



COST

European Network on New Sensing Technologies for Air Pollution Control
and Environmental Sustainability - *EuNetAir*

COST Action TD1105

WG3-WG4 JOINT SCIENTIFIC MEETING

Duisburg, Germany, 4 - 6 March 2013

**Environmental Measurements at Laboratory and In-Field Air-Quality
Stations in Spain**

id $\text{\textcircled{a}}$ ^a

 **CSIC**
CONSEJO SUPERIOR DE INVESTIGACIONES CIENTÍFICAS

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IDAEA-CSIC / Spain

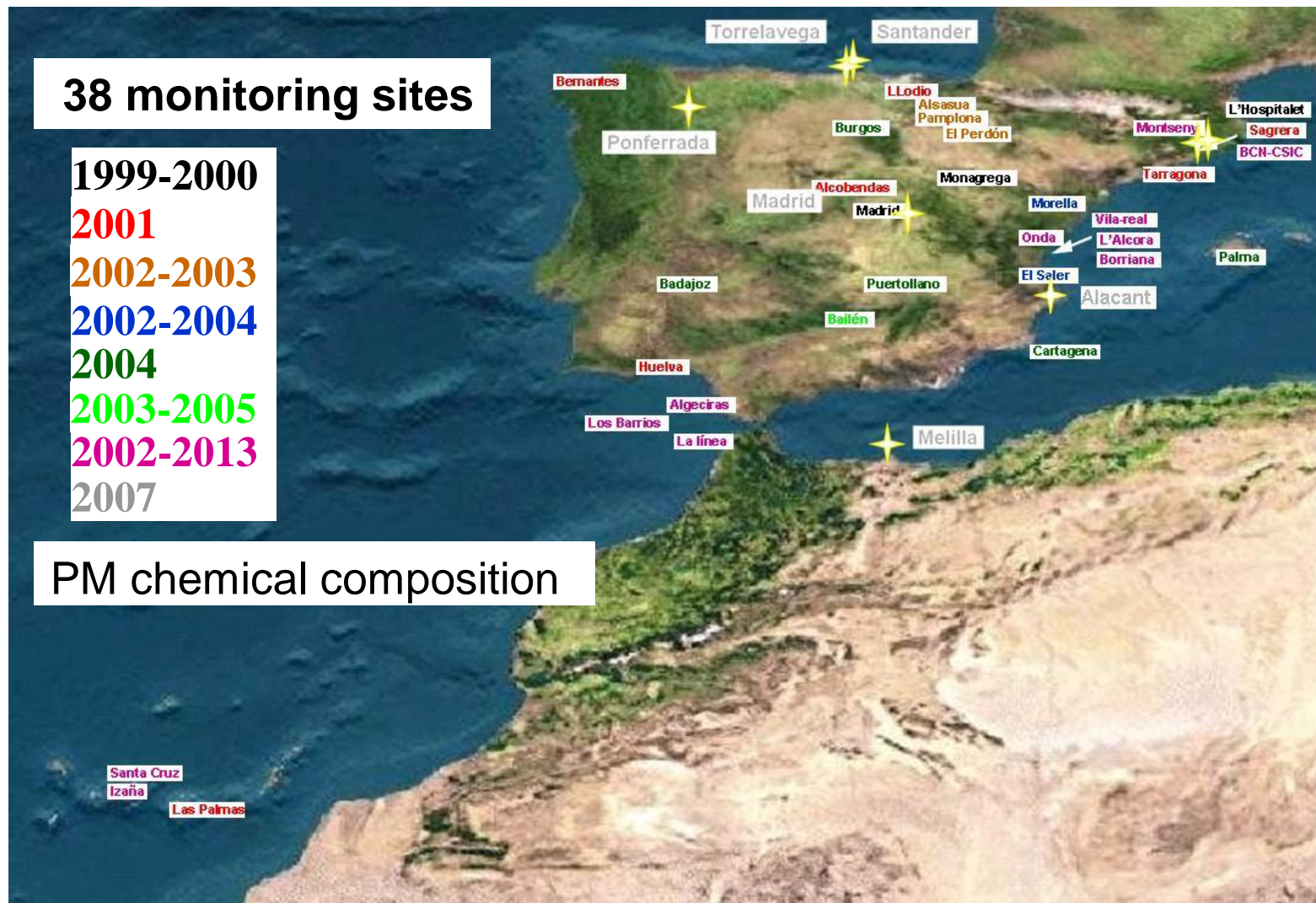
Scientific context and objectives in the Action

- **Action's objectives (from MoU) matching partner activities:**
 - implementing field validation at outdoor and indoor levels
 - Harmonising environmental measurements
 - Training students and early stage researchers
 - Assessing on guidelines for outdoor/indoor AQC
- **WG and SIG in which we participate:**
 - WG3: Environmental Measurements and Air-Pollution Modeling
 - SIG4: Expert Comments for the Revision of the Air Quality Directive (AQD)

Current research activities of the Partner (1/2)

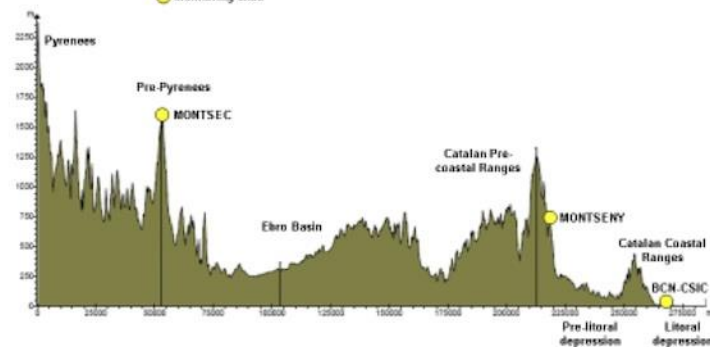
- NH_3
- NO_2
- PM
- N
- BC

Current research activities of the Partner (2/2)



