



## Institut national de l'information géographique et forestière

### Postdoctoral Research Position in Space Geodesy and Sea Level

#### Description of the work

The main objectives of this work are the following:

- ✓ To contribute to the computation of the geodetic references according to the configuration fixed by the Scientific Steering Committee at the end of the first half of the GEODESIE project.
- ✓ To contribute to the assessment of the accuracy of the geodetic references with external references, data and models (mainly of geophysical phenomena).
- ✓ To exploit the geodetic references to compute time series of sea levels from altimetric data and tide gauge records and to assess the quality of these time series.

The work will be carried out within the context of the French national project GEODESIE. This project is currently carried out by a team of 24 people, from four different French institutes (IGN, CNES – Centre national d'études spatiales, Paris' Observatory, and ULR – Université de la Rochelle). It is funded by ANR (the French National Research Agency, project ANR-16-CE01-0001) for 48 months (2017-2020).

The position is for two years, ideally starting on 07<sup>th</sup> January 2019, in the geodesy research team of IGN and IPGP (Institut de physique du globe de Paris), located at Université Paris Diderot, 35 rue Hélène Brion, 75013 Paris, France. Stays of several weeks at both LIENSs (Littoral environnement et sociétés, La Rochelle, France) and LEGOS (Laboratoire d'études en géophysique et océanographie spatiales, Toulouse, France) laboratories will be necessary for the fulfilment of the work. This work will be carried out under the supervision of MM. P. Bonnefond (SYRTE – Système de référence temps - espace, Paris' Observatory), D. Coulot (IGN), B. Meyssignac (LEGOS) and G. Wöppelmann (LIENSs). Depending on her/his profile, the candidate could expect a mean net salary of about 2000 €.

#### Requirements

Candidates must have a Ph.D. degree in space geodesy, reference systems or related fields. Experience in data processing is preferable, and experience in sea level determination would be an advantage. The successful candidate is also expected to have good communication (both oral and written) and interpersonal skills for collaborative work.

#### Application procedure

The application must include:

- ✓ Curriculum Vitae.
- ✓ Motivation letter.
- ✓ Two recommendation letters.

Applications should be submitted by e-mail to [geodesie.anr@ign.fr](mailto:geodesie.anr@ign.fr) with the reference *Application for the GEODESIE postdoctoral position* before the 11<sup>th</sup> November 2018.

## Description of the GEODESIE project

Many major indicators of climate change are monitored with space observations (sea level rise from satellite altimetry, ice melting from dedicated satellites, etc.). This monitoring is highly dependent on references (positions and velocities of ground observing instruments, orbits of satellites, etc.) that only geodesy can provide. The current accuracy of these references does not permit to fully support the challenges that the constantly evolving Earth system gives rise to, and can consequently limit the accuracy of these indicators. For this reason, in the framework of the Global Geodetic Observing System (GGOS), stringent requirements are fixed to the International Terrestrial Reference Frame (ITRF) for the next decade: an accuracy at the level of 1 mm and a stability at the level of 0.1 mm/yr. This means an improvement of the current quality of ITRF by a factor of about 5.

Improving the quality of the geodetic references is an issue which requires a thorough reassessment of the methodologies involved. The most relevant and promising method to improve this quality is the direct combination (Combination at Observation Level – COL) of the space-geodetic measurements used to compute the official references of the International Earth Rotation and Reference Systems Service (IERS). The GEODESIE project aims at (i) determining highly-accurate global and consistent references (time series of Terrestrial Reference Frames and Celestial Reference Frames, of Earth's Orientation Parameters, and orbits of Earth's observation satellites) with a beyond state-of-the-art space-geodetic data assimilation, and (ii) providing the geophysical and climate research communities with these references, for a better estimation of geocentric sea level rise, ice mass balance and on-going climate changes. Time series of sea levels computed from altimetric data and tide gauge records with these references (orbits of satellite altimeters, Terrestrial Reference Frames and related vertical velocities of stations) will also be provided.

We propose to process all the data available since the advent of space geodesy, with a specific data assimilation software, to compute simultaneously and consistently all the geodetic references and products. We also propose to use all the possible links between the space-geodetic techniques (DORIS, GNSS, LLR/SLR, and VLBI) and to question the contribution of each technique to the accuracy and stability of the Terrestrial Reference Frames. The quality of the references will be assessed with independent data and geophysical models.

The geodetic references will be essential bases for Earth's observation and monitoring to support the challenges of the century. They will be updated operationally after the project. The geocentric time series of sea levels will permit to better apprehend (i) the drivers of the global mean sea level rise and of regional variations of sea level and (ii) the contribution of the global climate change induced by anthropogenic greenhouse gases emissions to these drivers. All the results, and computation and quality assessment reports will be available on the Website of the project ([geodesie-anr.ign.fr](http://geodesie-anr.ign.fr)).

This project is an unprecedented opportunity to provide the team involved (and, by extension, the French Groupe de Recherche de Géodésie Spatiale – GRGS) with complete simulation and data assimilation capabilities to: (i) strengthen its position as an international leader expert on COL, (ii) prepare the future arrival of space missions such as the European Geodetic Reference Antenna in SPace – E-GRASP, and (iii) significantly contribute to the GGOS with accurate references estimated with data assimilation.

The GEODESIE acronym means GEOdetic Data assimilation and ESTimation of references for climate change InvEstigation.

One can contact the project team at e-mail [geodesie.anr@ign.fr](mailto:geodesie.anr@ign.fr) and follow the project on Twitter with the @GEODESIE\_ANR account.