

Characteristics and origin of pore water in the outer rise of the Japan Trench

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In the outer rise region on the seaward side of the Japan trench, a normal fault complex that break the crust developed due to bending associated with plate subduction, forming a horst-graben structure. Large-scale outer-rise earthquakes are known to occur in conjunction with trench-type earthquakes, but even now, more than 10 years after the 2011 Tohoku-oki earthquake, the largest trench-type earthquake in Japanese history, no large-scale outer rise earthquake has occurred. Besides its urgency, the fluid distribution in the outer rise region is considered to be a determining factor in the subsequent water and temperature structure of the subduction zone. Helium isotope ratio of pore water sampled in the Japan trench outer rise in recent years indicate mixing of mantle source materials, suggesting a large-scale fluid circulation (Park et al., 2021). It is extremely important to evaluate the characteristics and origin of the porewater in the area.

Sediments were collected from the outer rise faults of Japan trench and its vicinity during the R/V Hakuho Maru KH-20-8 and KH-22-6 cruises to understand the chemical composition of pore water and to estimate its origin. Porewater composition on the seaward side of the Japan Trench was characterized by high concentration of calcium, mainly controlled by interactions with sediments and reflecting the effects of volcanic ash alteration. In contrast, porewater near faults was more reductive and influenced by active organic matter degradation. In addition to oxygen and hydrogen stable isotope ratios and chemical composition of the pore water, analysis of microbial species composition will be used in this presentation for detailed discussion on its sources.

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