“Smog” events in Athens

Winters

2012-2013, 2013-2014,

2014-2015

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ΕΘΝΙΚΟΝ ΑΣΤΕΡΟΣΚΟΠΕΙΟΝ ΑΘΗΝΩΝ
NATIONAL OBSERVATORY ATHENS

IERSD - NOA

Institute for Environmental Research and Sustainable Development,

National Observatory of Athens

Research ID

Period

Objective

Specialized gas and particulate pollution monitoring for the assessment of “smog” in Athens and other Greek cities

Groups

NOA, NCSR Demokritos, UoC, UoPatras/FORTH, UoAegean, UoI, GIT

Framework

First 2 years – THALIS Project, NSRF 2007-2013

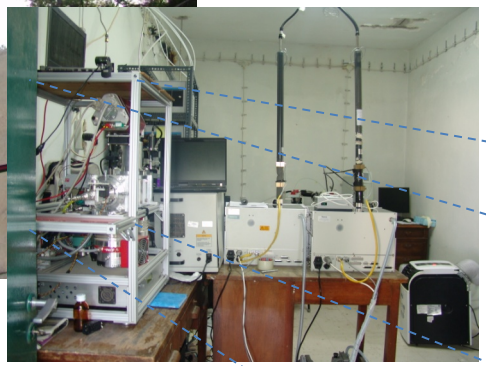
DETERMINATION OF THE SOURCES AND THE PHYSICOCHEMICAL PROPERTIES OF FINE AND ULTRAFINE AEROSOL PARTICLES THAT AFFECT THE REGIONAL CLIMATE OF GREECE

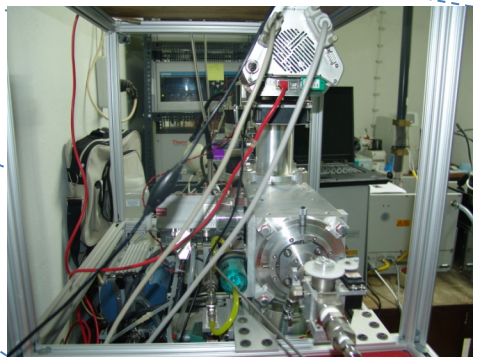
3rd year – THESPIA KRIPIS Project , NSRF 2007-2013

Research ID

Location

Premises of the National Observatory of Athens at Thissio (city center)





Infrastructure

Instrumentation

Routine measurements – ACTRIS campaign

NO-NO_2, O_3, CO, SO_2, PM_{10}
BC 7wl, PSAP, MAAP from Crete,
SMPS
$PM_{2.5}$, $PM_{2.5-10}$ sampling
POLLY^{XT}, ceiliometer