Research Facilities available for the Partner (1/2)

- Air quality monitoring network, 3 sampling sites: urban, regional and continental/remote.
- Instruments:
 - High and low volume samplers for PM₁₀, PM_{2.5} and PM₁
 - Optical particle counters
 - Absorption photometers, Aethalometers, Nephelometers
 - Condensation particle counters (CPC)
 - Scanning mobility particle sizers (SMPS)
 - Aerosol chemical speciation monitor (ACSM)
 - Conventional NO₂, O₃ and CO monitors



MAAP



Aethalometer



ACSM

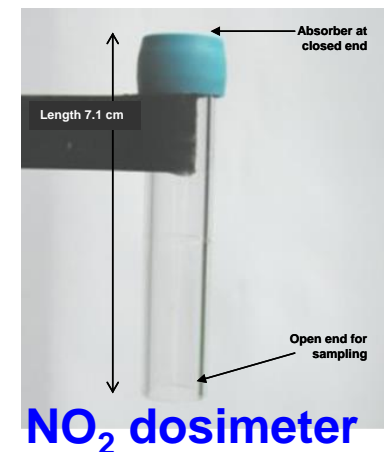
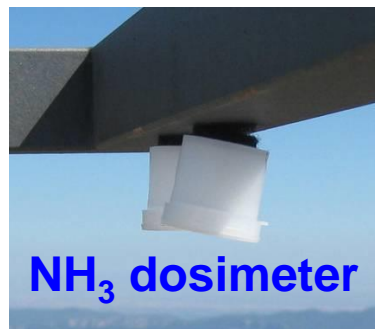


NH₃ real time
(rented)

Research Facilities available for the Partner (2/2)

- **Laboratories/analysis techniques:**

- Passive dosimeters (NH_3 , NO_2)
- ICP-AES and ICP-MS
- Liquid chromatography
- Gravimetric analysis
- OC and EC (thermo-optical)



- **Sensors:**

- Airbase sensors (O_3 , NO_2 , Total VOC, TSP, noise, RH, T)

Airbase sensors

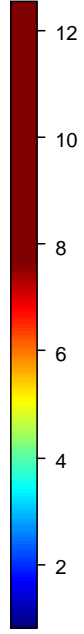
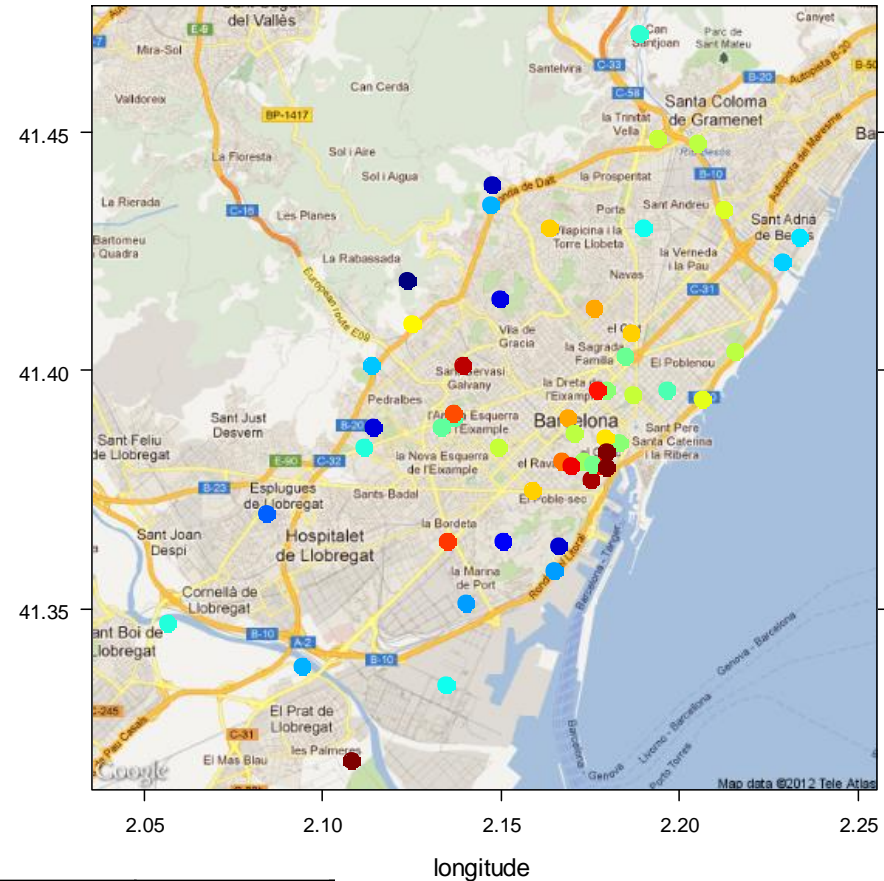
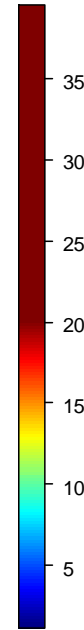
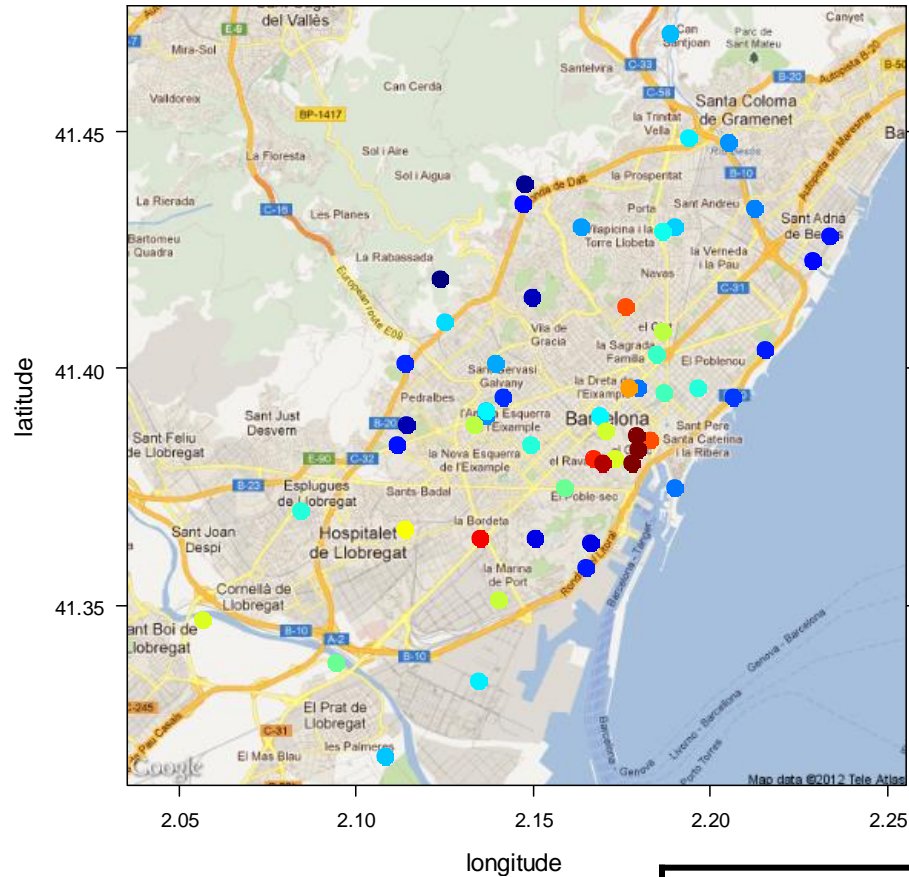


