



Notes: Reporting Period is January 2010 – December 2010

Information will be used for: reporting, fundraising, networking, strategic development & outreach

1. Scientific highlights

French scientific activities in the SOLAS topics were numerous, including achievement and continuation of endorsed projects.

- The FLATOCOA project on dust flux over the southern Ocean (Kerguelen Island) started in 2008. The atmospheric total deposition flux and the atmospheric dust concentration are now measured for more than 1 year at Kerguelen. In addition, another station is running from 2010 until 2011 at Crozet Island to assess gradient information on a 1000 km scale. Results will not be available before end of 2011. (http://www.institut-polaire.fr/ipev/programmes_de_recherche/en_cours/1188_flux_atmospherique_d_origine_continentale_sur_l_ocean_austral).
- The AMOP (Activité de recherche dédiée au Minimum d'Oxygène dans le Pacifique tropical sud est) started end of 2010 in collaboration with scientists from Peru, Germany, Ireland, Denmark, and Mexico.
- The IBAO project: Iron Biogeochemistry from the Atmosphere to the Ocean. Role of bioaerosols in the iron biogeochemical cycle started end 2008. It involves organic and biological complexation of iron.
- Participation to the MEECE program (<http://www.meece.eu/>) concerning models of CO₂ and trace gas exchange at the air-sea interface.
- Atmospheric aerosol impact and N₂ fixation is an important topic within SOLAS-France (DUNE, BOUM).
- Continuous activity is running using CARIOCA buoys and commercial ship equipment to quantify CO₂ air-sea exchange, as part of the CARBOOCEAN and LATEX projects.
- Analytical innovation is carried at Dunkerque (LPCA) to measure the evolution of the solid state chemical speciation of atmospheric iron during long-range transport events, using TEM. Results obtained on samples collected in West Africa show that a heterogeneous distribution of the iron oxidation state inside individual dust particles is frequently observed, with a dominance of Fe³⁺. The tomographic reconstruction of typical dust particles clearly indicates the presence of iron oxide nodules inside the aluminosilicate matrix. As a result, iron present in such inclusions may be inaccessible to reduction processes initiated by soluble compounds and may not be bioavailable in the ocean.

2. Main accomplishments (research projects, cruises, special events, workshops, outreach, capacity building, remote sensing used etc)

A key moment of the DUNE project (<http://www.obs-vlfr.fr/LOV/DUNE/>) in 2010 was the new mesocosms experiment that took place in the Preservation area of Scandola (Corsica Island) in summer during which 7 large clean mesocosms have been deployed (3 'control', 3 'dust' and 1 'dust' for optical measurements). Two successive seeding were performed and a large panel of chemical and biological parameters were measured during 15 days. The experiment was successful and some results will be presented by PhD students at the upcoming ASLO meeting. DUNE is a SOLAS endorsed project and more recent information (on the 2010 experiment and on recent publications) can be found at: <http://www.solas-int.org/science/researchendorsements/resendprojects/endorsedprojects.html>



A view of the optical cluster (3 instruments) deployed during the 2010 seeding experiment to follow the concentration, the size and the composition (mineral vs organic) of the sinking particles (here: outside of the mesocosm while performing a 'control'). Particulate export after the seeding was shown to be a multistep process and, as a function of time, the exported material has a variable proportion of mineral and organic particles. The third export event that occurred 20-28 hours after the seeding was due to large aggregates composed by a mixing of

organic and inorganic matter. This corresponded to the start of increase in chlorophyll induced by the dust addition: we can make the hypothesis that the organic matter is in part the one freshly produced via the fertilization. (from Bressac M., Guieu C., Doxaran D., Bourrin F., Obolensky G. and Grisoni J.M.: Optical measurements to observe the fate of Saharan dust in seawater: a simulated dust deposition during the DUNE project. Particles in Europe (PiE) 2010, Villefranche-sur-mer, 15-17 November 2010). (photo, David Luquet, OOV).

3. Top 10 publications in 2010 (Reports, articles, models, datasets, products, website etc)

Deboudt K., P. Flament, M. Choël, A. Gloter, S. Sobanska and C. Colliex, Mixing state of aerosols and direct observation of carbonaceous and marine coatings on African dust by individual particle analysis. 2010, *Journal of Geophysical Research - Atmospheres*, doi:10.1029/2010JD013921.

