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Dipartimento di  
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# PhD Program in Space Science and Technology - SST

## Solar wind - magnetosphere - ionosphere interaction in terms of GIC Hazard during the passage of Interplanetary shock

Specific Seminar – Curriculum 2 - April 16, 2025, 2.30 p.m.

### Speaker:

**Prof. Mirko Piersanti** – Department of Physical and Chemical Sciences, University of L'Aquila

### Abstract:

The impact of the interplanetary shock and of the Coronal Mass Ejections (CMEs) on the Earth's magnetosphere perturbs the geomagnetic field causing the occurrence of geomagnetic storms. Such extremely variable geomagnetic fields trigger geomagnetic effects measurable not only in the geospace but also in the ionosphere and at the ground. The rapid variations of the geomagnetic fields during geomagnetic storms generate intense geomagnetically induced currents (GICs). In recent years, GIC impact on the power networks at middle and low latitudes has attracted attention due to the expansion of large-scale power networks into these regions. This work presents a new model, called MA.I.GIC. (Magnetosphere - Ionosphere - Ground Induced Current) model, to derive the geoelectric field used to determine the magnitude of GICs. In addition, the results of the MA.I.GIC. model applied to the September 2017 Geomagnetic Storm is discussed, with particular focus on the two sudden impulses occurring on September 6 and 7, 2017, and the two main phases on September 7 and 8, 2017. The study also indicates that the eastward component of the geoelectric field is dominant for low-latitude locations during the Storm Sudden Commencements related to the impact of the interplanetary shock preceding the interplanetary CME. For some magnetotelluric station the availability of the electric field measurements allowed a direct comparison with the predicted geoelectric field. For these cases we obtain correlation coefficients as high as 0.92 and 0.95.

### Short bio:

**Mirko Piersanti** is an Associate Professor in the Department of Physical and Chemical Sciences at the University of L'Aquila, with over twenty years' experience in the study of space weather processes and magnetosphere–ionosphere–lithosphere coupling. He coordinates Italy's participation in the **Sino-Italian CSES-Limadou** mission, leading the **LiMIC group** and contributing to the development and validation of the electric and magnetic field instruments on board the CSES-01 and CSES-02 satellites. His scientific work has produced pioneering results, including the first analytical model of lithosphere–ionosphere–magnetosphere coupling during an earthquake and the first global geoelectric field model for calculating induced currents on the ground in the context of space weather. He is the author of over 90 articles in international journals and plays an active role in the scientific community as a reviewer, editor and member of AGU, IAGA, EGU and ESWW. In 2025, he founded **S.W.A.P. – Space Weather and Atmospheric Physics**, the first Italian degree course entirely dedicated to Space Weather.

### Online attendance:

Information on remote participation can be requested by sending an e-mail to [dn\\_sst@unitn.it](mailto:dn_sst@unitn.it)

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