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Rhythmic fracionation trends in lower oceanic crust: Evidence from hole GT1 of the Oman Drilling Project

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In the framework of the Oman Drilling Project, a 400m long core was drilled at about 1 km above the crust-mantle transition, covering layered gabbros of the lower oceanic crust. Petrological, microstructural, and geochemical evaluations (Fig.1) along the core (average sample spacing of 2 m) indicate a large scale fractionation trend over the lower 250 m, integrating several intervals of individual evolution possibly as a result of cyclic magma replenishments at the decameter scale. The uppermost 100 m of the drill core show intesified core/rim zonation in clinopyroxene, indicating an increase of interstitial melt at this horizon. The fabric symmetry evolves jointly with the petrology in our samples, suggesting changing liquid/solid ratios during fractionation. These findings suggest that the sampled section accreted by in-situ crystallization of decameter-scaled stacked magma sills beneath an oceanic spreading center.

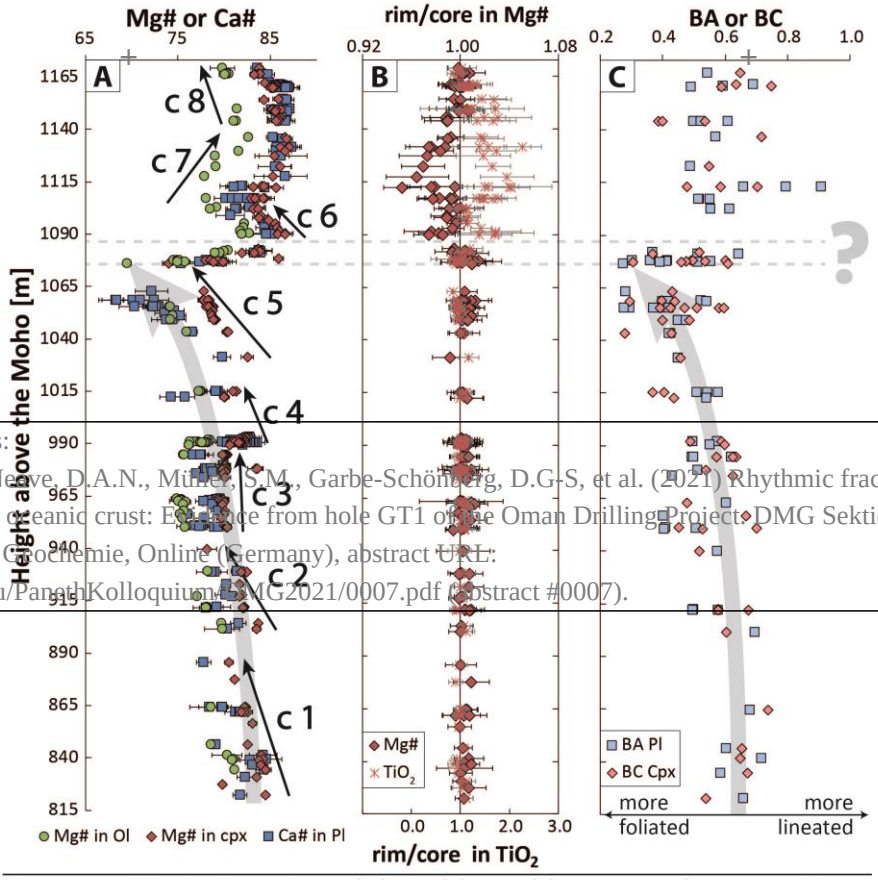

Figure 1 A) Mg# (Mg/(Mg+Fe)*100; molar basis) of olivine and clinopyroxene and Ca# (Ca/(Ca+Na)*100; molar basis) of plagioclase plotted versus height above the Moho transition zone. Note the fractionation cycles (c1-8) indicated by gradual changes in Mg# or Ca# in all phases. B) rim/core ratios of Mg# and TiO2 content in clinopyroxene. Note that TiO2 is plotted on a secondary axis; note stronger zonation in cycles 6 to 8. C) BA or BC index of plagioclase and clinopyroxene, respectively, quantifying the degree of lineation in a sample. Note the parallelism to A). Dashed lines mark horizon of possible intense replenishment event.