

Deformation, strength, cementation and ages of the sediments in the Nankai OOST zone exposed along the Shionomisaki canyon.

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The Shionomisaki submarine canyon cuts five EW-trending ridges developed in the Nankai accretionary prism. We observed lithology and structures of the prism across the first (YK06-02 6K#938 by Ogawa), third (YK99-09 6K#522 by Anma) and fifth ridge from the accretion toe in the south. The fifth ridge corresponds to the extension of the Omine ridge where out-of-sequence thrust (OOST) were detected through CDEX seismic profiles. The submersible Shinkai 6500 observed structures in the Nankai OOST zone along the eastern slope of the canyon during JAMSTEC cruises YK00-08 and YK05-08 (6K#579 and 6K#889 by Anma; 6K#890 by Moore; 6K#891 by Ogawa) and collected samples for strength, fabric, age determination. Each dive was designed to start from the canyon bottom, climbing up the canyon slope and end in EW-trending gully developed in the fifth ridge to obtain a 3D images of the Nankai OOST ridge. Four dives verified that Shionomisaki Canyon exposes sandstone dominant thick turbidite sequences. In contrast to the landward dipping strata expected from the seismic studies, seaward dipping strata were predominant in gently folded, often steeply inclined turbidites. Only near the Nankai OOST zone, extensive fluid seepages were observed demarcated by the presence of chemosynthetic biocommunities, such as Calyptogena and Vesicomysid clams and Vestimentiferan tube worms. Distributions of the chemosynthetic biocommunities were also observed in the north of the Nankai OOST ridge suggesting a development of antithetic fault system. The ridge itself was disrupted by numerous EW-trending gullies where Calyptogena colonies were widely distributed. These gullies must correspond to splay faults that were bifurcated from the main OOST fault. Radiolarian fossils indicate Plio-Pleistocene depositional ages. We also separated zircon crystals from volcanoclastic sediments for fission track age determination. Detailed observations on collected specimens revealed development of web and vein structures together with black seams. Porosity decreases systematically toward south along the OOST ridge. Uniaxial strength test indicated that the sandstones in the middle part of the OOST ridge is more consolidated compared to those of the north and south, whereas degrees in anisotropy of magnetic susceptibility fabric do not follow such pattern. Mudstones in contrast have rather uniform, lower strength values and degree of anisotropy. Thin section observation revealed that calcite cementation is responsible for sandstone strengthening. These observations imply that sandstones with a high pore-connectivity and permeability above or below thrust faults acted as a channel through which CaCO₃-saturated fluids migrated. Stable isotope studies of calcite veins suggest involvement of deep fluids.