



PhD position in Mercury Biogeochemistry in Oxygen Minimum Zones

Mediterranean Institute of Oceanography ([MIO](#)), Geosciences Environment Toulouse ([GET](#)), Instituto del Mar del Peru ([IMARPE](#))

The [Marseille Marine Mercury Laboratory](#) at the Mediterranean Institute of Oceanography (MIO) and the [Mercury Isotopes Group](#) at Geosciences Environment Toulouse (GET) are seeking to recruit a scientist for a fully-funded 3-year PhD position to work at the frontiers of trace metal oceanography, analytical sciences, stable isotopes biogeochemistry, and ecology. This PhD position is funded via the **ANR** (Agence Nationale de la Recherche) **MERTOX** project (2017-21) “**Unraveling the origin of methylMERcury TOXin in marine ecosystems**” (PI David Point, GET). 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 main goal of this PhD project to **study mercury biogeochemistry in oxygen minimum zones (OMZ)**, and to develop new stable isotope tools for a better understanding of the marine biogeochemical Hg cycle. The **MERTOX** case study will be conducted in the Peruvian Humboldt OMZ, which is very productive, exhibits extreme redox gradients, and is known to enhance *in situ* MeHg production. This region accounts for 15% of worldwide commercial fisheries while representing 0.1% of the global ocean surface. Peruvian anchovy fisheries contribute to more than half of world landings used for fishmeal production and then fuels a critical portion of world aquaculture production. The **MERTOX** field campaigns are planned for 2019, along several cruise transects covering the strong inshore/offshore organic matter gradients and steep shallow redox fronts. The cruises will be performed on board of IMARPE's R/V Olaya and will be supported by bi-annual transect surveys. Complementary physical (salinity, temperature,...), chemical (macronutrients, Fe, Mn, CH₄, HS⁻), microbiological (diversity, HgcAB methylating genes) and ecological (phytoplankton speciation, Chl-a,...) data will be gathered. The main field tasks of the PhD student is to sample and measure the full suite of Hg species (MMHg, DMHg, Hg⁰, Hg²⁺, pHg, pMMHg), perform isotopically labelled incubation experiments, and contribute to the isotopic measurement of both the Carbon ($\delta^{13}\text{C}$), and Hg ($\delta^{202}\Delta^{199}\text{Hg}$) atoms of the MeHg (CH₃Hg) molecule, along the trophic chain (seawater, phyto-, zooplankton,...). The PhD student will be based at the **MIO** (Lars-Eric Heimbürger, Sophie Bonnet, Marseille, France) and will closely collaborate with the **GET** laboratory (David Point, Jeroen Sonke, Toulouse, France) for stable isotopic analysis and with **IMARPE** (Michelle Graco, Lima, Peru) to explore and document Hg biogeochemistry in the Humboldt OMZ. Collaborative research actions with **LMD/IPSL** (Laurent Bopp, Paris, France) for biogeochemical modeling, and the **LEMAR** (Anne Lorrain, Brest, France) for ecological/trophic web investigations.

MIO is a joint research unit of **AMU**, **CNRS**, Institute of Research for Development (**IRD**) and University of Toulon (**UTLN**). MIO's objectives are to better understand the ocean system and its response to global change, with expertise in chemical, physical and (micro-)biological oceanography. MIO has infrastructures at 5 sites: AMU Luminy, UTLN, the IFREMER marine base in La Seyne-sur-Mer and the IRD Centre in Nouméa, New Caledonia. MIO is structured in 5 disciplinary teams, with 6 cross-thematic research areas and 6 analytical platforms, a marine monitoring service supported by its own research vessel Antedon II, which will be used for method development. The Marseille Marine Mercury Laboratory at MIO is fully equipped for basic and advanced Hg analysis: cold vapor atomic fluorescence spectrometry (3x CV-AFS Brooks Rand), an automated total Hg analyzer purge & trap CV-AFS (Brooks Rand MERX-T), an automated methylHg analyzer purge & trap GC-CV-AFS (Brooks Rand MERX-M), an automated combustion atomic absorption spectrometry AAS (Leco AMA 254), and a brand-new gas chromatography (Thermo Trace 1300) coupled to a HR-ICPMS (Thermo Element XR) for Hg speciation by isotope dilution. One fulltime dedicated technician manages daily operations and maintenance of these facilities.

The PhD student will be trained in ultra-trace clean techniques, participate in several field campaigns, help with the validation and interpretation of all acquired data, help with the implementation of the data into numerical models and contribute to the publication of the findings. The PhD student will be lead author of at least 2 publications.

The PhD student will be involved in another Pacific Ocean cruise in October-December 2019, as part of the **ANR TONGA** project (PIs Sophie Bonnet, MIO, Cecile Guieu, **LOV**, Villefranche sur Mer). A qualification comparable to a Master's degree or Diploma in chemistry, environmental chemistry, (chemical) oceanography or related field is required. Experience in analytical chemistry and / or marine biogeochemistry is desirable. An essential requirement for selection for the PhD projects is a top-quality MSc or equivalent 4–5 year degree. We also expect good English language skills, and that the candidate is motivated to participate in sea-going expeditions. Most importantly, we are looking for a creative and curious mind. Applications including a motivation letter, CV and contact details of 2 referees should be sent to lars-eric.heimburger@mio.osupytheas.fr, sophie.bonnet@mio.osupytheas.fr and david.point@ird.fr as a single pdf file, using as email subject "**PhD OMZ Hg**".

PhD supervisors

Dr. Lars-Eric Heimbürger, Dr. Sophie Bonnet

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Dr. David Point

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