Geophysical Research Abstracts
Vol. 16, EGU2014-6515, 2014
EGU General Assembly 2014

The radiative effect of aerosols over Europe during the EUCAARI-LONGREX campaign

Anna R. Esteve (1,2), Ellie Highwood (2), William T. Morgan (3), Hugh Coe (3), Phil Brown (4), Kate Szpek (4), and J. Antonio Martínez-Lozano (1)

(1) Department of Earth Physics and Thermodynamics, University of Valencia, Spain (anna.esteve@uv.es), (2) Department of Meteorology, University of Reading, UK, (3) Centre for Atmospheric Science, The University of Manchester, UK, (4) The Met Office, UK

Atmospheric aerosols affect the Earth's climate both directly, through the scattering and absorption of radiation, and indirectly, via changes to cloud microphysics and properties. The resultant change in net radiation (radiative forcing) is still characterized by a great uncertainty, both at regional and global scales, due to the variability of the optical properties and the spatial - temporal distribution of the aerosols.

Here, we calculate the radiative effect of anthropogenic aerosols over Europe using the data collected by the Facility for Airborne Atmospheric Measurements (FAAM) BAe-146 aircraft during the European Integrated Project on Aerosol Cloud Climate and Air Quality Interactions Long Range Experiment (EUCAARI-LONGREX). The EUCAARI-LONGREX campaign consisted of 15 flights over central Europe or off the UK coast (47 - 57°N and 12°W - 22°E) during May 2008, designed to map the aerosol concentrations and properties over Europe, with a particular focus on observing long range transport of aerosol properties, as well as changes in those properties. The instrumentation aboard the FAAM BAe-146 aircraft allowed the measurement of the chemical composition, microphysical, optical and hygroscopic properties of the atmospheric aerosols, as well as the upwelling and downwelling radiation. We have also quantified here the uncertainties in our calculations due to the variability of aerosol concentration and properties and the way in which they are represented in models. For our calculations of the direct aerosol radiative effect, we use the composition and microphysical measurements together with the Edwards and Slingo radiative transfer model to estimate irradiances from 0.2 to 10 μm. Vertical profiles of temperature, aerosol, water vapour and ozone are taken from the aircraft measurements. The modelled irradiances have been compared to the radiation data from flight b374 of the FAAM BAe-146 aircraft in order to evaluate the validity of model assumptions and the degree of "radiative closure" that can be achieved in a case of aged European aerosol. Our results provide a description of the radiative effect of aerosols of different ages over Europe which could be later employed to assess the sensitivity of climate response to the representation of aerosols in climate models.