Joint Geophysical and Petrological Inversion to Image the Lithosphere and Asthenosphere Beneath Ireland and Britain

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De-risking Ireland's Geothermal energy potential
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seai SUSTAINABLE ENERGY AUTHORITY OF IRELAND

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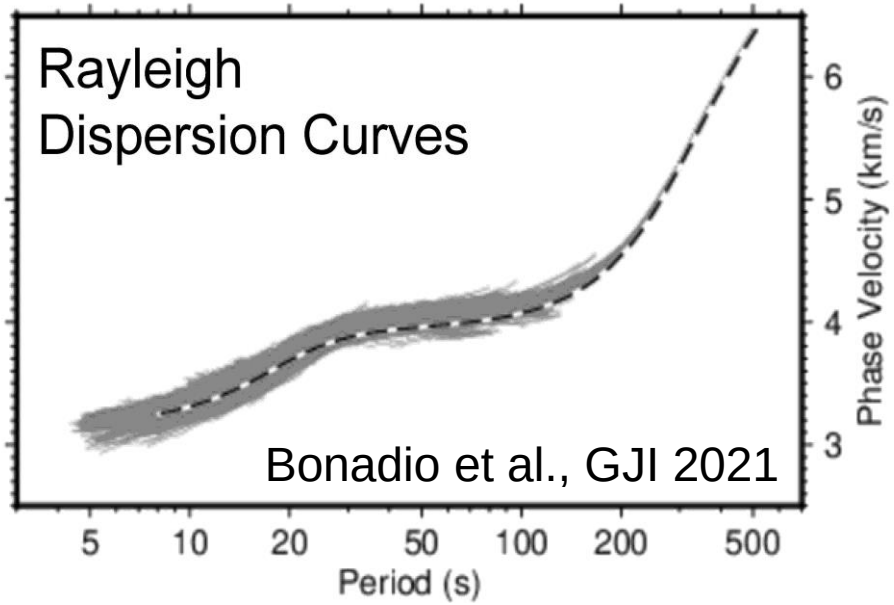
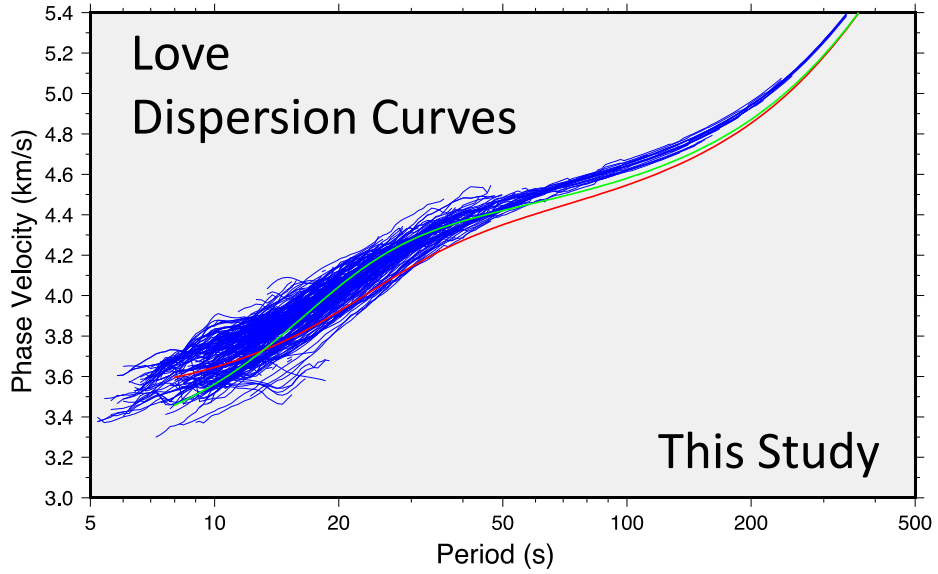
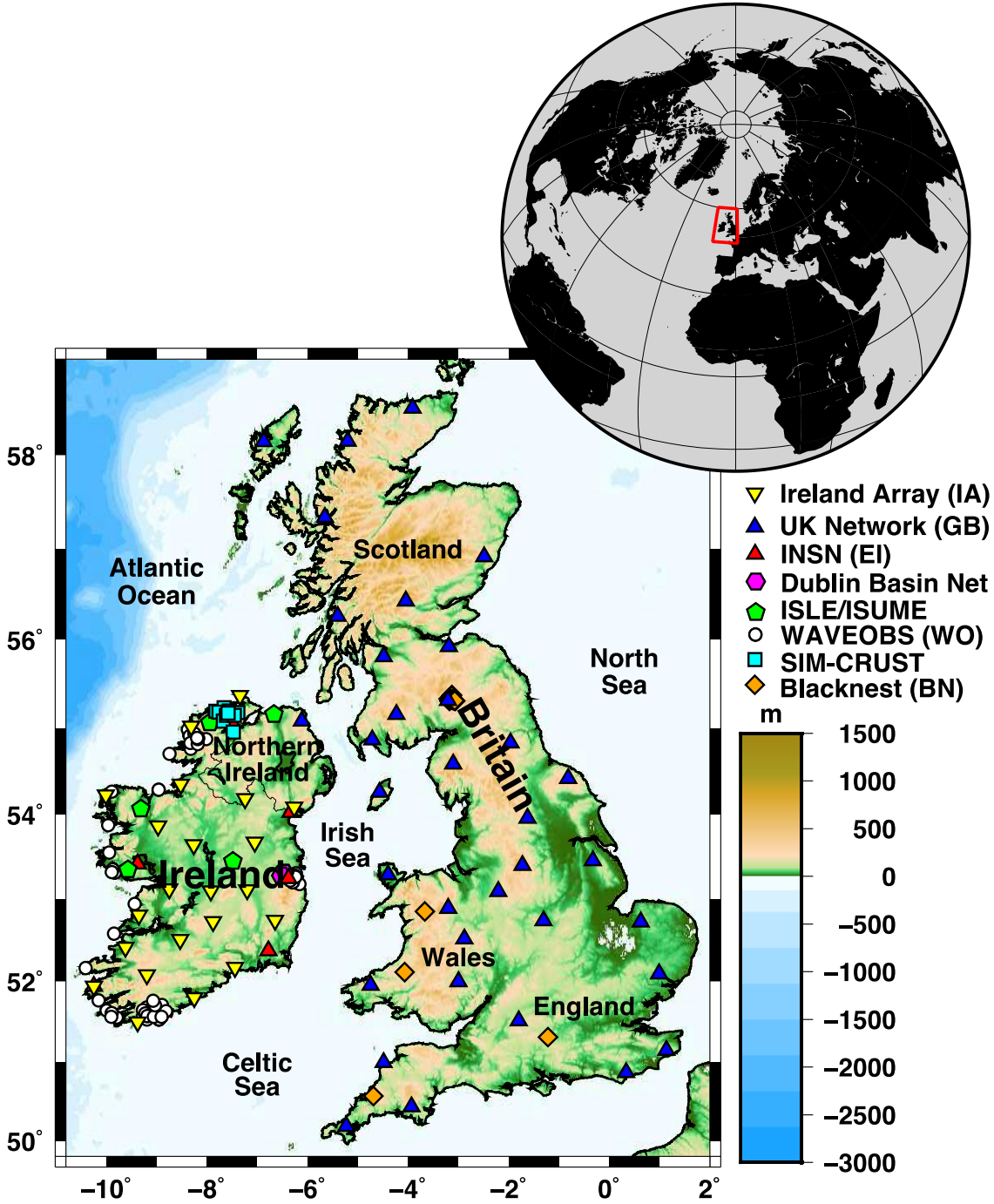
New seismic data

