



The significance of four magmatic foliations in a single batholith: An example from the Tuolumne Batholith, central Sierra Nevada, California (USA)

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For the first time, four distinct magmatic fabrics are documented in a batholith, the Tuolumne Batholith, central Sierra Nevada, California (USA). Thus magmatic strain histories formed by different processes may be preserved in a single magmatic body. One type of fabric in the Tuolumne Batholith formed by strain caused by highly localized magma flow, whereas the other three fabrics are chamber wide and recorded strain during batholith construction superimposed by increments of tectonic strain. In contrast to previous studies that interpret magmatic fabrics in plutons as simple structures formed by a single process, we emphasize that magmatic fabrics: (i) may form as complex polyphase structures, recording multiple strain increments caused by different processes; (ii) may form in relatively static (not flowing) rheologically complex crystal mushes at lower melt percentages after construction of a magma chamber; (iii) may track tectonic paleostain and thus inferred stress in arcs through time; (iv) may form composite fabrics when different processes result in a single fabric thus making it difficult to interpret which processes formed the magmatic fabric. We also have shown that some portion of melt must have been present over large portions of the Tuolumne Batholith during fabric formation implying that large magma chambers may exist in the upper crust for long periods of time (up to several m.y.).