Achieved **RESULTS** and future activities (1/9)

NH₃ (µgm⁻³)
Summer 2010

Urban ammonia

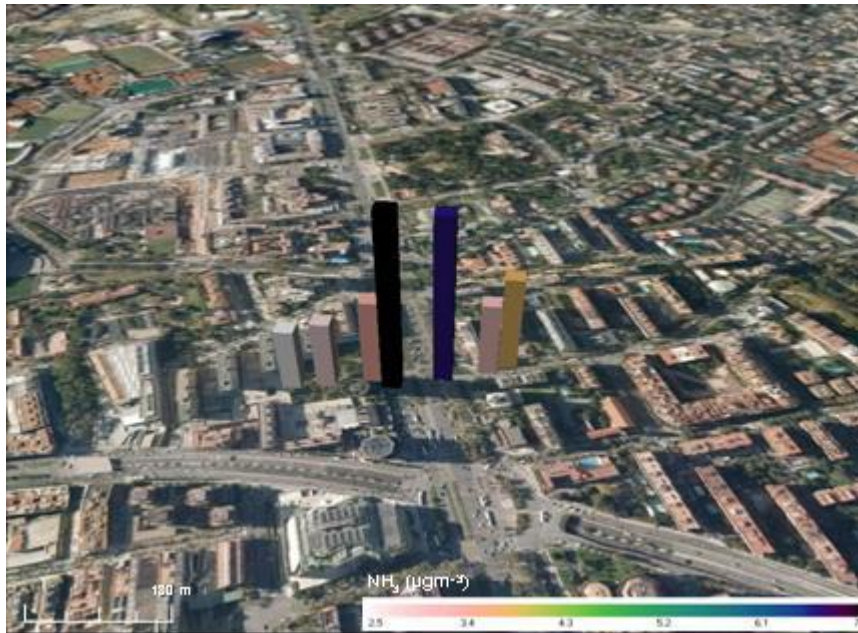
NH₃ (µgm⁻³)
Winter 2010



NH ₃ (µg/m ³)	Summer	Winter
Urban background	10.6	3.9
Traffic	7.6	4.6

Achieved **RESULTS** and future activities (2/9)

