenarios.

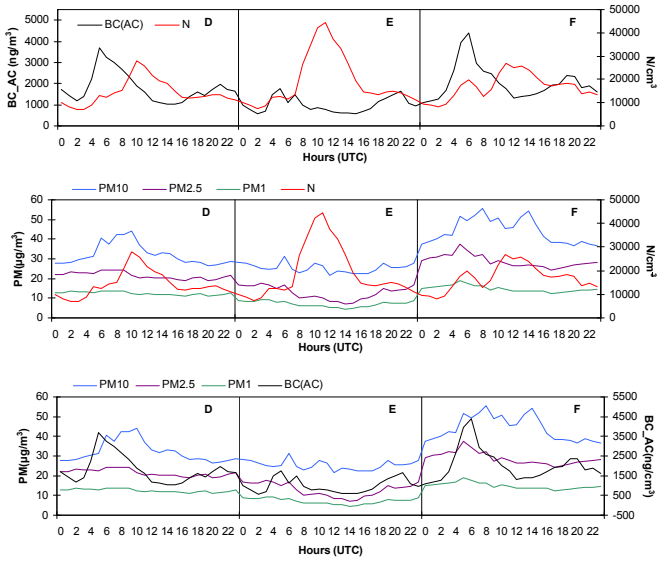


Mean hourly levels of **$PM_{2.5-10}$** at Barcelona (BCN – black line) and Montseny (MSY – red line) for: (a) whole DAURE summer campaign period, (b) D-scenarios, (c) E-scenarios, (d) F-scenarios.