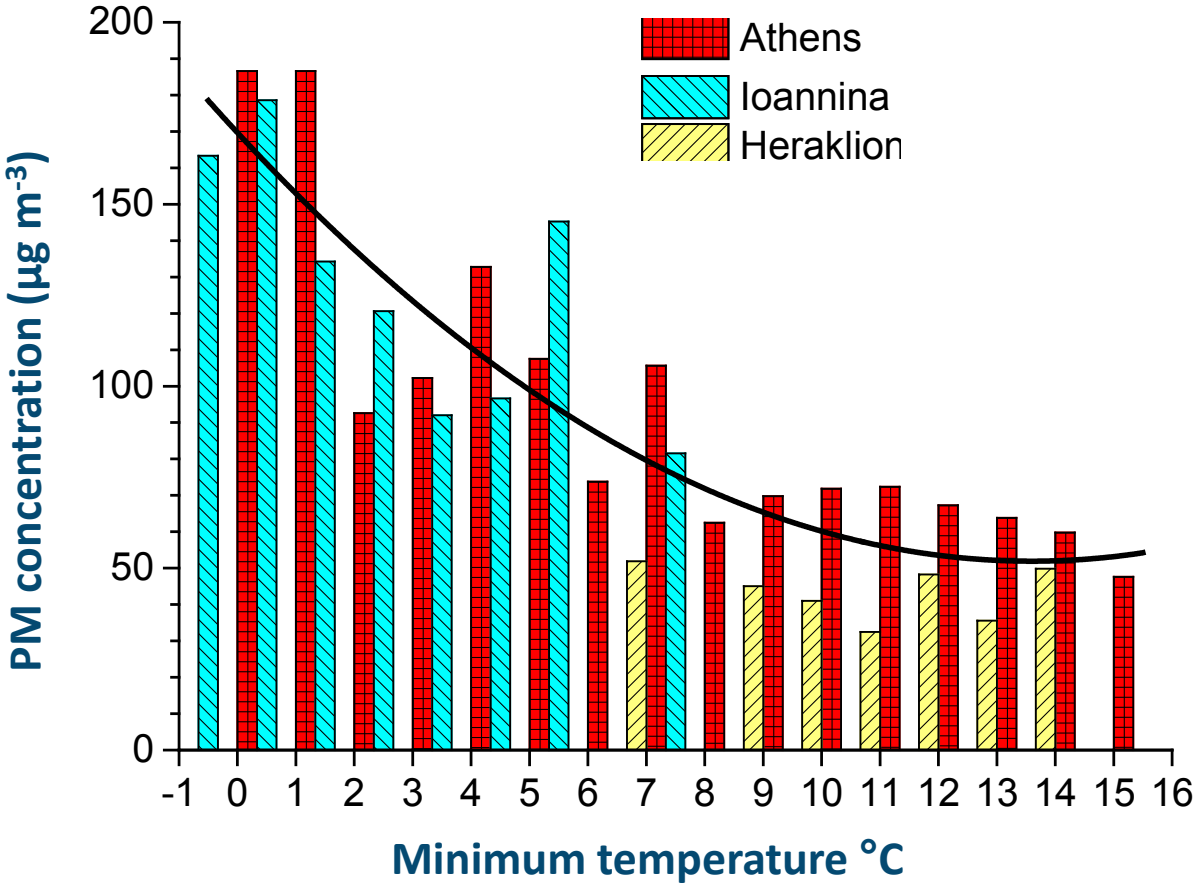
During previous campaigns

ACSM, PTRMS, PILS-IC, WAD (wet annular denuder)

