

Thermal structure of the Nankai accretionary prism estimated by vitrinite reflectance of carbonaceous material

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Paleothermal structure of an accretionary prism is one of the basic information to understand the nature of plate subduction seismogenic zones. To evaluate the entire thermal structure of the Site C0002 located in the Kumano Basin off Kii Peninsula, we performed vitrinite reflectance analysis for cuttings samples collected every 100 m from 870.5 to 3058.5 m below sea floor (mbsf) during the Integrated Ocean Drilling Program (IODP) Expedition 348: Nankai Trough Seismogenic Zone Experiment (NanTroSEIZE), which drilled down to 3058.5 mbsf.

R_o values of vitrinite reflectance are ~ 0.15 to ~ 0.20 in Unit III (forearc basin), 0.21 to 0.27 in Unit IV (accretionary prism), and ~ 0.26 to ~ 0.38 in Unit V (hemipelagic sediment), respectively. In general, R_o values tend to increase with depth, but several reversals of R_o suggest the existence of faults which have large displacements enough to offset paleothermal structure.

We estimated paleotemperature based on reaction rate equation of EASY% R_o (Sweeney and Burnham, 1990). Two heating duration time was assumed in the calculation: 1) depositional age of several formations by shipboard nannofossil ages, which is the maximum heating duration time, and 2) depositional age of lower forearc basin (1.67 Ma), which is minimum heating duration time.

Estimated maximum paleotemperatures are 1) $\sim 58^\circ\text{C}$ in Unit IV and $\sim 74^\circ\text{C}$ in Unit V, 2) $\sim 67^\circ\text{C}$ in Unit IV and $\sim 88^\circ\text{C}$ in Unit V, respectively. These temperatures are lower than estimated modern temperatures based on borehole temperature measurements and their downward extrapolations (Sugihara et al., 2014).

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