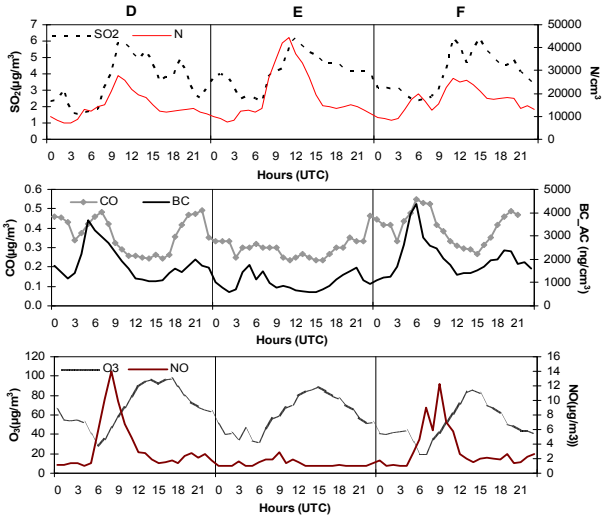
BCN

DAILY CICLES FOR EACH EPISODE

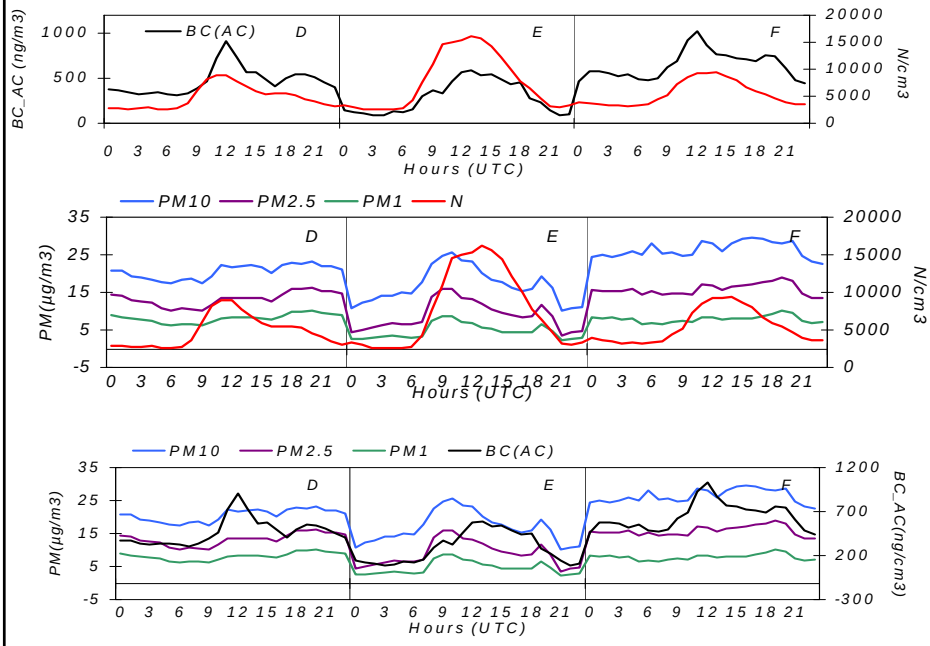


BCN

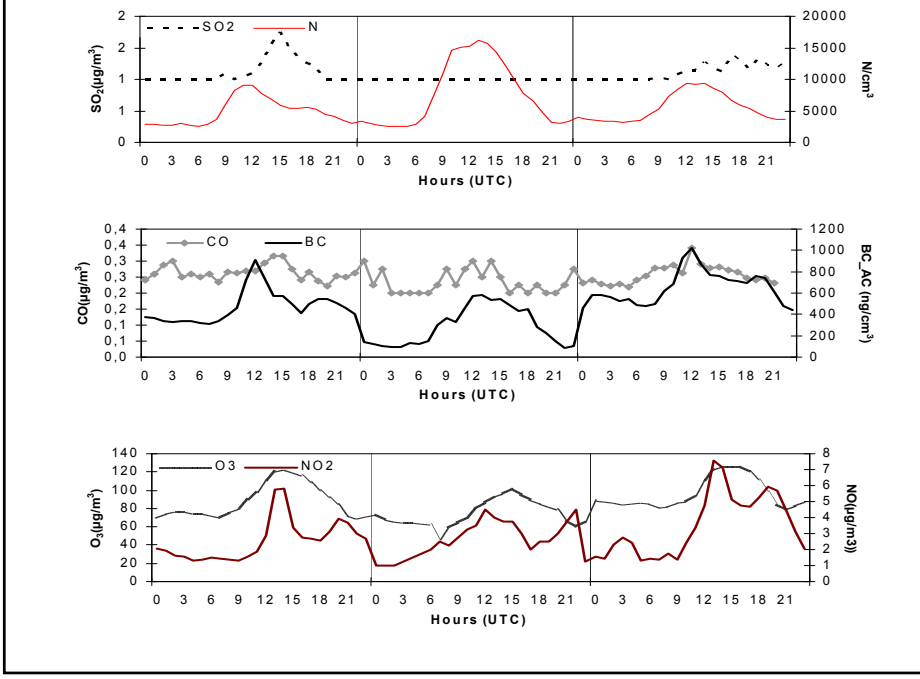
DAILY CICLES FOR EACH EPISODE



MSY: DAURE summer campaign

