

An international database of geoelectrical surveys on permafrost to promote data sharing, survey repetition and standardized data reprocessing

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Keywords: permafrost, database

Geoelectrical methods are widely used for permafrost investigations by research groups, government agencies and industry. Electrical Resistivity Tomography (ERT) surveys are typically performed only once to detect the presence or absence of permafrost. Exchange of data and expertise among users is limited and usually occurs bilaterally. Neither complete information about the existence of geophysical surveys on permafrost nor the data itself is available on a global scale. Given the potential gain for identifying permafrost evidence and their spatio-temporal changes, there is a strong need for coordinated efforts regarding data, metadata, guidelines, and expertise exchange. Repetition of ERT surveys is rare, even though it could provide a quantitative or at least semi-quantitative spatio-temporal measure of permafrost evolution, helping to quantify the effects of climate change at local (where the ERT survey takes place) and global scales (due to the inventory).

Our International Permafrost Association (IPA) action group (2021–2023) has the main objective of bringing together the international community interested in geoelectrical measurements on permafrost and laying the foundations for an operational International Database of Geoelectrical Surveys on Permafrost (IDGSP). Our contribution presents a new international database of electrical resistivity datasets on permafrost. The core members of our action group represent more than 10 research groups, who have already contributed their own metadata (currently ~ 300 profiles, including ~400 surveys, covering 12 countries) and have started to answer to the recent call for resistivity data. These metadata will be fully publicly accessible in the near future whereas access to the resistivity data may be either public or restricted (according to the data policy of the database). Thanks to this open-access policy, we aim at increasing the level of transparency, encouraging further data providers and fostering survey repetitions by new users.

The database is set up on a virtual machine hosted by the University of Fribourg. The advanced open-source relational database system PostgreSQL is used to program the database. Homogenization and standardization of a large number of data and metadata are among the greatest challenges, yet are essential to a structured relational database. In this contribution, we present the structure of the database, statistics of the metadata uploaded, as well as some exemplary results of repetitions from legacy geoelectrical measurements on permafrost. Guidelines and strategies are developed to handle repetition challenges such as changing survey configuration, changing geometry or inaccurate/missing metadata. Strategy and first steps toward transparent and reproducible automated filtering and inversion of a great number of datasets will also be presented. By archiving geoelectrical data on permafrost, the ambition of this project is the reanalysis of the full database and its climatic interpretation.