Emplacement and evolution of a mushy magma reservoir in the slow-spread lower oceanic crust

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Magmatic processes forming the slow-spread lower oceanic crust remain poorly constrained, mainly due to a lack of extensive sampling and imaging of these structures. However, several ODP-IODP expeditions drilled Oceanic Core Complexes (OCCs) that are interpreted as exhumed portions of the lower crust at the ridge axis. Here we focus on a ~250m long interval of ODP Hole 735B drilled in the Atlantis Bank OCC (SW Indian Ridge). This section presents the most primitive lithologies and compositions sampled in the OCC, and has been described as a single chemical unit by [1]; it is characterized by a decreasing whole rock (WR) Mg# trend upsection and is interpreted as a major intrusion emplaced within the accreting crust. We combined for the first time detailed structural and petrographic constraints with WR and *in situ* analyses of major and trace elements in order to quantify the processes of emplacement, crystallization and melt migration within lower crust.

First results highlight two main subunits in this section. The lower ~220m present alternations between olivine gabbros and primitive troctolites, associated with numerous igneous contacts and significant crystal-plastic and magmatic deformation. The upper ~180m uniform gabbroic sequence presents no igneous contact and a very weak deformation. WR compositions highlight the cumulative character of both units, with a great variability from primitive to evolved compositions in the lower sequence, when the upper gabbros are relatively homogeneous and differentiate upsection. In situ analyses further document the emplacement and differentiation processes, and the feedback between fractional crystallization and reactive porous flow. The combination of all those datasets allows us to propose that the lower section is formed of stacked primitive sills, differentiating and expulsing residual liquids to the overlying upper reservoir for further evolution. In this model, the upper unit formed as a single magma batch, evolving as a mushy reservoir that records the residual melt migration, interactions, and accumulation at the unit top. Our results finally provide the community with new constraints on magma migration and oceanic crust accretion.

[1] Dick et al. (2000) *EPSL* **179**, 31-51