Japan Geoscience Union Meeting 2010
(May 23-28 2010 at Makuhari, Chiba, Japan)

SSS023-08 Room: 302 Time: May 25 16:00-16:15

Deformation characteristics and associated clay-mineral variation in 2-4 km buried subduction thrust: Hota accretionary

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Although deformation and physical/chemical properties variation in aseismic-seismic transition zone were essential to examine critical changes in environmental parameters that result in earthquake, they are poorly understood because the appropriate samples buried 2-4 km have not been collected yet (scientific drilling has never reached there and most of ancient examples experienced the deeper burial depth and suffered thermal and physical overprinting). The lower to middle Miocene Hota accretionary complex, central Japan is a unique example of on land accretionary complex, representing deformation and its physical/chemical properties of sediments just prior to entering the seismogenic realm. The maximum paleotemperature was estimated approximately 55-70?C (based on vitrinite reflectance) indicative of a maximum burial depth about 2-4 km assuming a paleo-geothermal gradient as 25-35?C/km. Accretionary complex in this temperature/depth range corresponds with an intermediate range between the core samples collected from the modern accretionary prism (e.g. Nankai, Barbados, and so on) and rocks in the ancient accretionary complexes on land. This presentation will treat the detailed structural and chemical analyses of the Hota accretionary complex to construct deformation properties of decollement zone in its 2-4 km depth range and related clay-mineral transition leading to variation of frictional properties.
The deformation in this accretionary complex is characterized by two deformation styles: one is a few centimeter-scale phacoidal deformation representing clay minerals preferred orientation in the outer rim, whereas random fabric in the core, quite similar texture to the rocks in the present-Nankai decollement. The other is S-C style deformation (similar deformation to the melanges in ancient accretionary complex on land) exhibiting block-in-matrix texture and quite intense clay minerals preferred orientation in the matrix, cutting the phacoidal deformation.
The host and faulted (S-C structure) rocks composed of hemipelagic siltstone containing 79-85% of clay minerals. Considerable-smectite reduction and positive increase of illite were clearly identified inside the latter S-C structure, which would cause remarkable increase in friction coefficient. Such strain hardening associated with dynamic clay-mineral variation would be the primary mechanism in decollement -zone and/or melange-zone thickening and fundamental mechanical transition just prior to entering the seismogenic zone. Positive anomaly of the vitrinite reflectance data (Ro) inside infers frictional heating during the deformation plausibly caused the clay mineral variation.

Keywords: aseismic, subduction zone, accretionary complex, melange, smectite-illite, Hota