8D - Investigating Permafrost Using Geophysical Techniques

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Global warming affects Arctic environments and results in changing permafrost characteristics, alteration of permafrost hydrology, release of previously frozen carbon, and amplified morphological changes that can impact both the natural and built environment. Warming or thawing permafrost can multiply potential risks for infrastructure and lead to rapidly changing landscapes. Geophysical techniques are becoming a common field method for detecting internal structures and changes in permafrost and periglacial features or entire landscape units. Ground penetrating radar (GPR), electrical resistivity tomography (ERT), seismic, and electromagnetic (EM) methods have become well-tested and easily applicable to remote Arctic environments.

Due to their robust survey designs, geophysical methods are very useful for detecting and characterizing different permafrost features. Especially multi-dimensional approaches allow the detection of small-scale heterogeneities and can reveal spatial and temporal changes. In recent times, airborne geophysical approaches have been used, which significantly enlarge the spatial extent of measurements. Combined use of geophysics along with other in situ data can contribute to an enhanced understanding of changing permafrost environments and linkages between surface and subsurface changes.

In this session, we welcome contributions focusing on field-based studies on all kinds of Arctic permafrost and periglacial landforms and landscapes, such as thermokarst features (e.g., retrogressive thaw slumps), ice wedges, pingos, or drained lake basins using geophysical techniques. The focus can be on the characterization of internal structure but also on monitoring changes in active layer thickness, coastal erosion, or sub-sea permafrost. Contributions using multidisciplinary approaches of geophysics and other in situ or remote-sensing methods are highly encouraged.

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