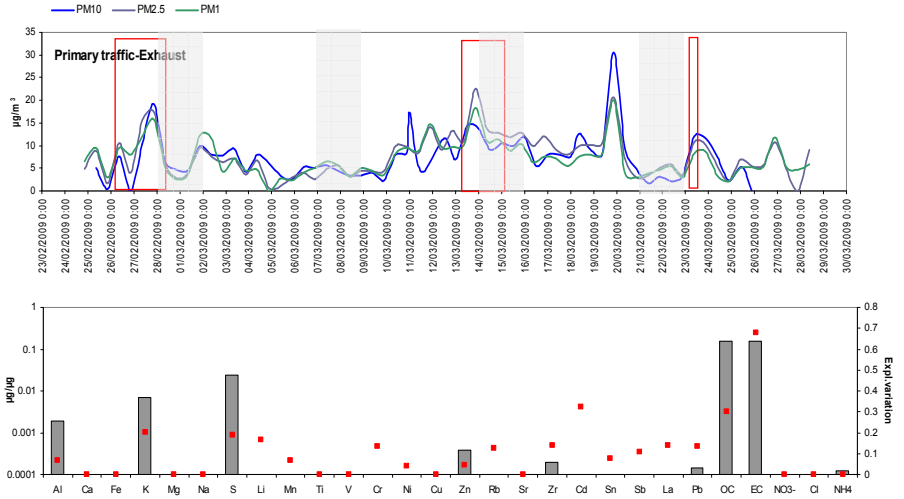


MSY: DAURE summer campaign



BCN_ DAURE winter campaign

PMF-Preliminary analysis



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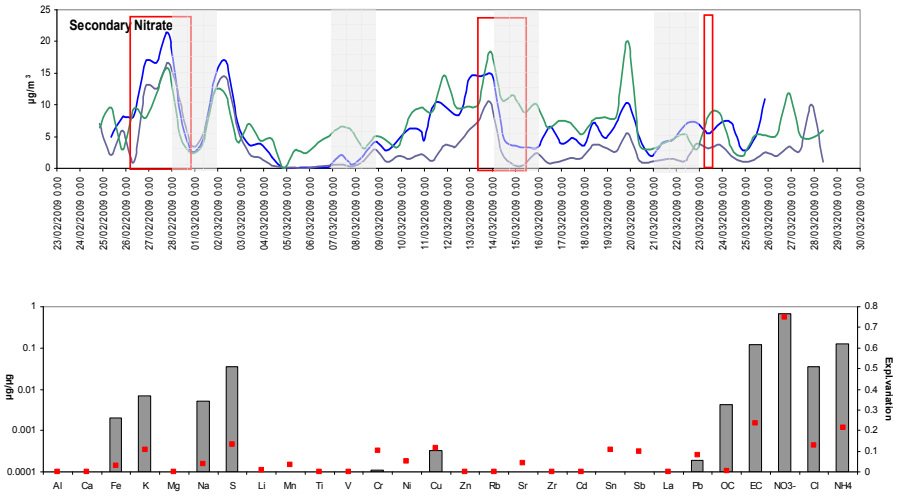
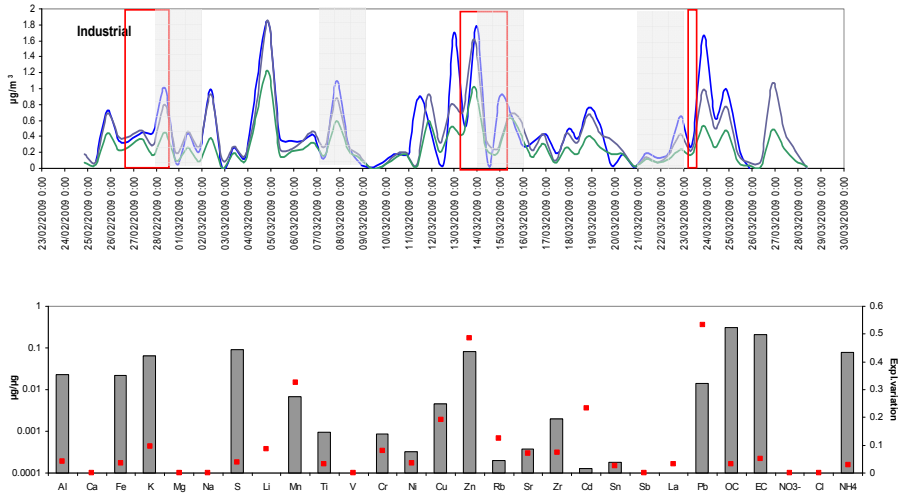


