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Timing of isoclinal folds in multiply deformed high metamorphic grade region using FIA succession

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Multiply deformed and isoclinally folded interlayered high metamorphic grade gneisses and schists can be very difficult rocks for resolving early formed stratigraphic and structural relationships. When such rocks contain porphyroblasts a new approach is possible because of the way in which porphyroblast growth is affected by crenulation versus reactivation of compositional layering. The asymmetries of the overprinting foliations preserved as inclusion trails that define the FIAs can be used to investigate whether an enigmatic isoclinal fold is an antiform or synform. This approach also reveals when the fold first formed during the tectonic history of the region. Isoclinally folded rocks in the Arkansas River region of Central Colorado contain relics of fold hinges that have been very difficult to ascertain whether they are antiforms or synforms because of younger refolding effects and the locally truncated nature of coarse compositional layering. With the realization that rocks with a schistosity parallel to bedding (S0 parallel S1) have undergone lengthy histories of deformation that predate the obvious first deformation came recognition that large scale regional folds can form early during this process and be preserved throughout orogenesis. This extensive history is lost within the matrix because of reactivational shear on the compositional layering. However, it can be extracted by measuring FIAs. Recent work using this approach has revealed that the trends of axial planes of all map scale folds, when plotted on a rose diagram, strikingly reflect the FIA trends. That is, although it was demonstrated that the largest scale regional folds commonly form early in the total history, other folds can form and be preserved from subsequent destruction in the strain shadows of plutons or through the partitioning of deformation due to heterogeneities at depth.