

Towards a geoelectrical database for permafrost monitoring to enable the processing and repetition of historical measurements

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Electrical imaging has been widely applied for permafrost detection and monitoring over different spatial scales. Only very few permafrost sites worldwide are continuously monitored with ERT as part of national monitoring programmes (~10). On the contrary, a much larger number of individual ERT surveys from the past exist (estimated to be >200 alone in the Swiss Alps). These data sets are neither included in a joint database nor have they been analysed in an integrated way. Within a GCOS Switzerland-funded project we address this important historical data source.

In a first step, historical data on permafrost terrain from UniFR groups and their collaborating national and international partners were collected and metadata archived (> 150 profiles). Some of the historical measurements were already repeated in summers 2019 and 2020 (e.g. Etzelmüller et al. 2020, Hilbich et al. 2019). The resulting resistivity changes on time scales of 10 to 20 years are presented and analysed according to several sites characteristics such as geomorphology, elevation and surface type. These results are analysed in the context of climate change, showing the value of repeated ERT measurements to detect the climate signal of permafrost change after time spans up to 20 years.

In a second methodological step, the Reproducible Electrical Data Analysis (REDA) scientific Python library (Weigand and Wagner, 2017) will be used for the homogenisation of processed ERT data. It is aimed to reprocess the historical data in the most integrative and reproducible manner. Technical challenges for reprocessing a large number of data sets in an integrative way will be discussed. Furthermore, the structure and the ongoing implementation of the international open-access database for permafrost ERT surveys is described.

Etzelmüller, B., Guglielmin, M., Hauck, C., Hilbich, C., Hoelzle, M., Isaksen, K., Noetzli, J., Oliva, M., Ramos, M. (2020): Twenty years of European Mountain Permafrost dynamics – the PACE Legacy., *Environmental Research Letters*, 15. Doi: <https://doi.org/10.1088/1748-9326/abae9d>.

Hilbich C., Hauck C., Pellet C., Isaksen K., Etzelmüller B. (2019): Permafrost degradation in Norway documented through repeated geophysical surveys after 10 and 20 year. Swiss Geosciences Meeting, 2019, Fribourg.

Weigand, M., Wagner, F. M. (2017): Towards unified and reproducible processing of geoelectrical data. 4th International Workshop on Geoelectrical Monitoring, Nov. 22-24, Vienna, Doi: <https://doi.org/10.5281/zenodo.1067502>