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Supporting Information for

High stress deformation and short-term thermal pulse preserved in exhumed lower crustal seismogenic faults (Lofoten, Norway)

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Introduction

The following supporting figures offer additional examples or analysis to support those in the main manuscript. All relevant methods are described in the main manuscript.

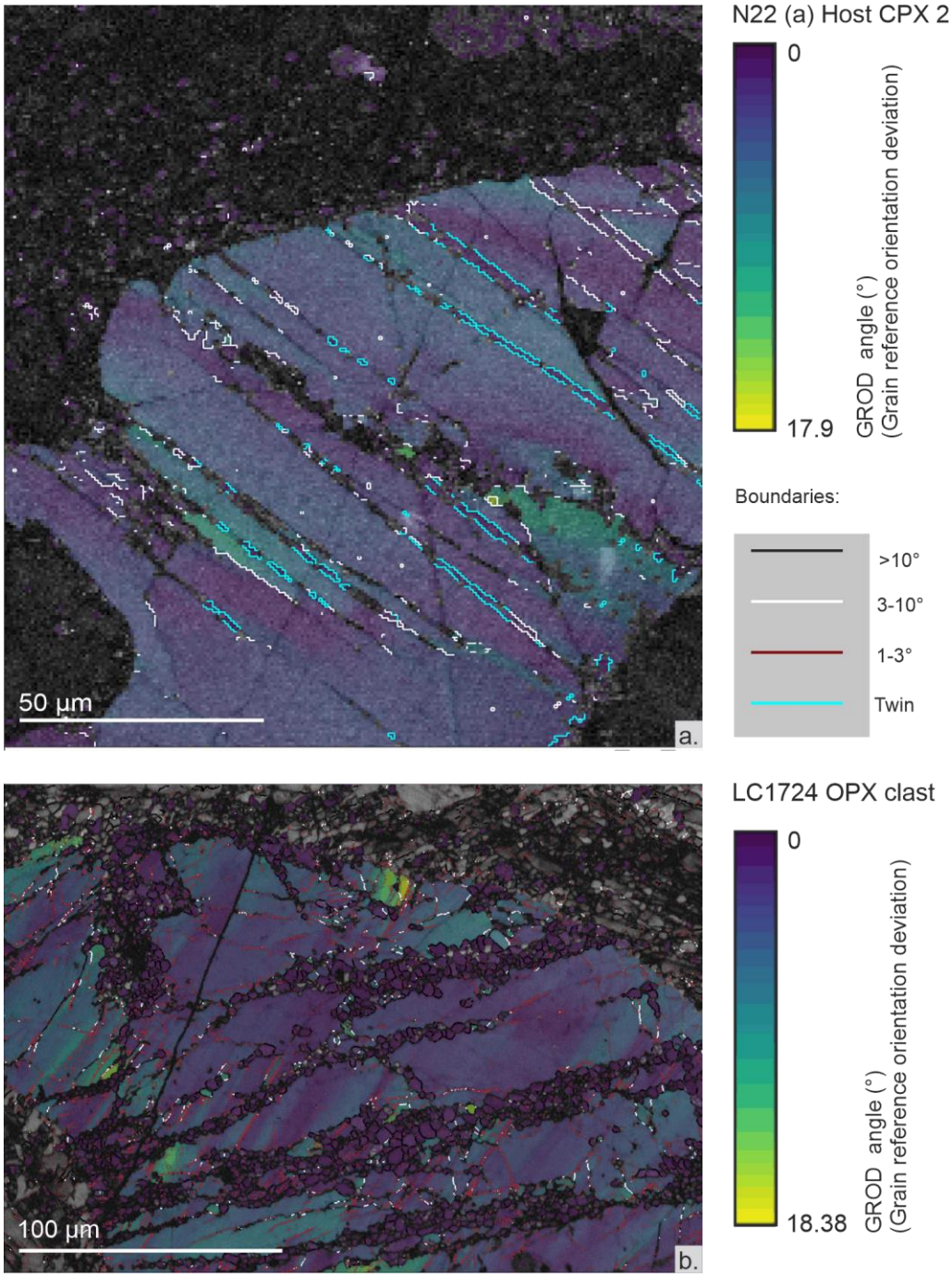

Figure S1. Grain reference orientation deviation (GROD) maps showing misorientation of points from the grain's mean orientation. **a)** GROD map of 'Host CPX 2' (see Fig. 3 f-g); **b)** GROD map of OPX clast (see Fig. 8).

