R010-15
A 会場 ：9/25　AM1 （9:00-10:30）
9:15〜9:40

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Modeling of Geomagnetically Induced Current (GIC) in Japan assuming various three-dimensional ground inhomogeneities

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We modeled the time series of geomagnetically induced currents (GICs) flowing in the Japanese 500 kV power grid. The three-dimensional distribution of the electric field was calculated using the finite-difference time-domain (FDTD) method. A three-dimensional electrical conductivity model was constructed from a global relief model and a global map of sediment thickness. First, we imposed a uniform sheet current at 100 km altitude to illuminate the influence of the structured ground conductivity. The simulation result shows that geomagnetically induced electric field (GIE) exhibits localized, uneven distribution that can be attributed to charge accumulation due to the inhomogeneity below the Earth's surface. The charge accumulation becomes large when the conductivity gradient is parallel to the incident electric field. Using the uneven distribution of GIE, we calculated the GICs flowing in a simplified 500 kV power grid network in Japan. The influence of the structured ground conductance on GIC appears to depend on a combination of the location of substations and the direction of the source current. Uneven distribution of the power grid system gives rise to intensification of the GICs flowing inremote areas where substations/power plants are distributed sparsely. Secondly, we used the equivalent current inferred from the ground magnetic disturbance for some magnetic storms. We show the sensitivity of the GIC magnitude on the three-dimensional ground inhomogeneity.