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An assessment of thermal regime in and around Japan

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Terrestrial surface heat flow provides a direct means to estimate the crustal thermal structure. However, the number of heat flow data is limited and spatially very inhomogeneous and even in regions with measurements the data quality varies. To provide an attempt at a higher resolution map of heat flow, we newly measured and acquired thermal conductivity data from existing samples and data. 122 core samples from 42 sites at 37 Japanese volcanoes [Coordinating Committee for Prediction of Volcanic Eruption core analysis group, 2011] were measured for thermal conductivity, thermal capacity, and bulk density, which may be used to improve the thermal regime of volcanoes. Also, to estimate the heat flow using geothermal gradient data, the closest thermal conductivity data is used for each gradient data [Tanaka et al., 2004]. This approach does not take into account geological and hydrodynamical models to use the thermal conductivity, but this assumption works well enough to provide rough estimates of heat flow from geothermal gradient.

On the other hand, the depth of magnetic sources based on spectrum analysis of magnetic anomaly data [e.g., Spector and Grant, 1970] is one of several proxies for estimating thermal regime at depth. This analysis is still controversial, however, good correlation between estimated depths of crustal magnetic sources and heat flow suggests that this depth may reflect the broad average temperature.

We discuss some of the limitations and possible uses for various data sources.