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Davidson Seamount: A Volcano Slowly Built on an Abandoned Spreading Center

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Davidson Seamount is located 80 km off Big Sur, California, and rises from the 3500 m abyssal plain to 1254 m depth. The elongated volcanic edifice consists of a series of parallel ridges serrated with steep cones, built over millions of years above an abandoned spreading center. It has been explored and sampled with the ROV Tiburon, and the lithologic distribution, glass chemistry, and ages of the rocks are presented here. Large, bulbous pillow lavas are common deep on the seamount. The shallower cones are mainly composed of blocky flows that provide substrate for large corals and sponges. The cones are draped with volcaniclastic rocks ranging from sandstone to breccia as thick, layered pavements that are now eroded with pits and potholes. This fragmental material is evidence of explosive eruptions. A perched lava pond was discovered in high-resolution maps made by MBARI's Mapping AUV and explored with the ROV Tiburon. Nothing like it has been found elsewhere on Davidson or the other seamounts off the California continental margin.

The pond lies between high ridges near the summit. It was a vigorous flow that overtopped its levees with elongate pillows, and then drained, leaving collapse pits a few meters deep veneered with "bathtub rings" and no lava pillars. Deeper than 2000 m, glass from pillow rinds and breccias are basalt and hawaiite. Shallower than 2000 m depth, the rocks include basalt and hawaiite, and also fractionated lavas of mugearite and trachyte. The lavas were all submarine erupted, even the fragmental material, as inferred from high sulfur content in the glasses. Ages of the lavas range from 9.8 to 14.8 Ma. The oldest rocks are along the central ridge, and the youngest rocks are on the flanks and southern end of the edifice. The volcano erupted onto much older crust, which is inferred to be 20 Ma from magnetic anomalies. The numerous small cones of disparate chemistry and long eruptive period suggest episodic growth of the volcano over 5 to 10 million years.

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