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A significant change in magnetic fabric in an accretionary prism toe at Sites C0006 and C0007, Nankai Trough

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The general goal of Nankai Trough Seismogenic Zone Experiment (NanTroSEIZE) is to reveal active process in an accretionary subduction zone with recurrent large earthquake. Structural evolution of accretionary prism has been interpreted in macroscopic point of view using remote sensing, however, further details such as mechanical process or controlling factor of rapture initiation are not well understood. Here we present magnetic fabric analysis to examine the internal structure of the accretionary prism toe- in the Nankai Trough, off the east coast of Japan. Two sites (C0006 and C0007) drilled during Integrated Ocean Drilling Program (IODP) Expedition 316 penetrated the sediment section, including intra wedge thrusts and the frontal thrust. Anisotropy of magnetic susceptibility (AMS) measurements provide insight into recorded strain during sedimentary and tectonic processes. Results from the upper part of the wedge show sedimentary acquired compaction fabric in general. In the lower part, AMS fabrics occasionally rotate almost ninety degrees and suggest horizontal compression. In contrast, magnetic fabrics did not show any correspondence to the thrusts or minor normal faults, which implies that those faults develop with concentrated shear deformation without disturbing surrounding sediments. Two adjacent drilling sites and dense sampling demonstrated clearly the change in strain field which is reported by previous studies. Based on these results, we propose a model of structural evolution at the toe of the prism. Underthrusting sediments induce horizontal stress in the lower part of the wedge, which reduces the effective stress and forms a high pore pressure anomaly and zones of fracturing. The frontal thrust is bent geometrically and terminates its activity in response to an increase of friction that triggers initiation of the next-generation frontal thrust. The upper part of the wedge tilts accordingly, resulting in an unstable slope.

Keywords: NanTroSEIZE, Anisotropy of magnetic susceptibility, Nankai Trough, accretionary prism