BCN

PMF-PRELIMINARY ANALYSIS



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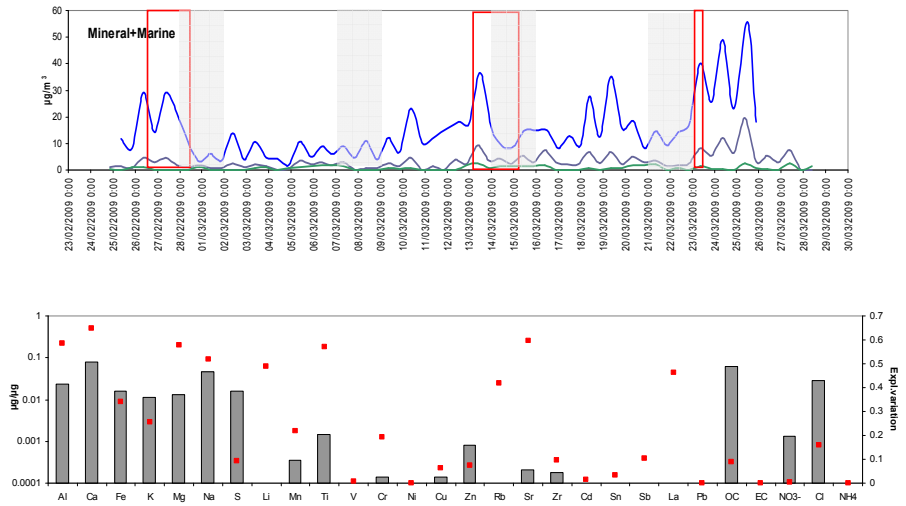

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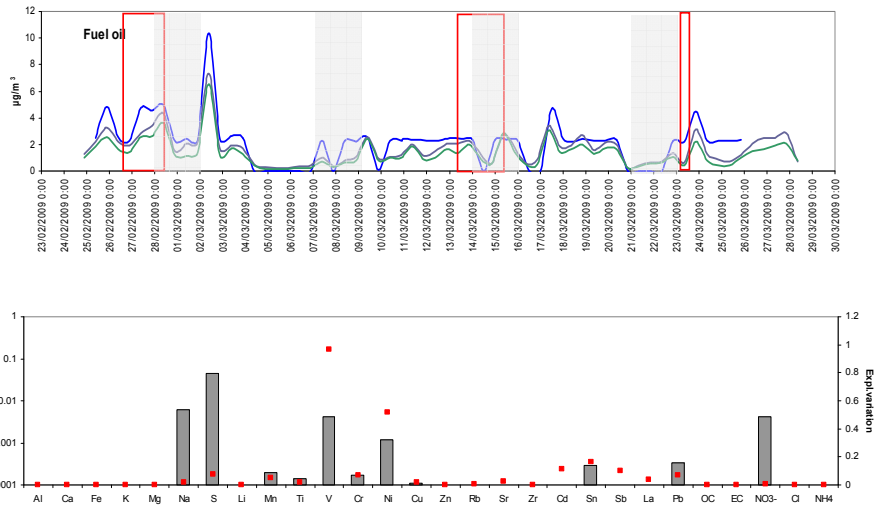
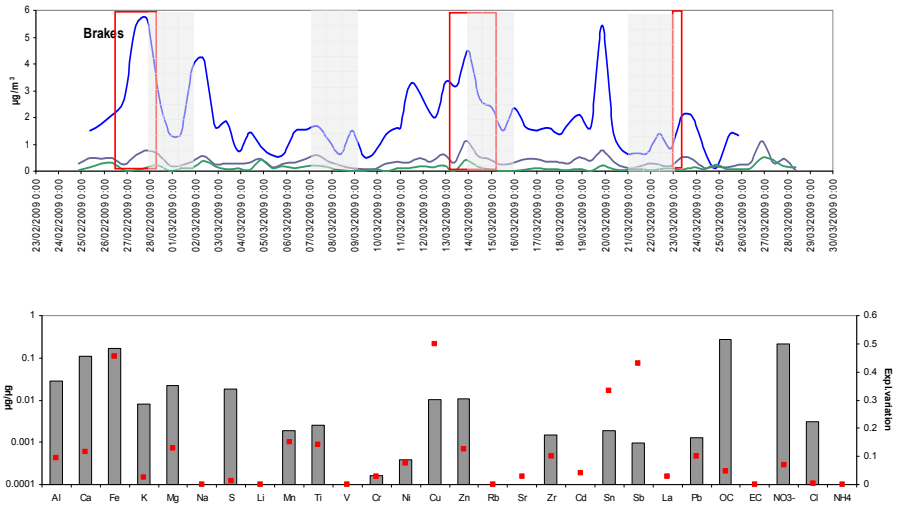
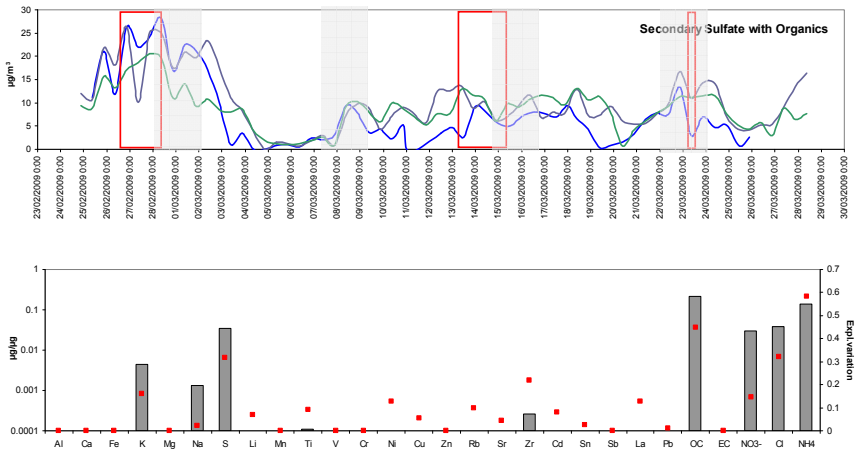
PMF-PRELIMINARY ANALYSIS



