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ProcEss studies at the Air-sEa Interface after dust deposition in the MEditerranean sea : results from the PEAcEtIME project

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Processes occurring at the atmosphere-ocean interface are critical to the regulation of the Earth climate and to the delivery of key services provided by marine ecosystems. The Mediterranean Sea, a hot spot for biodiversity but also for climate change and anthropogenic pressure, is an ideal natural laboratory to study these processes. The goal of the PEACETIME project is to provide the understanding necessary to accurately represent natural and anthropogenic chemical exchanges at the air-sea interface and their impacts on marine ecosystems and services, today and in the future.

In the frame of the PEACETIME project (http://peacetime-project.org/), an oceanographic cruise onboard the R/V 'Pourquoi Pas?' took place in the Western/Central Mediterranean Sea May 10–June 11, 2017. The purpose of this expedition was to study the processes induced by atmospheric deposition, in particular Saharan dust, occurring at the air-sea interface in the Mediterranean Sea, a region of the world where atmospheric input plays a key role as a nutrient source for the marine biosphere.

Combining in situ observations in the atmosphere and ocean with process studies in the water column as well as Climate Reactors incubation experiments, we characterized the chemical, biological and physical properties of the atmosphere, the marine surface micro-layer, and the deeper layers of the Mediterranean. Incubation experiments were set to reproduce different water temperatures and pCO_2 conditions so that scientists could assess the atmospheric impacts in both present and future climate conditions.

Moreover, the PEACETIME strategy included an "in-situ, real-time" approach: catching a real event of atmospheric deposition in Mediterranean waters, and documenting the ensemble of interactions induced on the surface ocean ecosystem. A fine-tuned team of people (on and off-board) worked together to examine quasi-real time dust transport forecasts and satellite observations, adjust the cruise track, and position the ship in an area where deposition events were forecasted. This unique coordinated effort succeeded, and the scientists were able to sample and measure the "real-time" effects of a dust deposition event on the marine surface waters.

PEACETIME yields insights into the impact of atmospheric deposition on the cycle of chemical elements (nutrients, metals), on the biogeochemical functioning of the pelagic ecosystem and on the retroaction to the atmosphere. A first set of results concerning physical, chemical, and biological measurements on both the marine stations, the atmospheric and marine underway and the incubation experiments will be presented to highlight the major findings so far.