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"Eye and sheath folds in turbidite convolute lamination: Aberystwyth Grits Group, Wales", Reply to comment by F.O. Marques

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We thank Fernando Marques for his interest in our paper. In essence, we think that there is no disagreement between his view of eye and sheath fold formation and our own. The purpose of our paper was not to challenge existing formation theories, but rather to report eye and sheath folds from a syn-sedimentary deformation setting; one with the potential to be widely confused with tectonic settings. We are happy to clarify points which we seem not to have made clear enough in our paper.

1. Definition of sheath fold

By not enclosing in quotation marks our opening statement of sheath fold geometry, we were indicating that it was not a direct quotation from a previous author. Ramsay and Huber (1987) were early authors to develop the essence of the geometrical definition. We are glad that our 'definition' agrees so closely with that of Marques et al. (2008).

2. Dip of axial surfaces

Although the majority of convolute folds overturn in the direction of current flow, some do indeed overturn upstream (our Figure 7). Marques is right that this geometry is incompatible with formation of convolute lamination only by bed-parallel shear due the turbidity flow. We state both in Section 2 (p. 1141) and Section 4 (p. 1143) that lateral shear must have been accompanied by a vertical deformation component due to buoyancy forces generated within the liquefied sediment, as proposed by Allen (1977). These buoyancy forces would, in isolation, have produce upright or doubly-vergent folds in cross-section. The superimposed current shear enhanced the down-flow vergence and suppressed the upstream vergence.

3. Strain regime

To put eye folds in their general context, we noted the idea that their geometry can discriminate between simple-shear and general-shear strain regimes and attributed the idea to Alsop and Holdsworth (2006). We did not test this hypothesis ourselves because we did not have sufficient data. If Marques doubts the hypothesis, he should engage with Alsop and Holdsworth.

4. Amount of shear strain

In stating that "sheath folds have mostly been interpreted as the product of high shear strain" we are not disputing that sheath folds can also form at lower strains. In particular, we recognize the body of theoretical and experimental work which shows that sheath folds can form at low shear strains if they nucleate on pre-existing structures. Indeed, our interpretation of sheath folds in convolute lamination implicitly accepts the role of precursor structures: current ripples in this case.

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5. Aim of the paper

The purpose of our paper was to report the evidence for sheath and eye folds in a novel deformational setting: during deposition of a single turbidite bed. Such a setting combines precursor sinuous or linguoid current ripples with shear from the depositing current, so that sheath folds are likely at low shear strains. We repeat our view that the possibility of this non-tectonic origin for some sheath and eye folds is a significant factor to be considered in metasedimentary terrains.

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