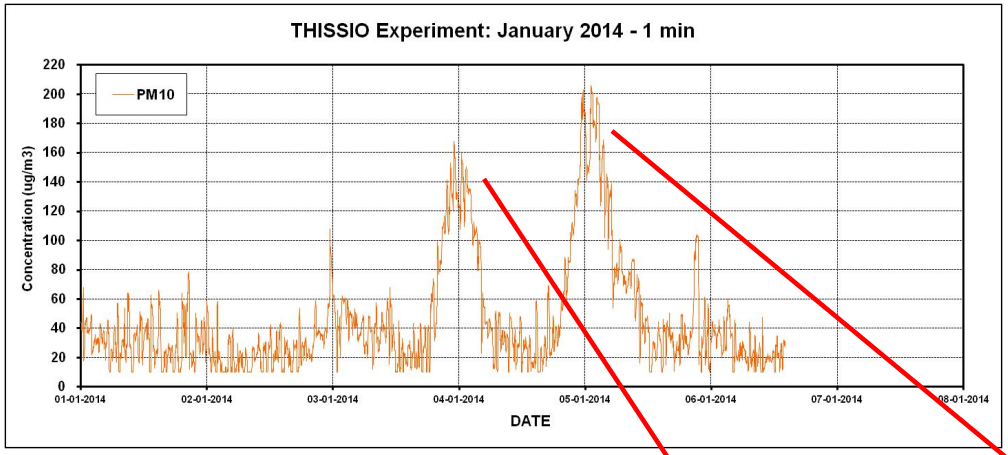
Snapshots

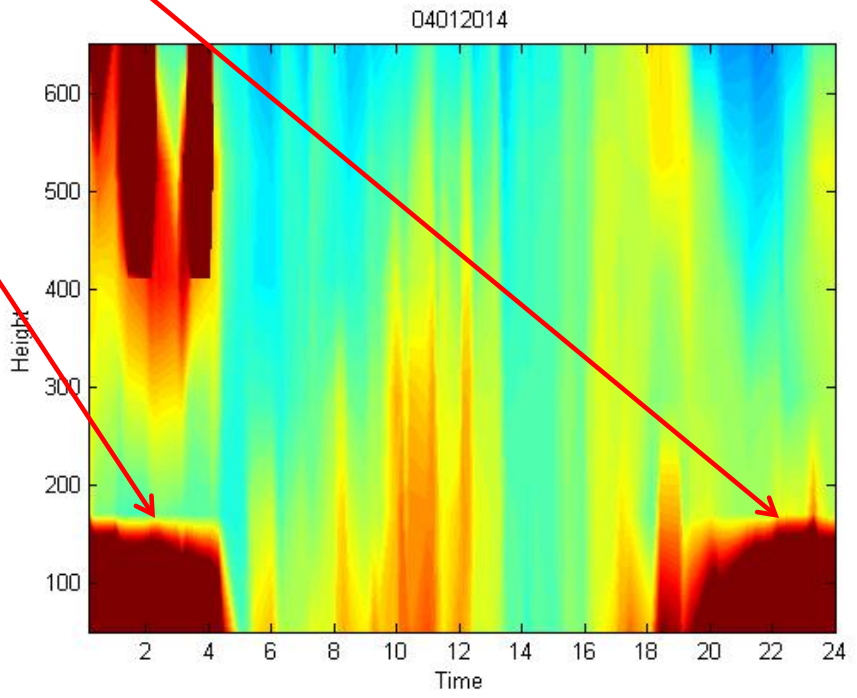
Selected results with emphasis on BC

The colder the worse …

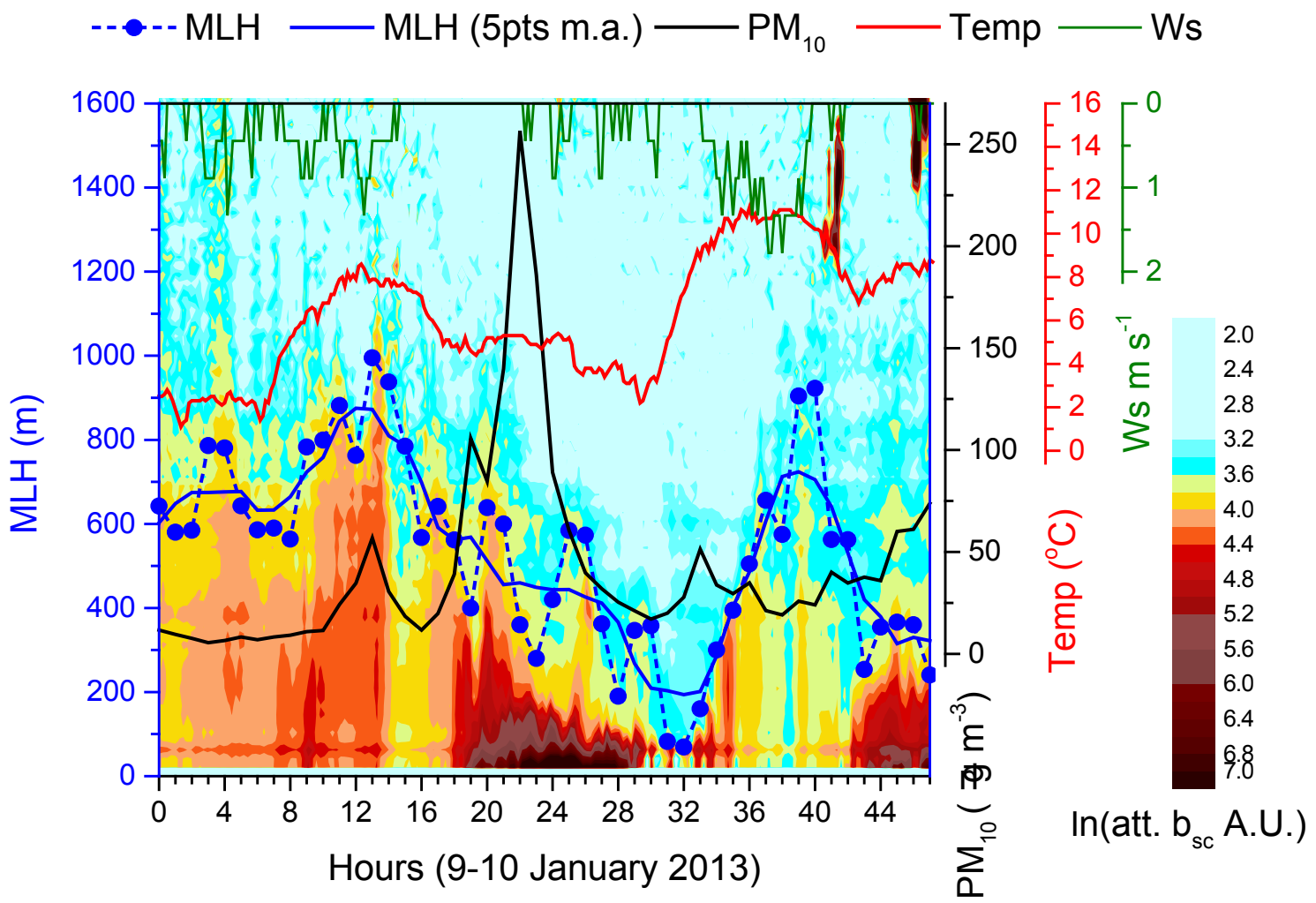


The colder the worse …



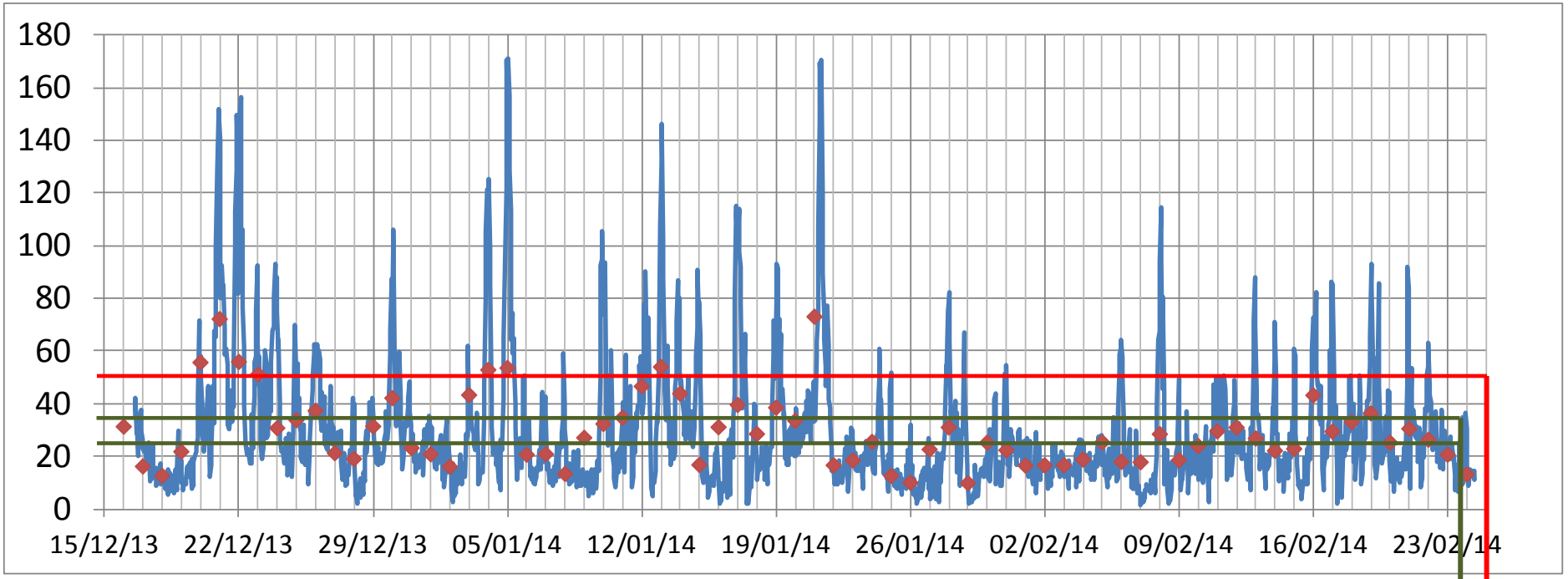


All in one!


