Saharan dust contribution to PM_{10} levels and composition in Cape Verde

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Sahara Desert is the most important source of mineral dust, contributing more than 1900 million tons per year (Goudie, 2009; Goudie and Middleton, 2006; Prospero, 1996; D'Almeida, 1986) and responsible for almost half of all the aeolian material provided to the world's oceans. Due to its geographical position, Cape Verde is highly affected by the transport of dust from the Sahara desert. Therefore, it is essential to elucidate the role of Saharan dust may play in the degradation of Cape Verde air quality, human health, wellbeing, visibility, tourism and economy.

The objective of this study was (1) to perform a chemical characterization of the airborne particles sampled in Cape Verde, (2) to identify the main sources and origins of the particles and (3) to assess the influence of Sahara desert on local suspended particles.

PM10 was sampled during 2011 and chemical characterization of particles was performed by Neutron Activation Analysis and Particle Induced X-ray Emission for elemental measurements, by Ion Chromatography for the determination of water soluble ions and by a Thermal-optical system for the measurement of carbonaceous aerosol. Source apportionment was performed by integrating Principal Component Analysis with Multilinear Regression Analysis, Positive Matrix Factorization and Cluster Analysis of Backward Trajectory.

Results showed that Cape Verde aerosol is affected principally by natural sources: dust coming from Sahara desert contributes on average to 48% of the total PM_{10} mass and sea salt spray contributes on average to 20%. During air mass trajectories from Sahara, dust contribution increases to more than 60% and PM_{10} reach concentrations 10 times higher than the EC limit values and WHO guidelines.

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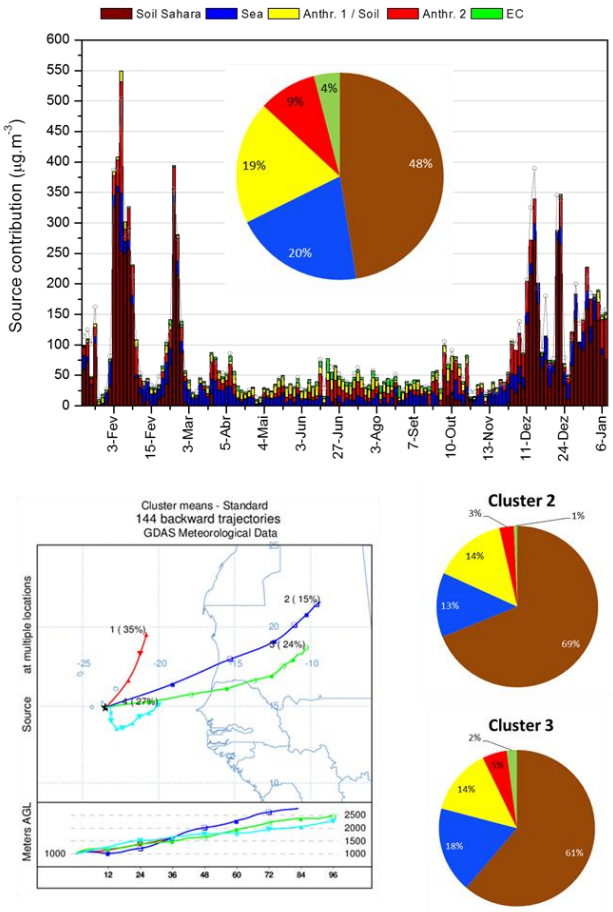

Figure 1. Source contribution for PM_{10} concentrations measured in Cape Verde during 2011. Cluster analysis applied to the backward trajectories and relative source contribution for trajectories coming from Sahara desert.

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