AEOLIAN DUST DEPOSITION IN THE WESTERN MEDITERRANEAN, AND THE PROJECT CHARMEX

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Abstract

Evidences of the impact of desert dust deposition on the biogeochemistry of surface marine waters call for atmospheric dust transport models to provide deposition fluxes. Dust deposition observations are critically needed to constrain the models. Here we show a compilation of (i) past results on dust deposition in the western Mediterranean, (ii) new measurements from Corsica obtained in the framework of the project DUNE, and (iii) CHIMERE-Dust model results, compared with 1-yr measurements from the project ADIOS. We finally advertise for a new deposition monitoring network and model validation effort in the framework of the project ChArMEx.

Keywords: Atmospheric Input, Western Mediterranean

Results on total dust deposition (eventually based on Al used as a tracer based on an average content of 7.1 to 8.2%) in the western Mediterranean are relatively scarce in the literature. They are widely dispersed in space and time, spanning from October 1982 to May 2002 at various sites from Campo de Gibraltar in southern Spain to the French Riviera, including island sites in Sardinia and Corsica. Yearly deposition fluxes range from about 2 to 26 g m^{-2}. Since late March 2008 a new monitoring station has been operated with a weekly sampling time step at Galeria (42.44°N; 8.65°E) on the western coast of Corsica in the framework of the project DUNE (a Dust Experiment in a Low-Nutrient Low-Chlorophyll Ecosystem). Figure 1 illustrates that no event larger than 0.45 g m^{-2} was recorded in one year so that the yearly flux is among the lowest ever observed in Corsica (2.9 g m^{-2}).

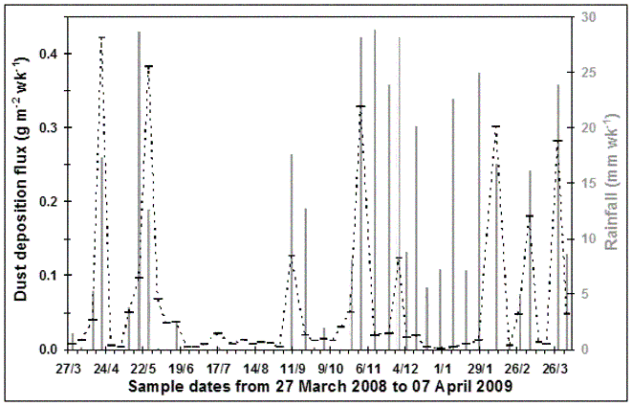

Fig. 1. Weekly dust deposition flux (horizontal dashes) based on an average Al content of 8.1% in soil dust, and rainfall (vertical bars) at Galeria, Corsica.

A 12-yr time continuous record obtained in Corsica[1] shows that interannual variability is high and precludes integrating non coincident data from various stations for studying spatial trends. During the ADIOS programme a few deposition sampling stations were operated simultaneously on a monthly basis from June 2001 to July 2002. Results show a factor of 4 range in yearly dust deposition fluxes, with the lowest values near Gibraltar and the highest in Corsica [2] not only reflecting the precipitation distribution.

Preliminary simulations of African dust deposition with the transport model CHIMERE-Dust[3] are compared with ADIOS observations and indicate that deposition data are necessary to constrain the dust transport budget in addition to optical depth observations. To better constrain the spatial variability of dust deposition fluxes, in the framework of the project ChArMEx (the Chemistry-Aerosol Mediterranean Experiment; http://charmex.lsce.ipsl.fr), we shall set up from late 2010 a new monitoring network of 10 stations in the western Mediterranean (Figure 2) to be operated for a 3-yr period with a 2-wk time step based on a new autonomous sampler under development. We propose that the network is completed in the western basin and enlarged to the eastern basin thanks to international collaborations.

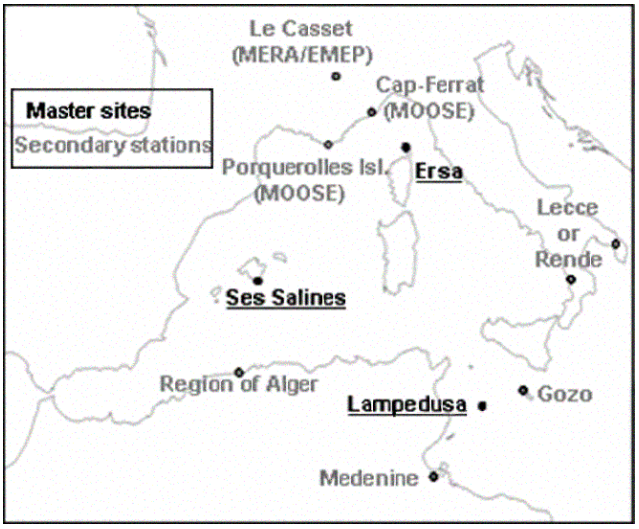

Fig. 2. Future network of total insoluble deposition measurement. Master sites on islands will include soluble and insoluble deposition fluxes of Fe, P, N, Si and C, and total flux of Hg.

References

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