MLH
MLH (5pts m.a.)
PM10
Temp
Ws
MLH (m)
PM10 (μg m-3)
Temp (°C)
Ws m s-1
ln(att. bsc A.U.)
Hours (9-10 January 2013)

Exceedances 2013-2014

PM_{10} (µg/m³)



- 23 nights with hourly PM values >80 µg/m³
- 8 days exceeding the daily threshold of PM_{10}
- 21-36 days exceeding the daily threshold of $PM_{2.5}$

Daily threshold for PM_{10}
EU, WHO 50

Daily threshold for $PM_{2.5}$
WHO 25
US EPA 35

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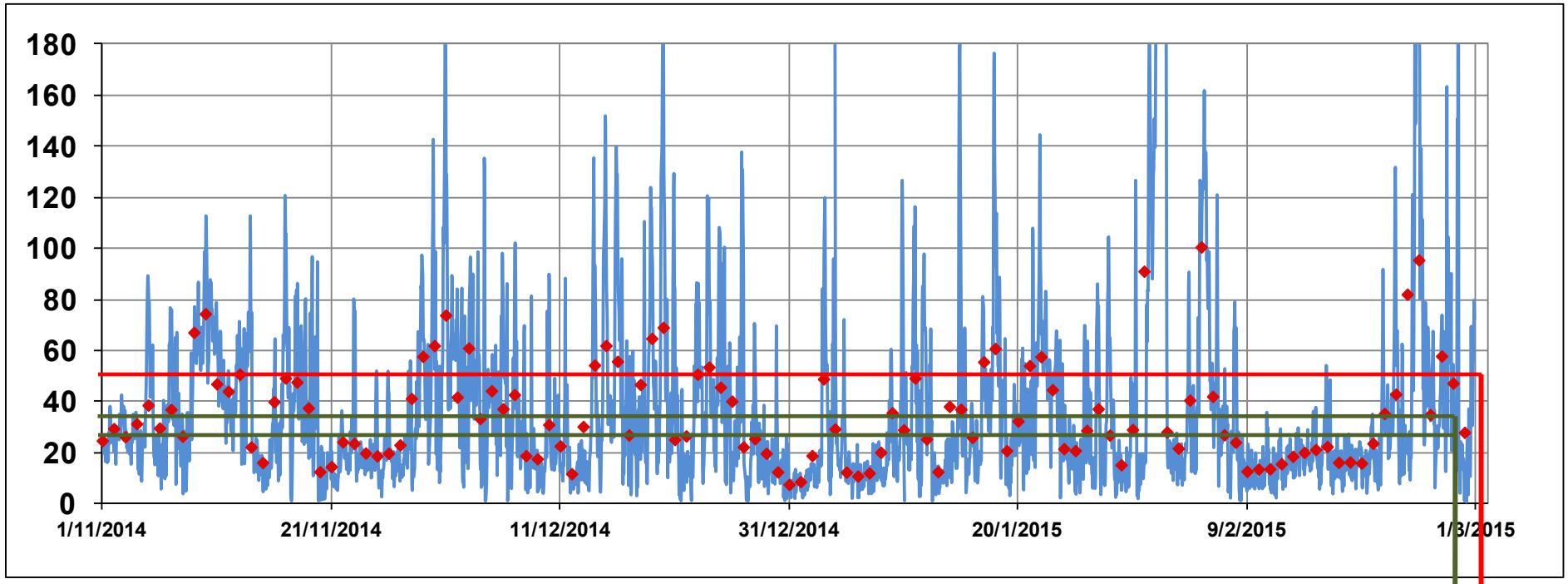
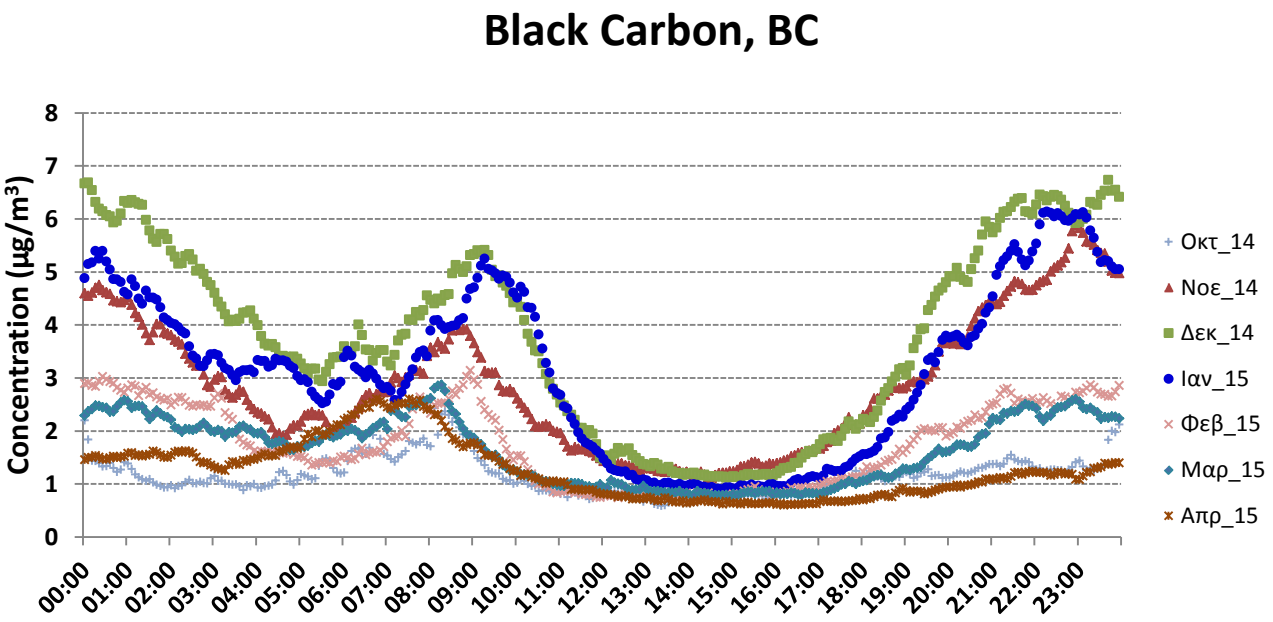
Exceedances 2014-2015

