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熊野沖南海トラフ斜面の BSR から推定した熱流量および地殻変動
Heat flow estimated from BSR and IODP borehole data: Implication of recent uplifting of the imbricate thrust zone in the

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New heat flow values were determined in the Nankai Trough forearc slope region of Kii Peninsula from the BSR identified in the 3-D seismic data volume and the thermal conductivity data measured on core samples obtained nearby during IODP Expeditions 315/316. High-resolution images in the shallower portion enabled detection of BSRs in the forearc slope. Comparison of P-wave velocities at drilled sites C0001/ C0004/C0006 and the interval velocity model constrains the uncertainty in BSR depth to <25m and error in heat flow by 5%. Thermal conductivity values were inferred from Vp-K relationship obtained in nearby borehole data, which would involve error of 0.1 W/m/K, or 10 % in terms of heat flow.

BSRs were identified only in the Imbricate Thrust Zone (ITZ) and no BSRs are visible either around the mega-splay fault or in the toe of the accretionary prism. Within the ITZ, the BSR near the axis of anticlines is significantly shallower than those in the adjacent slope zones. We designate the shallow BSR below the ridge axes 'Anticlinal High Value Zone (AHZ)', and designate other BSR 'Basal Low-value Zone (BLZ)'.

BSR-derived heat flow in the BLZ (60-70 mW/m2) is consistent with the general heat flow trend, which gradually decreases landward, from 120-140 mW/m2 in the Shikoku Basin to ˜55 mW/m2 in the Kumano Forearc Basin. Locally, it is lower than values obtained from probe measurements on the forearc slope region (60-90 mW/m2), and is higher than ones obtained at IODP drill sites nearby (47-55 mW/m2). These differences may be caused by the erosion or deposition of slope sediments. The anomalously shallow BSR in the BLZ produces an apparent high heat flow anomaly of 70-90 mW/m2, and a significant discontinuity is identified across the thrust fault complex. The most likely cause is the transient effect of thrust faulting followed by uplift and subsidence, then by the erosion and sedimentation. A one-dimensional time-dependent numerical model confirms that the relaxation time for the BSR depth to be reequilibrated from such a disturbance is 10-100 kyr.

The age of the accretionary prism and overlying sediment would be ˜1Ma or older, as inferred from the ages obtained at mega-splay (Sites C0004/C0008) and at frontal region (Site C0007). Three ridges in the ITZ have been uplifted since ˜1 Ma. Thus the thermal regime and the BSR depth in the AHZ have not yet equilibrated after the uplift due to faulting, resulting in an anomalously shallow BSR depth and higher heat flow. We propose that the anomalously shallow BSR in the AHZ and the BSR discontinuity across these fault zones are caused by thrust faulting activities since ˜1 Ma, followed by uplift and erosion.
Keywords: heat flow, BSR, methane hydrate, NantroSEIZE, thrust fault