6.093 Impact of the summer circulation regimes on the vertical tropospheric distribution of pollutants and aerosol processes over the Western Mediterranean area.

Early Career Scientist

Presenting Author:
Silvia Bucci, Institute for Atmospheric Sciences and Climate of the National Research Council , (ISAC-CNR), Rome, 00133, Italy, s.bucci@isac.cnr.it

Co-Authors:
Federico Fierli, Institute for Atmospheric Sciences and Climate of the National Research Council , (ISAC-CNR), Rome, 00133, Italy
Francesco Cairo, Institute for Atmospheric Sciences and Climate of the National Research Council , (ISAC-CNR), Rome, 00133, Italy
François Ravetta, Université Pierre et Marie Curie, UPMC-LATMOS-IPSL, Paris, 75005, France
Jean-Christophe Raut, Université Pierre et Marie Curie, UPMC-LATMOS-IPSL, Paris, 75005, France
Paolo Cristofanelli, Institute for Atmospheric Sciences and Climate of the National Research Council , (ISAC-CNR), Bologna, 40129, Italy
Stefano Decesari, Institute for Atmospheric Sciences and Climate of the National Research Council , (ISAC-CNR), Bologna, 40129, Italy
Johannes Größ, Leibniz Institute for Tropospheric Research, Leipzig, 04318, Germany

Abstract:

This work investigates the effects of different meteorological conditions on the vertical distribution of aerosol and chemicals over the Po Valley air pollution hot spot. This region is strongly affected by various natural and anthropogenic sources and its morphology, being a river basin surrounded by mountains, leads to frequent stagnation and pollutants accumulation. The unique and comprehensive observations database built by the ChArMEx (Chemistry-Aerosol MEditerranean Experiment), PEGASOS (Pan-European Gas-AeroSOls Climate Interaction Study) and SuperSito campaigns, simultaneously operating in the Mediterranean area during summer 2012, was exploited to carry out an aerosol discrimination based on LIDAR profiles and aerosol and chemistry in-situ observations. A broader view on the processes was provided by model analysis from the Lagrangian transport system FLEXPART and WRF-Chem, the Weather Research and Forecasting (WRF) model coupled with Chemistry. Results showed that particles were mostly individuated below 2000m, with a prevalence of local anthropogenic aerosol (> 50% of observations) and a bi-modal particle diameter (Dp) size distribution (Dp<1 um and 2um80%), both processes affecting the local Particulate Matter concentration. The combination of well-developed PBL and favourable winds allowed an event of pollution outflow, with air parcels overcoming the orography barriers and being transported toward

the Western Mediterranean sea for several hundred km. The plume, traced with CO concentrations, extended vertically up to 1000m and carried an average contribution of 50 ppbv over the background values.