Seismic velocity structure along the source fault of the 2024 Noto Peninsula Earthquake and aftershock distribution compared with the fault model

*Makoto MATSUBARA[1], Hiroshi Sato[2]

1. National Research Institute for Earth Science and Disaster Resilience, 2. Earthquake Research Institute, the University of Tokyo

On the New Year’ s Day the 2024 Noto Peninsula earthquake with MJMA 7.6 occurred. We compared the The Project on Earthquakes and Tsunamis in the Japan Sea (Japan Sea project) modeled the source faults around the Noto Peninsula (Sato et al., 2021). We relocate aftershocks with the three-dimensional (3D) seismic velocity structure (Matsubara et al., 2022) and compared with the source fault model. We also considered the relationship between the backarc rift beneath the Toyama Trough and the source fault of the Noto Peninsula earthquake in terms of the 3D seismic velocity structure.

We used the 3D seismic velocity structure using the arrival time data from the natural sources as well as the those from the air gun survey. The horizontal resolution is 0.2˚ (approximately 20 km). We relocated aftershocks with these 3D Vp and Vs structures. The mainshock is located on the fault named as NT5 on the northern side of the Noto Peninsula and aftershocks with NE dipping are active just after the mainshock on the fault named as NT6 along the Noto Peninsula on the west side of the NT5 fault. Aftershocks with NW dipping began to occur half an hour after the mainshock on the faults named as NT2 and NT3 on the east side of the Noto Peninsula. The estimated dip angles of these faults are 50-60˚ in the Japan Sea project, however, the dip angles of the distribution of aftershocks are 20-45˚.
We imaged the seismic velocity structure along the source fault of the Noto Peninsula earthquake (Asano et al., 2024). They estimated that two events occurred with the interval of 13 seconds. We imaged the velocity structure along the source fault of the first event along the Noto Peninsula on the northern side of the peninsula. The coseismic slip is extremely large at the shallow region at the western edge of the source fault. The P- and S-wave seismic velocity structure is low on the eastern part of the source fault, however, those are very high on the western part of that. The shallow zone is easy to deform owing to the high Vp/Vs and the deeper zone is difficult to deform owing to the low Vp/Vs. The large slip occurred at the zone with the high velocity and high Vp/Vs.
High-Vp lower crust along the Toyama Trough on the south side of the Noto Peninsula is notable and estimated as the backarc rift formed at the opening of the Japan Sea (Ishiyama et al., 2017). The long and large precursor swarm from the December 2000 before the Noto Peninsula earthquake began at a depth of 20 km at the southern part of the Peninsula (Yoshida et al., 2023) and crustal structure impose the backarc rift is related with the supply of the fluid.

Keywords: the 2024 Noto Peninsula Earthquake, source fault, seismic tomography, backarc rift

