U-Pb Dating of Carbonate Veins in Cretaceous to Neogene Oceanic Crust

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Carbon is sequestered back into the crust as carbonate veins (CV), at the flanks of MOR where they form at low temperatures (60 °C). A fundamental question that remains unknown, is whether carbon uptake by the upper oceanic crust is continuous over the life span of the crust, or whether it occurs relatively early, within the first (10 to 40) Ma after crustal accretion [1,2,3]. Recent developments in U-Pb dating of carbonate systems by in situ LA-ICP-MS have shown that it is possible to date carbonate systems with low (<5 ppm) uranium concentrations, and uncertainties of < ± 3% at 95% confidence. We dated 7 CV samples from 4 different sites, representing Cretaceous to Neogene Oceanic crust. Our preliminary results show that; regardless of the varied and complex textures in some CV, and despite the different carbonate compositions, all CV dated along the flanks of MOR, formed within the first (~20 Ma) of crustal accretion. Moreover, when we dated a texturally complex CV breccia from the (64 Ma) Burton seamount (U1376A-1-3), each textural domain produced a distinct age (63.9 ±0.7 Ma, 50.5 ±2.0 Ma, and 36.4 ±1.3 Ma). The detailed textural and age relationships derived from this sample show that; it is possible to date three distinct episodes of CV formation and alteration, and CV formation took place during the first 30 Ma, so far the longest period of CV formation observed in this study. Therefore, we interpret this sample to represent a prolonged (30 Ma) “open system” exchange between crust and seawater, that so far, has only be observed in seamount samples.

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