2013 GSA Annual Meeting in Denver: 125th Anniversary of GSA (27-30 October 2013)

Paper No. 247-77

Presentation Time: 9:00 AM-6:30 PM

POST-FOLDING VERTICAL FLATTENING STRAIN FABRICS IN MECHANICALLY RIGID ROCKS DEFORMED UNDER SUB-METAMORPHIC CONDITIONS IN A FORELAND FOLD-THRUST BELT

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The Silurian Shawangunk Conglomerate (grain-supported, quartz pebble conglomerate) of east-central New York State was deformed during the development of the northern Appalachian foreland fold-thrust belt. Structures in the vicinity of the Village of Rosendale trend NNE, suggesting that the shortening direction in this portion of the fold-thrust belt was WNW. Using EllipseFit, we calculated moment-equivalent strain ellipsoids from more than 350 grains on three orthogonal photomicrographs of thin sections prepared from seven oriented samples of Shawangunk Conglomerate. We expected to find horizontal layer-parallel shortening in WNW direction. Instead, we found that, in the outcrop reference frame, the long (X) and intermediate (Y) principal axes of strain ellipsoids are generally subhorizontal and do not consistently parallel the regional structural grain defined by trends of fold axes and tectonic cleavage. Significantly, short (Z) axes orientations cluster tightly around a vertical axis in the outcrop reference frame, but scatter when bedding dips are restored to horizontal. A fold test (carried out with software generally used in paleomagnetic studies) was used to calculate the degree of clustering among axes over progressively greater amounts of unfolding. Results of this test confirm that the maximum degree of Z-axis alignment (accumulation of grain-scale flattening strain) occurred either syn- or post-folding. A similar fold test was conducted on penetrative strain fabrics measured in samples from the Silurian Binnewater Sandstone (matrix supported argillaceous quartz wacke), which is stratigraphically above the Shawangunk Fm. and was involved in the same deformation event. The Z axis alignment in samples from the Binnewater Fm. is maximized at the intermediate stage of unfolding, consistent with strain accumulation during folding. Our results suggest that this portion of the fold-thrust belt was subjected to vertical flattening subsequent to fold-thrust belt deformation, perhaps due to loading by the Catskill clastic wedge. The resulting flattening strain was recorded by the grain-supported conglomerate, but not by the matrix-supported sandstone. If our interpretation is correct, it suggests that the folding was pre-Late Devonian (i.e., developed during the Acadian Orogeny).

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General Information for this Meeting

Session No. 247--Booth# 305
Sigma Gamma Epsilon Undergraduate Research (Posters)
Colorado Convention Center: Hall D
9:00 AM-6:30 PM, Tuesday, 29 October 2013