

Postdoctoral Position: 3D coupled hydrodynamic biogeochemical modelling of a Mediterranean region influenced by an oligotrophic boundary current and intermittent upwelling (AMICO project)

Context

A 12 to 18 months postdoctoral position is available at Laboratoire d'Aérodologie (Observatoire Midi-Pyrénées, Toulouse, France). The position is funded by a research program dedicated to prepare the future French operational coastal oceanography. The candidate will work with a team of Laboratoire d'Aérodologie, expert in models development and in high resolution modelling of hydrodynamic and biogeochemistry in the western Mediterranean. The postdoc will use the 3D hydrodynamic model SYMPHONIE (Marsaleix et al., 2008, 2009, 2012) and the biogeochemical model ECO3M-S (Auger et al., 2014 ; Ulses et al., 2016; Kessouri et al., 2017) developed by the team. The study will extend from the Ligurian Sea to the Gulf of Lion and will focus on the upwelling of the Marseille - Toulon region which is one of the largest upwelling areas in the Mediterranean. The upwelling is located on the edge of the continental slope along which flows the Northern Current, a component of the general circulation of the basin. The upwelling is induced by the Mistral wind which blows from north to north-west over the region and is influenced by the continental topography. It is particularly visible on the SST in summer with falls of up to 10° in less than one day. We are interested here in the competition between the horizontal advection of oligotrophic water by the Northern Current and the upwelling of nutrients. This will characterize the impact of upwelling on local planktonic production and its impact at longer distance through advection of nutrients and organic matter and export to the bottom.

Methodology

Supported by the researchers of the team and a postdoc in charge of the hydrodynamic simulations, the post-doc will be in charge of the validation of the biogeochemical simulations on the Marseille - Toulon region and in the Northern Current upstream of the upwelling. This validation will use in-situ data (chlorophyll derived from glider measurements, nutrients, O₂ ... from bottle water samples during summer cruises) and satellite ocean color data. The simulation will then be analysed in details to disentangle the positive and negative impacts of hydrodynamics on the phytoplanktonic production, offshore transport and vertical export.

Expected profile

The candidate should have a Ph.D. related to coupled modelling of physical biogeochemical oceanic processes.

An experience in Linux and scientific programming languages (Fortran, Python or Matlab ...) is required.

Importance will be given to aptitude for team work.

Contract

The postdoc should start as soon as possible. The gross salary will depend on the candidate experience.

How to apply

Send a letter of motivation, a CV including a publication list, and contact information for 2 references by e-mail to

caroline.ulses@aero.obs-mip.fr

claude.estournel@aero.obs-mip.fr

patrick.marsaleix@aero.obs-mip.fr

Postdoctoral Position : 3D biogeochemical modelling of the Gulf of Lion coastal zone (western Mediterranean) based on a pelagic benthic coupling. Potential impact of a nuclear accident on the contamination of the planktonic ecosystem (AMORAD project)

Context

A 12 to 18 months postdoctoral position is available at Laboratoire d'Aérodologie (Observatoire Midi-Pyrénées, Toulouse, France).

The position is funded by the national program "Investissement d'Avenir" AMORAD dedicated to the improvement of numerical models of the dispersion and impact of radionuclides in the environment. In the frame of the marine axis of this program, the objective is to improve the realism of the modelling of the transfer of radionuclides in the abiotic environment (water and sediment) and then in the trophic chain. In this context, the objective of the postdoc will be to simulate the planktonic ecosystem in the Gulf of Lion coastal zone, to analyse its structure and its temporal and spatial variability in response to the forcing by rivers, meteorology and exchanges with the sediment and the deep environment.

Time series of ocean color near the coast indicate that high frequency variability of phytoplankton biomass over a few days can sometime overwhelm seasonal variability. Several factors are responsible of this high variability such as changes of continental inputs and the impact - amplified by the shallow depths - of external forcings: wind-induced vertical mixing, wave-induced resuspension of sediment, organic matter and nutrient enriched pore-water. All these intertwined processes produce dynamic positive and negative feedbacks on pelagic primary production. The objective will be to understand how the coastal ecosystem reacts at these forcing from the scale of an energetic event to the seasonal and interannual scales.