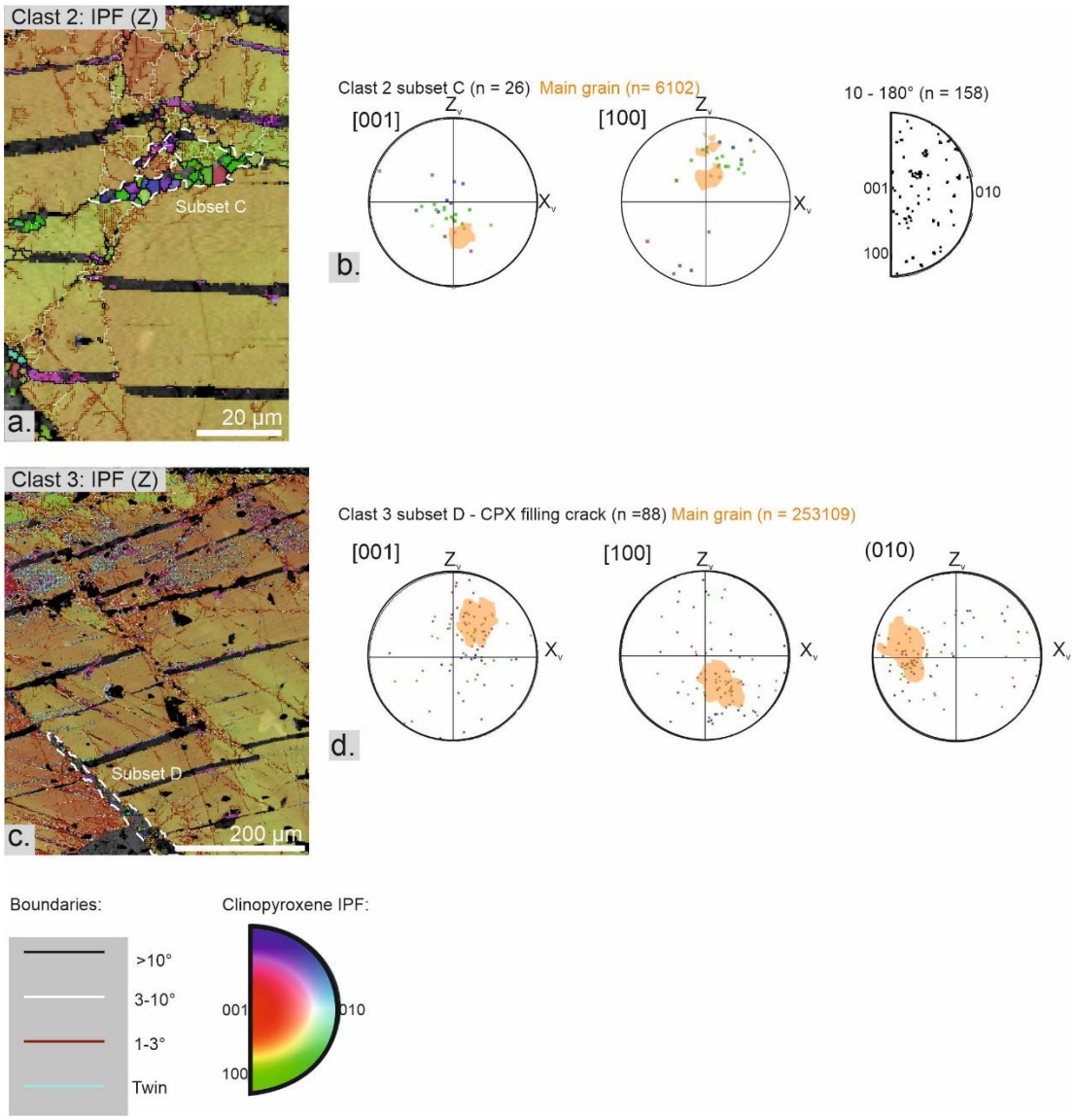

Figure S2. fine-grained clinopyroxene observed in clasts **a)** IPF (Z) map for clinopyroxene in clast 2; **b)** pole figures with IPF (Z) colouring and rotation axes in crystal co-ordinates for fine-grained CPX filling a crack in clast 2 (1 point per grain), points from main grain shown in orange overlay; **c)** IPF (Z) map for clinopyroxene in clast 3; **d)** pole figures for fine-grained CPX filling crack in clast 3 (1 point per grain), points from main grain shown in orange overlay.

