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A numerical evidence for SES Selectivity of the Izu earthquake swarm

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Although seismic electric signals (SES) has been reported independently and even been applied to short-term prediction of earthquakes, selectivity of SES, one of the mysterious problems, is still on great debates. In order to explain 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 the selectivity phenomenon of SES. Some analytical and numerical works based on a conductive channel model were also presented as an alternative 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 more realistic 3D finite element method (FEM) and investigated the possible electric field response to the model parameters. Our numerical results indicated that the surface inhomogeneity of resistivity, as well as the possible underground conductive channel at the Niijima island could be a plausible explanation of the reported SES selectivity prior to the Izu earthquake swarm. This study provides a numerical evidence of the SES selectivity and may strengthen further study on the debated SES selectivity.
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