$A\Sigma_{10}$ (μg/m³)

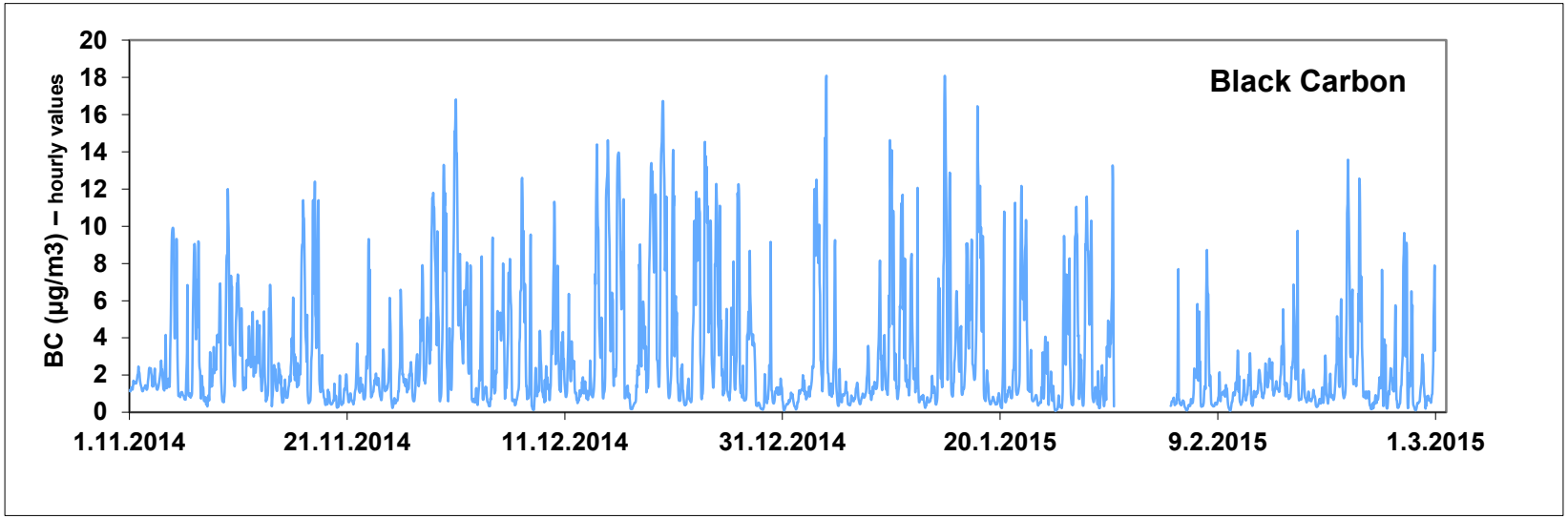


- 40 nights with hourly PM values >80 μg/m³ (33% from 33%)
- 22 days exceeding the daily threshold of PM_{10} (18% from 11%)
- 34-59 days exceeding the daily threshold of $PM_{2.5}$ (39% from 41%)