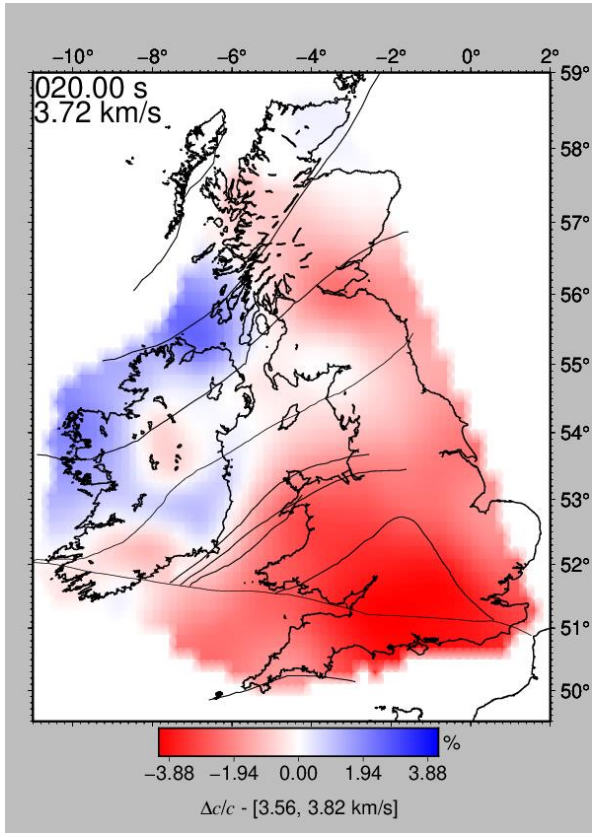




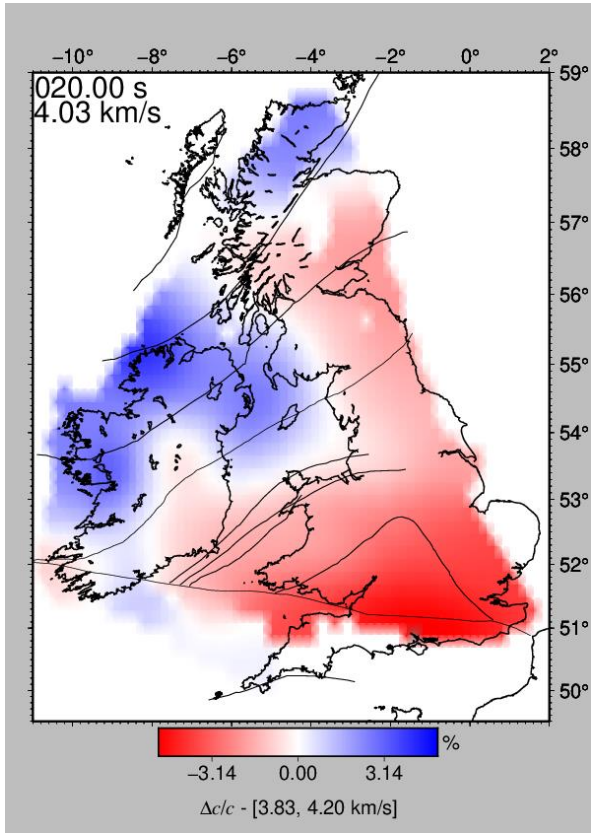


Combining surface waves with models - Anisotropy

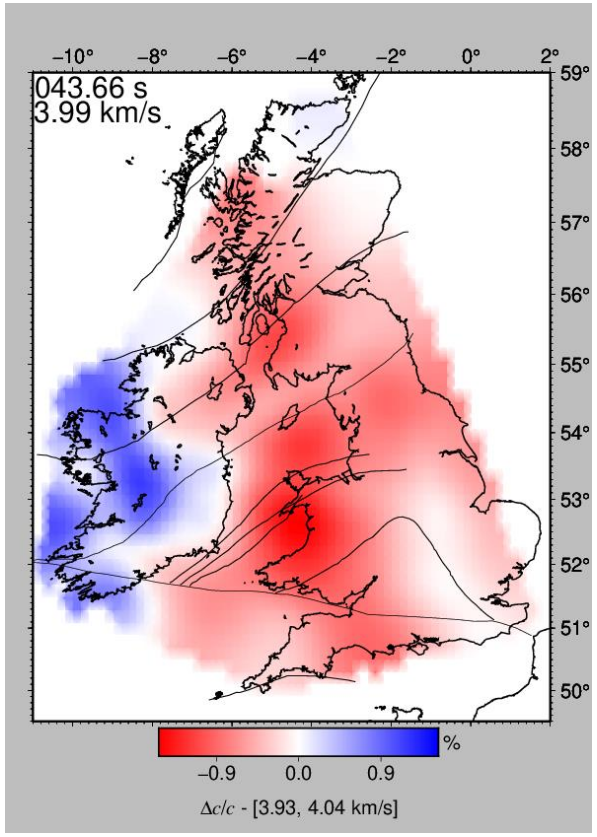
Rayleigh



Love



Rayleigh



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