Road traffic influence



Sewer system influence

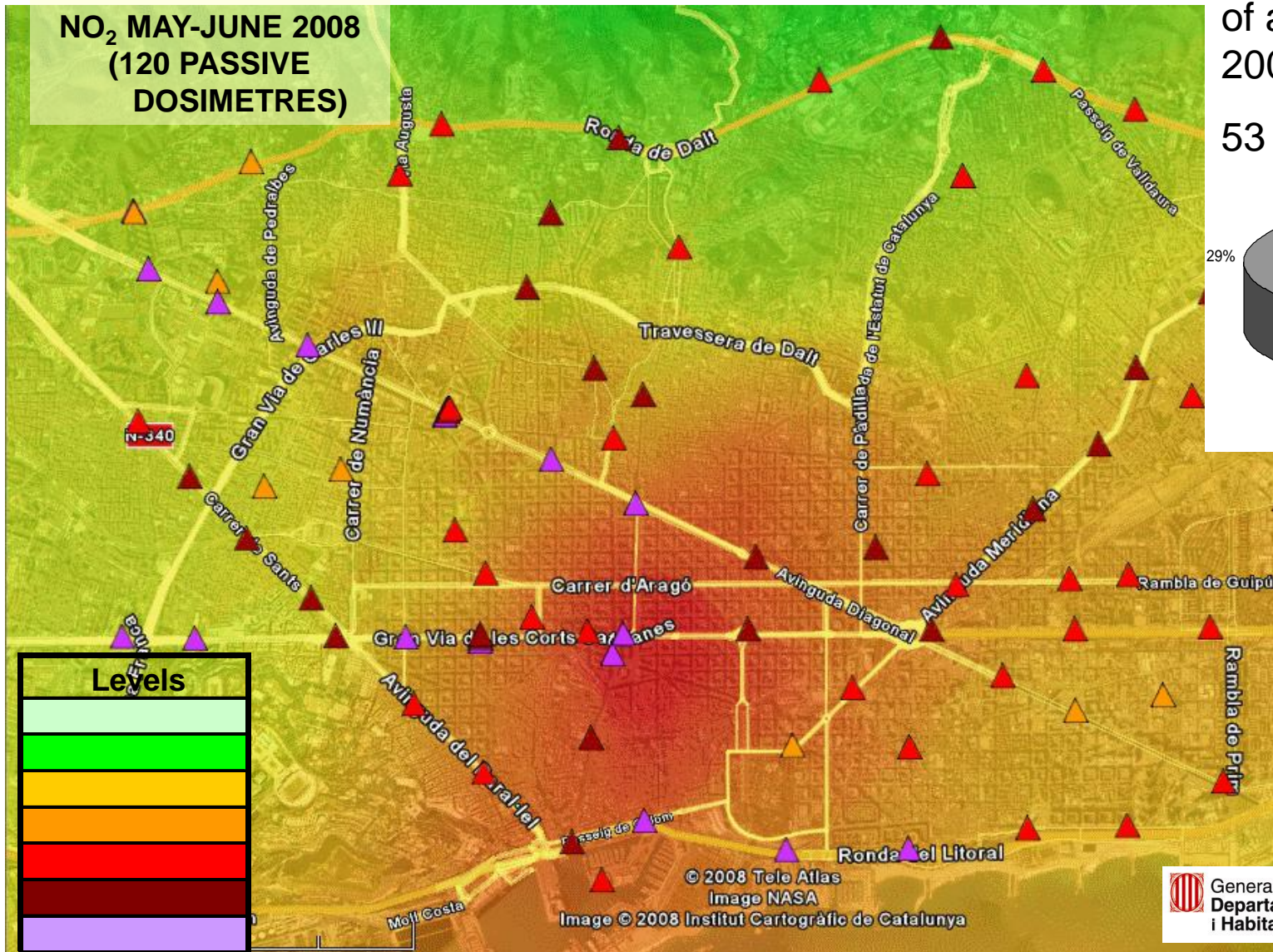
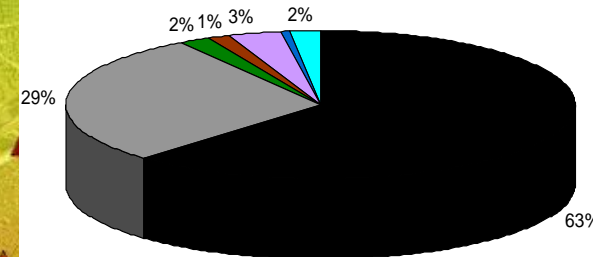


Achieved **RESULTS** and future activities (3/9)

NO₂

Causes of exceedances of annual limit NO₂ 2001-1009

53 Spanish sites



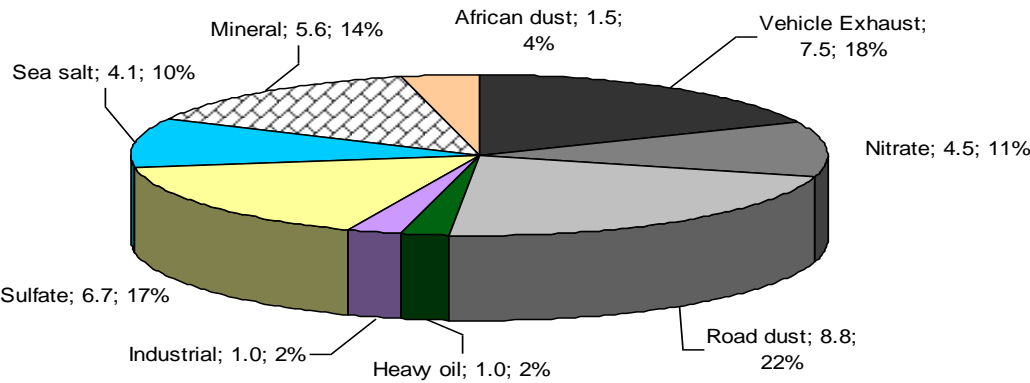
Achieved RESULTS and future activities (4/9)

