



ÉCOLE DOCTORALE SCIENCES DE LA TERRE



[Subject offered for a contract starting in September 2012](#)

SUBJECT TITLE: Space weather in the equatorial ionosphere from ground-based and *swarm* magnetic measurements

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Host lab/ Team: **IPGP- Geomagnetism Team – UMR7154**

Financing: **Doctoral contract with or without assignment**

For more information go to <http://ed109.ipgp.fr>, section: *Offres de these (PhD offer)*, You must apply on the Doctoral School website

Presentation of the subject:

The equatorial electrojet is an intense electrical current flowing in the Earth's equatorial ionosphere, around 110 km altitude. It flows eastward, on the dayside of the Earth, and generates a magnetic field of several tens of nT on the ground, within a thin band centered on the magnetic dip equator. Its intensity and time variability provide useful information on the state of the equatorial ionosphere, where instabilities such as plasma bubbles can develop and lead to disruptions of telecommunications and the GPS system.

The goals of the proposed research are: (1) to develop new algorithms providing real-time estimates of the intensity of the equatorial electrojet and the equatorial electric field from a combination of ground based and satellite data; (2) to investigate the possibility of improving the prediction of ionospheric instabilities based upon continuous geomagnetic measurements.

The doctoral student will work with advanced geomagnetic models and geomagnetic data processing tools, available within the IPGP Geomagnetism team. He/she will be expected to develop new processing algorithms in order to efficiently separate the electrojet signal from other time varying signals produced by electrical currents in the Earth's magnetosphere, and to combine ground-based and satellite data into integrated data products.

The ESA *Swarm* mission, to be launched in July 2012, will provide the satellite data for this research. The IPGP Geomagnetism team is heavily involved in *Swarm*, as the scientific team of the ASM instrument and as a member of the international consortium providing level 2 data products. Two level 2 data products developed by IPGP are directly relevant to the proposed thesis topic: a global ionospheric field model and an orbit-by-orbit determination of the equatorial electric field in the equatorial region.

In addition, the IPGP maintains several magnetic stations and observatories in the equatorial region: in Mali, Ivory Coast, Ethiopia and Vietnam (see www.bcmf.fr). New stations are to be installed in Djibouti and Cameroun in 2012. This unique observational capability will soon make it possible to monitor in real-time the state of the equatorial ionosphere in Africa and Southeastern Asia.

The proposed thesis is part of a wider research project involving IPGP and NOAA / University of Colorado scientists. This project was recently selected by ESA following its “*Swarm* Science and Validation Opportunity” call for proposals.