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Geologic implications of seafloor character and carbonate lithification imaged on the domal core of Atlantis Massif

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ABSTRACT

We document the seafloor character on Atlantis Massif, an ocean core complex located at 30°N on the Mid-Atlantic Ridge, with an emphasis on the distribution of carbonate features. Seafloor imagery, near-bottom backscatter, and bathymetry were analyzed on the Central Dome and the Western Shoulder of the exposed footwall to the detachment, and on the Eastern Block, a hanging wall to the fault. We merged *Argo II* still images to produce photo-mosaics and evaluated these together with video imagery, acoustic reflectivity, and basic rock composition. The seafloor was classified as unconsolidated sediment, lithified carbonate crust, consolidated carbonate cap, exposed basement, or rubble, and the spatial distribution of each type was assessed. Unconsolidated sediment, exposed basement, and rubble were documented in all three regions studied. Lithified carbonate crust was also present on the Western Shoulder and eastern Central Dome. Consolidated carbonate cap was found on the Eastern Block. The formation of the carbonate rock is interpreted to reflect precipitation and/or sediment cementation via fluids derived from serpentinization. Both processes occur at the nearby Lost City Hydrothermal Field. The newly documented locations of seafloor carbonate lithification therefore mark pathways of past, possibly recent, fluid flux from subsurface water-rock reaction zones and represent an additional constituent of the carbon cycling hosted by oceanic lithosphere.