

Update concerning the DUNE project: March 2010.

After a first successful seeding experiment in June 2008, we have demonstrated that large clean mesocosms are highly relevant tools and provide a powerful new strategy to studying *in situ* the response of an oligotrophic ecosystem to chemical forcing by atmospheric deposition of African dust. Guieu et al. have recently submitted a paper that fully describe the new methodology developed in the frame of the project (production of large amount of Saharan dust analogues and large mesocosms (52 m³) containing no metallic part and with as less as possible induced perturbation during the sampling sequence, allowing to work with the required conditions for biogeochemical studies in oligotrophic environments where nutrient and micronutrients are at nano- or subnano-molar levels). In this work, the comparison of physico-chemical characteristics of produced dust analogues with the literature confirms that our experimental simulations are representative of dust, ageing during atmospheric transport, and subsequent deposition to the Mediterranean. We also show that our strategy to perform the same Saharan dust addition in three distinct large mesocosms and to have also triplicate controls was very satisfactory: statistical analyses of the results show that data from triplicate mesocosms are highly reproducible (variability among triplicates <30%). We also demonstrate that there is no significant difference between data obtained from the control mesocosms and from outside the mesocosms.

Pulido-Villena et al. (2010) have shown that the DUNE mesocosm experiment provides a quantitative confirmation of the fertilizing potential of mineral dust as a significant increase in phosphate concentration was observed soon after the seeding. The DIP released was completely lost after 24 hours and no further increase was observed during the experiment. DIP loss might have been thus dominated by biological uptake in agreement with the observed rapid response of both bacteria and phytoplankton.

Several specific papers have been recently submitted. Among them, Wagener et al. paper is focusing on the modification of the iron cycle induced by the seeding. Main results concern the DFe scavenging that was observed rapidly after the seeding withdrawing almost 1nM DFe from the whole water column inside the 3 mesocosms amended with dust while the atmospheric particles are settling. Batch abiotic dissolution experiments performed in parallel to the mesocosm experiment indicate that after 168 hours, there is a clear evidence of increasing “iron solubility capacity” of the seawater in the dust-seeded mesocosms.

Laghdass et al. submitted a paper that investigates the effect of dust deposition on the diversity of the heterotrophic bacterial community. Combining several molecular biology approaches, the results indicate that besides a natural temporal trend observed inside and outside the mesocosms, dust deposition affected the particle-attached bacterial community. In particular, *Alteromonas macleodii* had a higher contribution to the active particle-attached bacterial community in the dust-amended than in the control mesocosms.

A new mesocosms experiment will take place in the Preservation area of Scandola (Corsica Island) in summer 2010 during which 7 large mesocosms will be deployed. The scientific objectives are the same with some specific focuses. Among those, we will investigate the role of the atmospheric particles in the aggregation processes favoring the export of organic carbon as evidenced in Ternon et al., 2010 from simultaneous observations of sediment traps data and atmospheric deposition in the North-Western Mediterranean Sea. An additional mesocosm will be dedicated to optical measurements in order to follow the evolution of the size distribution and of the quality of the exported material after the seeding. This will be

completed by biogeochemical measurements in different fractions (dissolved, colloidal, particulate) collected at several depth in the mesocosms.

The seeding will correspond to a 10 g m^{-2} deposition, identical to the one performed in 2008. The fine fraction of soil necessary to produce the hundreds g of dust analogues needed was collected in South Tunisia in Spring 2009 (F. Dulac et al.; coop. LSCE, LISA, IRA-Medenine). A comparison of physico-chemical and mineralogical properties as well as of soluble fractions between the dust particles derived from the fine fraction ($<20\mu\text{m}$) of semi-arid soils and the locally produced dust particles collected on site during the Tunisian campaign enabled us to check that the fine fraction of soil is a good analogue of dust aerosol particles. According to the same protocol fully described in Guieu et al., (submitted), the fine fraction of the soil was chemically transformed to be representative of Saharan dust transported over the Mediterranean (PI, K. Desboeufs, LISA).

In addition, atmospheric total deposition is continuously collected for chemical characterization and grain size distribution in the frame of the DUNE project since 2008 (PI K. Desboeufs, LISA) at a coastal site close to the site where the mesocosm experiments are performed. Those data will provide inputs for on-going ecosystem modeling (in progress) (PI P. Pondaven, LEMAR).

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Ternon E., C. Guieu, M-D. Loÿe-Pilot, N. Leblond, E. Bosc, B. Gasser, J. Martin, J-C. Miquel, 2010, The impact of Saharan dust on the particulate export in the water column of the North Western Mediterranean Sea, *BIOGEOSCIENCES*, 7, 809–826, 2010.

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M. Laghdass, S. Blain, M. Besseling, P. Catala, C. Guieu, I. Obernosterer : Impact of Saharan dust deposition on the bacterial diversity and activity in the NW Mediterranean Sea. *submitted to AQUATIC MICROBIAL ECOLOGY*, 2010

Contact: Cécile Guieu, Laboratoire d'Océanographie de Villefranche (LOV), CNRS-Université Pierre et Marie Curie, guieu@obs-vlfr.fr

web site <http://www.obs-vlfr.fr/LOV/DUNE/>