Monthly evolution of BC diurnal course

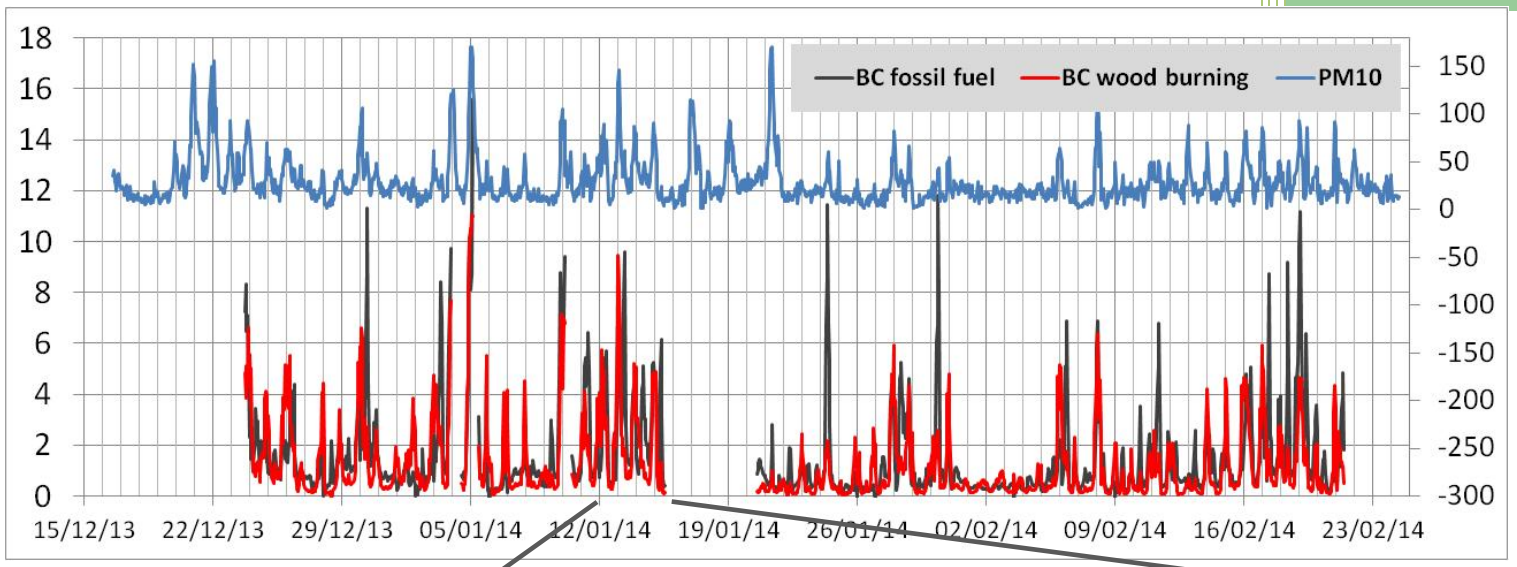


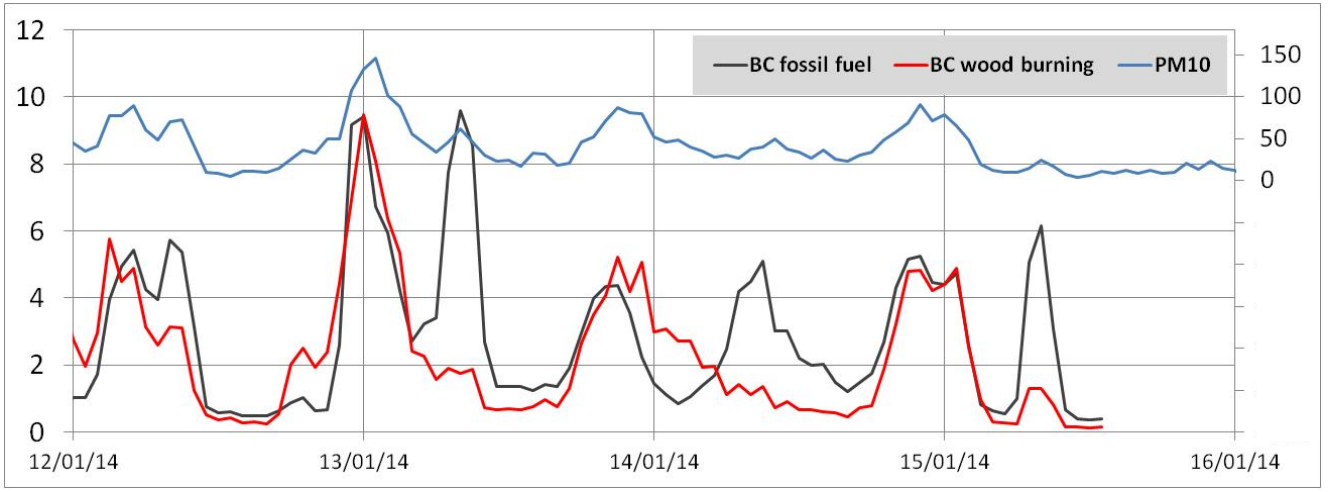
Black Carbon – Winter 2014-2015



(µg/m³)	average	maximum	upper quartile
BC	3	18	4

Black Carbon – Winter 2013-2014





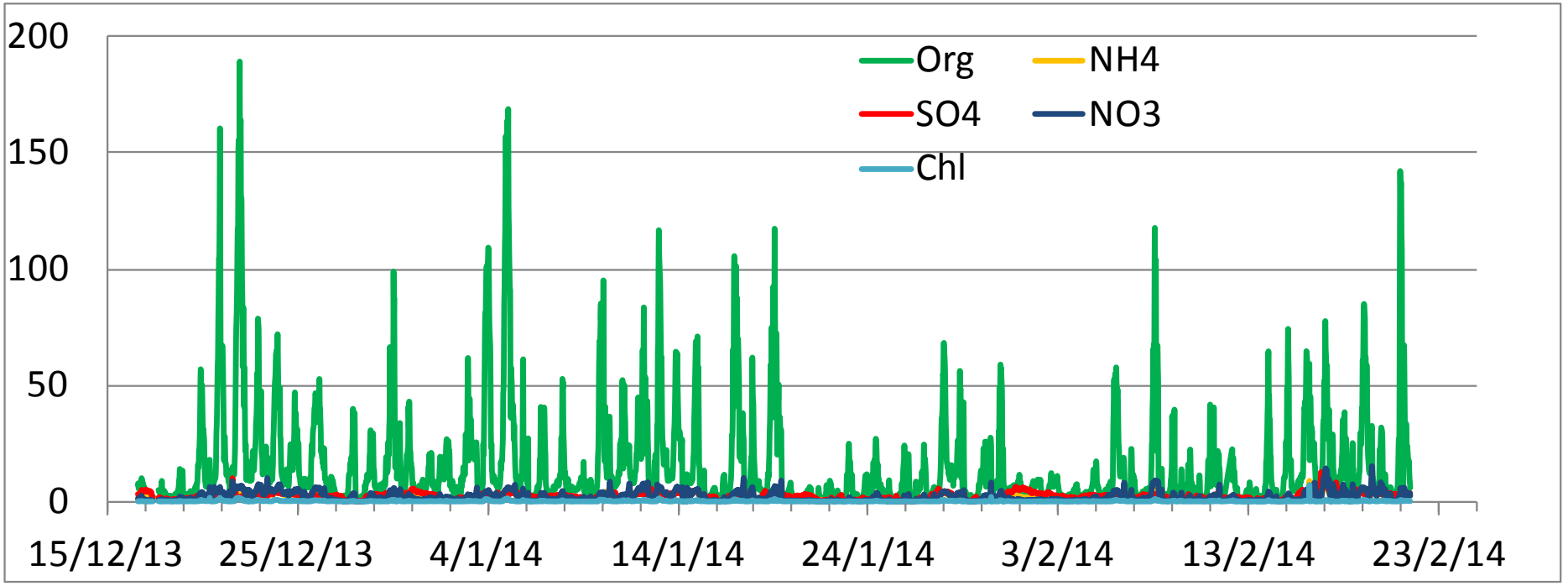
Sandradewi et al., 2008
Sciare et al., 2010

Interannual variability

(μg/m³)	Dec-Feb 2013-2014	Dec-Feb 2014-2015	Dec-Feb 2014-2015
BC	2,88	2,7	3
% Change		-6%	2,5%

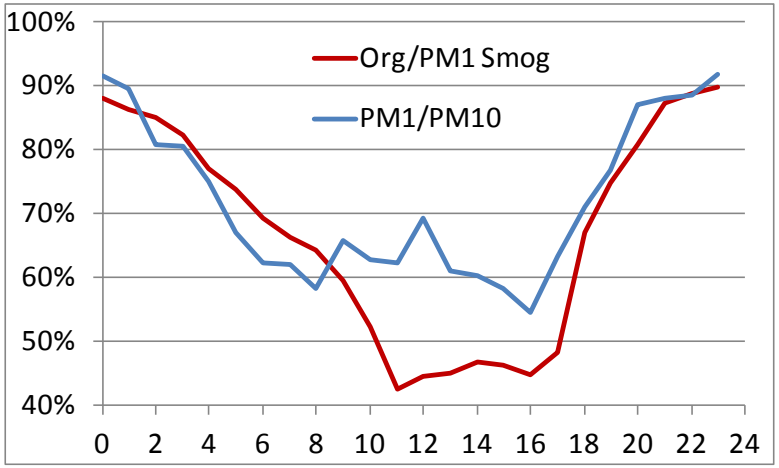
Chemical composition

PM_1 (µg/m³)

