議題十二

Shallow Crustal Thermal Structures of Central Taiwan Foothills Region

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Shallow Crustal Thermal Structures of Central Taiwan Foothills Region

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ABSTRACT

Crustal thermal structures are closely related to metamorphism, rock deformation rheology, exhumation processes, hydrocarbon maturation levels, frictional faulting, and other processes. However, it has been difficult to measure crustal heat flows. Drilling is the most direct way to access the temperature fields in the shallow crust, but a regional drilling program are expensive to carry out. Recently, a large-scale in-situ investigation program in the western foothills of central Taiwan has provided a rare opportunity to conduct heat flow measurements in this region where there are debates on whether previous heat flows measured are representative of the thermal state in this region. After more than one month of fieldwork we have successfully collected 28 geothermal gradients from these wells, and converted them into heat flows using the published thermal conductivity data. Here we show that the new heat flow dataset is consistent with previous heat flows. The thermal structures of central Taiwan are different from that of other subduction accretionary prisms. We then combine all the available heat flow information to analyze the frictional parameters of Chelungpu fault zone that ruptured during the 1999 Chi-Chi, Taiwan, earthquake. The heat flow dataset gave consistent results compared with the frictional and stress gradient parameters derived from another independent study that used cores recovered from Chelungpu fault zone at depth. Finally, this study also shows that it is suitable for use surface thermal data to constrain thrusting faulting parameters, similar to what has been done for the strike-slip San Andreas Fault in California. Additional fieldwork is planned to study heat flows in other mountainous regions of Taiwan for more advanced geodynamic modeling efforts.

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