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Ice properties revealed by an OPTV log of the full length of the NEEM deep ice borehole, Greenland

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Deployment of a digital optical televiewer (OPTV) in the NEEM deep ice borehole, Greenland, has resulted in an optical log of the entire ∼2.5 km hole. The log reveals a variety of ice properties. The presence of regularly-repeated layering, interpreted to be annual, can be seen intermittently to a depth of ∼1,600 m, allowing the construction of an age-depth curve. In addition, numerous dust layers are visible throughout the log, many of which are either incomplete or dipping, allowing comparison with, and (for the first time) orientation of, ice core sections. Debris inclusions also appear throughout the log with the basal zone showing a high volume of debris commonly occurring as scattered debris inclusions and large (33-55 cm), dipping (dip 20-36cm, dip direction 148-213°) layers. The log shows large-scale variations in returned luminosity, controlled by corresponding variations in the light transmissivity of the ice bounding the borehole. These include a gradual decrease in luminosity to a depth of ∼1,700 m where the ice type changes. Analysis of these changes in sections where annual layering is not clearly visible may be used to complement annual layer counting in the construction of a continuous age-depth curve.