

Seismic activity of the off-Yamagata Earthquake in 2019 and crustic movement of the NorthEast Honshu Arc

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A large earthquake 6.7 Mj(according to JMA), called the Yamagata-ken Oki jishin (Yamagata Offshore Earthquake), occurred on 18th June 2019 at 22:22 JST, offshore of Yamagata Prefecture, northwest Japan. There is few human damage luckily, but damage of less than 800 houses occurred near the epicenter around the border of Yamagata and Niigata Prefectures.

Maximum seismic intensity is 6 upper in northern margin of Murakami City, Niigata Prefecture and the second largest seismic intensity if 6 lower in southern margin of Tsuruoka City, Yamagata Prefecture. According to JMA Estimated seismic intensity map. Seismic intensity decreases as moving farther away from the epicenter.

Focal mechanism of Yamagata Offshore Earthquake in 2019 is derived by JMA (2019) as that strike of both nodal planes is NNE-SSW, and one of the nodal plane dips westward steeply and the other dips eastward gently. According to the distribution of aftershocks, the fault plane causing the earthquake corresponds to the nodal plane dipping eastward gently. This indicates that the landward hanging wall run onto the seaward footwall.

There are two mountain ranges along the arc in the Northeast Japan Arc; namely Ou Mountains on the axis of the arc and Dewa Hills along the Japan Sea. and there are seven mountain ranges running orthogonally to the ranges along the arc. Basement rocks as granitic rocks and active volcanoes often appears on the ranges of both directions. These geological features indicate that the ranges of both directions are actively uplifting and the movement of the ranges are driven by the magmatic activity in the crust or the upper mantle. Magmatic activity under the ranges are also provided by the seismic tomography (Hasegawa and Nakajima, 2009).

The Yamagata Offshore Earthquake in 2019 occurred on the anterior position of the orthogonal mountain ranges. This means that the fault movement causing the earthquake is driven by sagging seaward of the end of uplifting mountain ranges.

References:

HASEGAWA Akira and NAKAJIMA Junichi (2009) Deep Structure of the NE Japan arc and Its Implications for Tectonic Movement. Earth Science (Chikyu Kagaku), 63, 201-210.

JMA (2019) Monthly report of earthquake and volcanoes in Japan, June 2019.

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