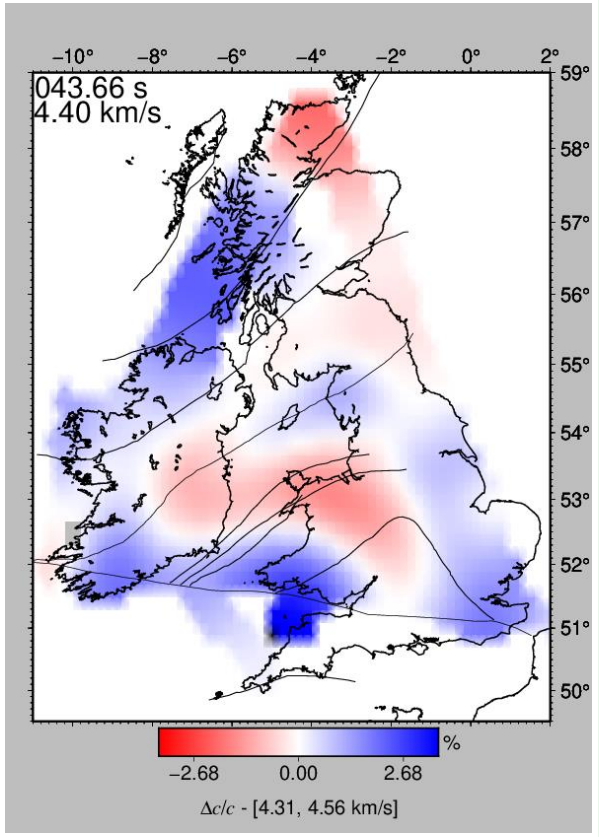
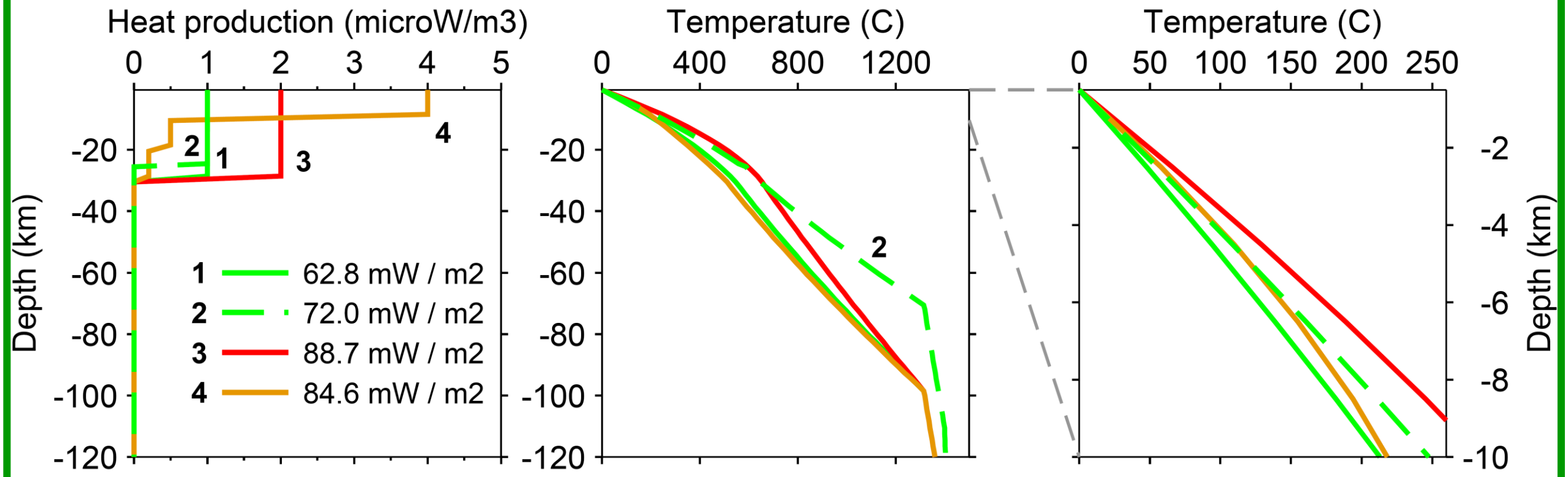
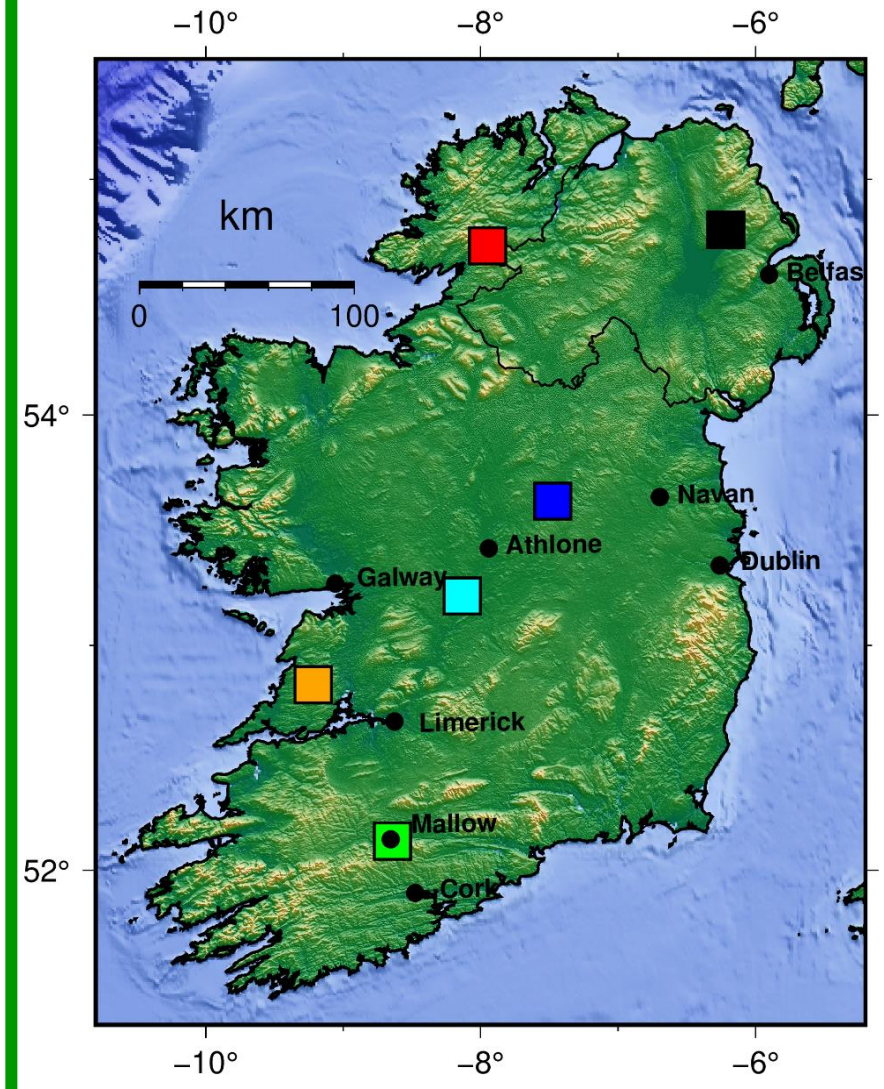


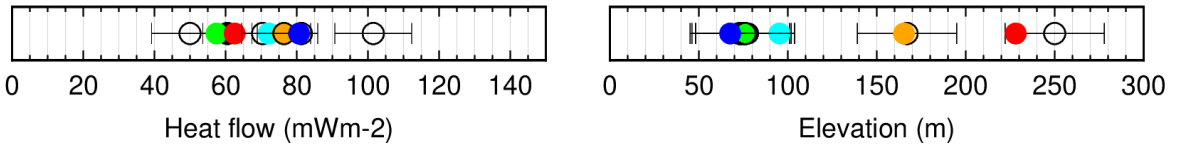
Results of joint geophysical – petrological modelling END MEMBER MODELS