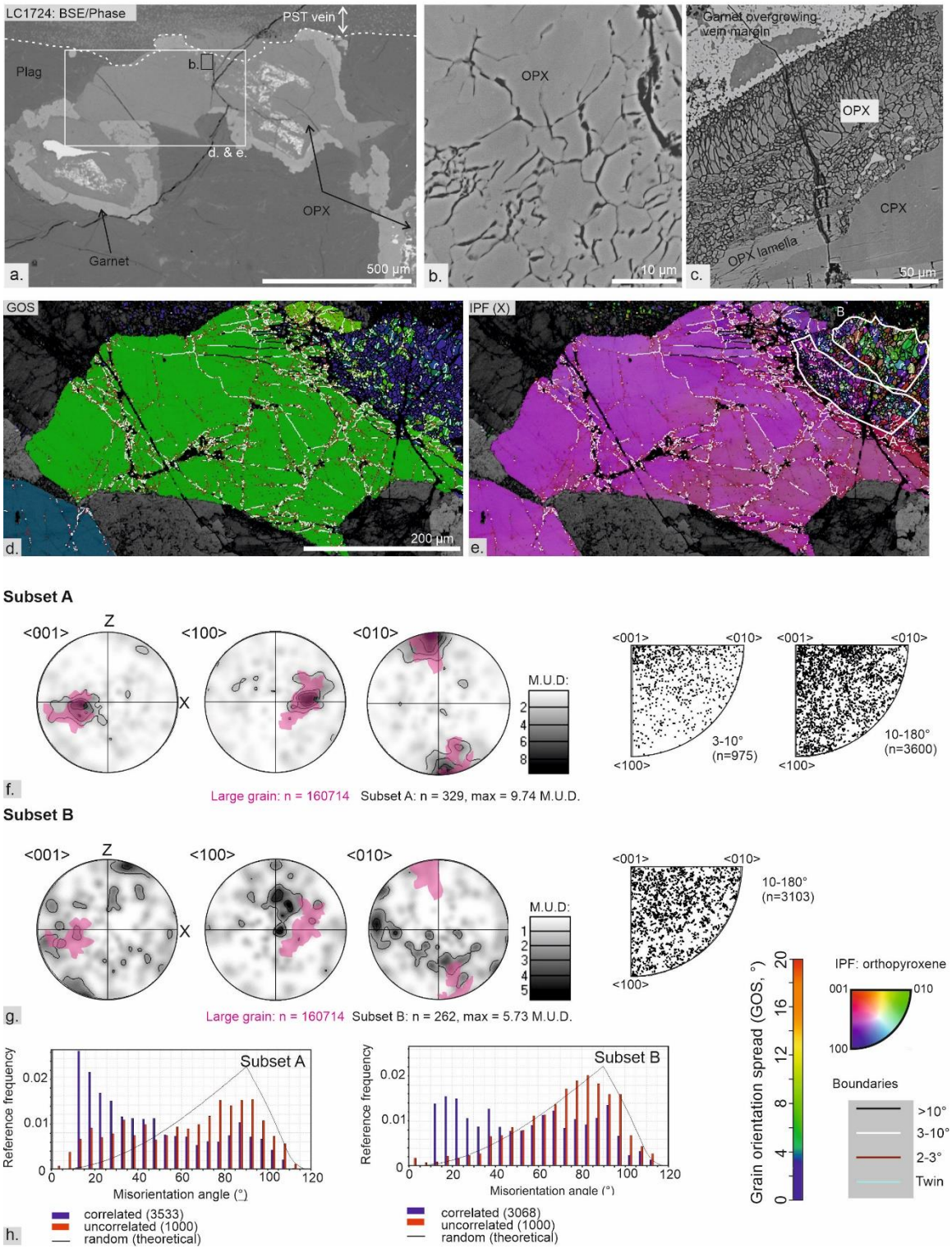

Figure S3. Additional examples of deformed orthopyroxene. **a)** BSE image of orthopyroxene grain bordering pseudotachylyte vein in sample LC1724, and adjacent pseudotachylyte vein, with adjacent phases and location of EBSD analysed region labelled; **b)** high magnification BSE image of pervasively fragmented region of orthopyroxene grain shown in a); **c)** fragmentation of orthopyroxene lamellae within a clinopyroxene grain

bordering a pseudotachylyte vein in N22. This forms part of a large polycrystalline clast surrounded by PST (location shown in Fig. 2f); **d)** EBSD GOS map of OPX in the host rock bordering a PST vein, LC1724 (location indicated in a)); **e)** IPF (X) orientation map of OPX; **f)** pole figures (lower hemisphere, equal