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

*Rina Fukuchi[1,2], Asuka Yamaguchi[1], Yuzuru Yamamoto[3], Juichiro Ashi[1,2]

1.Atmosphere and Ocean Research Institute, The University of Tokyo, 2.Graduate School of Frontier Sciences, The University of Tokyo, 3.JAMSTEC

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.
Ro 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, Ro values tend to increase with depth, but several reversals of Ro suggest the existence of faults which have large displacements enough to offset paleothermal structure.
We estimated paleotemperature based on reaction rate equation of EASY%Ro (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) ~58℃ in Unit IV and ~74℃ in Unit V, 2) ~67℃ in Unit IV and ~88℃ 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).

Keywords: accretionary prism, Nankai Trough, vitrinite reflectance

