Reconstructing lava flow emplacement process at the hotspot-affected Galapagos Spreading Center, 92 and 95W

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Volcanic eruptions at mid-ocean ridges (MORs) control the permeability, internal structure, and architecture of oceanic crust, thus establishing the foundation of the evolution of the ocean basins. To better understand the emplacement of submarine lava flows at MORs, we have integrated submersible-based geologic mapping with remote sensing techniques to characterize the lava flow morphology within previously mapped lava flow fields produced during single eruptive episodes at the Galapagos Spreading Center (GSC). Detailed attributes describing the surface geometry and texture of the lava flows have been extracted from high-resolution sonar data and combined with geo-referenced visual observations from submersible dives and camera tows. Based on signatures contained in these data, a fuzzy logic-based classification algorithm categorized the lava flow morphology as pillows, lobates, or sheets. The resulting digital thematic maps offer an unprecedented view of GSC lava flow morphology, collectively covering 77km2 of ridge axis terrain at a resolution of 2m x 2m. Error assessments with independent visual reference data indicate approximately 90