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Surface heat flow variation as a potential proxy for landslides in the forearc slope of Nankai Trough off Kumano

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Temperature is shown to be one of the key parameters to define the range of locked region along the seismogenic fault system. To infer accurate thermal structure along the fault zone, reliable heat flow measurements are essential.
Heat flow values can be obtained on the seafloor (using a few-m probe), measured in undisturbed portion of the borehole, or inferred from the depth of Bottom-Simulating Reflectors (BSR).
Surface heat flow measurements are most comonly conducted on the seafloow, but they are often affected by bottom-water temperature variations, seafloor topbathymetry, fluid flow along the fault zone, or slope failures.
Some surface heat flow data exist within the 3D seismic volume survey area off Kumano. The bathymetry data obtained from this 3D seismic survey is most accurate, revealing landslides or other topographic features (Kimura et al., this assembly). We investigated the existing heat flow with this bathymetry, and found that heat flow (Point A) at 0.5NM southwest of IODP NanTroSEIZE Site C0008 is ~90 mW/m2, higher than the regional average value (~60 mW/m2) estimated from BSR, whereas it is 70mW/m2 at ~1NM seaward of Site C0008 (point B). Heat flow at IODP sites C0001, C0004, C0008 is 47, 55, and 52-55 mW/m2, respectively, all of which are lower than surface heat flow values. The bathymetry data suggests that point A is at the base of escarpment and is in the erosional environment. The surface heat flow apparently becomes higher in the eroded region and becomes lower in the deposited region, so the observed heat flow at poit A would be affected by the landslides. A simple calculation shows that a 10-m thick erosion due to slope failure can reduce surface heat flow by a factor of 2 even after 100 years. Since the heat flow at Point A is almost twice as high as one at Site C0004 or C0008, we would suggest that the heat flow at point A is affected by the landslides from recent large earthquakes.
Similar heat flow anomalies are observed in the forearc slope region off Sumatra area, where a devastating earthquakes occured in 2004. By comparing results from both sites we can construct more reliable model for landslides in the forearc slope.

Keywords: NanTroSEIZE, heat flow, landslide