



Debris avalanche deposits offshore St Vincent (West Indies): impact of flank-collapse events on the morphological evolution of the volcano

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Major scarp features have been previously identified on the Soufrière volcano (St. Vincent, Lesser Antilles) and sometimes interpreted as flank-collapse structures although no associated debris avalanche deposits were recognized at the time. New offshore high-resolution bathymetry and geophysical data have been collected during the Caravel cruise (N/O L'Atalante, February-March 2002) offshore St. Vincent. Recent analysis of these data leads us to identify and characterize a debris avalanche deposit on the western flank of Soufrière volcano which extends down to the Grenada Basin. This deposit has been traced back to a horseshoe-shaped structure identified on-land which confirms the occurrence of a flank-collapse event during the evolution of the Soufrière volcano. The collapse volume has been estimated to about 9 km³ and the age of the event is less than 20 000 years (using marine geophysical constrains). The origin of the flank-collapse can be related to local causes (weakening of the flank by intense hydrothermal alteration, magmatic injections, increase of the load by accumulation of volcanic products) and/or to global causes (asymmetry of the arc, sea level variations induced by climate change which have an effect on the stability of the volcano). Taking into account this event, we proposed a model for the evolution of the Soufrière volcano including a new estimation of the magma production rate. The Soufrière volcano appears to be one of the most active volcanoes of the arc and future flank-collapse event could have catastrophic consequences for the entire area due to the emplacement of voluminous potentially tsunamigenic debris avalanches.