ABSTRACT

St. Vincent is one of the youngest islands in the volcanic island arc of the Lesser Antilles. The northern third of this island is occupied by the 1000 m Soufriere volcano which is believed to be of Pleistocene age. This is the youngest of a number of Plio-Pleistocene volcanic centres on the island which has an axis of migration from south to north. Soufriere probably originated as a submarine volcano which accreted onto the older part of the island. There is a Somma caldera wall which is the remnant of a volcano which was initially well over 1000 m high.

An extremely violent period of activity resulted in the destruction of the summit and southern flank of the Somma volcano. Later activity from main and parasitic vents located in the vicinity of the lowered southern flank gradually reconstructed the crater wall in this area. During this latter period of activity voluminous lava flows and pyroclastics were produced. The pyroclastic flows were mainly channelled into the Rabacca-Wallibou-Larikai valleys. Material from the late-Somma period is characterised by roughly equal proportions of andesite and basaltic-andesite lava flows with subordinate pyroclastics. Large volumes of andesitic pyroclastics were apparently produced towards the end of the Somma period. Subsequent activity up to the most recent eruptions show an overall trend towards decreasing proportions of lava flows as well as to lower silica content of the ejecta. The youngest materials of the last 4000 years are predominantly basalt or basaltic-andesite pyroclastics and minor lava flows.

The best understood stratigraphic relationships are for the last 4,500 years. At the beginning of this period extremely violent eruptions produced pyroclastic flows, ash-hurricanes, mudflows, lava

flows and many tens of millions of cubic metres of air-fall tephra. This period of extremely violent activity which may have lasted for a few hundred years apparently culminated in the partial collapse of the north-western flank to form the Baleine scarp. The Yellow Tephra series or yellow ash horizons which were produced by this violent activity were hitherto believed to be of Late-Pleistocene age but new C^{14} dates show them to be much younger, approximately 4,500 years B.P. The new C^{14} dates also indicate that this volcano is one of the most active in the Lesser Antilles and in recent times it has been averaging about one eruption per century. During the last 5,000 years all flow materials have been confined to the southern half of the volcano but the fall debris has sometimes mantled the entire island to minimum depths of about 5 centimetres.

The rocks are high-alumina basalts, basaltic-andesite and andesites occupying the narrow silica range from 46-59.9%. They are pyroclastic types with plagioclase and clinopyroxene being the dominant phenocrysts in all rocks. Amphibole is a ubiquitous accessory but olivine and orthopyroxene are restricted in their distribution. Observed chemical patterns indicate processes of crystal fractionation in the magmas. Chemical variation in vertical successions of pyroclastic fall units indicate that the eruptions tapped fractionated magma bodies the compositions of which graded downwards from a silicic top to less silicic lower zones. This resulted in the earliest products of an eruption being the most silicic and an overall trend towards more mafic compositions as the eruptions progress.