Postdoctoral researcher in physical oceanography: Modeling multi-decadal shoreline evolution

IUEM – UMR6538 Geo-Ocean

Université de Bretagne Occidentale

Recrute





The **University of Brest (Université de Bretagne Occidentale, UBO)** is a public scientific, cultural, and professional establishment (EPSCP) that has a rich diversity of teaching domains and research fields.

The university works on the production, transmission, and valorization of knowledge. It is engaged in the heart of the city, contributing educating students to become free and responsible citizens, respectful human values : responsibility, respect, integrity, inclusion, and solidarity.

With 23,000 students, 1300 researchers and teachers, and 900 administrative and technical staff, the UBO succeeds in its goal of being a community university that is also renowned nationally and internationally. The university places well on two international rankings that are worldwide references: the Shanghai rankings of academic subjects, where the UBO is ranked in 8 fields, in particular in the field of oceanography, with a 5th place global ranking, and the Times Higher Education (THE), where the UBO is in the top half of the rankings in 8 categories, among the 1900 ranked universities.

The UBO concentrates the majority of its activities at the site in Brest, but is also present in North (Morlaix) and South (Quimper) Finistère and extends from across all of Brittany with the sites of the National Higher Institute for Teaching and Education in Rennes, Vannes, and St Brieuc.

The UBO is also part of the European University SEA-EU that includes 8 partner universities: University of Cadiz (Spain), Kiel University (Germany), Univerity of Gdansk (Poland), University of Split (Croatie), University of Malta, Nord University (Norway) University of Algavre (Portugal), and University of Naples Federico II (Italy). This alliance aims to reinforce student and staff exchanges, and to improve the quality and competitive standing of European higher education.

The UBO searches for talented women and men to succeed in its public service mission and to contribute to its global impact.

RESEARCH UNIT AND TEAM

This postdoctoral researcher position is part of the EvolPlage project, which is a research and innovation partnership between the Geo-Ocean (UBO), M2C (URN), and LHSV (ENPC) laboratories, and the Cerema (Risks, Water, and Seas - research team RHITME, associated with the M2C laboratory). The project is financed by the DGALN (French Directorate-General for Planning, Housing, and Nature) and focuses on the development of new tools to improve estimates of shoreline evolution in response to changes in wave climate and mean sea levels. The EvolPlage project (2024-2028) grew out of a collaboration that began in 2014. The postdoctoral researcher will be located at the UBO and will work with a research team including the project leaders, a thesis student (located at the URN), and several interns who will be working at the 4 sites of the project partners.

The selected candidate will work at the European Institute for Marine Studies (IUEM) in the Observation and dynamics of coastal systems (ODYSC) research team of the research unit (UMR) GeoOcean (https://www.geo-ocean.fr/). As an internal school of the UBO, the IUEM has a mission to study the ocean and littoral zone, as well as the associated human activities. Its missions are focused on research, education, and observations. The research conducted in the UMR GeoOcean focuses on mechanical coupling, chemical exchanges, transfers at the interface between the solid Earth and the Earth surface dynamic processes causing geological hazards and coastal risks, as well as the sedimentary records of these processes. The ODYSC team is interested in understanding the dynamics of coastal environments in response to natural, metocean, and anthropogenic forcing factors. The investigation of the hydro-morphodynamic processes in coastal zones uses a multi-sensor approach (combining *in situ* measurements, airborne and space borne remote sensing techniques). These observations are integrated in numerical, empirical, and physical models for assessing shoreline evolution at different spatial- and time-scales (short to interannual and decadal scales)

JOB AND MISSIONS

Your principal mission?

The most commonly used approaches for predicting medium to long-term shoreline changes are primarily based on the extrapolation of historical trends and the application of an empirical formula, called the Bruun Rule, to estimate the impacts of sea level rise. These

approaches generate potentially large uncertainties, and a family of models called reduced-complexity models, which are a compromise between the physical processes modeled explicitly and the computational time, are currently the focus of many studies in the international scientific community.

The EvolPlage project is based on a morphological change model that was developed to simulate interannual shoreline evolution in response to changes in wave conditions (thesis T. Chataigner, 2018-2021). The model combines an equilibrium-based cross-shore model and a « one-line » longshore approach to simulate the coupled shoreline response. The two main themes of the EvolPlage project are to investigate and implement (1) the concept of memory effects in the sedimentary response of the system and (2) an innovative approach for taking into account the impacts of mean sea level changes. To validate the application of the new model at mutli-decadal to centennial scales, the project aims to analyze the model sensitivity and the temporal evolution of the calibration parameters (e.g. intrinsic versus extrinsic) by using data assimilation (ensemble-based or artificial intelligence techniques) with long-term satellite-based (e.g. Landsat and Sentinel 2) measurements of the shoreline position.

The postdoctoral project will be focused on two objectives within the project :

(i) the implementation of the innovative approach for taking into account the impacts of long-term sea-level changes on shoreline changes through a modified formulation of the equilibrium concept. The new model will be tested on a range of sites with different hydrodynamical and morphological characteristics (5 to 8 sites both in France and abroad where long-term observations are available); and

(ii) the comparison of the results obtained with the new approach and with existing approaches (e.g. « classic » and « expert » approaches) recommended in the « Recommandations pour l'élaboration de la carte locale d'exposition au recul du trait de côte » produced by the Cerema and BRGM in 2022.

