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Geothermal potential of Caledonian granites underlying Upper Palaeozoic sedimentary basins astride the Iapetus Suture Zone in Ireland

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Upper Palaeozoic sedimentary basins in Ireland overlie crystalline rocks within the Caledonian Iapetus Suture Zone. Beneath these basins, Lower Palaeozoic rocks, formed and deformed during the Caledonian orogenic cycle, were intruded by c. 420-390 Ma late-tectonic granites at various tectonic levels. These include the subsurface Kentstown and Glenamaddy granites discovered by mineral exploration drilling. While these granites comprise actual targets for Enhanced Geothermal System (EGS) exploration, several others likely exist based on geophysical considerations. In order to test the regional geothermal potential, the buried granites as well as analogue exposed rocks are being investigated geochemically.

The geothermal potential of the intrusives depends on their heat production rate (HPR), which is calculated using rock density and concentrations of the heat producing elements (HPE) uranium, thorium and potassium. In spite of their close spacing and similar ages, the whole-rock geochemistry of the granites varies significantly, but with no obvious geographical control (Fritschle et al., 2013; 2014). The granite HPR values range from 1.4 μW/m^3 for the Dhoon Granite (Isle of Man) to 4.9 μW/m^3 for the Drogheda Granite (Ireland). This compares with the average HPR for a 'typical' granite of 2.7 μW/m^3 (Goldstein et al., 2009).

It is demonstrated that an elevated HPR of a granite can be related to enrichment in one of the HPE alone (e.g., uranium-enrichment in the Foxdale Granite (Isle of Man), or thorium-enrichment in the Drogheda Granite). Enrichment in HPE in a granite may occur due to different reasons including hydrothermal (re-) distribution of uranium, or the assimilation of thorium-rich wall-rocks. Hence, the distribution of the HPE in particular minerals, veins and source lithologies, along with the petrophysical characteristics of the sedimentary basins and the granites' petrogenesis, are currently being investigated as possible mechanisms controlling their heat production budget.

Fritschle, T., Daly, J.S., Whitehouse, M.J., McConnell, B., Buhre, S., 2013. U-Pb Zircon Ages from Granites in the Iapetus Suture Zone in Ireland and the Isle of Man. Mineralogical Magazine, 77(5): 1115.

Fritschle, T., Daly, J.S., Whitehouse, M.J., McConnell, B., Buhre, S., 2014. Zircon geochronology and Hf-O isotope geochemistry from granites in the Iapetus Suture Zone in Ireland and the Isle of Man. This issue.

Goldstein, B.A., Hill, A.J., Long, A., Budd, A.R., Ayling, B., Malavazos, M., 2009. Hot rocks down under – evolution of a new energy industry. Geothermal Resources Council Transactions, 33: 185–198.