The orientation of Foliation Intersection Axis (FIA) preserved in garnet porphyroblasts from the Hunza Karakorum as a collision footprint between Kohistan-Ladakh Island Arc and Eurasian plate

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The Karakoram Metamorphic Complex (KMC) marks the southern margin of the Karakorum plate and mainly consists of metasedimentary rock sequences. These metasediments are mainly pelitic with carbonate layers, cut across by granitic sheets. The complex is bounded by the Indus Suture Zone in the south and Karakoram Axial batholiths in the north. This study focuses on detailed microstructural analyses of the metapelitic rocks of the KMC exposed along the Karakorum Highway of the Hunza region. Foliation Intersection Axis (FIA) method of Bell et al., (1995) and matrix foliation overprinting relationship were used to deduce the tectonic history of the KMC. FIA technique measures the axis of curvature of curved inclusion trails preserved in porphyroblasts (garnet and staurolite), whereas, the foliation overprinting relationship further establishes the latest phases of deformation in the given area. A total of 16 samples were collected, however, 11 samples preserved sufficient quality of inclusion trails to work further on FIA technique. Two dominant trends (sets) were measured by 'asymmetry switch' of inclusion trail geometry. The older E-W trending FIA (set 1) formed as a result of bulk N-S shortening, whereas, the younger FIA set (set 2) trending NE-SW direction formed as a result of bulk NW-SE shortening. At least two phases of deformation were observed in matrix from the Hunza Karakorum (1) an early phase of intense deformation resulting in the formation of continuous generally E-W and WNW-ESE striking foliation (Fig. 1a,b,c; stage 6 of Bell and Rubenach, 1983 classification) formed in response of N-S shortening, and (2) the latter phase is responsible for the formation of upright to isoclinal folding with an axial planer NE-SW foliation falls in stage 2 to 3 of Bell and Rubenach (1983) scheme (Fig. 1d). The first event represents the south verging tectonics and crustal thickening followed by younger NW-SE shortening event. The geometry of an early FIA set (E-W) preserve an overall clockwise asymmetry, whereas the younger FIA set (NE-SW) preserves counter-clockwise asymmetry, while looking towards west. The data set obtained from this study is significant because it has close similarity to the FIA data obtained from the Nepal Himalaya (Fig. 2; Sapkota and Bell, 2012).

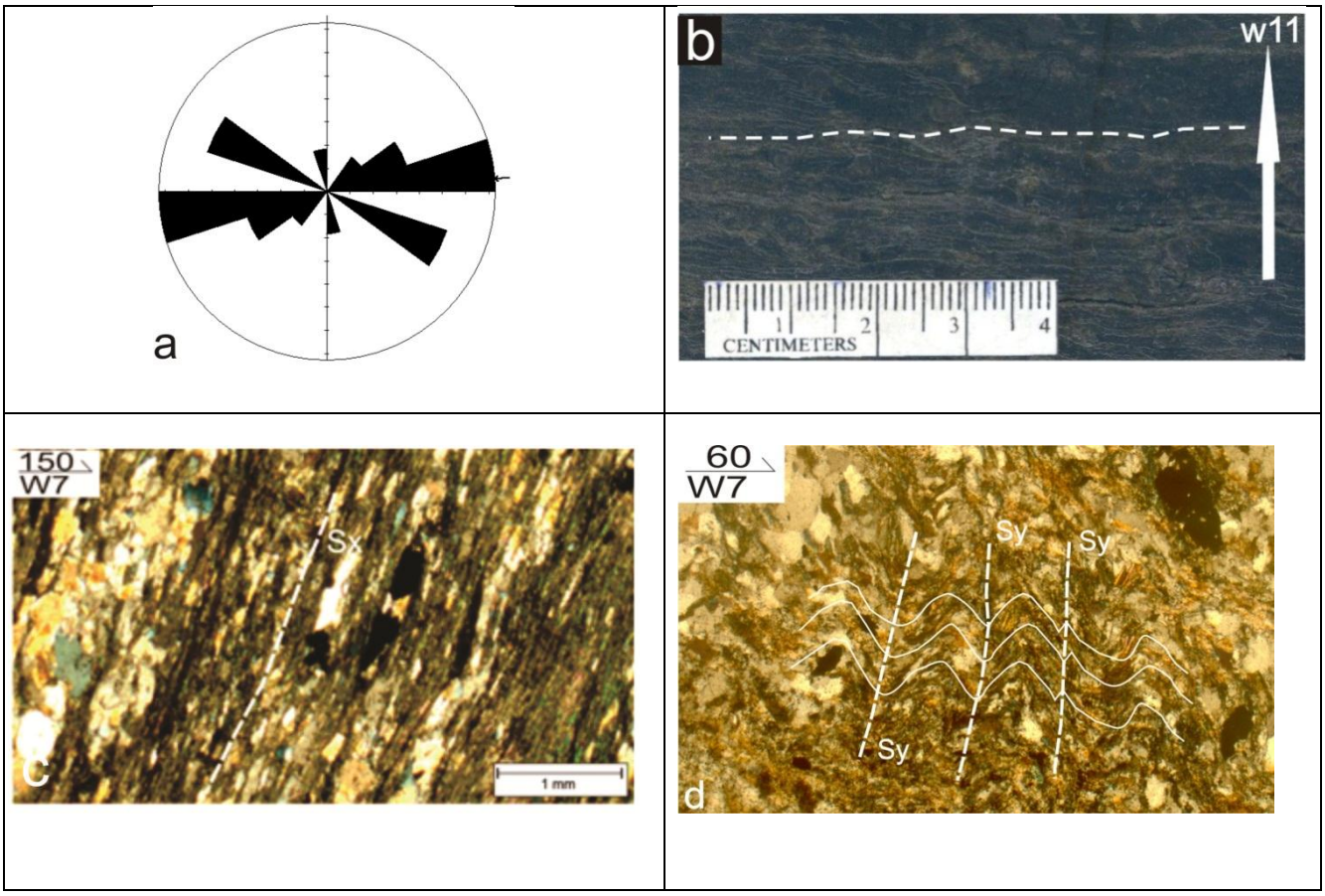

Fig. 1. (a) Rose diagram showing the strike of main foliation measured form horizontal thin sections. (b) Showing microphotograph of continuous foliation in N section of sample W7. (c) Photograph showing trace of foliation in the horizontal slab of sample W6 with north arrow. (d) Open to tight fold with evenly spaced axial plane cleavages in sample W7.

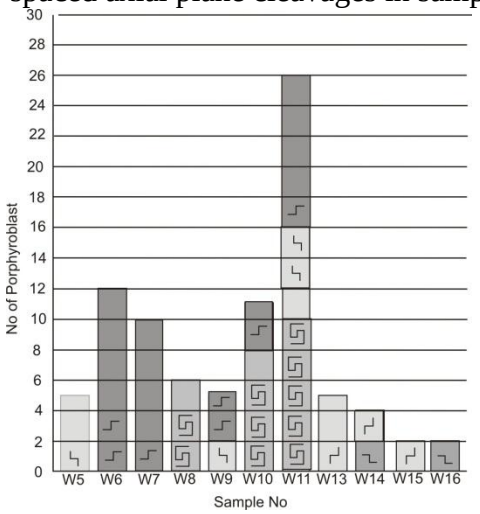

Fig. 2. Graph showing steep to flat (and vice versa) geometry of inclusion trails with respect to sample number. W5 to W11 shows CW asymmetry (FIA set 1) whereas; sample W13 to W16

shows CCW asymmetry (FIA set 2).

References

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