日本における地磁気誘導電流災害ハザードマップ

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A hazard map for the geomagnetically induced current disaster in Japan

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Recently, potential risk of the geomagnetically induced currents (GICs) which happen to cause large-area power line failure has been reported frequently by Japanese mass media. Japanese government (Ministry of Economy, Industry and Trade) also reported importance of GIC risk assessment in Japan. Responding to the circumstances, scientists of SGEPSS should work out to meet such demand from Japanese society. To perform the risk assessment, we need to investigate two issues at the same time. The first is to estimate magnitude of extremely severe space weather events and the second is to evaluate in a realistic way the GICs in Japan. The first issue is pursued by many scientists all over the world (e.g., Tsubouchi and Omura, 2007). Recently, Baker et al. (2013) reported an extremely large solar flare in 2012 which possibly causes geomagnetic disturbances comparative to the Carrington storm in 1859. On the other hand, the second issue has not been studied so intensively yet. In the talk, we present a map of the geomagnetically induced electric field (GIE) induced by the circular source current with unit intensity in the magnetosphere based on a 3D resistivity distribution estimated from the bathymetry data and sediment layer data. As the GIE depends on inclination of the current circle in the magnetosphere, we obtain local maximum of the GIC by changing inclination of the source current. Thus, by superposing the local maximums, we obtain a map indicating the regions with high risk of the GIC accident. Thus, this map is so-called the hazard map for disasters caused by GICs.

We also obtain the geomagnetic variations on the ground with a realistic resistivity distribution. The geomagnetic variations consist of direct magnetic signatures from the magnetospheric current and the induced magnetic variations by a heterogeneous Earth's resistivity. This information will be useful to investigation of the surface geomagnetic variations.

References

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