

A Case Study of Crustal Geothermal Gradients in Tungho, Taitung, Taiwan

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Abstract

Crustal geothermal gradient information is important for earth sciences and for thermal energy exploration. However, such lines of research have been less documented in Taiwan, despite some exciting developments in terms of instrumentations. Here we document the recent progress in terms of field operations on measuring crustal geothermal gradients in Taiwan region. We have used two types of instruments, all manufactured domestically, to measure geothermal gradients at a drill site provided by the Institute of Earth Sciences, Academia Sinica. We found that both instruments gave consistent geothermal gradients, suggesting that methods gave high quality and repeatable results. Each instrument has its own advantages. The compact thermistor is light-weight, and can record continuous time series of temperature perturbation with a resolution of 0.001°C. The portable thermistor can send the temperature readings, with a resolution better than 0.01°C, to the researchers in realtime, thus is possible to provide valuable information while researchers are still on site. We propose that we can reliably measure geothermal gradients for onland Taiwan regions using both instruments if suitable boreholes are available. In the future, we plan to systematically measure geothermal gradients and even heat flows in Taiwan region through multi-institute collaborations.

Key words: geothermal gradient, heat flow, Taiwan, survey technique.

摘 要

地溫梯度資料對於地球科學研究以及地熱能源的開發都相當重要。儘管在儀器方面已經有一些令人振奮的發展，此類研究在臺灣野外測量的結果依舊相對稀少。本篇文章中紀錄了臺灣地區地溫梯度量測的最新發展。利用中央研究院地球科學研究所提供的鑽井場地，以兩種國內生產的儀器測量地溫梯度。我們發現兩種方式皆提供了一致的結果，也表明了測量結果的高品質以及高可信度。兩種方式皆有其優勢。小型溫度計不僅輕量，並且有 0.001°C 的精度且可以連續量測溫度隨時間的擾動。攜帶式溫度計可以即時顯示精度高於 0.01°C 的溫度測量值，在現地就可以知道測量結果。經由一連串的測試，此兩種儀器在臺灣的陸地區域能夠可靠的測量地溫梯度。未來我們計畫有系統的測量臺灣地區的地溫梯度甚至是區域熱流。

關鍵詞：地溫梯度、地熱、臺灣、測量方法。

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