BCN

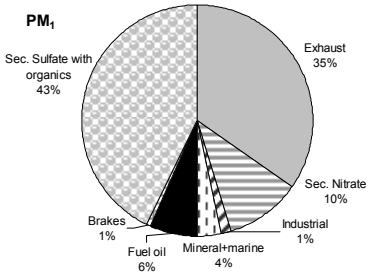


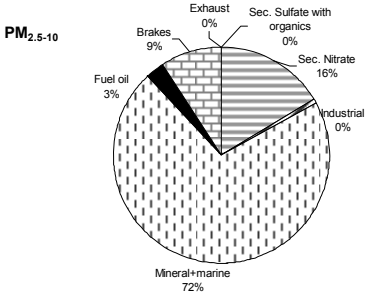
PMF-PRELIMINARY ANALYSIS

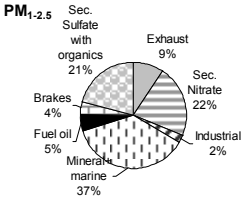


BCN

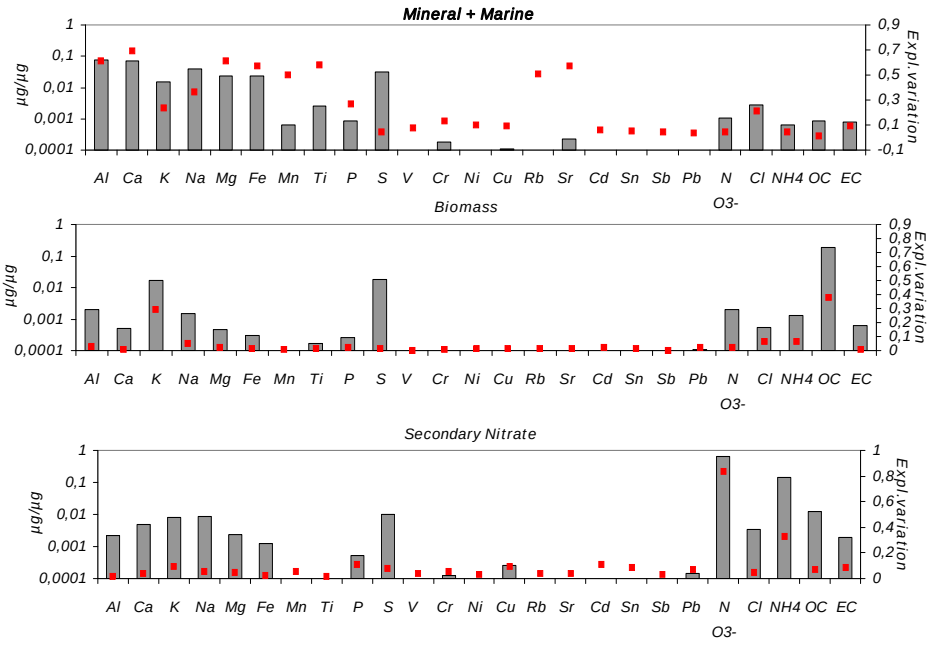
PMF-PRELIMINARY ANALYSIS