The candidate will work with the team of Laboratoire d'Aerologie, expert in high resolution modelling of hydrodynamic and biogeochemistry in the western Mediterranean. The team develops the 3D hydrodynamic model SYMPHONIE (Marsaleix et al., 2008, 2009, 2012) and the biogeochemical model ECO3M-S (Auger et al., 2014 ; Ulses et al., 2016) which will be used by the postdoc. The team is collaborating with the groups in charge of the time series (SOMLIT network) of the physical and biogeochemical parameters in the Gulf of Lion, in the frame of the CHIFRE project focused on the acquisition of these high-frequency parameters. A collaboration is also engaged with the group of Ch. Rabouille (LSCE), expert in the transfer at the sediment water interface in the Rhône river region.

The project will also rely on a model of transfer of cesium in the planktonic food chain developed in the frame of a PhD (Belharet et al., 2016) to analyse the consequences of the Fukushima accident .

Methodology

Physical simulations as well as a version of the coupled pelagic benthic biogeochemical model calibrated for the deep Mediterranean basin will be provided by the research group. Sediment transport modelling results including the suspended particulate matter discharged

by rivers and resuspended by waves and currents will also be available to determine the light conditions in the water column and provide a flux of nutrients and organic matter from the sediment to the overlying water. The postdoc will collect the available observations (satellite images and in-situ data, time series at coastal sites, cruises, gliders deployments), compare the results from the current calibration and possibly carry out sensitivity tests on the model parameters to improve the calibration.

She/he will then analyse simulations to establish the variability of the planktonic ecosystem and the compelling factors of this variability (meteorological forcing, fluvial inputs, vertical mixing). These simulations will be used to carry out scenarios of contamination by accidental releases of radiocaesium by the Rhone river and study the impact on phyto and zooplankton using a radioecological model.

Expected profile

The candidate should have a Ph.D. related to coupled modelling of physical/ biogeochemical oceanic processes.

An experience in Linux and scientific programming languages (Fortran, Python or Matlab ...) is required.

Importance will be given to aptitude for team work.

Contract

The maximum duration of the position is 18 months (dependent on the candidate experience) and should start as soon as possible.

The gross salary will depend on the candidate experience.

How to apply

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patrick.marsaleix@aero.obs-mip.fr

Postdoctoral Position : Sediment transport modelling in the region of the Fukushima power plant. Implications on the Cesium transport from the watersheds to the coastal ocean. (AMORAD project)

Context

The position is funded by the national program “Investissement d’Avenir” AMORAD dedicated to the improvement of numerical models of the dispersion and impact of radionuclides in the environment. The general objective of the marine axis of this program is to improve the realism of the modelling of the transfer of radionuclides in the abiotic environment (water and sediment) and then in the trophic chain. In this context, the objective of the postdoc will be to simulate the transfer of Cesium originating from the Fukushima power plant accident and adsorbed on the suspended particulate matter transported from the contaminated watersheds or directly from the powerplant to the sea.

The candidate will work with the team of Laboratoire d’Aérodynamique (LA), expert in high resolution modelling of hydrodynamic and biogeochemistry and with the DHYSED laboratory from IFREMER expert in hydro-sediment dynamics. The LA team develops the 3D hydrodynamic model SYMPHONIE (Marsaleix et al., 2008, 2009, 2012) and DHYSED develops the MUSTANG sediment transport model (Le Hir et al., 2011) which will be used by the postdoc. The group was among the first to simulate the dispersion of cesium in the Pacific Ocean after the Fukushima nuclear power plant accident in 2011 (Estournel et al., 2012). A model of transfer of cesium in the planktonic food chain and in pelagic fishes was then developed in the frame of a PhD (Belharet et al., 2016).

Methodology

Modeling will aim to understand the role of intense hydrometeorological events on the transport of contaminated sediments. First, typhoons induce the erosion of contaminated watersheds and thus produce in a few days transfer to the sea of relatively large amounts of suspended matter. Second, the most energetic waves produce resuspension of contaminated sediment discharged directly from the plant in the days following the accident or through the watersheds erosion. The MUSTANG sediment transport model will be used to study the impacts of typhoons on the dispersion of suspended matter. The simulations will be forced by currents and waves fields produced by the SYMPHONIE and WW3 models.

Expected profile

The candidate should have a Ph.D. related to hydrodynamic and/or sediment transport modelling.

An experience in Linux and scientific programming languages (Fortran, Python or Matlab ...) is required.

Importance will be given to aptitude for team work.

Contract

The maximum duration of the position is 18 months (dependent on the candidate experience) and should start as soon as possible.

The gross salary will depend on the candidate experience.

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