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CV-Dust: Atmospheric aerosol in the Cape Verde region: carbon and soluble fractions of PM10

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Every year, billions of tons of eroded mineral soils from the Saharan Desert and the Sahel region, the largest dust source in the world, cross Mediterranean towards Europe, western Asia and the tropical North Atlantic Ocean as far as the Caribbean and South America. Many aspects of the direct and indirect effects of dust on climate are not well understood and the bulk and surface chemistry of the mineral dust particles determines interactions with gaseous and other particle species. The quantification of the magnitude of warming or cooling remains open because of the strong variability of the atmospheric dust burden and the lack of representative data for the spatial and temporal distribution of the dust composition.

CV-Dust is a project that aims at provide a detailed data on the size distribution and the size-resolved chemical and mineralogical composition of dust emitted from North Africa using a natural laboratory like Cape Verde. This archipelago is located in an area of massive dust transport from land to ocean, and is thus ideal to set up sampling devices that are able to characterize and quantify dust transported from Africa. Moreover, Cape Verde's future economic prospects depend heavily on the encouragement of tourism, therefore it is essential to elucidate the role of Saharan dust may play in the degradation of Cape Verde air quality.

The main objectives of CV-Dust project are: 1) to characterize the chemical and mineralogical composition of dust transported from Africa by setting up an orchestra of aerosol sampling devices in the strategic archipelago of Cape Verde; 2) to identify the sources of particles in Cape Verde by using receptor models; 3) to elucidate the role Saharan dust may play in the degradation of Cape Verde air quality; 4) to model processes governing dust production, transport, interaction with the radiation field and removal from the atmosphere.

Here we present part of the data obtained throughout the last year, involving a set of more than 100 PM_{10} samples, addressing mainly their mass concentrations and the chemical composition of water soluble ions and carbon species (carbonates and organic and elemental carbon). Different PM_{10} samplers worked simultaneously in order to collect enough mass to make the aerosol characterization through the different methodologies and to collect aerosols in different filter matrixes, which have to be appropriated to the chemical and mineralogical analysis. The sampling site was located at Santiago Island, in the surroundings of Praia City (14˚55' N e 23˚29' W, 98 m at sea level).

High concentrations, up to more than 400 μg m^{-3}, are connected to north-east and north-northeast winds, and it was identified several dust events characteristic of "bruma seca", whose duration is on average of two to four days. Backward trajectories analysis confirms that the high concentrations in Cape Verde are associated with air masses passing over the Sahara. During dust events the percentage of inorganic water soluble ions for the total PM_{10} mass concentration decreased significantly to values lower than 10% in comparison with remainder data that range around 45$\pm$10%.

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