MSY: PMF preliminary results



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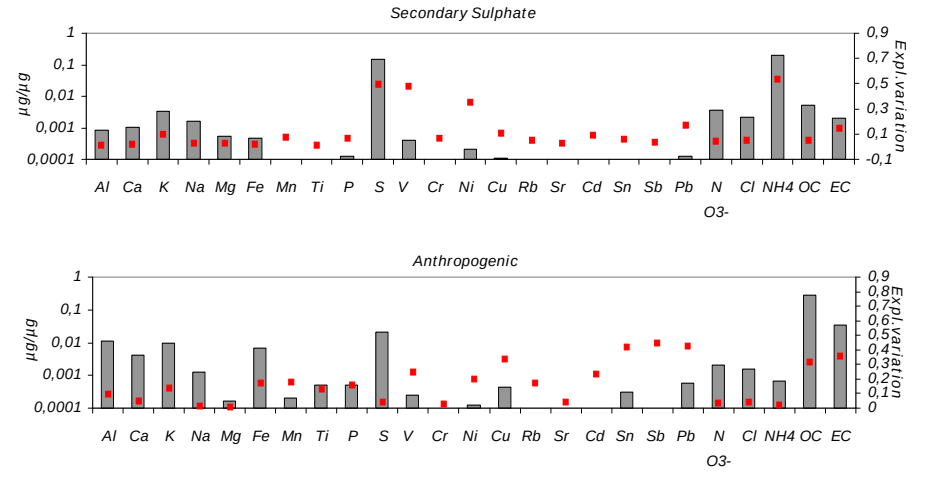

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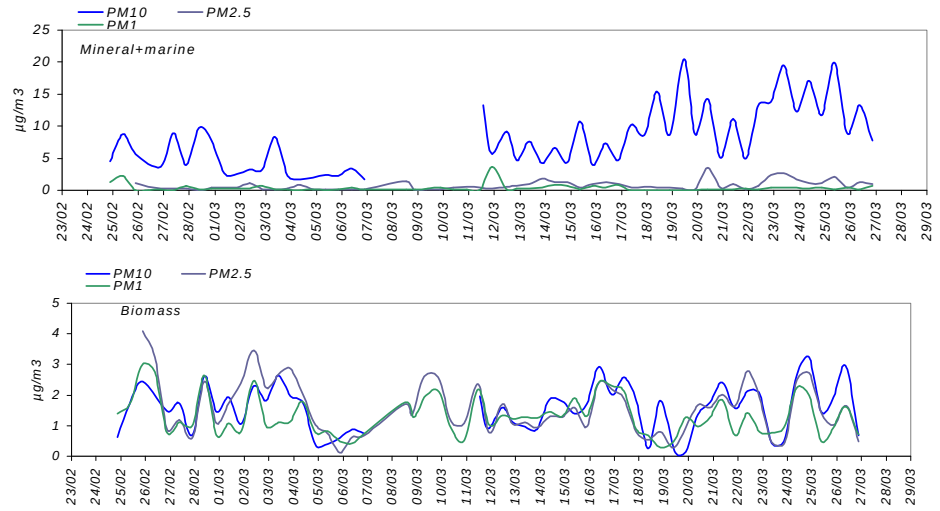

MSY: PMF preliminary results