



Recent developments in the optical televiewing of ice boreholes

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Developed in the past few years, the optical televiewing (OPTV) of ice boreholes has now been successfully applied to temperate and polythermal valley glaciers, to Antarctic ice shelves, to a shallow borehole on the surface of the Greenland Ice Sheet, and recently to the NEEM deep ice borehole.

Here, we report on several specific aspects of this work, outlining the capability of OPTV in glaciological analysis. These include:

- Revealing the 3D internal structure of valley glaciers, e.g. identifying eight separate structural generations on Midre Lovénbreen, Svalbard;
- Characterizing the internal ice facies forming the base of an Antarctic ice shelf rift, e.g. identifying three possible types of 'marine ice';
- Recording annual layering and allowing age-depth scales to be reconstructed for contrasting locations on both the Greenland and the Antarctic ice sheets.
- Providing a proxy for snow, firn and ice density, based on calibrating an OPTV record of an Antarctic ice-shelf borehole with densities measured gravimetrically on corresponding core samples.
- Reconstructing former surface melting and melt-pond formation on an Antarctic ice shelf, revealing that such melting is not a recent phenomenon.
- Revealing aspects of the internal structure of the Greenland ice sheet at the NEEM deep ice drill site, e.g. the presence of ash layers and annual layering at depths of several hundreds of metres in the ice.