

## Thermal/hydrological prediction in the toe region of Nankai Trough off Muroto - Are "T-Limits" the temperature limits?

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One of the essential objectives of IODP Expedition 370 is to know insitu temperature along the borehole. The temperature observatory (TTO) is developed in order to provide essential constraint to 'Limits of Life', including determination of insitu temperature from seafloor through decollement and down to the basement, and detection of any possible transient signals.

It is essential to predict downhole temperatures (down to the basement) for the design of TTO system. Currently available temperature sensors are rated to 50 degC, which is obviously lower than expected near the bottom.

The formation temperature profile is primarily controlled by the basal heat flow but is also affected by the rapid sedimentation, spatial variation of thermal conductivity, radioactive heat generation, and advective heat transfer. Since we have not information about the fluid flow the advection effect is not considered here. Rapid sedimentation apparently reduce the temperature gradient, and its effect is calculated by assuming the sedimentation rate similar to that at Site 1174. Temperature profiles are calculated for three basal heat flow values. Most likely temperature at the top of decollement is predicted as 93 -111 degC. The designed total length of TTO was set at 1200m, beneath the sediment/basement interface (1180m below sea floor). The primary target depth is set around the decollement, which was interpreted in the seismic profile at 800 mbsf but was revised at 760 mbsf later.

Array of 55 temperature sensors, outside and inside the 4-1/2" steel pipe (called the tubing), deployed from Chikyu into Hole C0023A. They keep measuring temperatures at each position (from zero=seafloor to ~1000mbsf, spanning every 10 to 100 meters interval.) at every 10 minutes or every 1 hour, for one year. The maximum temperature expected at the bottom-hole exceeds 120 degC. Temperature data is recorded in the memory inside each temperature sensor. The data is recovered wither by recovering the sensor array itself, or by connecting the connector when we revisit the site by ROV.

In order to achieve the overall goal of expedition, we deployed two independent arrays of temperature sensors; one is the thermistor array attached outside the tubing and the other the independent sensors attached to rope and lowered inside the tubing. They are successfully deployed during the expedition. The data will be recovered using the ROV in the spring of 2018.

Keywords: IODP, Nankai Trough off Muroto, heat flow