



## **Atmospheric electricity variation induced by electrical earth potential difference variation during seismic wave propagation**

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Phenomena that are coincident with earthquakes and those associated with seismic waves (co-seismic electromagnetic phenomena) are identified with its origin time and its P or S wave arrival time, respectively. Although electromagnetic variations that are associated with seismic wave propagation are important for clarifying the relationship between earthquakes and electromagnetic phenomena, few detailed observations have been reported. To clarify the relationship between earthquakes and electrical phenomena, signals of three parameters - ground acceleration, earth potential difference (EPD) and atmospheric electricity (AE) - were observed continuously at Sennan in Akita Prefecture, Japan. A large metal plate is used as an electrostatic electrode to observe AE variation. In this measurement, to reduce effects of earth current noises as much as possible, we measured EPD signals between vertically separated underground points rather than horizontally separated ones. The advantage of this technique is that electric currents do not influence the measurement because natural and artificial earth currents mostly flow horizontally. For each of three strong earthquakes in 2003 in Miyagi Prefecture and Hokkaido far from our site, we observed signals of EPD and AE variation that might be attributable to ground surface charges. However, the observed signals are synthesized with small co-seismic signals and large background signals. Then, to detect co-seismic signals clearly from the original observation signals we adopt the signal analysis using the Natural Observation Method. Applying this method to the observed EPD and AE variation signals can discriminate weak variation signals clearly. Thereby, we can demonstrate the existence of fluctuations of the EPD and AE signals accompanying seismic wave propagation. These results indicate the close relationship between earthquake phenomena and electrical ones. That is, the ground acceleration causes the EPD variation; then the EPD variation induces AE variation.