

# PhD Opportunity

**Deadline for applications: 29/10/2018 (15:00 CET)**

<b>Title of the topic</b>	<b>Modelling and measuring geomagnetically induced currents (GIC) and their sources in Iberia.</b>
<b>Host institution</b>	<b>Observatori de l'Ebre - Ramon Llull University.</b> <i>Roquetes (Tarragona Province), Spain.</i> <a href="http://www.obsebre.es">http://www.obsebre.es</a> - <a href="http://www.url.edu">http://www.url.edu</a>
<b>Advisors</b>	Dr. J. Miquel Torta (Observatori de l'Ebre-URL) Dr. Santiago Marsal (Observatori de l'Ebre-URL)
<b>Financial Framework</b>	<i>Ayudas para contratos predoctorales para la formación de doctores 2018. Programa Estatal de Promoción del Talento y su Empleabilidad en I+D+i. Subprograma Estatal de Formación.</i> Spanish Ministry of Science. <ul style="list-style-type: none"> <li>• <b>The call is open and the deadline is October 29th.</b> - <a href="#">Access to the call's website.</a></li> <li>• The position is for a maximum of 4 years.</li> <li>• Expected annual gross salary: <b>16.420 €.</b></li> <li>• The funding also includes the tuition fees for the doctoral studies in the Observatori de l'Ebre (<a href="http://www.obsebre.es/en/phdprogram">http://www.obsebre.es/en/phdprogram</a>) and some money for visiting other research centers.</li> <li>• The funds are linked to the <b>IBERGIC project.</b></li> </ul>
<b>Profile of applicant</b>	The candidate must have a M.Sc. or equivalent degree in Physics, Geophysics, Civil Engineering or similar. <ul style="list-style-type: none"> <li>• Experience in scientific programming with Matlab (or similar analyzing programming languages, such as FORTRAN, Python or R).</li> <li>• Excellent communication skills, including writing, and the ability to work in a team and individually with passion, dedication and integrity.</li> <li>• Good proficiency in the English language.</li> </ul>
<b>Description of the topic</b>	The student will work to achieve the following objectives: <ul style="list-style-type: none"> <li>• Spatio-temporal characterization of the sudden commencements of geomagnetic storms. To advance in the understanding of the morphology and temporal evolution of electrical current systems both in the near-Earth space and</li> </ul>

	<p>in the upper atmosphere that generate severe geomagnetic sudden commencements (SC).</p> <ul style="list-style-type: none"> <li>• Development of a methodology for the indirect measurement of GIC. It will be based on the monitoring of the magnetic field generated under certain power transmission lines previously chosen, which may be validated by the measurements made in the neutrals of transformers in the nearby substations.</li> <li>• Improvement of the modelling of GIC by integrating the geophysical models and the power grid models. The purpose is to obtain vulnerability maps of the power grid considering different scenarios and to identify critical aspects in the infrastructure.</li> </ul>
<b>Description of the project</b>	<p><b>Holistic characterization of GIC in the Iberian peninsula: from the analysis of magnetospheric and ionospheric currents to the influence of the lithosphere (IBERGIC)</b> <b>CGL2017-82169-C2-1-R</b></p> <p>By means of a multidisciplinary approach, this project aims at addressing the characterization, in the Iberian Peninsula, of one of the main ground effects of space weather on Earth: that derived from what are known as geomagnetically induced currents or GIC. These currents are produced in long terrestrial conductors as a result of geomagnetic storms, and may affect pipelines, railways and power supply, the critical infrastructure from which society has become more dependent. The main challenge of the proposal is to analyze and characterize the magnetosphere-ionosphere-earth electromagnetic coupling and to improve the accuracy of the vulnerability map of the Spanish high voltage power transmission network in front of the GIC. To do this, i) we will characterize the magnetospheric and ionospheric sources that generate the greatest GIC and how they are related to coronal mass ejections and solar flares, as well as the solar wind velocity, the incidence angle and the local time when the compression magneto-hydrodynamic wave reaches the Earth; ii) a geoelectric model will be determined on a lithospheric scale in the Iberian Peninsula to predict how the 3D structure of subsurface resistivity and network topology affect GIC; and iii) GIC intensities at critical locations will be obtained in a non-invasive manner, i. e., without interfering with the operations of the network or power plants. Improving GIC estimation by integrating geophysical models and transmission grid models will enable accurate mapping of</p>

	<p>geoelectric field variations and vulnerability maps of the power grid. These maps will allow the power grid operators to design strategies of resilience and mitigation of impacts considering different scenarios and also to identify critical aspects in the infrastructure, with the corresponding economic and social benefit at national level. The 3D model of electrical resistivity of Iberia, which will be obtained by integrating previous magnetotelluric soundings and new data through the surveys planned in this project, will be the first reference map, will serve as a basis for subsequent geophysical studies and will be an indispensable contribution for all international projects in this area. Finally, the contribution to the knowledge of this natural hazard, as well as its diffusion to the society, will generate a real and founded perception of its vulnerability and will allow taking the appropriate measures on a founded basis.</p>
<b>Application</b>	<p>The application process is managed by the Spanish Ministry of Science.</p> <p><b>All the details can be found on the <a href="#">call's website</a> (in Spanish only).</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Information on the application process</a>.</li> <li>• <a href="#">Guide for applicants</a> (PDF).</li> <li>• <a href="#">Legal text of the call</a>.</li> </ul> <p>It is very important that the candidates follow the Ministry's guidelines and prepare the necessary documentation in the right format and follow all the steps of the electronic application process. In the application the candidate must select the project <b>CGL2017-82169-C2-1-R</b> "Caracterización holística de las GIC en la península ibérica: del análisis de corrientes magnetosféricas e ionosféricas a la influencia de la litosfera (IBERGIC)".</p> <p><b>The application must be signed with a legally valid electronic signature. It can also be signed by hand, but in this case it must be presented in a valid registry.</b> In Spain this can be done at the post office (<b>Correos</b>) but if you apply from a foreign country you must present the documents at the <b>Spanish Consulate or Embassy</b>.</p>
<b>Contact</b>	<p>For any enquiry, please contact Dr. J. Miquel Torta (<a href="mailto:jmtorta@obsebre.es">jmtorta@obsebre.es</a>) or Dr. Santiago Marsal (<a href="mailto:smarsal@obsebre.es">smarsal@obsebre.es</a>) adding IBERGIC-FPI to the subject line.</p>

