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IRETHERM: Developing a Strategic and Holistic Understanding of Ireland's Geothermal Energy Potential through Integrated Modelling of New and Existing Geophysical, Geochemical and Geological Data

Alan G. Jones (1), Stephen Daly (2), Jan Vozar (1), Volker Rath (1), Joan Campanya (1), Sarah Blake (1), Robert Delhaye (1), Tobias Fritschle (2), Nicola Willmot Noller (3), Mike Long (3), and Tim Waters (3)

(1) Dublin Institute for Advanced Studies, School of Cosmic Physics, Dublin, Ireland (alan@cp.dias.ie), (2) UCD School of Geological Sciences, University College Dublin, Belfield, Dublin 4, Ireland, (3) UCD School of Civil, Structural and Environmental Engineering, University College Dublin, Belfield, Dublin 4, Ireland

The Science Foundation Ireland funded academia-government-industry collaborative IRETHERM project (www.iretherm.ie), initiated in 2011, is developing a strategic understanding of Ireland's (all-island) deep geothermal energy potential through integrated modelling of new and existing geophysical, geochemical and geological data. Potential applications include both low enthalpy district space heating of large urban centres and electricity generation from intermediate-temperature waters.

IRETHERM comprises three broad geothermal target types; 1) Assessment of the geothermal energy potential of Ireland's radiogenic granites (EGS), (2) Assessment of the geothermal energy potential of Ireland's deep sedimentary basins (HSA), and, (3) Assessment of the geothermal energy potential of warm springs. The geophysical subsurface imaging techniques of choice are controlled-source (CSEM) and natural-source (magnetotellurics, MT) electromagnetic methods. Electrical conductivity, being a transport property, is a proxy for permeability, and appropriate porosity-permeability relations are being developed.

To date, MT measurements have been made at 466 sites over sedimentary basins (190 sites), granites (156 sites) and warm springs (120 sites), with CSEM across one warm spring. An ongoing continuous geochemical (temperature and electrical conductivity every 15 mins) and time-lapse seasonal hydrochemical sampling programmes are in progress at six warm spring sites. A database on heat production in Irish rocks has been compiled, of more than 3,300 geochemical sample measurements, with 3,000 retrieved from various archives and over 300 new analyses. Geochemistry, geochronology and isotopic analyses have been conducted on subsurface granites and exposed analogues astride the Iapetus Suture Zone in order to understand the underlying reasons for their radiogenic heat production. Finally, thermal conductivity measurements have been made on borehole samples from representative lithologies.

This presentation will review all of the IRETHERM work within Ireland's low enthalpy setting.