Supplementary Figure Captions

Figure DR1. Additional examples of D2 microstructures and kinematic indicators. All photomicrographs in plane polarized light unless otherwise noted. (A) Relict crenulations preserved in a unit Ps schist where S1 is otherwise entirely absent. Photomicrograph in cross polarized light with quarter-wave plate inserted. (B) Kinked biotite surrounded by S2 matrix in a unit Pm marble from the northern domain. Black arrow denotes Type III calcite twin. (C, D) Examples of the increase in S2 schistosity from lower to higher structural levels, respectively, in the southern domain. (E) S2 matrix fabric typical of the core orthogneiss. (F) Garnet porphyroblast from unit Ts graphitic schist with a symmetric strain shadow, indicating mixed or ambiguous shear sense. (G) Garnet porphyroblast in unit Ps schist from the southern domain with asymmetric strain shadows that indicate top-south shear sense in a sample with overall symmetrical shear sense indicators. (H, I) Additional photomicrographs of C’ shear bands from the metasedimentary rocks that both indicate top-north-northwest shear sense. (J) C’ shear bands in an orthogneiss sample that also indicate top-north-northwest shear sense. (K) white mica fish from a unit Ps schist sample that indicate top-south-southeast shear sense. The sample contains C’ shear bands and other white mica fish (Fig. 10E) that indicate top-north-northwest shear sense. (L) quartz schist from the central domain that contains amoeboidal quartz grains with lobate boundaries that are locally pinned by biotite, indicating GBM I recrystallization. (M) Quartzite from the central domain that contains amoeboidal quartz with lobate boundaries, dissection microstructures, and inclusions of biotite, indicating GBM II recrystallization. (N) Orthogneiss sample containing feldspar grains with polygonal subgrains (white arrows) and amoeboidal quartz grains indicating plastic deformation of both phases under conditions favorable for quartz GBM II recrystallization. (O) Orthogneiss from the southern domain with...
large feldspar grains locally that exhibit subgrain microstructures (white arrows). Quartz grains are large, amoeboidal, and locally exhibit chessboard extinction, indicating GBM II recrystallization.

**Figure DR2.** (A) Schematic representations of quartz [c] (dark gray) and <a> axis (light gray) fabric patterns as contoured data on lower hemisphere, equal-area stereonets. Note the dependence of the overall crystallographic preferred orientation (CPO) pattern on both the active slip systems and the deformation temperature. Note also that asymmetry of the CPO reflects shear sense. Figure modified from Passchier and Trouw (2005). (B) Schematic examples of quartz [c] axis stereoplots showing the derivation of a fabric skeleton (green line) and opening angle (oa). Sn and Ln refer to foliation and associated lineation, respectively. For all LKD plots fabric is S2 and L2. Figure modified from Law et al. (2011). (C) Stereoplots of samples used for [c] axis fabric opening angle thermometry showing the derivation of fabric skeleton and opening angle for each. First row shows point-per-grain (PPG) data represented as points to show how crossed-girdle fabrics are initially inferred and to show source data for contoured plots. The second row shows contoured PPG data with “background” removed, as in Figure 13, in order to emphasize the patterns that are clear in the scattered PPG data but not in the contoured data. The white portion in the color ramps next to each plot shows range of m.u.d. values removed in order to highlight the crossed girdle shape. Long ticks around the perimeters of the contoured stereoplots are 10° increments and short ticks are 5° increments. The bottom two rows are included to show that, while PPG data are more appropriate for characterizing the CPO in these samples, there is not much difference between the raw and PPG contoured datasets.
Figure DR3. Deformation temperature-depth profiles showing the unaltered datasets used to generate the polygons in Figure 16A. Data from LKD are excluded here because they are shown unaltered on the original Figure 16. References and reference figure numbers from which the source data can be found are listed in the Appendix.

Figure DR2. Increasing deformation temperature

A<br>
- Rhomb <a> slip
- Prism [c] slip
- Basal <a> slip
- Prism <a> slip

B<br>
- Increasing deformation temperature
- Low to moderate T
- High T (prism [c]-dominant)

C<br>
- LK-54 (Ps, quartzite)
- LK11-74 (Ps, quartzite)
- LK11-57 (Ps, quartzite)
- LK11-54 (Ps, quartzite)
- LK11-87b (og, bt gneiss)

- PPG scatter [c]
- [c] fabric skeleton
- Raw [c] axes
- PPG [c] axes

- max = 5.57
- max = 8.73
- max = 5.61
- max = 4.16
- max = 3.71
Temperature indicators - quartz and feldspar microstructures plus mineral assemblages

Temperature indicators - matrix quartz, calcite, and feldspar microstructures, plus quartz opening angles and inferred active slip systems

Temperature indicators - matrix quartz, calcite, and feldspar microstructures, plus quartz opening angles and inferred active slip systems

Temperature indicators - matrix quartz, calcite, and feldspar microstructures, plus quartz opening angles and inferred active slip systems

Mabja dome

Kangmar dome, south

Kangmar dome, north

Dzakaa Chu