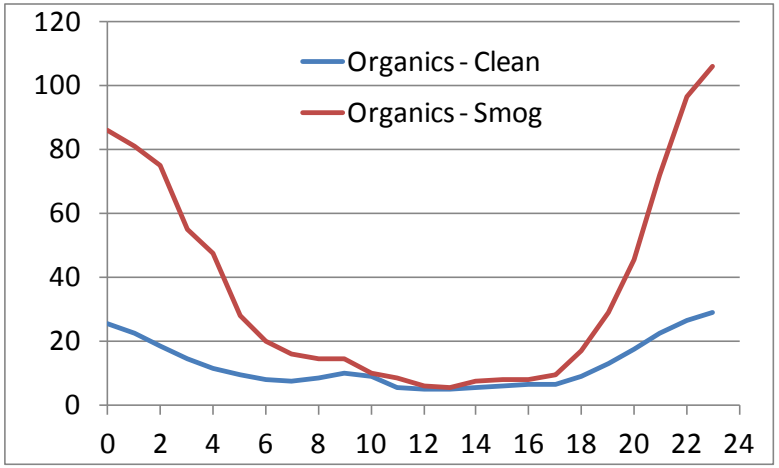


Diurnal variability

PM_1 and Organics contribution to PM

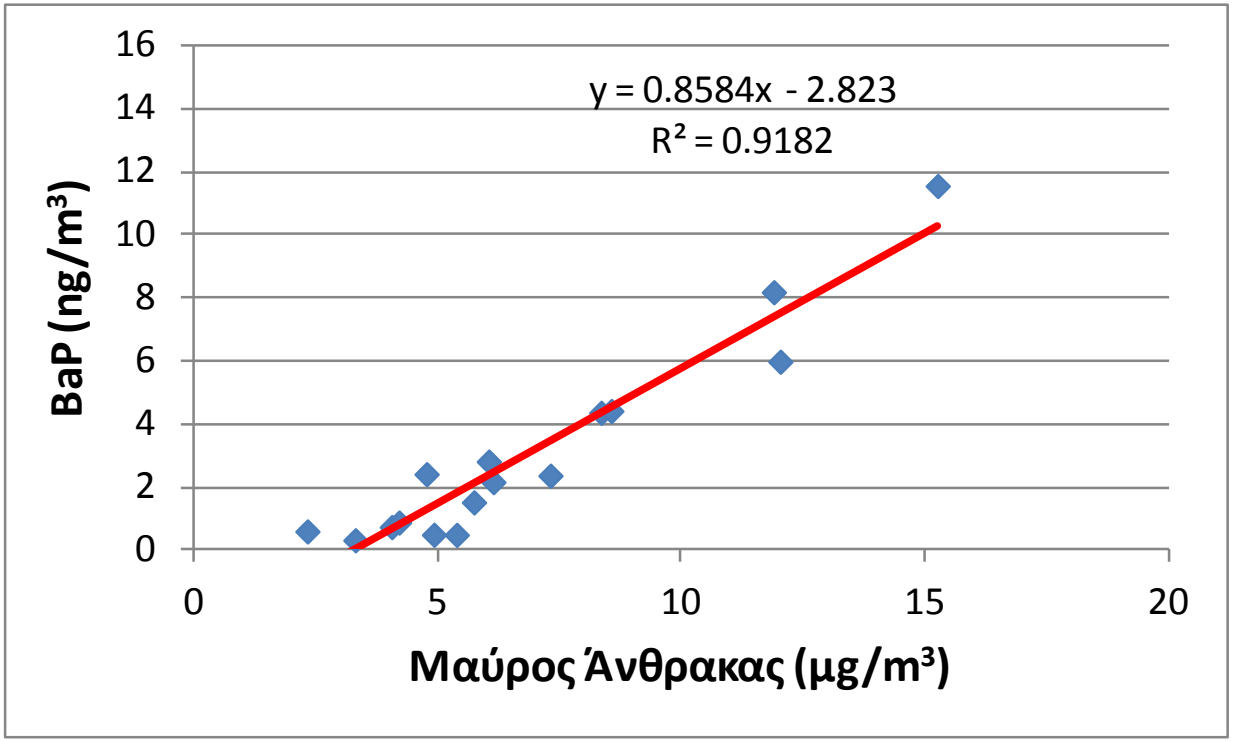


Organics concentration (µg/m³)



- PM_{10} are mostly comprised by PM_1 by:
  60% during day time - 90% at nights with smog
- The contribution of organics in PM_1 is:
  50% during day time – 90% at nights with smog

PAH vs BC


y = 0.8584x - 2.823
R² = 0.9182
BaP (ng/m³)
Μαύρος Άνθρακας (μg/m³)
0
2
4
6
8
10
12
14
16
0
5
10
15
20

thank you!