A Simple Method for Reconstructing an Ice Core's Orientation

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ABSTRACT

It has always been a challenge to determine an ice core's spatial orientation, ever since the first deep ice cores have been drilled. For shallow ice cores it is usually possible to match the adjacent core breaks, which preserves the relative orientation of the ice column. However, this method fails for deep ice cores, such as the EastGRIP ice core in Northeast Greenland. This paper provides a simple method to reconstruct an ice core's orientation using visual stratigraphy and information about bore hole geometry. Because ice core is drilled through the North East Greenland Ice Stream we use information about the directional stresses to perform a full geographical re-orientation. We compared the re-oriented core with logging data from core break matching as well as with the pattern of the stereographic projections of the crystal's fabric orientation. Both comparisons agree very well with the proposed re-orientation method. The method has worked for reconstructing 441 of 451 samples from a depth of 1375 to 2120 m in the EastGRIP ice core. It can also easily be applied to other ice cores, providing a better foundation for interpreting physical properties and understanding the flow of ice.