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Numerical model for SES Selectivity of Izu earthquake swarm

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There are numerous reports on geoelectric changes prior to earthquakes. The so-called seismic electric signal (SES), which is a kind of precursory geoelectric potential changes, has been applied to short-term prediction of earthquakes in Greece. This approach is known as the VAN (Varotsos, Alexopoulos, and Nomicos) method. There have been, however, some active debates on this method, mainly including the physical generation mechanism of SES and the selectivity phenomenon of SES. In this study, we will focus on the SES selectivity.
Some laboratory analog experiments based on a geographical scaling model and a waveguide model were developed to simulate the propagation of seismic electromagnetic signals. These experimental results showed that the geographical effect such as the distribution of ocean and land may lead to some aspect of the selectivity phenomenon. Some analytical and numerical works based on a conductive channel model were also presented as an explanation of the SES selectivity. However, due to the limitation of the software they used in their numerical simulation, whether or not their conclusion holds for a more realistic 3D model deserves further investigation.
As a case study on the 2000 Izu earthquake swarm, we made a numerical simulation based on a 3 D finite element method (FEM) and investigated the possible electric field response to the model parameters. Our numerical results indicated that the existence of conductive channel under Niijima island could explain the reported SES selectivity prior to the Izu earthquake swarm.
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