Onshore temporal aftershock observation for the 2019 Yamagata-Oki earthquake (2)

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On June 22 (JST), a M6.7 earthquake occurred off Yamagata Prefecture in NE Japan. This Yamagata-Oki earthquake is located within the East Margin of the Japan Sea (EMJS) strain/deformation concentration zone.

To obtain more reliable aftershock distribution of the 2019 Yamagata-Oki earthquake, we deployed temporal seismic stations. It began about two days after the earthquake. We used the double-difference tomography method (Zhang and Thurber, 2003, 2006) for relocation. Initial velocity structure is from Okada et al. (2015).

We can see major eastward-dipping alignment with a dip angle of 30 degrees. In southern area of aftershock area, aftershock distribution seems to be complex and we can see westward-dipping alignment with a dip angle of about 60 degrees.

Focal mechanism of the 2009 Yamagata-Oki earthquake is reverse-type with P-axis oriented NNW-SSE by F-net_NIED and JMA. One of nodal planes is eastward dipping with a dip angle of about 30 degrees, and anothers is westward dipping with a dip angle of 60 degrees. These nodal planes of focal mechanism seem to correspond well with the aftershock distribution.

We also obtained focal mechanisms of aftershocks. Stress inversions (Tagami et al., this meeting) from the earthquakes surrounding the focal area in this study and other previous studies (e.g. Terakawa and Matsu’ura (2010)) show almost pure reverse faulting with a sigma-1 axis oriented to “WNW-ESE”.

We analysed shear wave splitting (polarization anisotropy) using data from the temporal and routinely operated stations (cf. Mizuta et al., this meeting). The method we have deployed was MFAST (Savage et al., 2010). Results at some of the stations shows polarization azimuth of fast shear wave (PAFS) is oriented to WNW-ESE, which corresponds to the sigma-1 axis orientation. Results at the other stations shows polarization azimuth of fast shear wave is oriented to about N-S. The N-S oriented anisotropy would be interpreted as the structure-controlled anisotropy caused by faulting and deformation, mylonitazed rock near the station.

In conclusion, the 2019 Yamagata-oki earthquake is an reverse-fault earthquake in very complex crustal structure formed in a long time range.

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