CAPEX – AEROPOR Overview : objectives and first results

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Keywords: aerosol characterization, optical properties, measurements

CAPEX (Clouds and Aerosols over Portugal Experiment) is an European project, coordinated by Évora Geophysics Centre, to investigate aerosol particles, radiation, cloud properties, precipitation and radioactivity over Portugal using both airborne and ground based instrumentation. The airborne measurements were obtained with the BAE-146 aircraft, provided by the Met Office (UK) and operated by FAAM, based at Beja Air Force Base, in the south of Portugal; the ground based remote sensing and “in situ” measurements were obtained at Geophysics Centre Observatory at Évora and at the Cabo da Roca site, respectively, located 70 km northern of Beja and at the sea coast 20 km northwest of Lisbon. This project, funded by EC under the 6th Framework Program within the EUFAR Initiative, took place from 30th May up to 18th June 2006 over central and south Portugal, and consisted of three individual projects: AEROPOR (AERosols Over Portugal: Optical and Radiation Measurements), CLAPREC (Clouds, Aerosols, Precipitation) and VPRACOP (Vertical Profiles of Radioactive Aerosol Constituents Over Portugal). Within AEROPOR project two teams were involved, the one from Évora Geophysics Centre, and the other one from Granada University

Within the framework of AEROPOR, about 10 flight hours were used to obtain stack profiles and some radiation runs over different sites in order to derive aerosol properties and their vertical distribution, for different aerosol situations (European pollution from Central Europe and Iberian Peninsula, Saharan desert dust, remote continental aerosols), perform aerosol radiative calculations for different aerosol situations, and to validate surface reflectance algorithms and contribute to regional surface reflectance data base. Within AEROPOR project, the following airborne measurements were made: broadband solar radiation and spectral irradiances (up and downwelling) the latest with a SWS and SHIM radiometers, spectral radiances (up and downwelling) with an ARIES interferometer, volume scattering and absorption coefficients respectively with a nephelometer and a PSAP instrument, size distribution measurements with a PCASP instrument and temperature, humidity and wind measurements. At the Évora site, the following measurements were made continuously: volume scattering and absorption coefficients, respectively with a three wavelength nephelometer and a MAAP instrument, aerosol mass concentration with a TEOM instrument, aerodynamic particle size distribution with an APS instrument, spectral aerosol optical thicknesses and spectral almucantar measurements, with a sunphotometer within the AERONET network, spectral global and diffuse solar irradiances with a MFR shadowband radiometer, broad-band solar and thermal down-welling irradiances and the cloud base heights with a ceilometer; during the flight profiles, LIDAR measurements were also determined and for the entire time period of the campaign during night time period, water vapour mixing ratio profiles were also measured. At the Cabo da Roca site (another AERONET site), spectral aerosol optical thicknesses and spectral almucantar measurements were continuously taken, and at the Beja site, spectral aerosol optical thicknesses were made at certain periods with a handheld sunphotometer instrument. At all sites, meteorological information was provided at the surface, and the 5-days back-trajectories analysis at different pressure levels, ending at Évora site were also computed, using the HYSPLIT model (Draxler & Rolph, 2003).

From the ground based measurements at Évora site it was possible to identify, a mixture of different aerosol types at different altitudes even when the remote continental aerosol situation prevailed. The aerosol events, which occurred during CAPEX campaign were clearly identified both with the airborne and ground based instruments. Different aerosol distributions were clearly identified within a 50 km horizontal distance, during the desert dust episode event over different underlying surfaces.

This research has been partially funded by EUFAR, by the Spanish Projects HP-2003-0013, CGL2004-05984-C07-03 and P06-RNM-01503 and by FCT under grant SFRH BPD 14508 2003 under POCTI.