Slip Distribution of the 2024 Noto Peninsula Earthquake by Joint Inversion of Tsunami Waveform and GNSS Data

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The Noto Peninsula earthquake (M_{JMA} 7.6) that occurred on January 1, 2024 caused strong seismic motion, large-scale crustal deformation, and a tsunami, resulting in significant damage in the region. Offshore submarine active faults and some inland active faults have been identified around the Noto Peninsula in past projects: "Investigative Commission on Large-Scale Earthquakes in the Japan Sea (MLIT)" by Ministry of Land, Infrastructure, Transport and Tourism (MLIT), Cabinet Office, and Ministry of Education, Culture, Sports, Science and Technology (MEXT), and "Japan Sea Earthquake and Tsunami Research Project (JSPJ)" by MEXT. We jointly inverted the tsunami waveform data recorded on six wave gauges and 12 tide gauges along the Japan Sea coast and GNSS data recorded at 53 stations in and around the Noto Peninsula to estimate the slip distribution and seismic moment for each active fault model. The estimated slips of the 2024 earthquake were 3.5 m, 3.2 m, and 3.2 m for the NT4, NT5, and NT6 subfaults of the JSPJ model, which are located on the north coast of the Noto Peninsula and dip to the southeast. On the other hand, the slip was as small as 1.0 m for NT8 subfault, which is at the southwest end of the 2024 source region. This may be because the fault was ruptured by the Off Noto Peninsula earthquake in 2007. The total length of these four faults is about 100 km, and the seismic moment is 1.9 $\times 10^{20}$ Nm (Mw=7.5). Aftershocks, including M_{JMA} 6.1, occurred in the NT2–NT3 area, but the slip amount during the mainshock was small (about 0.4 m). These faults have the potential to generate larger earthquakes (Mw 7.1 or so) and associated tsunamis. The MLIT model shows a similar trend, with only F43 along the northern coast of the Noto Peninsula being ruptured in 2024, while F42 in the northeast was not ruptured, leaving the potential for future events.

Keywords: Noto Peninsula earthquake, Active faults, Tsunami, GNSS, Joint inversion, Slip distribution

