

A modeling of Geomagnetically Induced Currents in Midlatitude Regions

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We have simulated an electromagnetic field to reproduce Geomagnetically Induced Currents (GIC). GIC are induced along an electrical conductor on the ground from electric fields generated by an ionospheric current, and are serious threat to a power grid system. The generation of GIC depends on the geomagnetic latitude, the current system, and the structure of a stratum and the topology of the electrical conductor. We use the exact method offered by Hakkinen et al., which can take into account the above-mentioned factors, for the sake of reproducing GIC at a transmission network. By this method, the intensity of GIC is calculated as a function of the parameters of the ionospheric currents and the earth, i.e. height, density, frequency of the ionospheric currents, as well as magnetic inclination, magnetic declination and its distribution. We calculate an electromagnetic field for GIC by various parameters of the ionospheric current, and clarify which parameters affect the intensity of GIC. As a result, we find that the height and the frequency of the ionospheric currents greatly influence the intensity of the electromagnetic field and GIC. We also find that the magnetic declination and the magnetic inclination and declination because of the field aligned currents. In the presentation, we discuss the factors that affect GIC and adversely affect infrastructure systems at mid-latitudes including Japan.