CIEMAT

Madrid, SPAIN

Atmospheric Pollution Unit

Introduction

Team participating in DAURE-2009

Scientists

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Dr. Javier Plaza
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Dr. Esther Coz
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Group of Characterization of the Atmospheric Pollution

Technician
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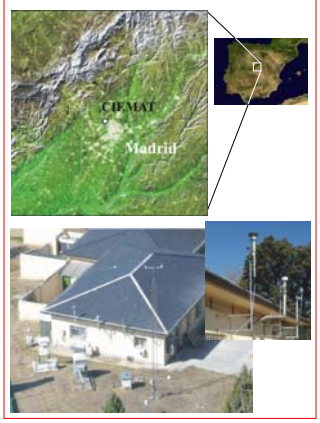
KNOW HOW

- Research on **physico-chemical atmospheric processes of air pollutants** (specially photochemical pollutants and aerosols). Source-receptor relationships, micro, local and regional scales
- **Experimental characterization**: meteorology and atmospheric pollution, including had-hoc designs and experimental set-up
- **Optical Remote sensing** of pollutants
- Development and application of **data analysis methodologies**: pattern behaviour, statistical methods, source-apportionment analysis

The CIEMAT site: Urban Aerosol studies

CIEMAT site



Continuous measurements

Sampling devices

Meteorology and gases

LIDAR station

MAIN OBJECTIVE

Characterize the scenarios an processes involved in primary and secondary aerosol presence in the Madrid atmosphere.

Instruments at DAURE 2009

BCN-2 SITE

Semi-continuous systems	Sampling devices
Particulate nitrate analyser (R&P8400N)	Cascade impactor MOUDI
Particulate sulfate analyser (Thermo 5020i SPA)	Sierra-Andersen impactor

MSY-2 SITE

Size particle/ number distribution (SMPS)

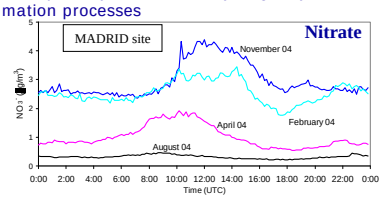
+ Half of the samples from CEH will be analyzed for NH3 and HNO3 at the CIEMAT facilities in Madrid.

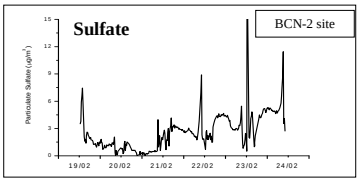
Objectives for DAURE- 2009

Inorganic aerosol BCN site

Semi-continuous measurements (20min)

- Daily evolution pattern of nitrate (PM2.5) and sulfate (PM1) under different meteorological and emission scenarios
- Discrimination of primary and secondary origin by correlation with gaseous pollutants
- Study of formation processes

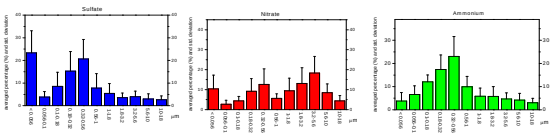


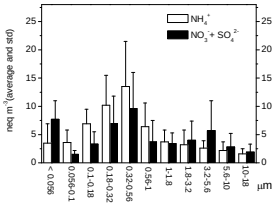


Size segregated measurements and chemical analysis

- 12 hour sampling schedule, nocturnal-emission and photochemical periods
- Mass size distribution of soluble ions from ultrafine to coarse ranges (11 size stages) : NO_2^-, NO_3^-, SO_4^{2-}, Cl^-, Ca^{2+}, Na^+, K^+, Mg^{2+}, NH_4^+
- Chemical and neutralization balances

Sulfate **Nitrate** **Ammonium**



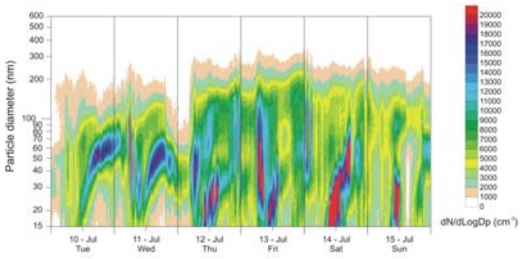


Objectives for DAURE- 2009

Size distribution and number at MSY site (*)

Objective

- Characterize size distribution and processes in the submicronic range associated to primary and secondary aerosol at the rural site under different atmospheric scenarios: local emissions (biogenic) and regional transport



*SMPS to be installed this week

Objectives for DAURE- 2009

Individual Particle Analysis (SEM/EDS)

In collaboration with RJ Lee Group, Inc.

Objectives

Variability/evolution in concentration/morphology of particles in the $PM_{2.5}$ by samples taken at four different times of the day: 8-10 am, 12-2 pm, 4-6 pm, 8-10 pm, BCN2 - 3 samplings (12 samples), MSN2 – 1 sampling (4 samples), data from ~75000-100000 particles in total:

- Carbonaceous aerosol (C-bearing particles) and organic/sulfate mixtures (lost all the volatile compounds). Relationship with variations in aerosol acidity if possible.
- Heavy metal bearing particles.
- Primary Biogenic Organic Aerosols (PBOA): fungi spores, detritus and microorganisms.

Fully Computer Controlled SEM

- Size, morphological parameters, and elemental composition of 1000 particles per hour.
- Less than 5% of error in size and morphological parameters for particles within 0.2 – 2.5 µm.
- Carbon corrections within the size ranges 0.2-0.5 µm, 0.5-1 µm, 1-2.5 µm.

High Resolution SEM

- Characterization of particles down to several nanometers.
- Detailed information about particle texture/phases.
- Elemental mapping to study particle heterogeneity of chosen elements.