area) & rotation axes (in crystal co-ordinates) for subset A in the fragmented part of the grain(s) – subset location shown in b). The pink areas in the pole figures represent the orientation of the host opx grain; **g)** pole figures (lower hemisphere, equal area) & rotation axes (in crystal co-ordinates) for subset B in the fragmented part of the grain(s) – subset location shown in b). The pink areas in the pole figures represent the orientation of the host opx grain; **h)** misorientation histograms for subset A and subset B.

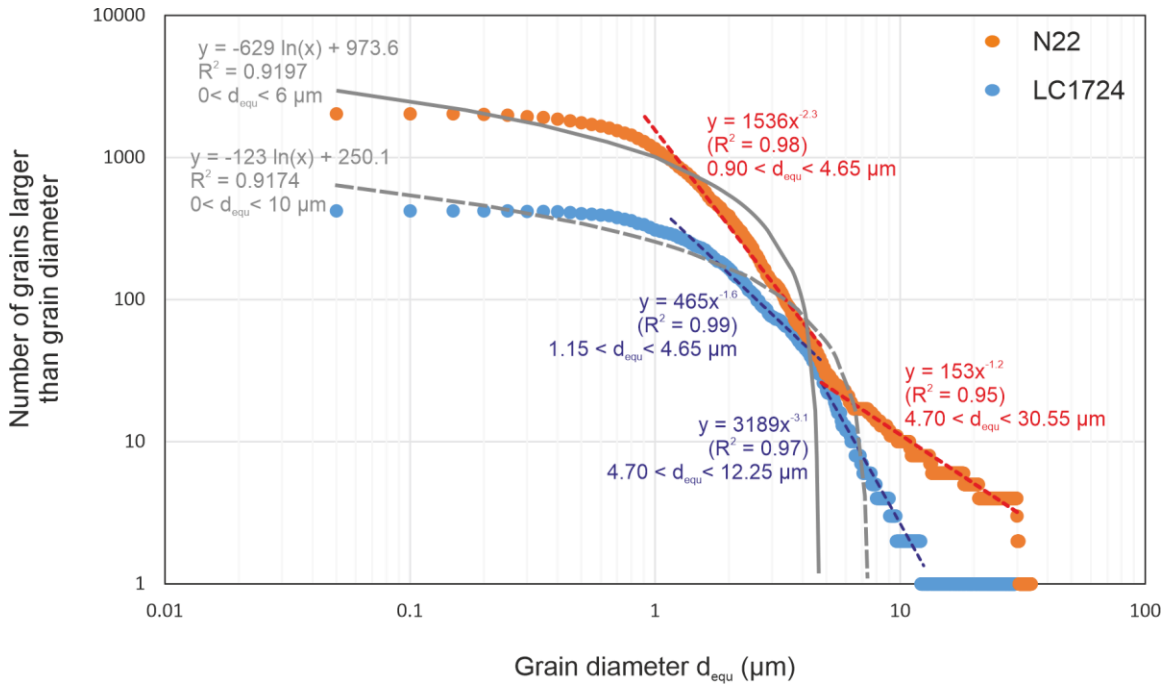

Figure S4. Grain size distribution (GSD) for fragmented orthopyroxene in vein margins for samples N22 and LC1724. Best fit lines are shown for log normal (grey) and power law (red/blue) distributions.

