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Compositional multivariate statistical analysis of thermal groundwater provenance: A hydrogeochemical case study from Ireland

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1 **Compositional multivariate statistical analysis of thermal**
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3 **Ireland**

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15 **Abstract**

16 Thermal groundwater is currently being exploited for district-scale heating in many locations
17 world-wide. The chemical compositions of these thermal waters reflect the provenance and
18 circulation patterns of the groundwater, which are controlled by recharge, rock type and
19 geological structure. Exploring the provenance of these waters using multivariate statistical
20 analysis (MSA) techniques increases our understanding of the hydrothermal circulation
21 systems, and provides a reliable tool for assessing these resources.

22 Hydrochemical data from thermal springs situated in the Carboniferous Dublin Basin in east-
23 central Ireland were explored using MSA, including hierarchical cluster analysis (HCA) and
24 principal component analysis (PCA), to investigate the source aquifers of the thermal

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