

## **FLANK FAILURE OR CALDERA COLLAPSE ON AN ISLAND ARC VOLCANO? A DIGITAL ELEVATION STUDY OF THE QUALIBOU DEPRESSION, ST. LUCIA**

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### **ABSTRACT**

Sector collapse is now viewed as an important mechanism in the primary geomorphic evolution of volcanic edifices. In contrast to caldera collapse, which is accompanied by catastrophic or effusive eruptions, sector collapse may occur at any time during the growth of a volcanic edifice. We use published 1:25,000 topographic maps and unpublished bathymetric data to derive digital elevation models (DEMs) of the onshore and offshore portions of the Qualibou Depression, St. Lucia, to evaluate quantitatively its morphological and topographic characteristics, which have been attributed previously to both sector and caldera collapse. Similar features are observed on Morne Patates and Watt Mountain in Dominica, Soufriere in St. Vincent, La Soufrière in Guadeloupe, and Mount Pelée in Martinique. Based on the angular shape of the depression, the steep offshore submarine slope, and the high aspect ratio derived from the DEMs, we conclude that the origin of the Qualibou Depression is more consistent with a large-scale sector collapse rather than a caldera collapse. We estimate that  $\geq 30 \text{ km}^3$  of debris slid into the Caribbean Sea towards the ESE, probably triggering a large tsunami. The minimum age of the sector collapse event is constrained as greater than the cross-cutting dacite of Petit Piton, radiometrically dated as  $0.26 \pm 0.04 \text{ Ma}$ . The maximum age, though poorly constrained, may be as old as  $0.33 \text{ Ma}$ , as recorded by coarse-grained clastic beds, perhaps tsunami-deposited, within a Quaternary limestone unit on La Blanquilla in the Venezuela Antilles, approximately 500 km from St. Lucia.