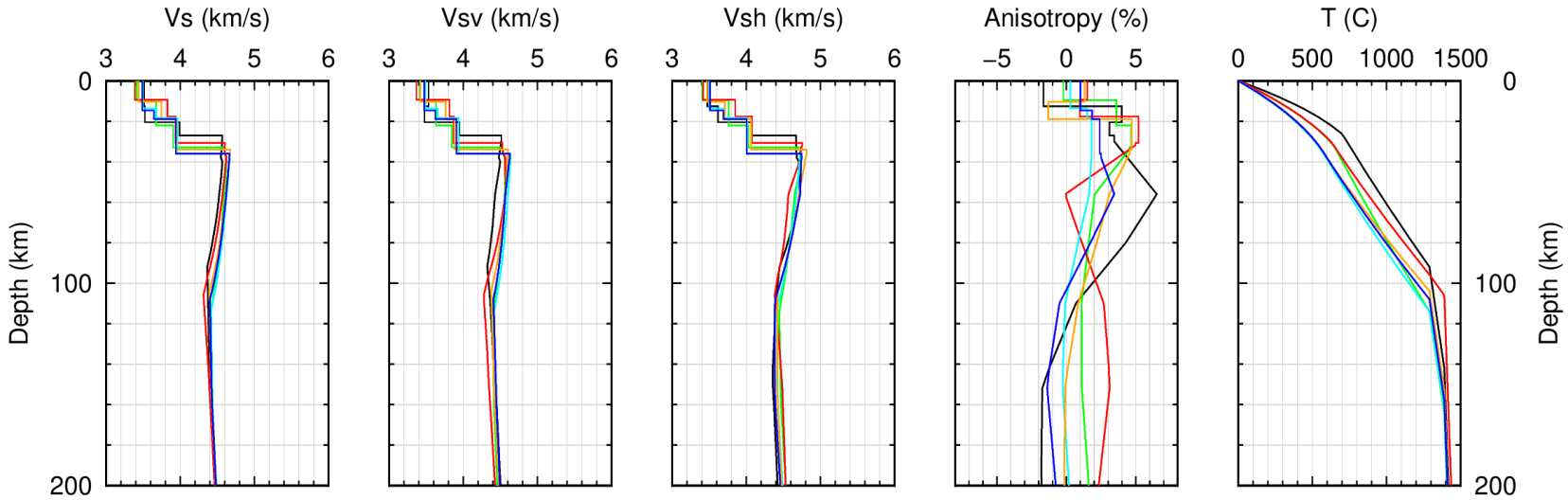


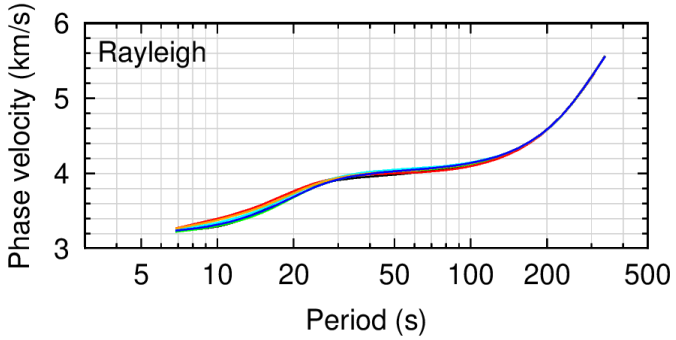
The same crustal thickness but different LAB depths results in 10-20K difference in temperature.

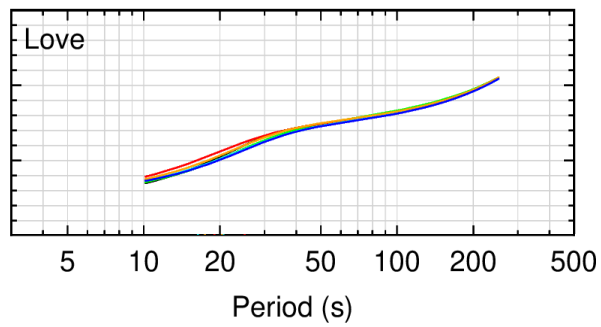
Joint geophysical-petrological inversion

