Job Title	Geophysical imaging and joint inversion
Main Research Field	Environment and Geosciences (ENV)
Sub Research Field	Geophysics
Key words	Global geophysical imaging, electromagnetism, space magnetism, planet exploration, electrical conductivity, 3-D inversion, joint inversion
Job Summary	The purpose of global 3-D electromagnetic induction inversion of natural electromagnetic fields measured near or on telluric planets is to infer the 3-D distribution of electrical conductivity in the Earth down to mantle depth which in turns provides insight on the thermodynamical processes at work in the planet mantle. Inversion algorithms are now available and tested either on earth with real observatory data or on synthetic satellite data. The applications to real satellite data (such as the Swarm constellation https://www.esa.int/Our_Activities/Observing_the_Earth/Swarm) encounter difficulties due to limited knowledge to characterize the inducing field and the awkward acquisition mode (magnetic time series sample both time and space) with regard to ordinary processing techniques of fixed magnetic observatory. For the internal induction community, the challenge is to extract from the reduced data (that is the static global and lithospheric field have been removed) the tiny induced magnetic field arising from 3-D structures in the planet mantle from a transient field controlled by interplanetary, magnetospheric and ionospheric magnetic sources.
	Even more challenging is the work on magnetic data from satellite having orbited or orbiting other planets of our solar system (Moon, Mars, Mercury). Some preliminary work showed that the analysis of the induction process may be observed un those data which may provide unvaluable informations on the electrical conductivity of their mantle.
	The proposed Marie- Curie fellowship aims at work on satellite magnetic data to extract the induction field that may be modeled to infer the planet structure.
	Depending on the fellow interest (global study of the earth or planetary investigation), he/she will work on available satellite data and explore new avenues to process them, in particular accounting for realistic source field models. Alternatively, global induction in the earth can be addressed using magnetic observatory data that can be associated with global seismological and petrological models to inverse them with constraints. Thus the interested fellow may also work on joint inversion techniques at the global scale.
Job detailed information	Different options are proposed : - SWARM magnetic data processing with external magnetic source constraints - Moon (Kaguya), Mars (MGS, Maven), Mercury (Messenger) data processing and interplanetary models constraints - Joint global geophysical inversion of earth magnetic data with seismological and petro-physical models

Supervisor(s)	Pascal Tarits, Ph.D, Professor of Geophysics at University of Western Brittany, France, since 1993. Head of laboratory, vice chair of institute and chair of international induction working group of IAGA, Specialist in electromagnetic induction in the earth, special interest for 3D MT inversion, joint inversion, global electromagnetic imaging of earth and planet mantles. PI and coI of space projects (Ampere from CNES), Co-funder of two companies IMAGIR sarl and MAPPEM Geophysics SAS. Civet, F. & Tarits, P., 2013. Analysis of magnetic satellite data to infer the mantle electrical conductivity of telluric planets in the solar system, Planet. Space Sci., 84, 102–111. Civet, F., and P. Tarits (2014), Electrical conductivity of the mantle of Mars from MGS magnetic observations, Earth Planets Space, 66(1), 85, doi:10.1186/1880-5981-66-85. Tarits, P. Tri-Dimensional Inversion of satellite magnetic data for induction studies, 2Nd Scientific SWARM meeting, 2006, p. Tarits, P., & Mandea, M. 2010. The heterogeneous electrical conductivity structure of the lower mantle. Phys. Earth Planet. Int., 183, 115–125.
Department/ Lab :	*National/international projects ?* Global studies are international, based on global scale and multi country and institution data acquisition. Whatever the topic developped in this fellowship, the fellow will be in close contact with international institution and laboratories
Suggestion for interdisciplinary / intersectoral secondments	The fellow will joint the programs in charge of the data and the laboratories working on them
Skills Requirements (optional) :	*Skill Specific Requirements* Global geophysics and associated mathematical tools is expected to be mastered. Experience in large data set processing appreciated. *Required Languages:* Fortran 90 useful *List of Publications: recommended at least 1 per year since the PhD in 1st author*