climate models that include the cycle of mineral dust. This will make it possible to determine whether information on the mineralogical composition of mineral dust can reduce the uncertainty associated with their climate impact.

References

Claquin, T., et al. (1999) Modeling the mineralogy of atmospheric dust sources. *J. Geophys. Res*. 104 (D8)22:243-22,56.

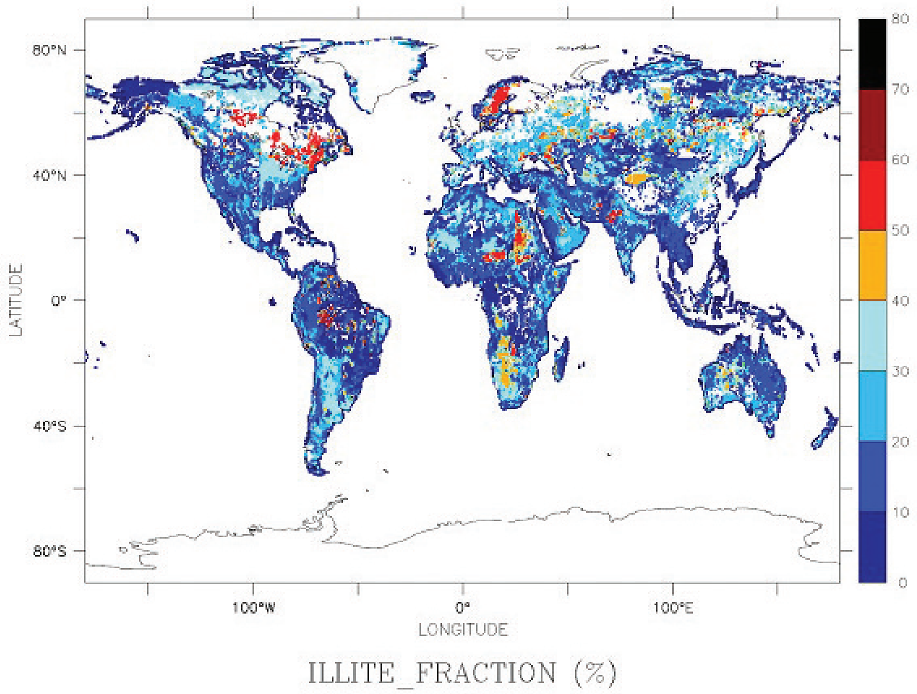
Duce, R. and Tindale N. (1991) Atmospheric transport of iron and its deposition in the ocean. *Lim. and oceanography* 36(8) :1715-26.

Formenti, P., et al. (2011) Recent progress in understanding physical and chemical properties of African and Asian mineral dust. *Atmos. Chem. Phys*. 11:8231-56.

Journet, E., et al. (2008) Mineralogy as a critical factor of dust iron solubility. *Geophys. Res. Lett*. 35(7):L07805.

Mahowald, N., et al. (2005) Atmospheric global dust cycle and iron inputs to the ocean. *Glob. Biogeochem. Cycles* 19:GB4025.

Moore, C., et al. (2006) Iron limits primary productivity during spring bloom development in the central North Atlantic. *Global Change Biology* 12(4):626-34.



Λ Figure 1: Amount (in % by weight) of Illite in the clay fraction (<2μm) at the surface of soils.

Schroth, A., et al. (2009) Iron solubility driven by speciation in dust sources to the ocean. *Nature Geoscience* 2(5):337-40.

Shi, Z., et al. (2012) Impacts on iron solubility in the mineral dust by processes in the source region and the atmosphere: A review. *Aeolian Research* 5:21–42.

Sokolik, I. and Toon, O. (1999) Incorporation of the mineralogical composition into models of the radiative properties of mineral aerosol from UV to IR wavelengths. *J. Geophys. Res*. 104(D8) :9423-44.

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AMOP: Activity of research dedicated to the Minimum of Oxygen in the Eastern Pacific

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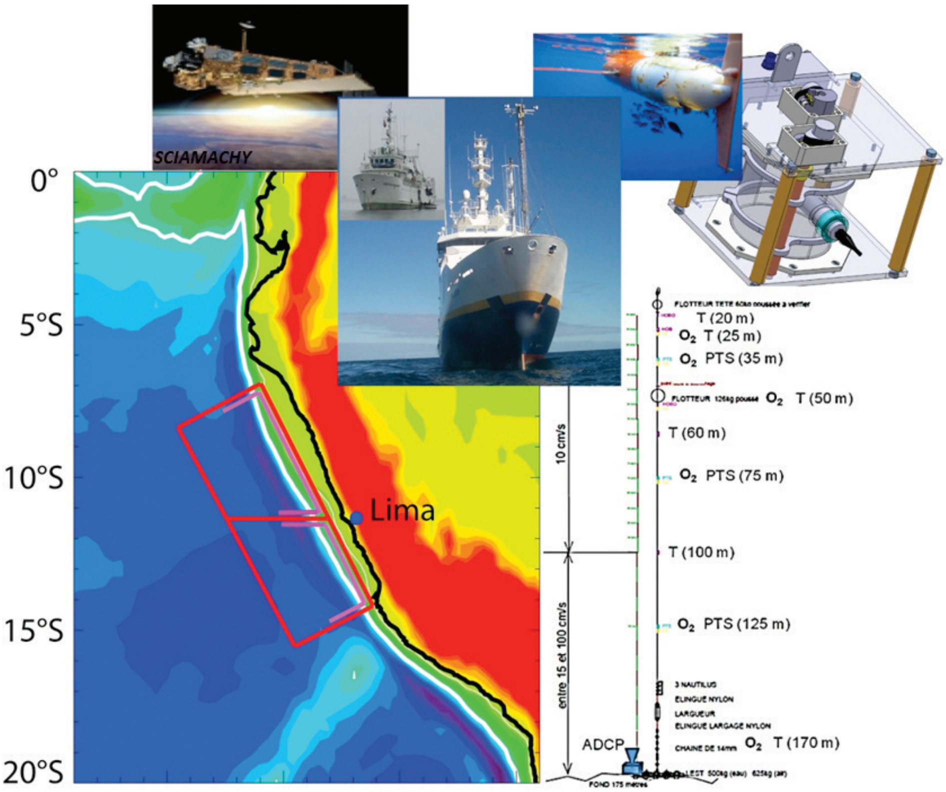
Oxygen Minimum Zones (OMZs) as suboxic layers are known to play a key-role on the evolution of climate (greenhouse gases production) and living resources from ecosystems to fisheries (nitrogen loss, respiratory barrier for zooplankton and fishes). In response to climate and environmental changes, OMZs would contract during cold periods and extend during warm periods. Despite their importance and the worrying problem of the ocean deoxygenation due to global warming and human activities, most of the OMZs have not been extensively studied. State-of-the-art numerical models exhibit severe biases in simulating the vertical and horizontal O_2 distribution in OMZs, although oxygen is one of the first measured parameters in oceanography. In particular, the origin of the OMZs existence, as well as their variability associated with a very large spatio-temporal scales range, remains unresolved.

