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A new high resolution permafrost map of Iceland from Earth Observation data

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High resolution maps of permafrost are required for ongoing monitoring of environmental change and the resulting hazards to ecosystems, people and infrastructure. However, permafrost maps are difficult to construct – direct observations require maintaining networks of sensors and boreholes in harsh environments and are thus limited in extent in space and time, and indirect observations require models or assumptions relating the measurements (e.g. weather station air temperature, basal snow temperature) to ground temperature. Operationally produced Land Surface Temperature maps from Earth Observation data can be used to make spatially contiguous estimates of mean annual skin temperature, which has been used a proxy for the presence of permafrost. However these maps are subject to biases due to (i) selective sampling during the day due to limited satellite overpass times, (ii) selective sampling over the year due to seasonally varying cloud cover, (iii) selective sampling of LST only during clearsky conditions, (iv) errors in cloud masking (v) errors in temperature emissivity separation (vi) smoothing over spatial variability. In this study we attempt to compensate for some of these problems using a bayesian modelling approach and high resolution topography-based downscaling.