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Geothermal Study of Southern Ireland: DIG Project

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One aim of the DIG Project (De-risking Ireland's Geothermal Potential: Chambers et al., this conference) is to evaluate the geothermal energy potential of the Upper Devonian Munster Basin within the Variscides of southern Ireland. One of our primary targets is the Mallow Warm Springs Area (MWSA) which is sited along the Killarney-Mallow Fault Zone (KMFZ). The fault zone represents the major basin-bounding normal fault system to the basin and regionally controls sediment facies and thickness distribution. The KMFZ was re-activated as a compressional reverse fault in late Carboniferous-early Permian time, during the Variscan Orogeny. Tectonic strain variation is well understood from structural/geological analysis and increases towards Killarney, where the highest strain is associated with a large Bouguer gravity low in the (Avalonian) Caledonian basement. The basin-fill sediments are dominated by siliciclastic sediments, deposited in thick alluvial fan systems, that are succeeded by lower Carboniferous carbonate-prone marine limestones.

Primary porosity in sediments is obliterated by sub-green-schist metamorphism and Variscan deformation fabrics. Fluid flow within the crust around the KMFZ is likely related to the Cenozoic tectonic reactivation of faults and thermally driven uplift as revealed by recent thermo-chronological results in the vicinity of the fault. There was also significant fluid flow during the Munster basin extension and Variscan basin inversion. The focussed part of the DIG study uses potential field (gravity/magnetic) and legacy wide-angle seismic data from the Munster Basin to develop a "new" geological model for crustal structure, with direct application to geothermal research. Critical properties such as thermal conductivity and heat production measurements will also encompass the island-wide aspect of the DIG Project.

The constraints gathered by the magnetotelluric and passive seismic data within the KMFZ will be integrated with rock physics and geochemical data. This substantial body of work will also include a fluid chemistry program to understand the fluid rock interactions within the KMFZ and their impact on physical properties (electrical conductivity and velocity). Collectively, using this expertise, the study evaluates the geothermal and economic potential of the region and more

specifically the MWSA. This local focus on the MWSA aims to directly image fault conduits and fluid aquifer sources at depth, within a convective/conductive region associated with the known occurrence of warm thermal springs. This will determine the scale of the geothermal anomaly, its correlation with our gathered data and will so evaluate the potential for both local and industrial-scale space heating in the survey locality.

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