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Timing and nature of magmatic fabrics from structural relations around stoped blocks: Discussion

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I would like to begin by congratulating the authors, and particularly the first author, from whose work the primary data in Fowler and Paterson (1997) appears to be derived (Fowler, 1996), for presenting us with such detailed, carefully and arduously acquired field information from such an exceptionally exposed granitic area. Such data as these, showing clear relationships between their different elements are extremely important in the development of ideas and models in this science and it is to be regretted that the practices of making such detailed maps and presenting them in the public domain are not more commonplace. Such clear information, as presented in figs. 2, 3, 5, 7 and 9 of the contribution by Fowler and Paterson (1997), must, however, be used with great care. In particular the context of the information has to be as clearly understood as the primary detailed data itself; were this not so, major misconceptions would probably arise. It is in this latter respect that my principal concern lies.

The authors' fundamental case is this: (a) The country rock blocks have not caused any significant deformation/deflection, etc. of the magmatic foliation in the host granite. (b) The country rock blocks have fallen a great distance (360 m) into the host. (c) Because the deformation/deflection of the magmatic foliation is not great enough to be consistent with such a 'fall' then; (d) The magmatic foliation must have formed in the host after the country rock blocks fell into it. These observations and reasoning are then extended, via a number of less clearly defined examples to make some general statements which are of considerable importance to researchers in the field of gran-

ite emplacement, viz that magmatic fabrics may form too late to record pluton emplacement (space making) mechanisms; that the strain memory of such fabrics may be very poor; that pluton and host rocks may be at least partially decoupled. If I may summarise and stress the worst case scenario, that magmatic fabrics give no, or highly misleading, information about emplacement mechanisms and histories.

Would the authors like to consider an alternative? If we consider the second premise in the argument laid out above and turn to p. 212, paragraph 3 of their paper, there it is stated that "...it is possible to draw a cross-section in which the blocks are still attached to the roof, it is unlikely that this is the correct interpretation because..." (my italics). It therefore seems that the authors cannot be certain that the blocks have actually detached from and fallen away from the roof! That being the case, would a more prosaic and certainly less dramatic alternative fit just as well with *the facts*? That is, the reason the deformation and deflection of the host rock magmatic fabrics is so little is because the country rock blocks have not fallen any appreciable distance at all and that the observed deformation is simply that produced mainly by the small and visible relative separation and rotation of the fragments?

A second point concerns the authors' use of enclave axial ratios. The authors present a considerable amount of detailed data in summary form (table 2, figs. 9 and 10) concerning the deformation that a suite of mafic enclaves have undergone, within the host, in the vicinity of the large stoped blocks. The basic data in this analysis are measurements, on natural joint surfaces, parallel or subparallel to the principal strain planes, of the enclave axial ratios together with measurements of the enclave long axis orientations. They have applied to these data one of the traditional and best known methods (the R_f/ϕ technique) for

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determining strain from enclaves which had variations in their initial axial ratios and augmented this basic analytical procedure with a number of quite sophisticated algebraic techniques; in all a powerful mix of methods designed to generate quite precise strain determinations from naturally occurring data. From this they have shown, quite conclusively, that the low strains, inferred from the small amount of magmatic foliation deflection around the stoped blocks, are corroborated by the enclave data.

What concerns me is this: in many previous publications, both together, and singly as co-authors with other workers, Fowler and Paterson have consistently argued against the use of mafic enclaves in granite deformation studies. The clearest statement of this is in Vernon and Paterson (1993, p. 27, paragraph 4), concerning the Ardara Granite in Ireland: “Our re-examination of these enclaves indicates that they cannot be used to calculate strains”. Other similar statements can be found in Paterson and Fowler [1993, p. 198, paragraph 3 (also concerning Ardara)]; in Paterson and Fowler [1993, p. 200, paragraph 6 (more general)]; in Vernon and Paterson [1995, p. 137, paragraph 2 (also Ardara)]—“In fact we discarded enclave strains for a variety of reasons...”; and most recently in a major review paper [Paterson and Vernon 1995, p. 1361, (more general)]. Whilst the authors in the present paper begin by appearing to make careful justification of not discussing strain (Fowler and Paterson, 1997, p. 217, paragraph 1), their text immediately following this contains many references either to; (a) synonyms of ‘strain’ (e.g. ‘weak enclave fabrics’, ‘fabric ellipsoid

intensities’ etc.) (op. cit. p. 218, paragraphs 1 and 2); (b) ‘strain’ specifically mentioned in this context (op. cit. p. 218, paragraph 3 and paragraph 4; p. 219, paragraph 1; p. 220, paragraph 6); (b) actual comparative axial ratios (op. cit. p. 219, paragraph 1; p. 220, paragraph 6). Having previously devoted so much print space in attempting to convince other earth scientists of the uselessness of measuring the axial ratios of deformed mafic enclaves in many different plutons around the world, would the authors like to explain what it is about the nature of the enclaves in this particular situation that makes the precise measurement of their shapes and determination of their strains of such importance?

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