Terrestrial heat flow distribution in the Kanto metropolitan area

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Introduction

Measurements of heat flow and geothermal gradient using boreholes on land are often concentrated in specific areas such as geothermal region, so the measured heat flow data in non-volcanic area is poorly mapped. We newly measured temperature profile of very deep boreholes in ten years or more long period time after drilling, so we could get accurate terrestrial heat flow data in the deep structure of the Pre-Neogene layer in the Kanto metropolitan area.

New Heat Flow Data on Deep Borehole Temperature Logging

The process of drilling a hole introduces temporary disturbances to the temperature of the surrounding rock, both by friction of drilling and by heat exchange with the drilling fluid. At the end of drilling, after the circulation of fluid is stopped, the temperature of the fluid left in the hole quickly adjusts to that of the immediately adjacent rock. However, the disturbance has by this time penetrated into the rock over all but the bottom few meters, and recovery to the original rock temperature takes place over a much longer time. As a rough approximation the recovery is completed to within the accuracy of most measurements in a period that is ten to twenty times greater than the time of drilling (Bullard, 1947).

Four deepest (2300-3500m) borehole stations, 19 very deep (1000-2000m) borehole stations had been constructed under the four research projects; Research on Seismic Activities in the Southern Metropolitan Area, NIED and Research on Crustal Activities in the Kanto-Tokai Area, NIED by the early 1990's, Fundamental Survey and Observation Plan for Earthquake Research after the disastrous 1995 Kobe earthquake, and Special Project for Earthquake Disaster Mitigation in Urban Areas promoted by the Japanese government. We newly measured temperature profile of 7 deep boreholes ; Iwatsuki, Fuchu, Mooka, Isezaki, Yokohama, Tsukuba-Minami, Hasunuma.

Conclusion

Comprehensive heat flow distribution in Kanto district is as follows: low heat flow in southern region, high heat flow in northern region, and the boundary line along 36N. Low heat flow under 40mW/m^2 are observed. The South Kanto area is sedimentary basin, and Philippine Sea (PHS) and. Pacific (PAC) plates subduct beneath there. Heat flow data with the subducted PHS depth range from 20 to 40km in Kanto area is under 40mW/m^2. But in the North Kanto area with the subducted PHS depth range from 40km to 80km, heat flow date over 80mW/m^2 is observed.