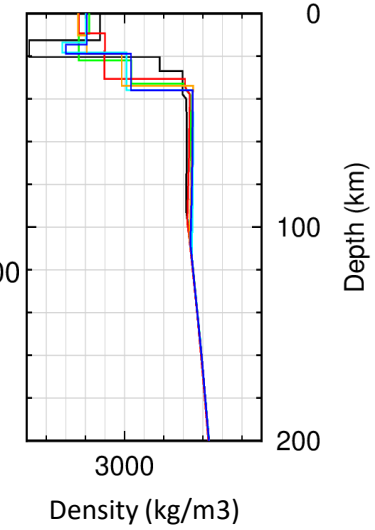




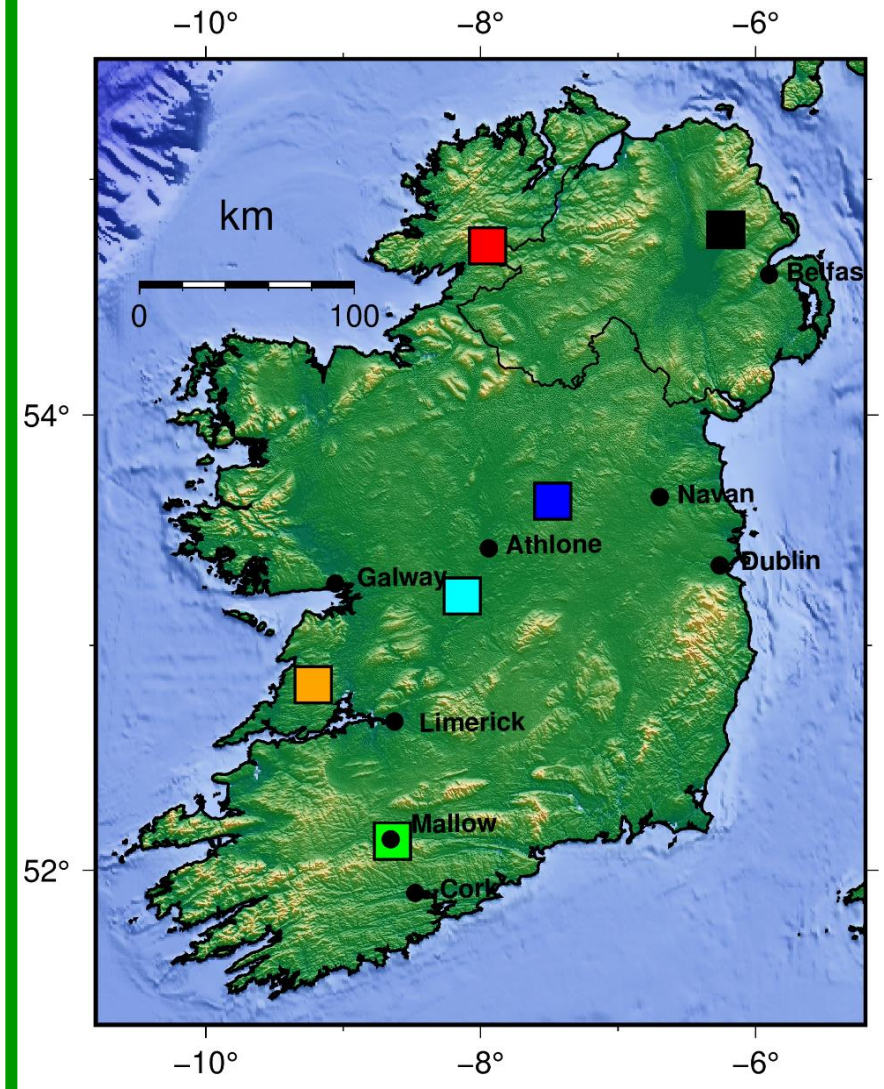




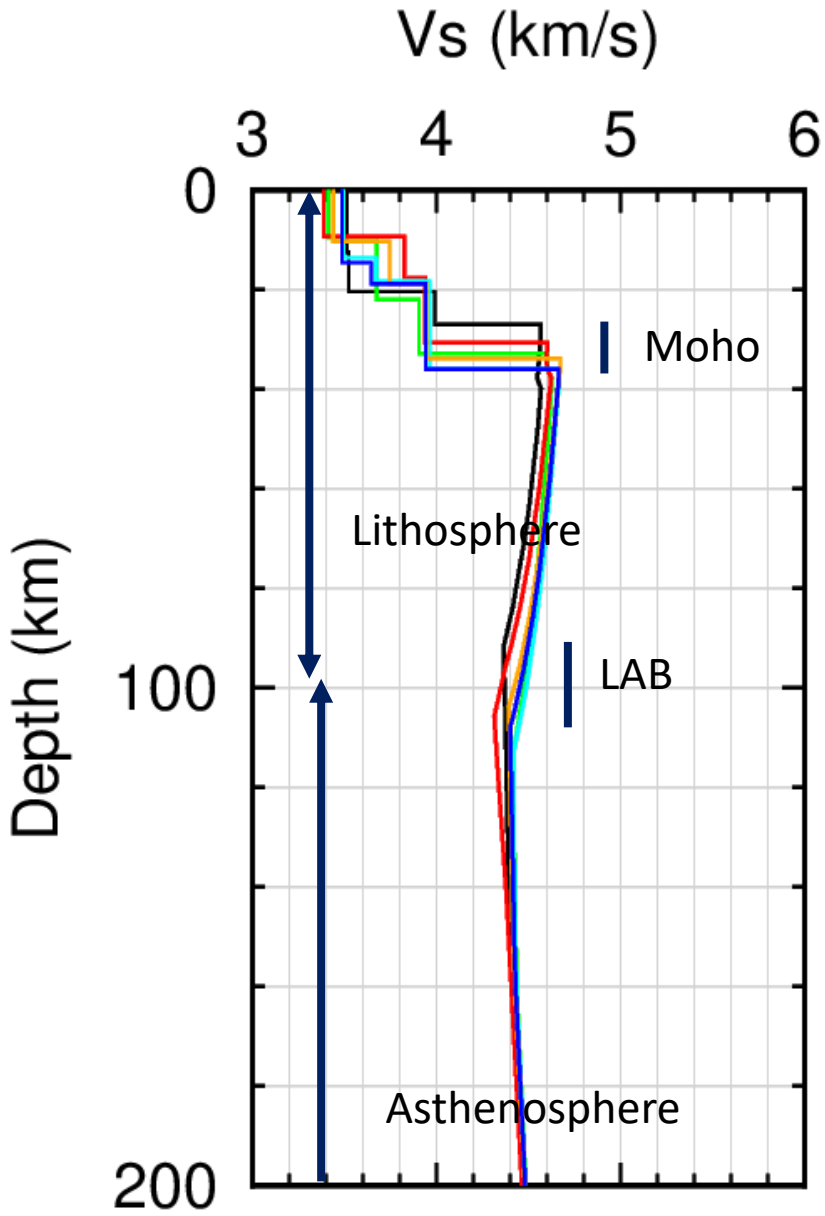