PM source apportionment

Non road resuspension 14%

Road traffic 48%

PM10

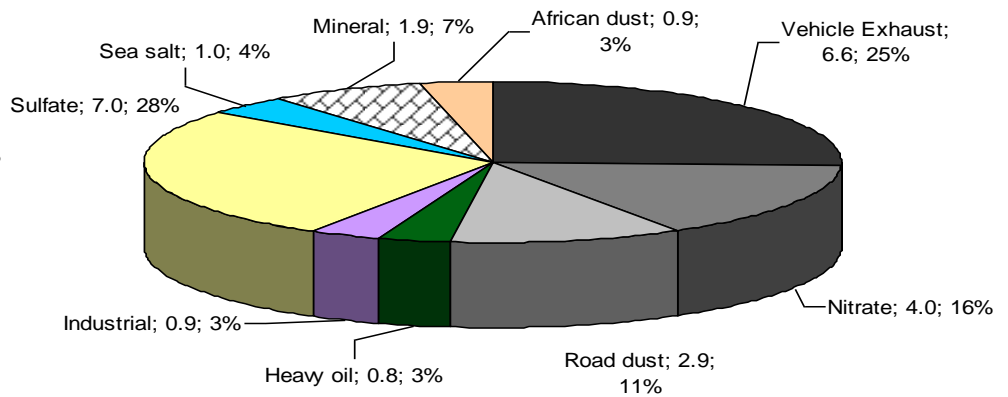


Shipping 2%

Non road resuspension 4%

Road traffic 49%

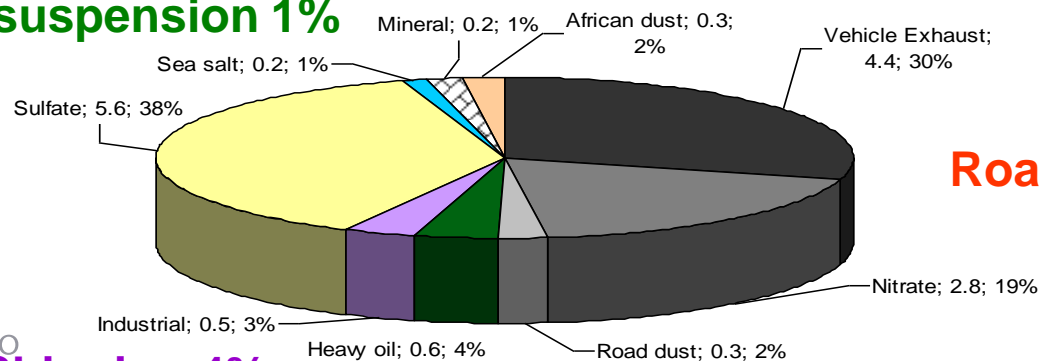
PM2.5



Shipping 3%

Non road resuspension 1%

PM1

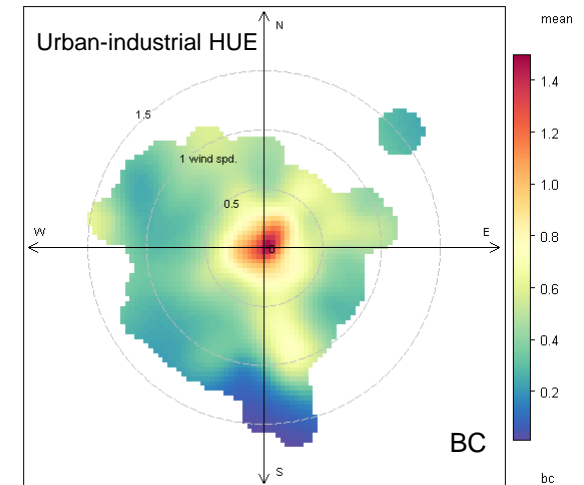
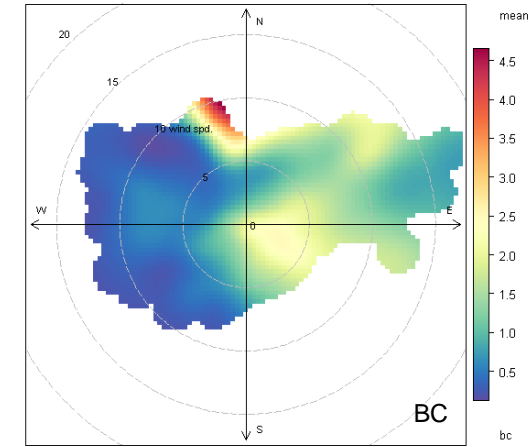
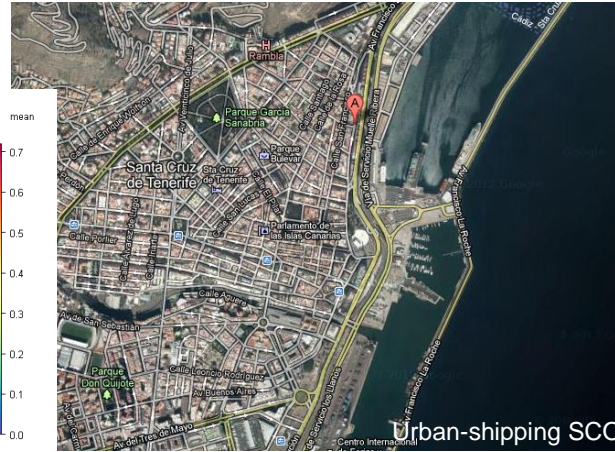
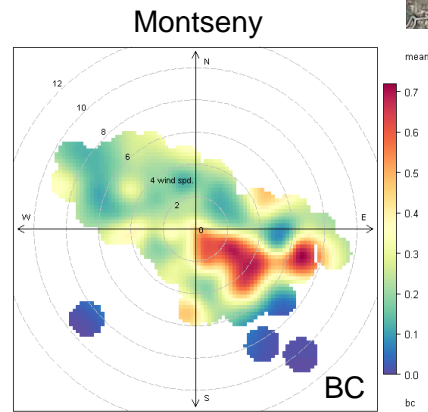
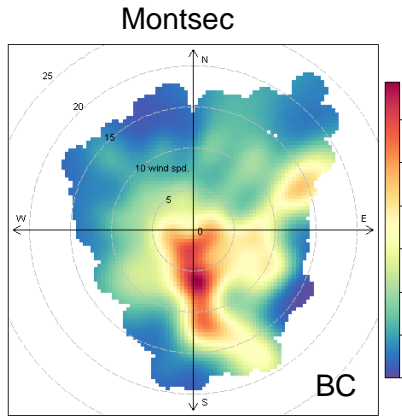


