**Supplement of ‘Crystallographic preferred orientation (CPO) patterns in axially compressed deuterated ice: quantitative analysis of historical data’**

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This supplementary material explains the parametric routines applied to pole figure data in our study. All routines were developed using MTEX (<https://mtex-toolbox.github.io>).

**Intensity spectra**

The routines described here are variations of the ‘intensity spectrum’ analysis described in Hunter and others (2018). In general, this method is used to identify and analyse changes in CPO pattern characteristics across specific transects of the pole figure. The result is a two-dimensional cross-section of the multiples of uniform distribution in an XY plot form.



**Figure S1** – Examples of intensity spectra used in this contribution. The top-most pole figure (A-A’) represents *c*-axis CPO data. The two bottom pole figures (B-B’; C-C’) represent *a*-axis CPO data. In all cases the multiples of uniform distribution in the pole figures (or ‘intensity’) are collected along the transects (black dashed lines) and transferred to a two-dimensional XY plots (right) for closer inspection of the variations in intensity (blue dashed lines).

Figure S1 presents the three types of intensity spectra plots that were used in this contribution. For analysis of ice *c*-axis patterns in the current study, we collected transects across both hemispheres of the pole figure (e.g. A-A’ in Fig. S1) at azimuth angles between 1-180 degrees (*n*=180 transects). We then took the average of all the transects to calculate the mean intensity spectrum. For *a-* and *m*-axis patterns, we collected transects as described for *c*-axis patterns described above (B-B’), and also parallel to the pole figure margin (C-C’).



**Figure S2** – Examples of intensity spectra for ‘cluster-dominant’ (top) and ‘cone-dominant’ (bottom) *c*-axis patterns. The ‘cone-to-cluster’ ratio is derived by taking the maxima intensity for a cluster peak (Pcluster) and the mean of the two cone peaks (Pcone). The ‘cone colatitude’ (green lines) delineates the plunge angle at which these cone peaks occur.

**Cluster and cone analyses**

When viewed in pole figure form, ice CPOs typically present as either ‘cone’ or ‘cluster’ patterns. We aimed to better quantify these patterns in our data, so we use the mean intensity spectrum of samples (as described above) and applied peak detection algorithms in MTEX to identify peaks associated with clusters (*P*cluster) and with cones (*P*cone).

Once peaks were identified, we calculated a ‘cluster-to-cone ratio’ (CtC), which is the proportional difference between the cluster and mean cone intensities (i.e *P*cluster */ P*cone). This is shown in Figure S2. For a ‘cluster dominant’ pattern the CtC value will be greater than 1, indicating that the cluster peak is of greater value than the mean of the cone peaks (refer top plot in Figure S2). For a ‘cone dominant’ pattern the opposite will be true. The CtC value will be less than 1 because the cone peaks are of greater value than the cluster peak (refer bottom plot in Figure S2).

We are also able to derive the ‘cone colatitide’, or the mean plunge angle at which the *P*cone values are detected across the pole figure (green lines in Figure S2). The cone colatitude value is between 0˗90°, where the pole figure margin is 0° and the pole figure centre is 90°. All cone colatitude values are presented in Table 1.

**References**

Hunter, NJR, Weinberg RF, Wilson CJL and Law RD (2018) A new technique for quantifying symmetry and opening angles in quartz c-axis pole figures: Implications for interpreting the kinematic and thermal properties of rocks. *Journal of Structural Geology*, **112**, 1-6(doi:10.1016/j.jsg.2018.04.006)