

Scanning the crust with magnetospheric currents

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Solar activity is the main driver for a number of electromagnetic effects at the Earth's surface, as e.g. geomagnetically induced currents (GIC) in power grids. With the aim to assess the geomagnetic hazard to power systems in Portugal mainland, we start, in this study, by separating different magnetospheric contributions at the time of the most intense geomagnetic storms measured at the Coimbra magnetic observatory (COI) during solar cycle 24. We identify zones on the local crust that are sensitive to each particular source and compute a chart of the induced electric fields that can drive GIC currents in the crust and in the power lines.

Different steps include i) modelling and separating the ionospheric contribution using principal component analysis; ii) using Tsyganenko and Sitnov TS04 model to identify different magnetospheric contributions in the geomagnetic storms signal; iii) using magnetotelluric resistivity models for the local crust/mantle in the computation of electric field charts.