

SEM037-P02

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## Characteristics of frequency transfer function between electric field and ground velocity for natural earthquakes

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Several mechanisms have been proposed to account for electromagnetic field variations associated with earthquakes, but most of them are insufficient in explaining characteristic variations observed at the time of seismic-wave arrival. A new mechanism called the seismic dynamo effect has been attracting considerable attention. It claims electric field generation due to the resonance-like motion of ions contained in groundwater excited by seismic wave under the Earth's magnetic field. Although this mechanism is found to be successful in explaining an observational feature of circular polarization of horizontal electric field variation (Honkura et al., 2009), more convincing evidence is still required. For verification of this mechanism, we analyzed data acquired for earthquakes in the vicinity of Wakuya in 2009 and 2010, aftershocks of the 2007 Noto Hanto Earthquake, and aftershocks of the 2008 Iwate-Miyagi Nairiku Earthquake, in terms of transfer functions between the ground velocity as the input and the electric field as the output. To estimate transfer functions, we used data recorded by a short-period seismometer of velocity type and two pairs of Pb-PbCl<sub>2</sub> electrodes with data loggers. The sampling rate was 200 Hz. The dipole length was in the range between 15 m and 20 m in both the NS and EW directions.

In the case of aftershocks of the 2007 Noto Hanto Earthquake, we stacked transfer functions for five aftershocks, and then clear peaks appeared at frequencies lower than expected from the mechanism. This result made us realize the necessity of considering the boundary condition at the ground surface. The electric field generation in this case stems from three ions in groundwater: HCO<sub>3</sub><sup>-</sup>, Cl<sup>-</sup> and Na<sup>+</sup>. In the case of earthquakes in the vicinity of Wakuya in 2009 and 2010, we estimated the averaged transfer function from 19 datasets. Although the result turned out to be unclear, we could interpret it in terms of the same mechanism operative in a deep groundwater layer together with the ground. However, a problem of anisotropy still remains. On the other hand, stacking of transfer functions for 19 traces from 16 aftershocks of the 2008 Iwate-Miyagi Nairiku Earthquake yielded smoother transfer functions, but definitive characteristics were not found, although some groundwater layers seem to be responsible for complicated characteristics, particularly at frequencies higher than 22 Hz.

Keywords: the seismic dynamo effect, electric field variation, earthquakes