

# Features and Source Current of the Ground Induced Geoelectric Field During Magnetic Storms

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Geomagnetically induced currents (GICs) is a space weather driven phenomena, which could be a threat to the power grid. The maximum disturbance and its direction of the ground induced geoelectric field during magnetic storms are key problems of the ground hazard of space weather.

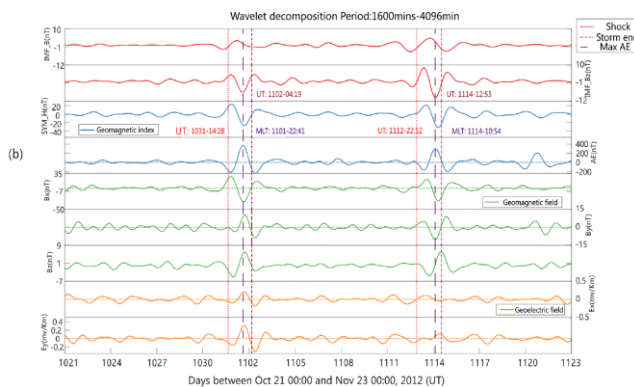
This work studies the ground induced geoelectric field disturbance during magnetic storms. The geomagnetic field and geoelectric field measured by Changchun Observatory and Beijing Observatory enrolled in Chinese Meridian Project, and by Kakioka Magnetic Observatory in Japan are studied. Space Weather Modelling Framework is adopted to calculate the global geomagnetic field disturbances and the contribution from different current systems. In one case study, weaker magnetic storm generates stronger geoelectric disturbances at the same observatory. The disturbance of the eastward component of the geomagnetic field, which is generated mainly by the

field-aligned current at different magnetic local time, significantly changes the magnitude and direction of the induced geoelectric field via the underground electric impedance tensor. In another case study, the maximum disturbance of the ground induced geoelectric field occurred in the initial phase of the magnetic storm rather than in the main phase. The modelling shows that the field aligned current contributed to the sudden jump of geomagnetic field and thus the maximum disturbance of geoelectric field. Therefore, both the effects caused by ring current and field-aligned current during magnetic storms should be considered in analyzing the ground induced geoelectric field.

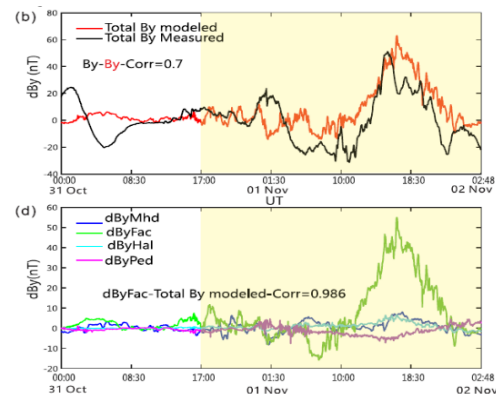
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## References:

- [1] Wu, Yao\*, et al., Space Weather, 2020
- [2] Wang, Yao\*, Wu, et al., in prep. 2025



**Figure 1.** Ground induced geoelectric field determined by the eastward geomagnetic field disturbance.



**Figure 2.** Disturbance of eastward geomagnetic field mainly contributed by field-aligned current