Road traffic 46%

Shipping 4%

Achieved **RESULTS** and future activities (5/9)

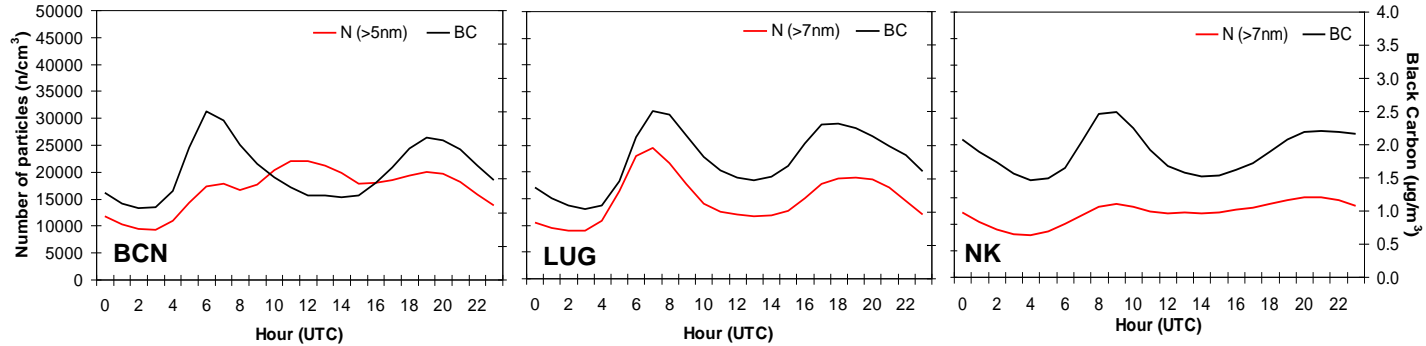
Black carbon



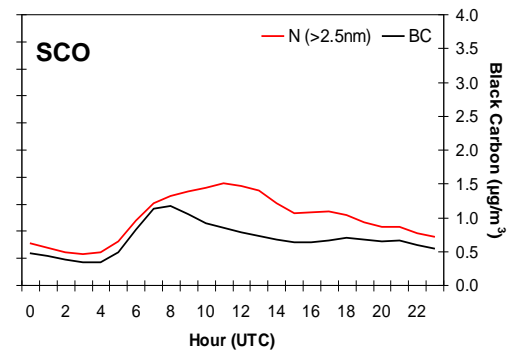
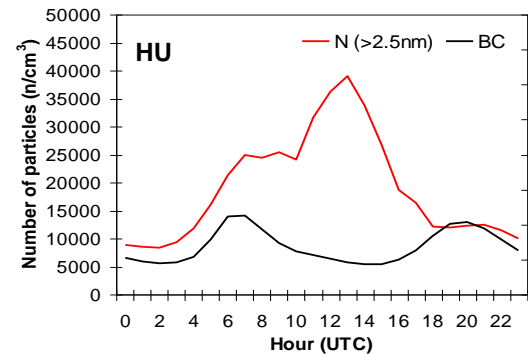
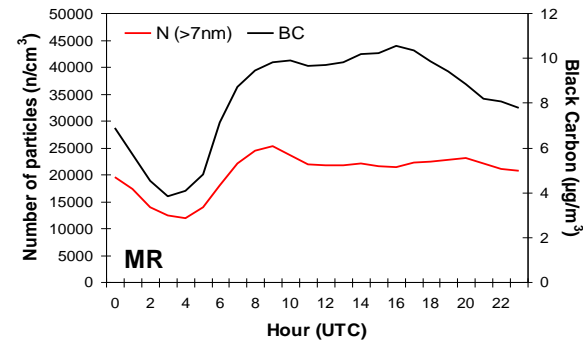
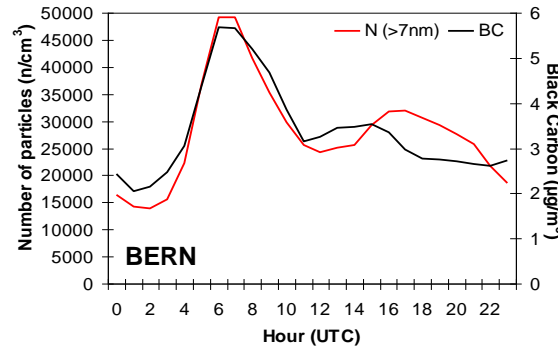
Achieved **RESULTS** and future activities (6/9)

Particle number (N) and Black carbon (BC)

