Plate boundary temperature at the prism slope estimated from topographically corrected BSR-derived heat flow in the Nankai Trough

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Seismogenic zones have been investigated in numerous studies to understand the occurrence mechanisms of earthquakes and tsunamis at subduction zones. Temperature on the plate interface is considered to bound the upper and lower limits on the seismogenic zone, whose temperatures are estimated to be around 100–150˚C and 350–450˚C, respectively [*Hyndman and Wang*, 1993, JGR]. Thus, temperature along the plate boundary fault should be a significant player governing the seismogenesis of plate boundary faults. Subseafloor temperature is known to be affected by various phenomena. For example, undulation of seafloor relief is one of the major factors disturbing thermal regime especially in shallow part of subseafloor. However, few studies have considered the topographic effect to estimate the plate boundary temperature, while studies taking into account the effect might be required for the precise estimation. This study focuses on the temperature at the upper limit of the seismogenic zone around 100˚C at the prism slope off southwest of Kii peninsula where the number of studies is restricted. First, we mapped the distribution of BSRs in the Nankai subduction zone. Second, we modeled a two-dimensional thermal structure to topographically correct BSR-derived heat flow in areas of undulating seafloor. Third, we estimated the plate boundary temperature one-dimensionally using topographically uncorrected and corrected BSR-derived heat flow by assuming uniform thermal conductivity with depth.
Distance from the trench axis of plate boundary temperature of 100˚C is approximately 25 km calculated from the uncorrected BSR-derived heat flow off southwest of Kii peninsula. On the other hand, the distance is approximately 22 km calculated from the corrected BSR-derived heat flow there. This suggests the depth of upper limit of the seismogenic zone on the plate interface shifts 450 m associated with the topographically corrected thermal structure.

