Physical property, textural variation and fluid flow near the Nankai Mega Splay Fault zone in the Shionomisaki canyon

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The Shionomisaki submarine canyon cuts five EW-trending ridges developed in the Nankai accretionary prism. We traversed outcrops exposed along the eastern canyon wall using submersible SHINKSI 6500, along the landwardmost ridge where extension of the mega splay fault detected by previous seismic studies was exposed. Four dives were conducted to obtain lateral variations of physical property and texture of sediments along the mega splay fault zone. Southward (seaward) dipping strata were predominant in gently folded, often steeply inclined turbidites; the structures concordant with the younging direction confirmed by radiolarian biostratigraphy. Pliocene - recent strata (younger than 4.3 Ma) consist the sediments of this region. The ridge itself was disrupted by numerous EW-trending gullies. Detailed observations on specimens revealed presence of soft sediment deformation structures such as web structure, vein structure and black seam. The position of the mega splay fault and its bifurcations was deduced from topography and distribution of the deformed rocks and chemosynthetic biocommunities (vesicomyid bivalves and tube worms) that mark active cold seepage zone. Porosity decreases southward toward the position where the mega splay fault was deduced. The porosity decrease has almost negative correlation with the age of the sedimentation; older sediments have higher porosity. This porosity decrease implies progressive tectonic compaction toward the mega splay fault. Uniaxial compressional strength calculated from a needle penetration test indicates that the strength of sandstones increases shapely just above the active cold seepage zone due to carbonate cementation. We attribute this cementation to precipitation from CaCO3-saturated fluids migrated along the cold seepage zone form deeper part of the accretionary prism. Sandstones with high pore-connectivity and permeability above faults acted as a channel through which CaCO3-saturated fluids migrated.