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On the possible magnetospheric and ionospheric sources of the geoelectric field variations during the May 2021 Geomagnetic storm.

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The space environment near Earth is constantly subjected to changes in the solar wind flow generated at the Sun. Examples of this variability are the occurrence of powerful solar disturbances, such as coronal mass ejections (CMEs). The impact of 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, upper atmosphere, and on the ground. For example, during extreme events, rapidly changing geomagnetic fields 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 the analysis of the geoelectric field determined by the use of the MA.I.GIC. (Magnetosphere - Ionosphere - Ground Induced Current) model, on May 12, 2021 Geomagnetic Storm over the northern hemisphere. In addition, we discriminate between the ionospheric and magnetospheric origin contribution on the geoelectric field in Europe and on the Northern America in order to evaluate their relative contribution to the GIC amplitude.