

Applications in Permafrost Monitoring

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Automatic ERT monitoring in permafrost areas: logistical challenges and high-resolution process analysis

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Permafrost is a widespread phenomenon in arctic and high mountain regions and describes the permanently frozen state of the subsurface in lithospheric material. In the context of climate change, monitoring techniques are of great importance, which are able to quantify thaw (and freeze) processes in the subsurface. Geoelectrical monitoring approaches are especially well suited as they can detect even small changes in the unfrozen water content in permafrost areas. In addition, the depth of the seasonal thaw layer (active layer) can be monitored on a seasonal as well as a multi-annual time scale, which can be used as an indicator of long-term permafrost degradation.

We present results from automatic ERT monitoring data at the Schilthorn permafrost site (Swiss Alps) since 2009. The data set is not continuous due to several technical problems related to its high altitude location and the related harsh conditions. We will focus on (1) high resolution process analysis of the snow-melt and active layer thaw period in early summer as well as the freezing period in autumn and (2) a discussion of the influence of measurement errors and inversion choices on the interpretation of the results. Ground truth data exist in form of subsurface temperature data from two boreholes and soil moisture data from two sites along the profile line.