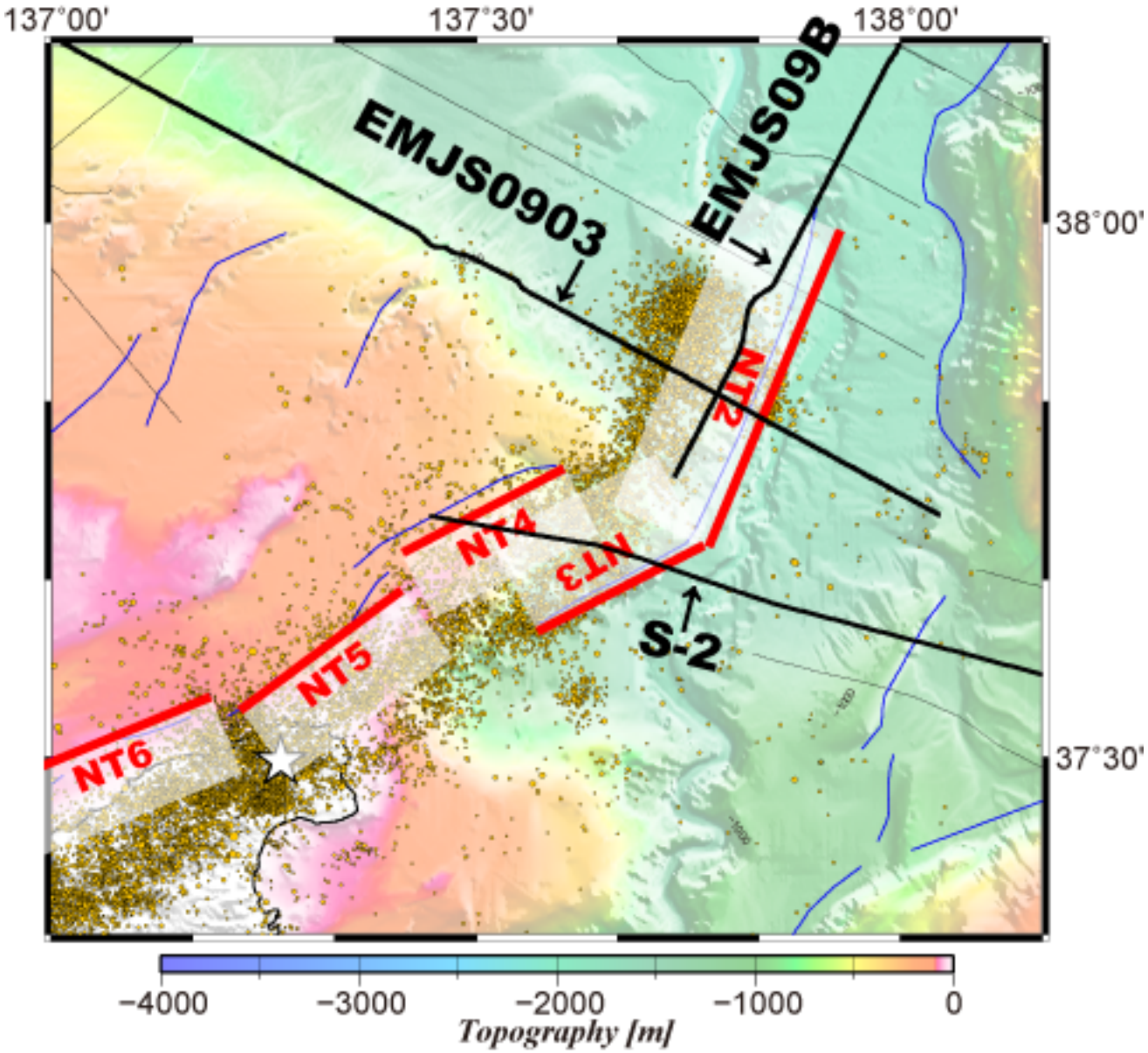
Crustal structure in and around the eastern edge of hypocentral region of the 2024 Noto Peninsula earthquake based on the existing seismic survey data

