



PhD in INGEGNERIA AMBIENTALE E DELLE INFRASTRUTTURE / ENVIRONMENTAL AND INFRASTRUCTURE ENGINEERING - 39th cycle

Research Area n. 3 - Environmental and Hydraulic Engineering and Geomatics

**THEMATIC Research Field: DATA SIMULATIONS AND ANALYSIS FOR THE PREPARATION
OF A FUTURE GRAVITY MISSION EXPLOITING NOVEL MEASUREMENT CONCEPTS**

Monthly net income of PhDscholarship (max 36 months)

€ 1195.5

In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity

Motivation and objectives of the research in this field

The main goal of the research will be the study and exploitation of novel measurement concepts for the determination of models of the Earth gravity field from satellite missions. Besides laser interferometry that will be exploited by the NGGM/MAGIC mission, the high potential of quantum technology will be mainly investigated in view of the missions planned for the next decade.

In particular, one important research project is ongoing on this topic, namely CARIOQA-PMP (Cold Atom Rubidium Interferometer in Orbit for Quantum Accelerometry – Pathfinder Mission Preparation) which is a project funded under the Horizon Europe program, CUP D47G22000170006, G.A. n° 101081775. In this frame, the Ph.D. candidate will cooperate with the POLIMI Satellite Geodesy team with the objectives to consolidate the space-wise approach method and tools and develop and optimise the software devoted to the analysis of cold atom observations in space for the gravity field retrieval.

Methods and techniques that will be developed and used to carry out the research

The Ph.D. student will join the POLIMI team that will exploit its satellite geodesy heritage to carry out the simulations of the mission data necessary for the verifications of the instrumental part, also producing



	<p>estimates of the resolution and accuracy of the gravitational field, based on the instrumental characteristics of Quantum accelerometers, as compared with the “classic” electrostatic ones. Validation of the results will be carried out by comparing the obtained solutions, and verifying the performances of future missions based on Quantum technology as opposed to the ones which are currently obtained by exploiting the “traditional” accelerometers based on electrostatic technology.</p> <p>In this frame, various orbit scenarios will be investigated for a cold atom satellite mission, also taking into account the needs of the scientific users, namely geophysicists, oceanographers and hydrologists. The validation will also include comparisons with the expected performances of the forthcoming NGGM/MAGIC mission, still processing the simulated data with the space-wise approach.</p> <p>The methods applied will be based on simulations of missions in different scenarios, such as GRACE-class constellation, Bender constellation, multiple satellite pairs constellations.</p>
Educational objectives	The main objective is to form scientists or high level technicians capable of dealing with complex problems in the field of physical geodesy, with a particular focus on satellite/space applications.
Job opportunities	Job opportunities can be found as scientists in universities and research centers of geodesy, and high-level technicians for the advanced industry of space technology or generally for small-medium companies requiring knowledge in statistical data analysis.
Composition of the research group	1 Full Professors 2 Associated Professors 2 Assistant Professors 1 PhD Students
Name of the research directors	Federica Migliaccio, Mirko Reguzzoni

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Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents (more than 80Km out of Milano)	--

Scholarship Increase for a period abroad	
Amount monthly	597.75 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information

Educational activities (purchase of study books and material, funding for participation to courses, summer schools, workshops and conferences): the Ph.D. course supports the educational activities of its Ph.D. students with an additional funding equal to 10% of the scholarship, starting from the first year.

Teaching assistantship (availability of funding in recognition of support to teaching activities by the PhD student): Ph.D. students are encouraged to apply, upon prior authorization, to the calls to support teaching activities at the undergraduate and Master levels at Politecnico, being paid for that. The teaching assistantship will be limited up to about 80 hours, maximum half of them devoted to teaching and classroom activities and the rest to support classworks and exams.

Computer availability and desk availability: each Ph.D. student has his/her own computer for individual use. Each Ph.D. student has his/her own desk, cabinet and locker.