



Balloon-borne and ground-based aerosol measurements with the aerosol counter LOAC during the ChArMEx 2013 campaign

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LOAC (Light Optical Aerosol Counter) is a small optical particle counter/sizer of ~ 250 grams that can fly under all kinds of balloons. The measurements are conducted at two scattering angles: the first one, at 12° , is used to determine the aerosol particle concentrations in 19 size classes within a diameter range of ~ 0.2 -100 micrometers. The second angle is at 60° , is used to discriminate between the different types of particles dominating the different size classes. The sensor particularly discriminates wet or liquid particles, mineral dust and carbon particles.

30 flights of LOAC have been conducted during the ChArMEx campaign (Chemistry Aerosol Mediterranean Experiment) on summer 2013, from Minorca Island (Spain) and Ile du Levant (south of France): 19 flights under meteorological balloons and 12 flights under low altitude drifting balloons. Most of the flights were also coupled with ozone concentration measurements. LOAC balloons were especially, but not only, dedicated to study the various Saharan dust events that occurred during the campaign. In particular, flights were conducted every 12 hours during the 15-19 June dust event. Turbid air masses from North America were also sampled in late June over Minorca.

The flights allow us to determine the vertical extent of the dust plume and various aerosol layers, and to follow the particle size distribution and the concentration evolution along the vertical. The low altitude drifting balloons, which stayed at constant altitude (between 0.4 and 3 km) for several hours, allow us to study the time-evolution of the aerosol concentrations in the same air mass. Under both balloon types, LOAC has detected large particles up to ~ 30 micrometers in diameter. The flights drifting within dust layers indicate that there is a relatively stable particle size distribution during transport over the sea, with no clear sedimentation loss of large particles. LOAC is used to tentatively identify the various kinds of particles (marine salt close to the sea, pure sand or more heterogeneous layers).

Continuous surface measurements have also been conducted on Minorca Island with a LOAC. The LOAC number concentration measurements are converted to mass concentrations, in order to evaluate the effect of the mid-June dust event on the ambient air quality.

Coincident ground-based remote sensing (lidar, sun-photometer) and in situ measurements (aethalometer, TEOM...) performed on Minorca Island and occasionally close airborne data are also used for comparison with balloon data.