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Drilling inputs to the Nankai Subduction Zone: heat flow, diagenesis and basement alteration.

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As part of the NanTroSEIZE IODP project, which targets deep drilling of the seismogenic zone of Nankai subduction in Japan, two sites were drilled south of the trench to determine the composition and properties of the subducting sediment and crust. Site C0011, may be considered representative of the Shikoku Basin in the Eastern Nankai area, while Site C0012 lies on top of a basement high, Kashinozaki Knoll. This topographic high is known to result from a combination of volcanic and tectonic processes. These sites were partly cored during Expedition 322 in 2009. The recently finished Expedition 333 filled gaps between the seafloor and the intervals cored during 322, and performed temperature measurements in the formation with APCT-3 tool. The basement-sediment interface was cored at one site and interstitial water samples were extracted from red calcareous claystone immediately overlying the basaltic basement. Basaltic oceanic basement cores were also recovered to a depth of 630 m. Heat flow is 140 mW/m2 on Kashinozaki Knoll but 90 mW/m2 at Site C0012. The temperature extrapolated at the sediment-basement interface assuming pure conduction is 65°C, and 80°C, respectively. There is no evidence for magmatic activity on Kashinozaki Knoll over the last 14 Ma and geochemical data do not suggest fluid migration in the sediment is important between sites C0011 and C0012. Therefore, the higher heat flow on the basement high may indicate redistribution of geothermal heat flow by convection within the basement. Faulting and fracturing as the plate approaches the trench may maintain basement permeability. Basement is highly altered and heterogeneity in strength resulted in patchy recovery. Glass, olivine, and also often plagioclases, have been replaced by clay and zeolite phases. Water will be released from mineral dehydration as the basalt is buried in the subduction zone, which is expected to influence the mechanical behavior of the subduction channel. However, one important question is whether, and how deep, the oceanic crust remains permeable as it is being subducted. The mechanical and geochemical consequences of basalt dehydration will depend on the evolution of basaltic crust large-scale permeability during subduction.