*Tetsuo No[1], Hiroshi Sato[2], Ryo Miura[1], Yasuyuki Nakamura[1], Takeshi Sato[3], Tatsuya Ishiyama[2]

1. JAMSTEC, 2. ERI, Univ. of Tokyo, 3. JMA

Since the 2007 Niigata-ken Chuetsu-oki Earthquake (M_J6.8), several research projects related to seismogenic zone in the Japan Sea have been conducted. The Japan Agency for Marine-Earth Science and Technology (JAMSTEC), in collaboration with the Earthquake Research Institute of the University of Tokyo (ERI), has conducted various studies to understand the relationship between source faults and crustal structure in the Japan Sea, primarily through multichannel seismic reflection (MCS) surveys and seismic surveys using ocean bottom seismographs (OBS).
The aftershocks of the 2024 Noto Peninsula earthquake (M_J7.6) spread over approximately 150 km in a northeast-southwest direction as of April 7, 2024 (Japan Meteorological Agency, 2024), and some of the seismic survey lines from the 2007 (Cruise ID: KR07-E01) and 2009 (Cruise ID: KR09-09 and KY09-06) cruises crossed eastern edge of the aftershock zone (No et al. 2009; No et al., 2014). These data were used to construct a recently published source fault model for the Japan Sea (Committee for Technical Investigation on Large-scale Earthquake in Sea of Japan, 2014; Sato et al., 2021). The results of lines S-2 and EMJS0903, crossing eastern edge of the aftershock zone, provided one of the bases for the rectangular model of the northwest-dipping and southeast-dipping reverse faults in the source fault model.
For example, for line S-2, source fault models NT2 and NT3 were set at the boundary between the Toyama Trough and continental shelf off the Noto Peninsula, and the MCS profiles were imaged as an asymmetric anticline that plausibly formed on the continental shelf side with northwest-dipping reverse faults. The seafloor topography has a specific height of approximately 1 km at top of the anticline and bottom of the trough, but the MCS image showed a step of approximately 2 km with respect to the reflector, which corresponds to the base of the sedimentary layer. The area corresponding to source fault model NT4 was imaged as an asymmetric anticline formed by a southeast-dipping reverse fault into the continental shelf, which is supposed to be a fault caused by inversion tectonics widely recognized on the eastern margin of the Japan Sea. The difference between the basement and fault is not as large as in the area corresponding to fault models NT2 and NT3 and is less than 1 km in length. For both faults, no corresponding reflection surfaces were observed in the crust beneath the basement.
For line EMJS0903, an asymmetric anticline formed with a northwest-dipping reverse fault corresponding to the source fault model NT2 was clearly imaged using MCS profile. The top of the anticline appeared to be slightly eroded, and the basement of the sedimentary layer stepped up by approximately 2 km. The northwest-dipping reverse fault that formed the anticline corresponded to the northwest-dipping reverse fault, which was also found in line S-2. A shortening structure with a southeast-dipping reverse fault was also imaged, but it lacked significant structural development compared to the northwest-dipping shortening structure corresponding to the source fault model NT2 identified in the line S-2.
In this presentation, we report the characteristics of the crustal structure in and around eastern edge of the aftershock zone based on past seismic surveys conducted using JAMSTEC vessels, focusing on survey lines crossing eastern edge of the aftershock zone of the 2024 Noto Peninsula earthquake.

Keywords: 2024 Noto Peninsula Earthquake, Seismic survey , Multi-channel seismic reflection survey, Japan Sea, Crustal structure, Toyama Trough



☆: mainshock hyposcenter of the 2024 Noto Peninsula earthquake (MJ 7.6), yellow dots: unified earthquake catalog of JMA (2024/01/01-04/07), black lines: seismic lines of JAMSTEC, NT2-NT6: source fault models (Sato et al., 2021), blue lines: active faults (Okamura, 2019)

