

Dispersion and transport of tropospheric aerosol and pollutants in the Western Mediterranean: the role of the Po Valley under different transport regimes

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This work reports a characterization of the vertical variability of tropospheric aerosol and gaseous pollutants, over the western Mediterranean, during the 2012 summer season. In particular, we investigate the role of the Po Valley region as a receptor and emissive region of both natural and anthropogenic aerosol. The observational analysis, based on a comprehensive database of meteorological, aerosol and chemical measurements, is integrated with a model analysis using the Lagrangian transport system FLEXPART combined with emission databases, and WRF-Chem, the Weather Research and Forecasting (WRF) model coupled with Chemistry. Observations have been performed in the framework of the Supersito project by Regional Agency of Prevention and Environment of the Emilia Romagna region (ARPA-ER, Ital), the TRAQA campaign (TRANsport et Qualité de l'Air au dessus du bassin Méditerranéen) performed in the ChArMEx (Chemistry-Aerosol Mediterranean Experiment) project, and the european project PEGASOS (Pan-European Gas-AeroSOl-climate interaction Study). An alternation between different transport regimes characterized the 2012 summer, resulting in a large variability of aerosol and pollution at different time and spatial scales. Particles of different nature have been discriminated basing on optical properties retrieved from lidar data and supported by in-situ observations and transport analysis. Results show that, during the analysed season, aerosol in the Po Valley was mainly confined below 2000 m and dominated (50% of detections) by spherical particles. Two events of dust advection from northern Africa were identified (19th-21th June and 29th June-2nd July), with intrusion and mixing with local pollution in the PBL and a non-negligible occurrence ($\sim 7\%$) of dust at the ground. Frequent events (22% of occurrence) of non-spherical particles resuspension, likely due to uplift of mineral soil particles, were observed from the ground to 2000 m during afternoon and evening. In the same season, the combination of airborne measurements with transport and chemical model analysis, allowed to individuate two episodes of inversion in the main advection pattern (23th -24th June and 26th -27th June), causing an easterly pollution export from the Po basin toward the Genoa Gulf (North-Western Mediterranean). Using the CO species as a tracer of pollution, we estimated the Po Valley contribution over the local pollution background value. The CO plume affected a layer from the sea level to 1000 m over the Genoa Gulf, with concentrations reaching 50 ppbv.