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Inferring crystal orientation with polarimetric radar measurements at EastGRIP

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Crystal Orientation Fabric (COF) of c-axes in ice cores reveals information about deformation within ice sheets. While this is a well established analysis technique for deep ice cores from ice divides, information about COF in ice streams is just now becoming available: the EastGRIP ice core is situated inside the largest ice stream in Greenland, the North East Greenland Ice Stream (NEGIS). With the ongoing analysis of samples from the EastGRIP ice core, COF is now available down to 1714 m, revealing an extremely more rapid evolution of COF anisotropy with depth compared to all other ice cores. This enables us to study the ability of polarimetric radar measurements to infer an overall pattern of COF from measurements conducted at the surface. Depending on whether the COF is isotropic or anisotropic, a radar signal is reflected differently in terms of angle dependence and polarization. We conducted these polarimetric measurements around the EastGRIP drill site and we compare them to COF data obtained from 778 thin sections, prepared and measured at EastGRIP drill site. We investigate the hypothesis that the same pattern of COF can be retrieved from the polarimetric measurements as is available from the ice core. If confirmed, this would provide an addition constraint on the (an)isotropy at locations where no ice core is available. This would potentially provide quasi spatial coverage and greatly improve our understanding of the evolution of anisotropy over from ice divides to outlet glaciers.