



Position

Chargé de recherche 2^{ème} classe du Développement Durable

in *Physical Geodesy*

CR2

Institut National de l'Information Géographique et Forestière (IGN)

Position : Researcher in Physical Geodesy

Scientific area : Geodesy

Speciality : Physical Geodesy

Institute : Institut national de l'Information Géographique et Forestière (IGN), <http://www.ign.fr>

Research team : Direction Recherche et Enseignement (ENSG), Laboratoire LaSTIG, Equipe LAREG

Placel: IGN/LAREG, Université Paris-Diderot, 35 rue Hélène Brion, 75013 Paris.

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Context :

The French national institute for geographical and forestry information (IGN, Institut National de l'Information Géographique et Forestière) is preparing a major evolution of the French vertical reference system management, in order to decrease the maintenance costs of the leveling network (400,000 bench marks), and to improve the quality of the service to the users. IGN needs notably to improve the estimate of the French vertical reference level 0 surface, in order to provide the users with a better access to altitude values through GNSS, and to allow the evolution of the network maintenance towards a better cost-effectiveness. In this context, the Geodetic and leveling department of IGN (SGN, Service de la géodésie et du nivellement) is preparing a new determination of the level 0 surface, with state-of-the-art software and the development of novel tools for assessing the quality of the geoid and level 0 surface estimates.

This task has to be supported by a scientific activity in physical geodesy at IGN for several reasons :

- the emergence of an **international height reference system**, based on the real Earth potential field will require a significant progress of the accuracy of geoid estimates, in order to tie conventional national height system to the international reference; it is likely that the same need also appear rather quickly at the European scale; this requirement also induces research needs in the field of geoid quality assessment, since all available quality estimates are known to be biased;
- the recent **progress of the stability of the measurement of time** with optical atomic clocks engages new challenges; within a few years, synchronizing clocks will yield an information on Earth gravity potential differences with a precision of the order of 1cm or better (consequence of Einstein general relativity); research keeps necessary to assess the information that will bring time measurement technologies to geoid estimates, as well as to understand whether Earth potential independent estimates can contribute to time measurement processing; with possible consequences on the part played by national height systems, tied to the international one, in the field of time processing;
- the need for increasing the **international scientific outreach** of IGN in the very domain of geoid determination; IGN wishes to foster European and international collaborations with the view to contributing to the challenge posed by the world geodetic infrastructure in the field of height systems.

Research team:

The position is opened within a small team in physical geodesy, constituted within the team LAREG of a research director and two researchers, with general objectives on gravity field inversion at all spatial and temporal scales, height system level-0 surface determination, Earth gravity field and Earth gravity field variations modeling, measurement technologies, and the valorization of the results – in scientific fields in collaboration with Earth science laboratories, and on operational issues in close connection with the IGN geodetic and leveling department (SGN).

Activity:

Under the scientific direction of the Research director in charge of physical geodesy at LAREG, the researcher will:

- work on novel high resolution geoid determination methods and on quality assessment of geoid models;
- work on the assessment of the contribution of Earth potential difference direct measurements to the quality of geoid models, in order i) to propose strategies for exploiting past leveling measurements, and ii) to assess the synergy between the measurement of time through optical atomic clock synchronization and Earth gravity field measurements (collaboration with Paris observatory);
- provide the IGN geodetic and leveling department (SGN) with scientific expertise in his research field, and participate to the transfer of novel methods to production lines;
- develop and international activity, in particular through an active participation to the working groups of the International association of geodesy (IAG), e.g. of the sub-commission SC 2.2 (Methodology for Geoid and Physical Height Systems) or SC 2.4 (Regional geoid) of the commission 2 (Gravity field).

In the long term, his research activity may evolve toward research on the contribution of the determination of the gravity field to the one of the International terrestrial reference frame (ITRF): contribution of gravity time series to ground displacement modeling, etc.

Within the frame of his activity, the researcher will also be solicited for punctual missions in his field of competences, concerning either technological transfer or R&D contracts carried by other IGN departments. He may also contribute to education and give lectures, in priority at the National school for geographical information sciences of IGN.

Requirements : the candidate must hold a PhD or justify of an equivalent education level or career (publications, research contracts, teaching, etc.)

Education/Competences: Phd in a field connected to the planned activity (geodesy, physical geodesy, Earth sciences, information processing...), competences in numerical analysis and statistics (geostatistics appreciated), skill in English language sufficient to use English as working language; mastering C/C++ programming language will be highly appreciated; autonomy, rigor, good relationship.

The candidate is expected to propose a research project within the frame of the position; contacting the aforementioned contacts is highly recommended.