Development of the Decollement in the Toe of Nankai Accretionary Prism: Results from ODP Leg 196

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The objective of Ocean Drilling Program (ODP) Leg 196 was to clarify deformation behavior and fluid flow in the Nankai accretionary prism. Leg 196 (May-July 2001) was the 3rd deep-sea drilling investigation of the Nankai accretionary prism following Legs 131 and 190. In order to measure the physical properties of the decollement zone, a special method was designed which uses LDW (Logging-While-Drilling) tools. During LWD, the logging tool string is located just above the drill bit. The attached logging tools acquire resistivity, density, porosity and velocity data. For the first time in deep-sea drilling history, resistivity borehole images (Resistivity-At-the -Bit (RAB) images) of the decollement zone were obtained.

In Leg 196, drilling in two sites - the decollement zone and the proto-decollement region of the accretionary prism was carried out in order to obtain information about the early deformation style during the compressional phase. Site 808 and Site 1173 were selected where the decollement is still forming and has not advanced into the accretionary wedge. The contrast between each site was clear. The decollement zone was characterized seismically as a high-amplitude, reversed-polarity reflection, which corresponds to a high-porosity, low-density layer. However, core samples recovered on Leg 131 suggest low-porosity and high-density in the decollement zone. Because core recovery in the decollement zone was 20% or less, sequential data by logging were required. High quality LWD data were obtained at Site 808: Here the base of the decollement is marked by an offset to high-density, whereas the totality of the decollement shows an offset to low-density. Estimated permeability change drastically at the base of the decollement. We suggest that dynamic conditions controlling physical property change rapidly depending on the flux of the turbidite at the axial trench wedge. Our LWD results shed light on the deformation processes in the fluid-filled decollement zone.