Precision Temperature Logging as a Tool for Geothermal Exploration

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The geothermal energy industry in Australia is in its infancy. Regional prospectivity across much of the country is poorly understood. One problem is that conventional regional geophysical datasets such as gravity and magnetics are poorly suited for geothermal exploration. Conceptual geological models suggest that southeast Australia may be prospective because it has some of the youngest volcanic features in Australia, is close to energy markets, and some published values of crustal heat flow are relatively high. Exploration on the play or prospect scale is hampered, however, by a lack of reliable, closely spaced temperature data.

Southeast Australia is well covered by a network of shallow boreholes used for groundwater monitoring. We have been granted access to many of these bores for the purpose of precision temperature logging. The precision logs reveal boundaries between layers with different thermal conductivities, and delineate patterns of heat flow variation. They allow the identification of thermally insulating layers and provide information to allow reliable temperature extrapolation to depths many times that of the individual bores. Where water bores coincide with deeper petroleum exploration holes, bottom hole temperature data generally confirm heat flow estimates from the shallow boreholes.

Data from precision temperature logging exercises have been used to investigate the broad regional geothermal prospectivity of southeast Australia; test different geological models of heat flow; assess the viability of individual prospects; target drilling programs; and improve the accuracy and geographic density of the heat flow database.