

Fold vergence reversal at Rhoscolyn

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The Rhoscolyn Anticline/Antiform on Holy Island, Anglesey, is popular for structural and mapping field courses, and yet it has been subject to a number of different interpretations. In a forthcoming paper¹, we conclude that the RA was an original tight upright F_1 anticline that has undergone considerable modification and distortion in a second deformation. However, despite the two obvious phases of approximately coaxial folding, refolded folds and classic Type 3 interference patterns are rare. High-angle cross-cutting relationships of the first and second cleavage (S_1 , S_2) are clear all round the Rhoscolyn Anticline, and S_2 clearly cross-cuts mesoscale F_1 folds whose vergence supports an F_1 interpretation for the RA. However, in the central ‘flat’ part of the RA, within the South Stack Fm, the small-scale folds commonly reveal that they are hybrid $F_1 + F_2$ structures. The neutral vergence of these folds locates the hinge of the present-day RA to a position agreed in the different interpretations. However, we argue that this neutral vergence is the effect of the second deformation and F_2 folds on the F_1 structures. Unravelling hybrid $F_1 + F_2$ structures suggests that the present-day hinge of the RA actually belongs on the SE limb of the original F_1 Rhoscolyn Anticline.

From F_2 folds in quartz veins, the 2nd deformation can be quantified as an oblique pure shear with X/Z strain ratio of ~ 3 . This has altered the RA and its minor structures into its present-day open and SE-overtaken geometry, from an original upright tighter geometry. We calculate that the original hinge of the Rhoscolyn Anticline was ~ 260 m NW of the present-day hinge, positioned within the present ‘flat’ limb. In the region between the original and final fold hinges, initially NW-verging F_1 structures have been modified into neutral to SE-verging, by two processes. First, on the large scale the 2nd deformation appears to have operated as a quasi-homogeneous pure shear, and to have passively distorted F_1 folds around the whole of the Rhoscolyn Anticline. Secondly, F_2 buckle folds have initiated on favourably oriented steeply dipping F_1 fold limbs, resulting in hybrid $F_1 + F_2$ folds. For these, the *total* vergence is mildly SE-verging or neutral, masking the NW vergence of the original F_1 minor folds.

The Rhoscolyn area illustrates that fold vergence can be misleading in areas of polyphase deformation.

¹ Treagus, S.H., Treagus, J.E. & Droop, G.T.R., 2003. Superposed deformations and their hybrid effects: the Rhoscolyn Anticline unravelled. *Journal of the Geological Society, London*, 160, January.