Beitrag ID: **18** Typ: **Presentation**

Tracing Extended Internal Stratigraphy in Ice Sheets using Computer Vision Approaches.

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Polar ice sheets Greenland and Antarctica play a crucial role in the Earth's climate system. Accurately determining their past accumulation rates and understanding their dynamics is essential for predicting future sea level changes. Ice englacial stratigraphy, which assigns ages to radar reflections based on ice core samples, is one of the primary methods used to investigate these characteristics. Moreover, modern ice sheet models use paleoclimate forcings which are derived from ice cores and stratigraphy contribute to improvement and tuning of such models.

However, the conventional semi-automatic process for mapping internal reflection horizons is prone to shortcomings in terms of continuity and layer geometry, and can be highly time-consuming. Furthermore, the abundance of unmapped radar profiles, particularly from the Antarctic ice sheet, underscores the need for more efficient and comprehensive methods.

To address this, machine learning techniques have been employed to automatically detect internal layer structures in radar surveys. Such approaches are well-suited to datasets with different radar properties, making them applicable to ice, firn, and snow data. In this study, a combination of classical computer vision methods and deep learning techniques, including Convolutional Neural Networks (CNN), were used to map internal reflection horizons.

The study's methodology, including the specific pre-processing methods, labeling technique, and CNN architecture and hyperparameters, is described. Results from more promising CNN architectures, such as U-net, are presented and compared to those from image processing methods. Challenges, including incomplete training data, unknown numbers of internal reflection horizons in a profile, and a large number of features in a single radargram, are also discussed, along with potential solutions.

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