Porphyroblast rotation versus non-rotation: Conflict resolution: COMMENT

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Fay et al. (2008, p. 307) state that: “no porphyroblast rotation occurs during ductile deformation relative to spatial coordinates” and that “porphyroblasts can now be routinely used to access lengthy structural events in matrix foliations. The process of reactivation (as defined by Bell et al., 1995) is required because they need to explain the absence of crenulations in locations where the models that they advocate would otherwise require their existence. The more credible alternative is that, in most cases, crenulations are not present in these locations because they did not ever form in the locations. For example, in folded psammo-pelite beds defined by graded turbidite sequences, the transitional zone between a competent psammite and an incompetent pelite often marks the zone where nucleation of axial-plane crenulation cleavages can be observed. The progressive evolution of such crenulations (with amplitude increasing as sand content decreases) makes it clear that the reason that crenulations did not form immediately adjacent to the competent layer is quite simple. The competent bed (and the adjacent transitional zone) is relatively strong in comparison to the adjacent weaker-flowing pelite layers. There is thus no need to postulate a process solely for the purpose eliminating all micro-structural traces of previously formed crenulations. It is evident that those crenulations did not exist in the first place.

The models advocated by Fay et al. (2008) require adherence to one or more statements of doctrine, as outlined above. These contrast to views that attract little debate, because they define the mainstream of modern theory as to the structural evolution of deformed and metamorphosed tectonites: 1) material frameworks can be defined that allow explanation of observed microstructures, including the variation in the orientation of inclusion trails in porphyroblasts, and 2) many folds are the result of shortening accommodated by the buckling of relatively competent lithologies (e.g., in the psammitic layers of a turbidite sequence). These strong layers drive flow in the relatively weak (and thus accommodating) incompetent lithologies in between the buckling competent layers (e.g., in crenulating pelitic layers, where the strongest axial-plane cleavages result). Finally, we note that similar fold geometries such as those that led to models advocated by Bell et al. (1995) have been shown largely illusory, and/or the result of strains later more uniformly imposed upon the rock mass after the initial buckling produced parallel folds. There is no reason to require the existence of earlier-formed foliations that are now uncrenulated because an undocumented (and largely imaginary) process has eliminated all evidence. The absence of evidence has never been proof of the existence of an otherwise non-testable phenomenon. There is thus no conflict to be resolved, except in the minds of those proponents of a world view that allows planets to rotate, but not porphyroblasts.

REFERENCES CITED

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