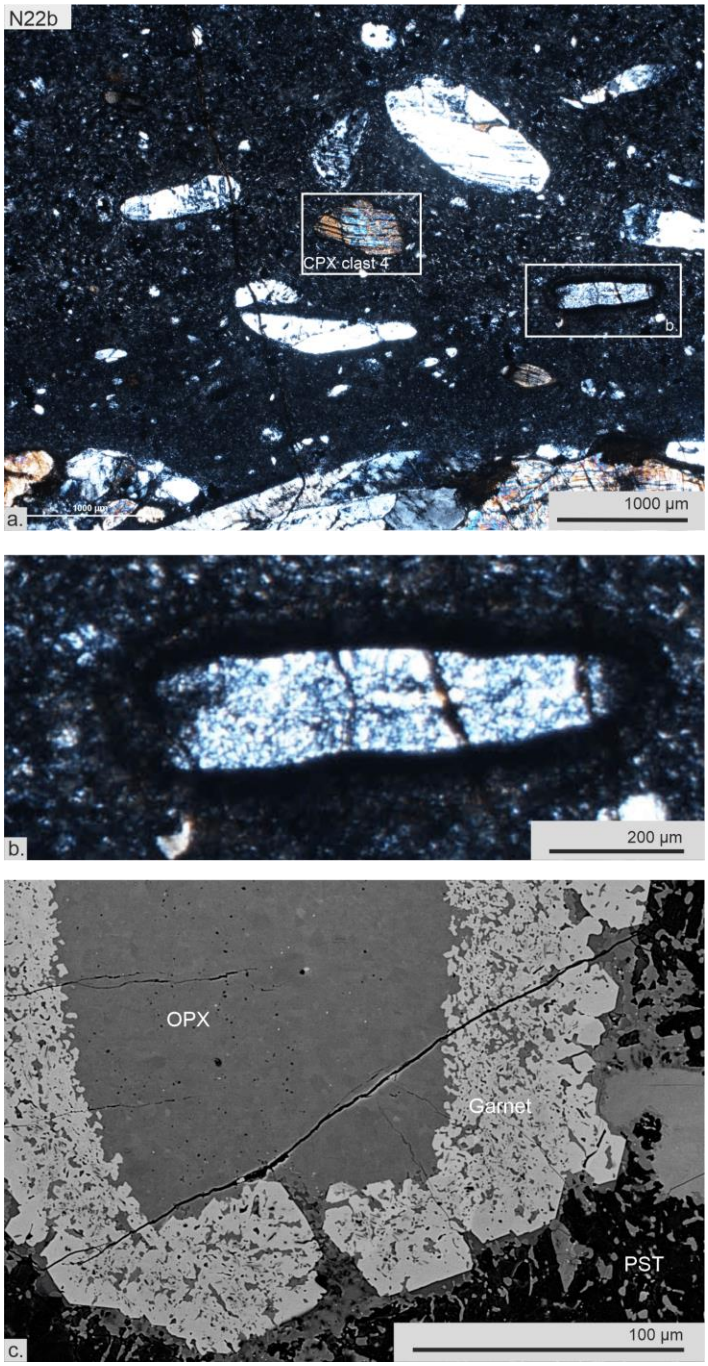

Figure S5. Fragmented OPX clast: **a)** Optical micrograph (XPL) showing position of clast in thin section N22b relative to CPX clast 4. Fragmentation of the OPX can be seen in the mixed extinction of the OPX; **b)** close-up image of same clast, (XPL) ; **c)** BSE image of part of same clast, showing fragmentation in the OPX and the garnet rim.