Geomorphological and geological characteristics of the Toyama trough based on detailed bathymetric map and submersible dives

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The Toyama trough is a tectonic depression that incised the continental sloop of the Japan Sea side of the Japanese archipelago. Both the Fossa Magna and the Toyama trough was a bounding belt of island arcs developed during the period from the late Oligocene to the early Miocene and there distributed thick Neogene sediments.

In the late Miocene, tectonic shortening started with activities of basement faults and surface folds in the eastern margin of Japan Sea. Then, normal faults formed during the spreading of Japan Sea had been reactived as reverse faults in response to the inversion of tectonic stress field. In this study, we report a few aspects of geomorphologic and geologic research utilizing R/V NATSUSHIMA and ROV HYPER-DOLPHIN in Toyama-bay.

At the western survey area, sea bed slope is gentle in inclination getting deep northeastward. The uppermost drainage of Toyama deep-sea channel seems to be controlled by the growth of the N-S striking slope in the northeastern edge of Toyama-bay around the depth of 1200 meters, and it extends over the eastern survey area with winding through at a wavelength of 40 kilometers. Subsequently, at the eastern survey area, the off-Itoigawa deep-sea channel flows down to merged into the Toyama channel, where it turns to the north. There are some pockmarks formed possibly by methane gas eruption. Side scan images as byproducts of SeaBat8160 swath mapping illustrate the fine topography of Toyama deep-sea channel in detail, such as undulation of its edge and small-scale sea channels. At the off-Kurobe-fan area, gravel bed was confirmed in submersible dives. Considering reflection seismic survey on land, it is correlatable with Kurehayama gravel bed, suggesting the tectonic subsidence on the footwall of the active Uozu fault.