

## Coexistence of soft and hard sediments at deep Nankai accretionary prism, NanTro SEIZE Project, IODP Exp.358

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It was believed that sediment strengthened irreversibly with depth, and same lithology has same strength in same depth. It was found that quite soft portions were developed within hard sedimentary rock at deep Nankai accretionary prism, southwest Japan, during the NanTro Seize Project, IODP Expedition 348 and 358.

The site C0002 is located at the Tonankai Earthquake (1944 M=8.0) area and penetrates 3262 m below sea floor (mbsf) through the Kumano basin and Nankai accretionary prism. The porosity decreases, and hardness increases with depth gradually. Deeper than approximately 2000 mbsf, the Silty claystone of dark gray lithified hard rock with low porosity less than 20% is occurred for main lithology. Interleaved between this hard rock, the Fine silty claystone with high porosity upper than 30% was observed deeper than 2360 mbsf (Tobin et al., 2015). This soft sediment is similar with the Silty claystone in grain size and mineral assemblages, but strength is totally difference. Such soft stuffs are commonly generated during drilling. In this site, various types of drill tools of bit and reamers were operated due to unstable hole condition. However, no relationship was found between drilling tool and occurrence of the Fine silty claystone. Optical microscope and micro X-CT observations revealed that some sedimentary laminations and burrows of benthos were preserved within the Fine silty claystone. These show that the fine silty claystone is natural sediment, but not drilling induced artifact.

The reason for coexistence of soft and hard sediments in same depth can be explained by conceptual idea as below. In initial state of diagenesis, some crystals will grow larger having smaller surface energy than the other. This surface energy difference in same solution causes that smaller crystal dissolution and larger crystal grow further. Resulting of this process, well crystalline and less crystalline parts probably have marked contrast in strength. This implies that present of heterogeneous strength distribution around the initiation depth of diagenesis.

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