The central hypothesis of this project is that the physical and biogeochemical O_2 contribution to the OMZ, its maintenance and variability, depends on the different OMZ layers; in particular, the oxycline which would be the engine of an intense but intermittent biogeochemical and ecosystem activity (e.g. O_2 consumption). AMOP aims at testing this hypothesis in the largest OMZ and the most productive upwelling systems: The Peru system in the Eastern Pacific Ocean. Conversely to other projects dedicated to different OMZ impacts study, AMOP is specifically oriented on the oxygen parameter, with the objective to carry out the most complete O_2 budget; taking into account physical (advection/diffusion) and biological (e.g. O_2 consumption/production through bacteria, phytoplankton and zooplankton) contributions.

Article continues on next page

The project implies a transdisciplinary approach: biogeochemistry, microbiology and physics coupled with the atmosphere, acoustics, ecology, benthic studies, palaeoceanography; disciplines all aiming towards the understanding of the O_2 fluxes. The approach is based on i) a 30-day cruise with two ships working simultaneously (*R/V L'Atalante* from IFREMER and the *R/V Jose Olaya Balandra* from IMARPE) and associated gliders and Argo floats experiments (Fig.1); ii) a fixed mooring (> 3yr) coupling water column and sediments located on one of the historical stations sampled by IMARPE; iii) a modeling component in order to a) bridge the gap between sampled and non-sampled spatio-temporal scales; and b) to assist the interpretation of our full data set (from in vitro to satellite observations). The cruise will include on-board experimentations and the use of innovative technologies (e.g. Pump-CTD, HPBs-O_2, IODAs/sediment traps/ANESIS) and is focused on nine fixed stations (3-day) and on three transects in the North (7°S), Centre (12°S) and South (14°S), covering three distinct topographic conditions of the OMZ system: the continental shelf, the slope and the open deep ocean.



Λ Figure 1: General schematic AMOP strategy (below on the left) including in situ observations: French (red track) and Peruvian (pink track) Research Vessels, a subsurface mooring, gliders, innovative systems (e.g. *In situ* Oxygen Dynamics Autoanalyzer: IODA) as well as satellite and modeling approaches.

To fulfill the objectives of this ambitious program, AMOP will involve 13 research units in France, seven research units from two Institutes in Peru and ten Institutions in six other countries (China, Denmark, Germany, Ireland, Mexico, Spain) acting as an international consortium on the deoxygenation topic (~100 participants). It benefits from the dynamics of national and international programs (RTRA/MAISOE, LMI-DISCOH, SENSEnet, HYPOX, EURO-ARGO, EUR-OCEANS Oceanflux, SOLAS, IMBER, GEOTRACES). AMOP is viewed as one of the main pilot projects of an initiative to co-ordinate, on the OMZ and in partnership with Peruvian Institutions, international actions (e.g. German SFB754 and US Torero initiatives) from 2012-2013: cruises, scientific flights, experiments, long-term monitoring, and modelling. Presently, the AMOP project is approved and labeled by LEFE-CYBER and LEFE-GMMC from the National Institute of Universe Sciences. The modelling activity has already begun at a regional scale (dynamics and biogeochemistry coupling) and microbial scales (e.g. O_2 consumption). The AMOP-mooring, including one Acoustic Doppler Current Profiler (ADCP) and a suite of biogeochemical sensors will be implemented in January 2013. The planning for cruise, including the glider and ARGO-floats activities in 2013-2014, still needs to be confirmed. More details will soon be available on a dedicated AMOP website.

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The characterisation and quantification of carbon cycle processes in the Gulf of Cádiz and the Strait of Gibraltar

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Since the last century CO_2 emissions from human activity, deforestation and fuel burning are gradually increasing. Nevertheless atmospheric concentrations of these greenhouse gas do not present the high values expected due to these anthropogenic emissions. The remaining carbon dioxide is being removed by natural sinks, the land and ocean; both with approximately the same percentage of CO_2 capture (Le Quere et al. 2009) . In the global ocean, several studies have confirmed that the North Atlantic is the most important sink for atmospheric CO_2 (Sabine et al., 2004; Takahashi, 2009), although there still remain uncertainties about the total amount stored by this oceanic region. In the past, the contribution of areas such as marginal seas, semi-enclosed seas and continental shelves (including estuaries and wetlands) to the global carbon inventories was understudied. Nevertheless,