The results of the postdoctoral project will include the development of a robust model for estimating multi-scale shoreline evolution. The ultimate goal that this model may become a reference used for operational modeling of coastal morphological evolution in littoral communities.

Your activities?

The activities of the postdoctoral researcher include:

- complete a bibliographic study of the state of the art in shoreline modeling of the impacts of climate change in reduced-complexity models;
- identify an innovative approach (either the proposed approach, previously conceptually designed but not numerically implemented, or a new approach) to take into account the water level in the reduced-complexity model;
- implement this approach in the existing numerical model;
- test the new approach at different study sites where the necessary data are available in open source;
- compare the results obtained with the new approach and with existing approaches to evaluate the advantages and limitations (working with the doctoral student in the EvolPlage project);
- publish the work in high-ranking scientific journals, including submitting at least one journal article. The postdoctoral researcher will also have the opportunity to present this work in national and/or international conferences (e.g. ICCE, Coastal Sediments or Coastal Dynamics, JNGCGC, ...);
- contribute to the technical reports and presentations of the EvolPlage project (including participating in project meetings, progress reports, and the presentation and communication of the results with stakeholders);
- participate in the life of the Geo-Ocean laboratory and the ODYSC team, including seminars and lab meetings. The postdoctoral researcher may have the opportunity, for example, to participate in field campaigns of other laboratory projects related to hydro-morpho-sedimentary dynamics of beaches;
- participate in exchanges with European and international networks in which the EvolPlage project coordinators are involved (GESEM, and others), which may lead to opportunities to do exchanges with European and international research institutes.

YOUR PROFILE

We are seeking a talented candidate with a diploma in physical oceanography (or another related field with equivalent knowledge), with knowledge of coastal geomorphology and risks. The candidate should have strong skills in methods and tools for data acquisition, production and analysis of observations, modeling results, and GIS and geographical data sources, in particular concerning morpho-sedimentary data for studying littoral evolution and hydrodynamic conditions (topographic and bathymetric surveys, waves, water levels, geographic databases, ...). Programming skills are also necessary (e.g. numerical methods, optimization techniques, programming languages, in particular python, ...).

Good knowledge of the legal, ethical, organizational, and functional framework of public research is also needed. A strong capacity for publishing in scientific journals and good communication skills are required. It is necessary to have a sufficient level of written and

spoken English, and to work well in teams. We are seeking an organized, rigorous and autonomous researcher with good conceptualization skills, a high level of curiosity and critical thinking, and excellent interpersonal and communication skills.

WHY JOIN OUR TEAM?

- Integrate in an innovative and international university that conducts high-level research;
- Share the strong values of public service: continuity, engagement, integrity, loyalty, neutrality, and respect;
- Join a diverse and inclusive institution that is engaged in promoting professional equality between women and men,
- Enjoy an exceptional living environment: to find out more about Brest, which is ranked the 9th most livable city in France, visit Brest, l'esprit libre (free spirit).

Our strengths :

- Education, support throughout your career, and preparation for civil service exams
- Signed the parenting charter
- Possibility to work 4.5-day weeks
- Possibility of partial teleworking after 3 months of seniority (subject to conditions)
- 45 vacation days
- Access to the university restaurant
- Interministerial social welfare benefits: CESU childcare vouchers, vacation vouchers, transportation assistance, health insurance assistance
- Social life: renowned university orchestra, workshop, community garden, conversation workshops, sewing, theater, reading club
- Leisure and Culture: Over 50 sports activities to choose from, UBO exhibitions, Cezam card, and more.

To learn more:
Discover our video presentation of the UBO
Visit our UBO internet site and follow our Linkedin page

COMPLEMENTARY INFORMATION

Type of recruitment: contract
Type of contract: fixed term
Employment: 100 % (full time)
Number of job positions: 1
Length of contract: 12 months (renewable once for an additional 12 months)
Number of hours per week: 35h
Starting date: November 1st, 2025
Ending date: October 31th, 2026 (October 31th, 2027 if renewed)
Work address: Institut Université Européen de la Mer – rue Dumont d'Urville 29280 Plouzané
Job title UBO: Postdoctoral researcher
Gross monthly salary: according to the current pay scale (about 2500 €)
Special conditions: travel, and even short stays, at partner laboratories will be planned; a stay of several weeks at a laboratory abroad is possible, within the framework of existing international collaborations with EvolPlage project partners, subject to funding.
Application: CV + Motivation letter should be addressed to Nicolas Le Dantec (nicolas.ledantec@univ-brest.fr)
Application review process: on an ongoing basis by the Application Selection Committee (the response to the candidate will be sent at the end of the evaluation process).
Recruitment process: a first round of selection of candidates will be based on the written application, and the selected candidates will be invited for an (online) interview
All applications received before October 10th, 2025 will be reviewed with interest.