6.9 DIG: A RESEARCH PROJECT TO ASSESS IRELAND'S GEOTHERMAL ENERGY POTENTIAL

D. Kiyan[1,2], B. O'Reilly[1,2], J. Fullea[1,3], S. Lebedev[1,4], C.J. Bean[1,2], P. Meere[2,5], E.L. Chambers[1], T. Ye[1], M. Rezaeifar[1], A. Scully[5], and the DIG team

[1]DIAS, School of Cosmic Physics, Geophysics Section, Dublin Institute for Advanced Studies, Dublin, Ireland
[2]iCRAG, SFI Research Centre in Applied Geosciences, Dublin, Ireland
[3]UCM, Department of Physics of the Earth and Astrophysics, Universidad Complutense de Madrid, Madrid, Spain
[4]UC, Department of Earth Sciences, University of Cambridge, Cambridge, UK
[5]UCC, School of Biological, Earth and Environmental Sciences, University College Cork, Cork, Ireland
**Corresponding author e-mail: duygu@cp.dias.ie , bor@cp.dias.ie*

ABSTRACT

Potential deep (greater > 400 m) geothermal resources, within low to medium temperature settings remain poorly understood and largely untapped in Europe. DIG (De-risking Ireland's Geothermal Energy Potential) is an academic project started in 2020, which aims to develop a better understanding of Ireland's (all-island) low-enthalpy geothermal energy potential through the gathering, modelling and interpretation of geophysical, geological, and geochemical data. In the island-scale strand of the project, we develop a novel approach to determine the geothermal gradient using a new joint geophysical-petrological inversion where seismic velocities and density in the mantle are related to temperature and bulk composition within a thermodynamic framework. Large datasets of phase velocities of seismic surface-waves are now incorporated into the inversion, and provide essential constraints on the lithospheric thickness and temperature, which shape the crustal geotherms to a significant extent. We also include all available measurements of the surface heat flow, radiogenic heat production and thermal conductivity within the crust, to further constrain the temperature and geothermal gradient, in particular in the top few kilometres of the crust. Local-scale research aims to evaluate the geothermal energy potential of the Upper Devonian Munster Basin within the Variscides of southern Ireland. A more specific objective is to focus on the Mallow Warm Springs Area (MWSA) which is sited along the Killarney-Mallow Fault Zone (KMFZ). The constraints gathered by the magnetotelluric and passive seismic data within the KMFZ are 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 (MT and seismic). 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. The project is funded by the Sustainable Energy Authority of Ireland under the SEAI Research, Development & Demonstration Funding Programme 2019 (grant number 19/RDD/522) and by the Geological Survey Ireland.

KEY WORDS: Low-Enthalpy Geothermal, Mallow Warm Springs Area, Ireland