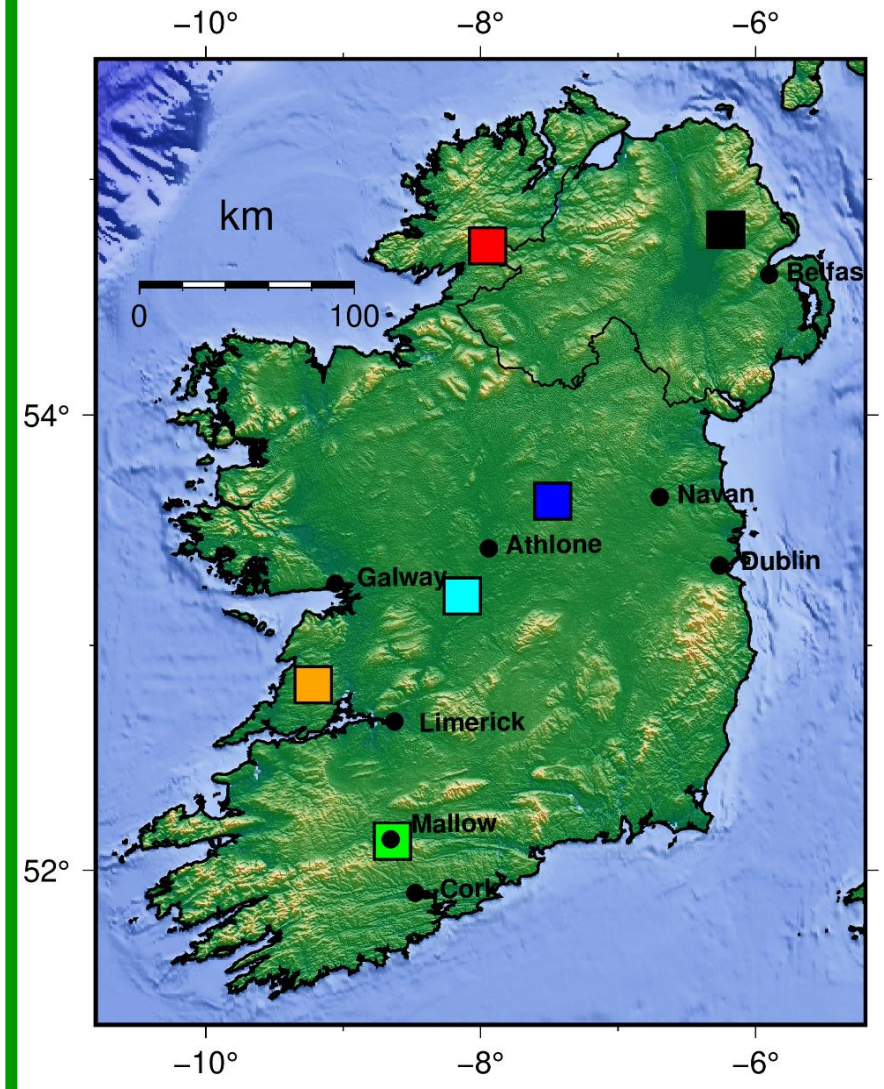
Joint geophysical-petrological inversion



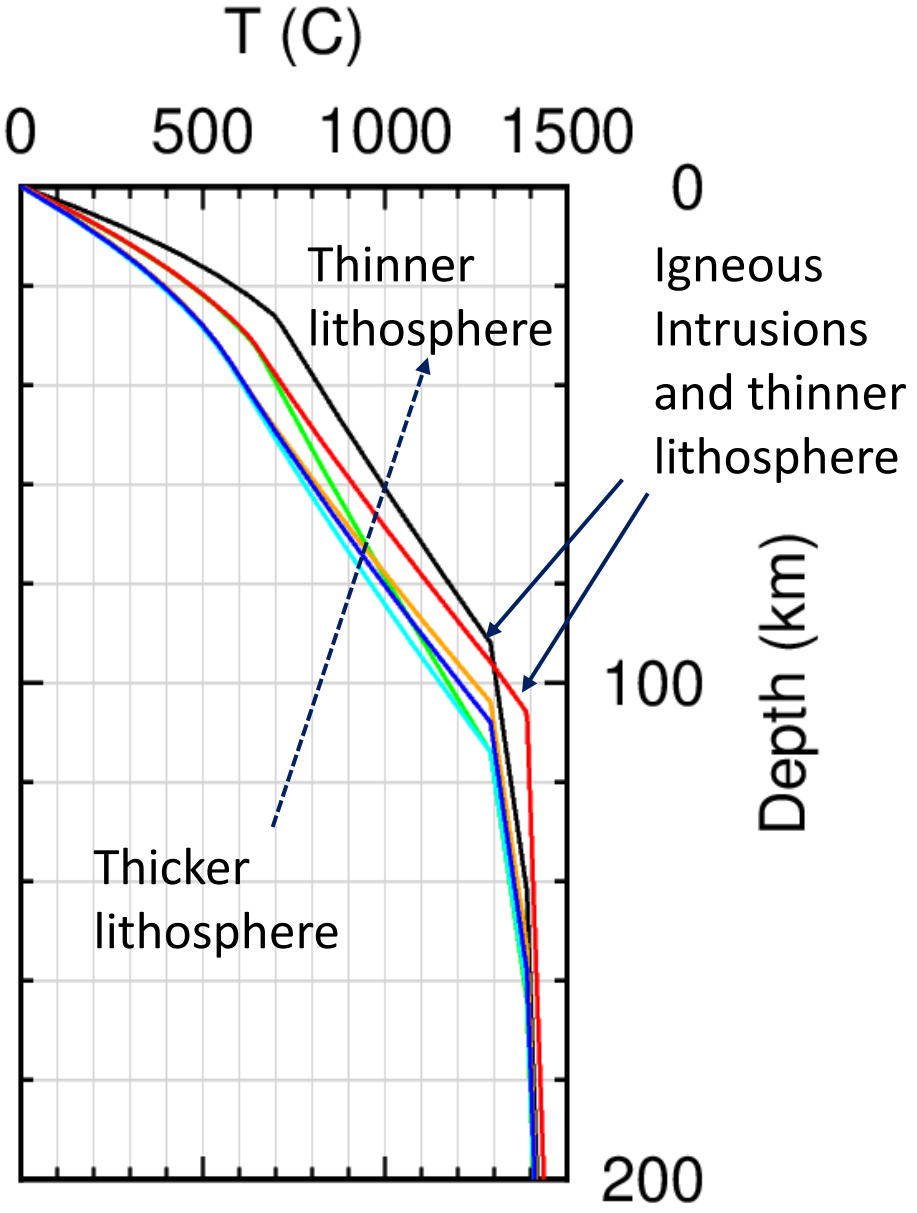
- Observe variations in Moho and LAB depths
- Shallower in the North. Thicker in central and Southern Ireland