Guieu C. , F. Dulac, K. Desboeufs, T. Wagener, E. Pulido-Villena, J.-M. Grisoni, F. Louis, C. Ridame, S. Blain, C. Brunet, E. Bon Nguyen, S. Tran, M. Labiadh, and J.-M. Dominici, 2010, Large clean mesocosms and simulated dust deposition: a new methodology to investigate responses of marine oligotrophic ecosystems to atmospheric inputs, *Biogeosciences*, 7, 2765-2784

Guieu C. , Loÿe-Pilot M-D, Benyaya L., Dufour A., 2010, Spatial and temporal variability of atmospheric fluxes of metals (Al, Fe, Cd, Zn and Pb) and phosphorus over the whole Mediterranean from a one-year monitoring experiment; biogeochemical implications, *Marine Chemistry*, 120, 164–178

Heimbürger, L.E. , Migon, C. , Dufour, A. , Chiffolleau, J.F. & Cossa, D., 2010, Evolution of trace metal concentrations in the Northwestern Mediterranean atmospheric aerosol between 1986 and 2008. *Science of the Total Environment* , 408, 2629-2638.

Jouandet M.P., S. Blain, N. Metzl and C. Mongin, 2010. Interannual variability of the net community production and air-sea CO₂ flux in a natural iron fertilization region of the Southern Ocean. (Kerguelen plateau), *Antarctic Science*, (in press).

Laghdass M., S. Blain S., M. Besseling M., P. Catala P., C. Guieu C., I. Obernosterer I., 2010, Impact of Saharan dust on the microbial community during a large clean mesocosm experiment in the NW Mediterranean Sea, accepted, *Aquatic Microbial Ecology*

Metzl, N., A Corbière, G. Reverdin, A. Lenton, T. Takahashi, A. Olsen, T. Johannessen, D. Pierrot, R. Wanninkhof , S. R. Ólafsdóttir, J. Olafsson and M. Ramonet, 2010 Recent acceleration of the sea surface fCO₂ growth rate in the North Atlantic subpolar gyre (1993 2008) revealed by winter observations, *Global Biogeochem. Cycles*, 24, GB4004, doi:10.1029/2009GB003658.

Paris R., K. V. Desboeufs, P. Formenti, S. Nava, and C. Chou, 2010, Chemical characterisation of iron in dust and biomass burning aerosols during AMMA-SOP0/DABEX: implication for iron solubility, *Atmos. Chem. Phys.*, 10, 4273–4282.

Pulido-Villena E., Rerolle V., Guieu C. , 2010, Transient fertilizing effect of dust in P-deficient

LNLc surface ocean, Geophysical Research letters, vol. 37, L01603, doi:10.1029/2009GL041415.

Paulmier, A., Ruiz-Pino, D., V. Garçon, CO₂ maximum in the OMZ. Biogeoscience (Accepted).

Racapé, V., C. Lo Monaco, N. Metzl and C. Pierre, 2010. Summer and winter distribution of ¹³CDIC in surface waters of the South Indian Ocean (20°S-60°S). Tellus-B, DOI: 10.1111/j.1600-0889.2010.00504.x.

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

Wagener, T., Guieu C., Leblond N., Effects of dust deposition on iron cycle in the surface Mediterranean Sea: results from a mesocosm seeding experiment., Biogeosciences Discuss ., 7, 2799-2830, 2010

4. International interactions and collaborations

Meetings organized (See full report on these 3 meetings in this SOLAS NewsLetter issue) :

- The GEOTRACES Mediterranean Planning Workshop, 6-8 Oct. 2010, Nice, France
- The International SOLAS Workshop on the “OMZs systems”, 8-10 November 2010, Lima, Peru : <http://www.solas-int.org/aboutsolas/organisationaandstructure/midtermstrategy/omzmeeting.html>.
- The COST Sub-working group 2&3 meeting “Atmospheric versus land based controls of nutrient cycling and production in the surface ocean: from fieldwork to modeling”, 8-9 December 2010, Istanbul, Turkey.

5. Goals and plans for future activities

Driven by the French initiative MISTRALS (Mediterranean Integrated STudies at Regional And Local Scales; <http://mistrals.insu.cnrs.fr/spip/>) – an interdisciplinary program initiated in 2008 - two new projects are directly related to SOLAS science: (i) ChArMEx (the Chemistry-Aerosol Mediterranean Experiment; <http://charmex.lsce.ipsl.fr>) aims at a scientific assessment of the present and future state of the atmospheric environment and of its impacts in the Mediterranean basin; and (ii) MerMeX (Marine Ecosystems Response in the Mediterranean Experiment; <http://mermex.com.univ-mrs.fr/>) is focused on the response of ecosystems to modifications of physicophysical and -chemical forcing at various scales, both in time and space, linked to changing environmental conditions and increasing human pressure.

A joint meeting with the French IGAC community is planned for June 2011 in Paris.

6. Other comments

All details of the SOLAS-France activities is presented on the SOLAS-FRANCE web pages:

<http://www.lisa.u-pec.fr/SOLAS>.