EGU2020-5715, updated on 29 Oct 2020
https://doi.org/10.5194/egusphere-egu2020-5715
EGU General Assembly 2020


# Compaction versus reactive flow: How does melt fraction change in crustal mush reservoirs?

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Chemical differentiation requires the relative motion of melt and crystals during multicomponent phase change. Compaction is often invoked as the mechanism that allows this in crystal rich 'mush' reservoirs. Compaction is a term used broadly to describe the coupled processes of buoyancy-driven melt flow through permeable crystalline matrix and matrix deformation in response to the extraction or accumulation of melt. One key challenge to melt segregation models that invoke compaction is that textural evidence for crystal deformation in the residual material left after melt extraction is largely absent (Holness, 2018).

Here, we test the relative contribution of compaction and reactive flow to melt fraction change in crustal mush reservoirs using a modified version of the reactive flow model of (Solano et al., 2014). Reactive flow changes melt, solid and bulk composition and is essential to chemical differentiation in crustal mush reservoirs but has been largely neglected in models of melt segregation. We find that melt fraction changes in response to reactive flow can be as important as those caused by compaction, irrespective of the phase behaviour tested. That compaction may account for only half the melt fraction change observed in mush reservoirs could help to explain why textural evidence for mush deformation remains enigmatic.

References

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