

What factors contribute to cut-off depth of crustal seismicity?

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Heat flow data contribute to the imaging of the lithospheric thermal structure, which greatly influences tectonic and geological processes and constrains the strength of the lithosphere, the modes of deformation, and the depth distribution of earthquakes. To provide a more reliable estimation of the lithospheric thermal structure, some complementary approaches are possible.

One approach is to update and incorporate the existing thermal data. The compilation of global heat-flow data is currently under major revision by the International Heat Flow Commission (IHFC [<http://www.ihfc-iugg.org/>]) of the IASPEI/IUGG. The significant improvement over the former heat-flow database structure is the implementation of a parent-child system for heat-flow data determined at each location and an extended set of meta data fields, relevant to enable quality control, and supporting interoperability following FAIR (Findable, Accessible, Interoperable, and Reusable) and open data principles. We updated and incorporated the existing thermal data in and around Japan. A new version of the database “Thermal Data Collection in and around Japan”, which contains continuously updated heat flow and geothermal gradient data and adds thermal conductivity data in and around Japan, has been released in 2019 [https://www.gsj.jp/data/G01M/GSJ_MAP_TDCJ_2019.zip]. This provides an opportunity to revisit the thermal state of the lithosphere along with other geophysical/geochemical constraints.

Another approach is based on the complementary interpretation of different geophysical data sets. One of the promising indicators is the cut-off depth of shallow seismicity. Several studies have been conducted to assess the inverse correlation between the cut-off depth and heat flow since it has been attributed primarily to the temperature. Some abrupt fluctuations in seismogenic depth may be caused by changes in lithology affecting rheology [e.g., Magistrale 2002]. Relative contributions of heat flow and lithology to controlling the cut-off depth will be discussed.