— N
— BC



N does not always co-vary with traffic



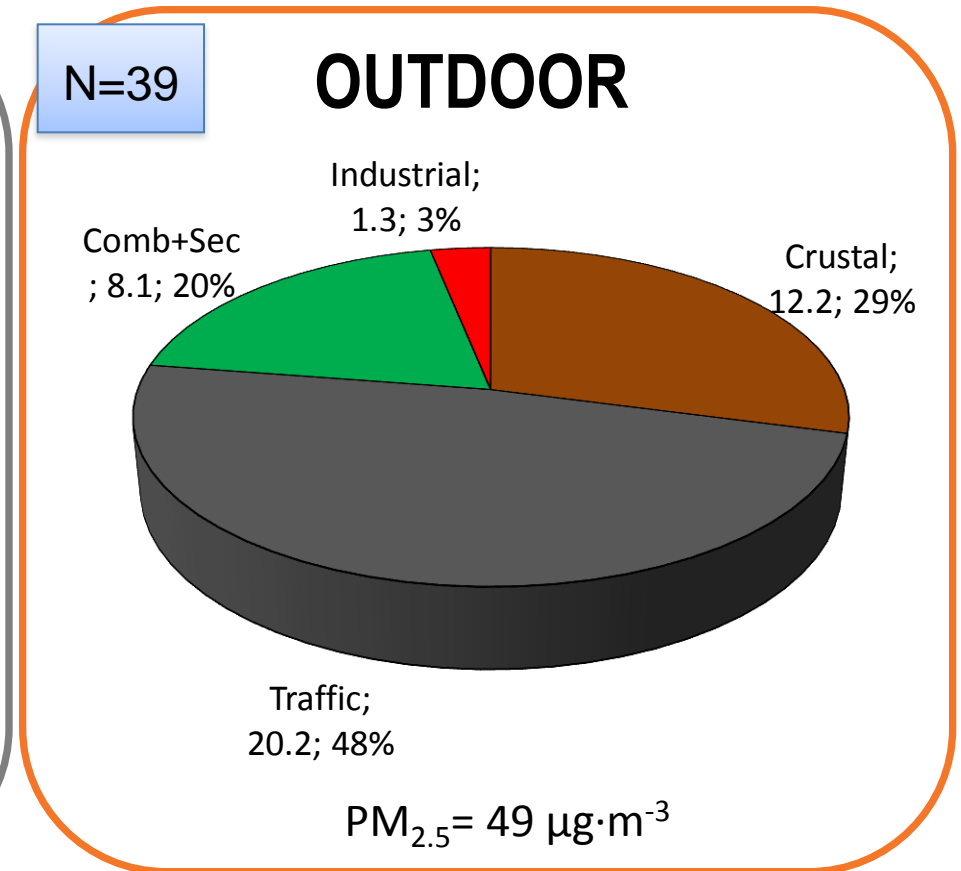
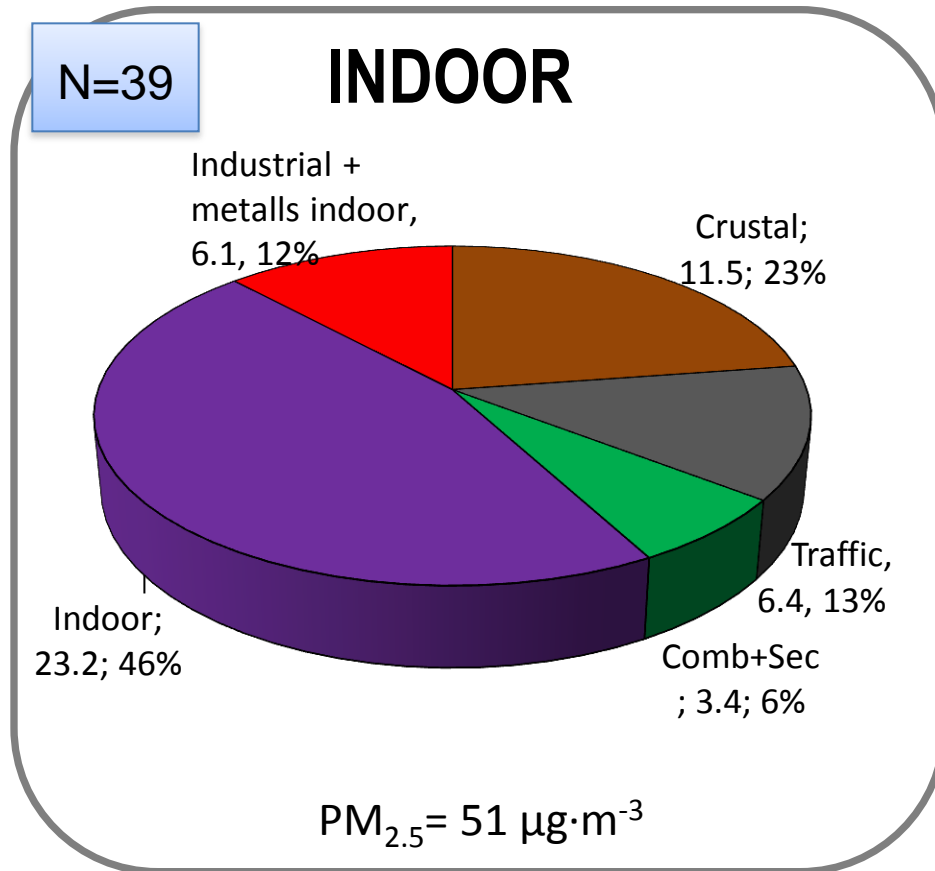
Achieved **RESULTS** and future activities (7/9)

BREATHE

	Schools		Reference site
	INDOOR	OUTDOOR	OUTDOOR
	Mean	Mean	Mean
NO_2 ($\mu\text{g}\cdot\text{m}^{-3}$)	32	52	42
$\text{PM}_{2.5}$ ($\mu\text{g}\cdot\text{m}^{-3}$)	51	49	18
BC ($\mu\text{g}\cdot\text{m}^{-3}$)	1.7	2.0	1.7
N ($\text{pt}\cdot\text{cm}^{-3}$)	17209	23824	15110
LDSA ($\mu\text{m}^2\cdot\text{cm}^{-3}$)	35	44	39

Achieved **RESULTS** and future activities (8/9)

