Shear wave splitting caused by triggered seismicity near the Moriyoshi-zan volcano in the Akita Prefecture, northeastern Japan

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We measured shear wave splitting parameters from earthquakes near the Moriyoshi-zan volcano in the Akita Prefecture. Seismic activity in the area was triggered by the 2011 Off the Pacific coast of Tohoku Earthquake, and is characterized by long duration more than four years, migration of hypocentral location, and distinct scattered waves that appear after S-wave, which suggests the contribution of geofluid to seismogenesis. We analyzed seismograms of more than 2000 earthquakes observed at two temporary stations near the source area of triggered seismicity. The splitting parameters obtained by the analysis are the polarization of fast S-wave and the delay time between the fast and slow waves. We used a grid search to find the parameters that give two identical pulses with orthogonal polarization, one delayed with respect to the other. The result shows clear difference between two stations. The polarization is NW-SE and the delay time is around 0.015 s at a station located just above the earthquake cluster (Moriyoshi station). On the other hand, the polarization is nearly N-S and the delay time is close to 0 s at a station situated about 5 km to the north of the cluster (Array station). Rose diagrams of polarization and histograms of delay time show the difference between the two stations is significant. The slitting parameters at the Array station have a common characteristics to a permanent station located about 10 km WSW of the cluster. Because the ray paths to the Moriyoshi station traverse the source location of triggered seismicity, the anisotropy observed at the station is probably caused by the seismic activity of triggered earthquakes. We then investigated temporal variation of the splitting parameters to find no significant change in delay time, but slight change in polarization. Since we started the temporal observation about 16 months after the initiation of triggered seismicity, we cannot specify the time when the anisotropic feature was formed. One possible scenario is that the fracturing at the early stage of triggered seismicity resulted in the formation of anisotropy.

Keywords: shear wave splitting, anisotropy, triggered seismicity

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