

Calibration and intercomparison results in the Spanish network on environmental DMAs

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Keywords: Atmospheric aerosols, Particle size distribution, DMA, SMPS

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There are currently six groups in Spain involved in the measurement of atmospheric particle size distributions by means of Differential Mobility Analyzers (DMAs). These groups are: IUMA-UDC, IDAEA-CSIC, INTA, IARC-AEMET, University of Granada and CIEMAT. All the groups have to solve many common problems related with the instrumentation required for this type of measurements. For this reason, the Spanish network on environmental DMA (Red Española de DMAs Ambientales, REDMAAS) has been working during 2010-2011 (Gómez-Moreno et al., 2011). The REDMAAS has as main objective the cooperation between the groups, which will lead to solve common problems and to optimize their facilities and protocols. In this work, the main results obtained during these two years will be discussed.

The main activities developed in the network include: DMA calibration; CPC, SMPS and UFP intercomparison; measurement quality control program; losses in sampling lines; support for the radioactive facility license; webpage; and new DMA applications. In the current work, we show the results obtained in the calibrations and intercomparison performed this last year 2011.

Four DMA calibrations have been checked. First, it was necessary to check the DMA (sample, sheath and excess) and CPC (monodisperse) flow rates and then, a monodisperse aerosol, latex, was introduced into the DMA to calibrate the electrical mobility. Two particles sizes have been selected: 80 and 190 nm. In the case of the first particle size, the instruments measured 80 nm, with a -2.3-0.6% deviation, except one of the instruments with 5.8%. The second particle size gave a deviation of 0-2.8%, with the same exception again 9.3%. There is a clear shift in the calibration of one of the instruments. This result shows the need for an environmental DMA network.

A field intercomparison exercise was performed during October 2011 in the INTA facilities (El Arenosillo, Huelva). There were 4 complete SMPS systems, an UFP and two additional CPCs. After calibrating all the flow rates and the DMAs, a CPC intercomparison was performed, see figure 1. The main

result obtained was that the CPC3022 was measuring properly concentrations below 10^4 cm^{-3} , but above this value the counter uses the photometric mode which was clearly uncalibrated.

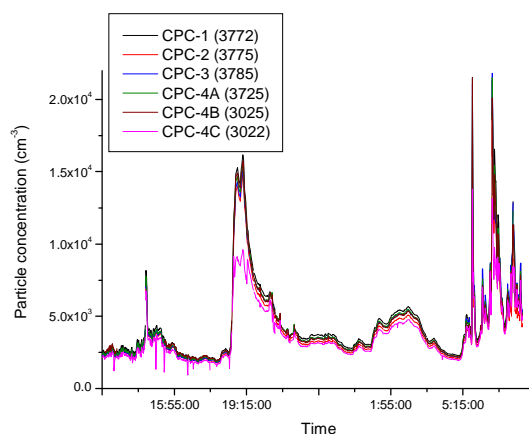


Figure 1. CPC intercomparison

The four SMPS systems and an UFP were compared. As during the 2010 field intercomparison, different concentrations were measured for the nucleation mode, depending on the sheath flow rate. Taking into account the diffusion correction included in the TSI software, these differences were reduced very much.

This network is financed by the Ministry of Science and Innovation (CGL2011-15008-E).

Gómez-Moreno, F. J., Sastre, M., Artíñano, B., Juncal Bello, V., Piñeiro Iglesias, M., López Mahía, P., Pey, J., Ripoll, A., Alastuey, A., Sorribas, M., Fernández, M., de la Morena, B. A., Trujillo de Cabo, J. L. and Rodríguez, S. (2011) *European Aerosol Conference*, 4P291, Manchester.