BREATHE

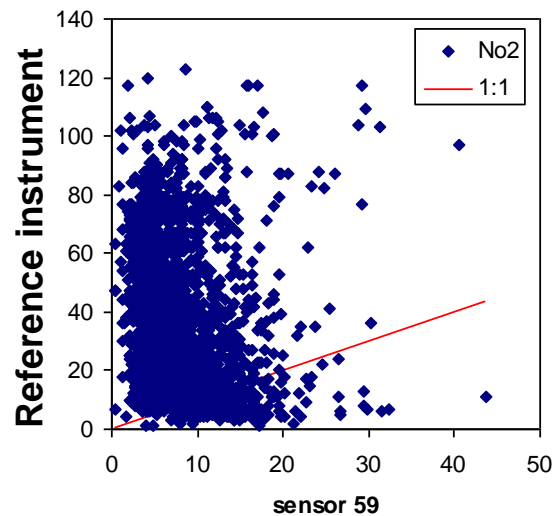
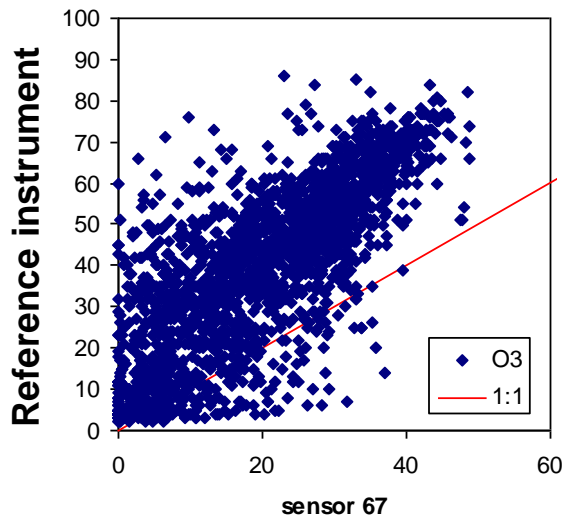
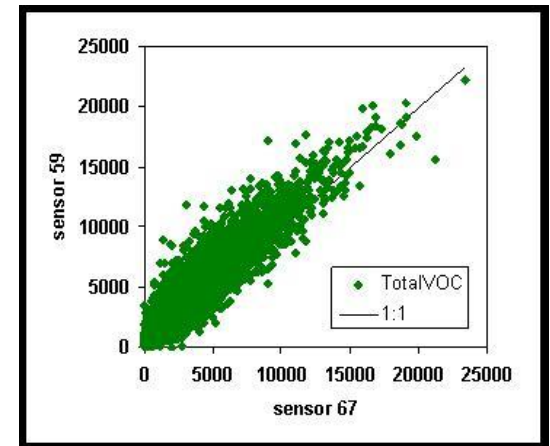
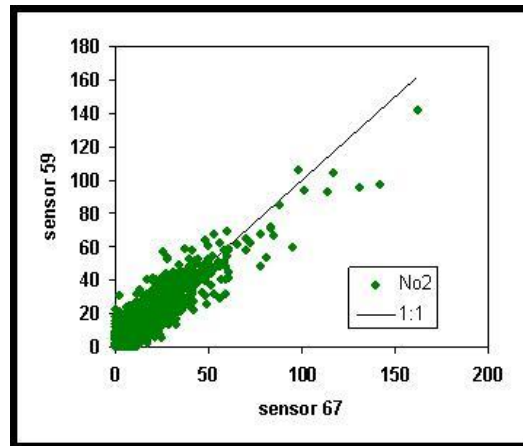
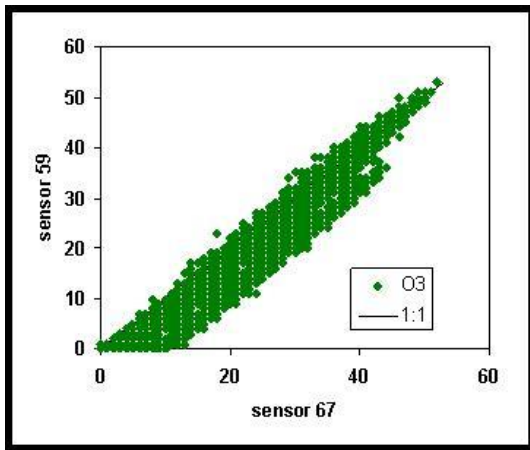


Achieved **RESULTS** and future activities (9/9)

Sensors measurements

17 Dec 2012 – 30 Jan 2013

5min data



Future planned **Activities**

- Continuous measurements at our urban, regional and remote sites
- Specific campaigns within different projects (Life+AIRUSE, HEXACOMM, PRISMA, among others)
- Availability for testing sensors performance in comparison with routine measurements
- Assessing national administration on effectiveness of air quality measures
- BREATHE ERC-Advanced grant and other health related projects on characterization of exposure
- Commuting exposure and abatement of PM levels

Suggested **Priorities** for future research

- **Research directions as PRIORITIES:**
- Development of NH_3 sensors. Comparison with existing real time NH_3 measurements and with NH_3 dosimeters.
- Coupling of real time NH_3 provided by sensors with other real time parameters (wind speed and direction and more) to identify sources
- Similar with NO_2
- PM sensor development
- BC sensor development

CONCLUSIONS

- NH_3 sources identified (waste, sewage, traffic)
- NO_2 sources identified (mainly traffic)
- PM source apportionment ME2, PMF,... (ambient air, exposure and commuting)
- PM concentrations in schools between background and traffic
- BC and N do not vary simultaneously in Spain (as opposed to other European areas)
- More work to do on sensor development