

PhD position in Mediterranean Mercury Modeling, LSCE & MIO, France

The Laboratory of Climate and Environmental Sciences ([LSCE](#), Paris, France) and the Mediterranean Institute of Oceanography ([MIO](#), Marseilles, France) are offering a

PhD Position

Topic: Modeling the biogeochemical mercury cycle in the Mediterranean Sea.

Starting on October 1st 2018

Job Description / Duties

The Mediterranean Sea is under the influence of anthropogenic emissions and changing climate, both affecting the biogeochemical mercury cycle. This oligotrophic basin, limited by macronutrients (P, N), mainly receives supply via atmospheric deposition, upwelling of deep waters and rivers.

The PhD objective is to investigate the impact of climate change and atmospheric forcing on the Mediterranean Sea and its marine biogeochemistry. The strategy is based on the use and analysis of 3D atmospheric and oceanic models, especially the regional coupled NEMOMed-PISCES model that simulates the dynamics and biogeochemical cycles of the Mediterranean at high resolution (1/12°). This study is part of the national [MISTRALS](#) and the international [GEOTRACES](#) programs.

Firstly, we will study the evolution of the biogeochemical cycling according to different IPCC climate change scenarios. We will simulate the response of the changes in forcing (temperature, circulation), nutrient supply (atmospheric dust deposition, rivers), and nutrient redistribution (circulation) on primary production, and the first trophic levels (phyto- and zooplankton). The numerical modeling efforts will be supported by recently acquired *in situ* observations, including a Saharan dust event, during the 2017 GEOTRACES PEACETIME cruise.

Secondly, we will attempt to simulate for the first time the complex biogeochemical cycle of mercury (Hg), resolving all Hg species (MMHg, DMHg, Hg⁰, Hg²⁺, pHg, pMMHg) in the Mediterranean Sea. Mercury is global pollutant and a neurotoxin with a serious health risk for humans, mainly via the consumption of marine fish. Anthropogenic Hg emissions have largely altered natural Hg levels. Bacteria feeding on sinking marine organic matter in the mesopelagic zone are thought to produce the toxic methylmercury species (MMHg) that bioaccumulates along the marine trophic chain to harmful levels. The direct links of anthropogenic Hg emissions and changing climate to marine fish Hg levels, and ultimately human exposure remain ill-understood.

The Mediterranean Sea is one of the best covered areas in terms of observational Hg data (*Cossa et al. 1991, 1994, 1997, 2017a,b, Horvat et al. 2003, 2005, Kotnik et al. 2007, 2009, Heimbürger et al. 2010*). The data comprises over 800 data points and the new data acquired during the 2017 GEOTRACES PEACETIME cruise added another 200 data points. The wealth of observational Hg data and the well-studied circulation and biogeochemistry (*MERMEX group, 2011*) make the Mediterranean Sea the ideal place to implement marine biogeochemical models (*Ayache et al., 2016*).

The PhD student will be based at the Laboratoire du Climat et d'Environnement ([LSCE](#)) and collaborate intensely with the Mediterranean Institute of Oceanography ([MIO](#)) in Marseilles, France. S/he will help with the validation and interpretation of all acquired data and be in charge of the implementation of the data into numerical models. The PhD student will be lead author of at least 2 publications. Although the data for PhD project is already acquired, the student will be given the opportunity to learn about the observational aspects, ultra-trace clean techniques, participate to field campaigns.

Qualification

A qualification comparable to a Master's degree or Diploma in (chemical) oceanography, environmental chemistry, or related field is required. Experience in programming and numerical modeling is a requirement, and notations in marine biogeochemistry are desirable. An essential requirement for selection for the PhD projects is a top-quality MSc or equivalent 5 year degree. We also expect good English language skills.

Applications including a letter of motivation, CV and contact details of 3 referees should be sent to jean-claude.dutay@lsce.ipsl.fr and lars-eric.heimburger@mio.osupytheas.fr as a single pdf file, using as subject "**MED Hg modeling**".

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Evaluation will close end of April.

References

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