

Postdoc position APC-IPGP open at the University of Paris,

LabEx UnivEarthS

We have an opening for a postdoc position in the framework of the LabEx (Laboratory of Excellence) of the University of Paris.

The objective is to conduct theoretical and experimental analyses of the Newtonian (gravity gradient) noise affecting gravity field measurements and associated with atmospheric disturbances and interactions between oceans and solid Earth.

Our groups, APC and IPGP are involved in the detection of gravitational waves (GW) at frequencies higher than 100Hz and of the prompt gravity signal due to earthquake rupture at sub Hz frequencies. We detected for the first time a tiny gravity signal before the arrival of seismic waves during the Tohoku-Oki earthquake (March 11th, 2011, magnitude 9.0) (Montagner et al., Nature Com., 2016; Vallée et al., Science, 2017). While seismic waves propagate in the medium at a rate of a few kilometers per second, the gravitational field is modified almost instantaneously (at the speed of light).

To increase the capability of detection of gravity signals produced by earthquakes, new instrumentation is necessary and requires a dramatic improvement of the signal-to-noise ratio, which is impossible with the present instruments. The development of new sensors will use the sophisticated mechanical and optical devices developed in the astrophysical community for Virgo and LIGO interferometers (which led to the discovery of gravitational waves in 2016, Abbott et al., P.R.L., 2016).

The understanding and the mitigation of Newtonian noise in a very broad frequency range is fundamental for the 3rd generation GW detectors, such as ‘Einstein Telescope’ and for PEGASEWS (Prompt Earthquake Gravity Anomalies and Seismic Early Warning Systems), a planned instrument which aims to detect the prompt gravity signal originated by earthquake, based on concepts arising from GW community.

The origin of Newtonian noise is multiple. In the last decades much was done to understand and model the contribution of microseismic translational noise, the atmospheric Newtonian noise but not the rotational noise.

Newtonian noise gives rise to a gravity signal mixing up with the tectonic prompt gravity signal that we want to detect, or – in case of Virgo- with the GW signals. In order to mitigate the effect of this noise, the detectors will be complemented by an array of seismic and geophysical sensors, which will allow to estimate Newtonian noise and to subtract it from the signal.

The post-doc will study the sources of Newtonian noise by modeling and using existing data recorded around the Virgo interferometer in Pisa and other National Facilities, including local seismic data, microbarometers laser-ring interferometers and high sensitivity strainmeters. The next step will be to use this information to subtract the noise from the relevant signals.

The fellowship is for one year but can be renewed for a second year upon mutual agreement.

Required qualifications: PhD in Physics, Geophysics, or Engineering.

Applicants should submit a cover letter including a statement of interest, a curriculum vitae and the name and address of two persons of reference via email to :

Matteo Barsuglia (APC, barsu@apc.in2p3.fr) and

Jean-Paul Montagner (IPGP, jpm@ipgp.fr).

The position will remain opened until filled.

Thank you for posting this advertisement in your laboratory and sending it to potential candidates.