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In-situ, sunphotometer and Raman lidar observations of aerosol transport events in the western Mediterranean during the June 2013 ChArMEx campaign

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We present a preliminary analysis of aerosol observations performed in June 2013 in the western Mediterranean at two stations set up in Barcelona and Menorca (Spain) in the framework of the ChArMEx (Chemistry Aerosol Mediterranean Experiment) project.
The Barcelona station was equipped with the following fixed instruments belonging to the Universitat Politècnica de Catalunya (UPC): an AERONET (Aerosol Robotic Network) sun-photometer, an MPL (Micro Pulse Lidar) lidar and the UPC multi-wavelength lidar. The MPL lidar works at 532 nm and has a depolarization channel, while the UPC lidar works at 355, 532 and 1064 nm, and also includes two N2- (at 387 and 607 nm) and one H_2O-Raman (at 407 nm) channels. The MPL system works continuously 24 hour/day. The UPC system was operated on alert in coordination with the research aircrafts plans involved in the campaign.
In Cap d'en Font, Menorca, the mobile laboratory of the Laboratoire des Sciences du Climat et de l'Environnement hosted an automated (AERONET) and a manual (Microtops) 5-lambda sunphotometer, a 3-lambda nephelometer, a 7-lambda aethalometer, as well as the LSCE Water vapor Aerosol LIdar (WALI). This mini Raman lidar, first developed and validated for the HyMEX (Hydrological cycle in the Mediterranean eXperiment) campaign in 2012, works at 355 nm for eye safety and is designed with a short overlap distance (<300m) to probe the lower troposphere. It includes depolarization, N2- and H_2O-Raman channels. H_2O observations have been calibrated on-site by different methods and show good agreement with balloon measurements. Observations at Cap d'en Font were quasi-continuous from June 10th to July 3rd, 2013. The lidar data at both stations helped direct the research aircrafts and balloon launches to interesting plumes of particles in real time for in-situ measurements.
Among some light pollution background from the European continent, a typical Saharan dust event and an unusual American dust/biomass burning event are highlighted in our measurements. The lidar ratio, depolarization ratio and water content, as well as the usual aerosol vertical distribution and extinction properties provided by the Raman lidars, and the size distributions provided by AERONET, prove very helpful in characterizing particle types and sources, especially for the multi-layer situations observed. Further on, the study of parameters extracted during this campaign will allow us an assessment of the local direct aerosol radiative forcing.