Joint geophysical-petrological inversion



- Temperature largely explained by mantle heat production
- Lithospheric thickness a primary control,
- Points with igneous crustal intrusions, radiogenic heat production also significant



Conclusions

- Produced surface waves for Ireland
- Inverting for shear velocity we find large variations in anisotropy
- Integrating results of the updated petrological inversions to improve temperature models for Ireland with reduced uncertainty in the models.
- Lithospheric thickness is a major control on temperature and also the radiogenic heat production in the crust

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Mather & Fullea 2019

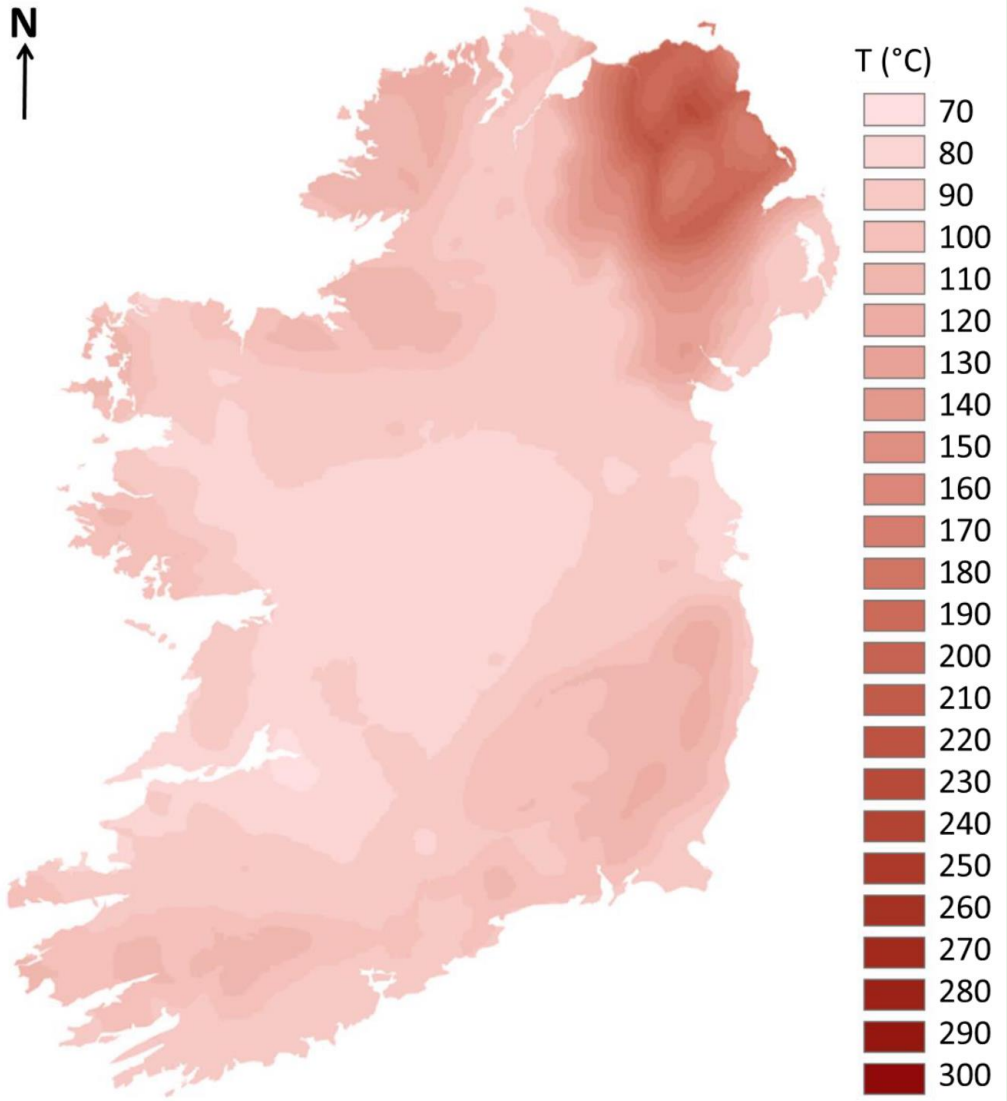

Figure 1 Deep temperature map at 2.0 km. Temperatures in degrees Celsius. Scale approx. 1:2,000,000. Values range from 70°C to 230°C.

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Acknowledgements

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Linked presentation:

EGU22-10526 | ERE2.4 | Wed, 25 May, 13:55–14:02 Room 0.96/97

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