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Collapse structures and the segregation and accumulation of melt

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Although large volumes of magma and fluid move through the crust, the sites where these volumes once resided are difficult to recognize. We show that some (foliation) boudinage and shear band structures, which are classically interpreted as resulting from externally imposed extension or shearing, are better explained by the ductile collapse of magma- or fluid-filled voids (Bons et al. 2008). Experiments show that the shape of the collapse structures depends on the original shape of the void and the direction of confluence of its walls when its contents are drained. This can lead to both symmetrical boudin-like, and asymmetrical, shear band-like structures. The recognition of the true nature of these structures necessitates a re-evaluation of strain measurements reported in the literature and the tectonic models based on them. Identifying the "missing volumes" clarifies the process of segregation and accumulation of melt as it ascends through the crust to make many cubic kilometer-sized granitoid plutons in the upper crust.

Bons, P.D., Druguet, E., Castaño, L.M., Elburg, M.A. (2008) Finding what is not there anymore: recognizing missing fluid and magma volumes. Geology 36, 851-854.