

Long-range Transport of Aerosol at a Mountain Site in the Western Mediterranean Basin

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The Mediterranean Region has been identified as sensitive to changes in the hydrological cycle, which could affect the water resources for millions of people by the turn of the century. However, prior to recent observations, most climate models have not accounted for the impacts of aerosol in this region. Past airborne studies have shown that aerosol sources from Europe and Africa are often transported throughout the lower troposphere; yet, because of their complex vertical distribution, it is a challenge to capture the variability and quantify the contribution of these sources to the radiative budget and precipitation processes. The PAEROS ChArMEx Mountain Experiment (PACMEx) complemented the regional activities by collecting aerosol data from atop a mountain on the island of Corsica, France in order to assess boundary layer / free troposphere atmospheric processes.

In June/July 2013, PACMEx instruments were deployed at 2000 m.asl near the center of Corsica, France to complement ground-based aerosol observations at 550 m.asl on the northern peninsula, as well as airborne measurements. Comparisons between the peninsula site and the mountain site show similar general trends in aerosol properties; yet, differences in aerosol properties reveal the myriad transport mechanisms over the Mediterranean Basin. Using aerosol physicochemical data coupled with back trajectory analysis, different sources have been identified including Saharan dust transport, residual dust mixed with sea salt, anthropogenic emissions from Western Europe, and a period of biomass burning from Eastern Europe. Each period exhibits distinct signatures in the aerosol related to transport processes above and below the boundary layer. In addition, the total aerosol concentrations at the mountain site revealed a strong diurnal cycling between the atmospheric boundary layer and the free troposphere, which is typical of mountain-top observations.

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