



Particle size distribution and inorganic aerosol characterization during DAURE 2009 winter field campaign at Montseny site

M. Aranzazu Revuelta (1), Francisco J. Gómez-Moreno (1), Javier Plaza (1), Esther Coz (1), Jorge Pey (2), Michael Cusack (2), Marco Pandolfi (2), Jesús J. Rodríguez-Maroto (1), and Manuel Pujadas (1)

(1) CIEMAT, Dept. Medio Ambiente, Av. Complutense 22, 28040 Madrid, Spain (maranzazu.revuelta@ciemat.es), (2) IDAEA-CSIC, C/Lluís Solé i Sabaris, s/n, 08028 Barcelona, Spain.

During DAURE 2009 winter field campaign, one of the sampling sites was Montseny, a rural background station located 40 km NNE from Barcelona and 25 km W from the Mediterranean Sea. It is a Natural Park and a protected area, thus with low human activity, mainly agriculture. The sampling station was located on a valley with its axis oriented on the direction NW-SE. At this site, a TSI-SMPS (DMA 3071 and CPC 3022) was installed in order to measure the particle number distribution in the size range 15-600 nm during the period March 19-27 with a measurement cycle of 12 minutes. The particle mass distribution was measured by a micro-orifice uniform deposit impactor (MOUDI) using eleven size stages with aluminum substrates and a quartz fiber backup filter. Four samples were taken during the period 13-19 March, two during 24 hours and other two during 48 hours. This impactor has a wider size range allowing to measure from 56 to 18000 nm. The substrates and filters obtained were later analyzed for determining soluble ions (sulfate, nitrate, ammonium and calcium) by IC.

There are mainly two different kinds of events measured with the SMPS. When the air masses were coming from SE, which meant that they could come from the park but also from the urban and industrial areas located in the pre-coastal depression, it was characterized by higher particle number concentrations and by size distributions centered on 80 nm. This meant it was an aged aerosol, which had grown up by coagulation, condensation and oxidation processes. When the air masses were coming from NW (the second valley axis side), the particle measured were much smaller, the instrument started to detect particles with 15 nm, but smaller ones could be possible. This meant that new particle nucleation could have occurred in the valley, just before arriving to the sampling point.

From MOUDI samplings, two different types of events were also observed. Three of the four samplings coincided with stagnation of air masses or slight SE flows. During the 4th sampling, the air mass direction was oscillating, arriving from both possible axis sides. Comparing both situations, it was observed that there was not a big difference between them for sulfate and nitrate. Sulfate was found in the accumulation mode and in the backup filter, while nitrate also appeared in the coarse mode. Ammonium had a different behavior. It appeared in the accumulation mode and in the backup filter but not in the coarse mode during both kinds of events. When the air mass direction was oscillating, the ammonium concentration was much higher than during the other 3 samplings, more than enough to neutralize the sulfate and nitrate ions. In this case, the particulate nitrate observed in the coarse mode was neutralized by the calcium ion.

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