
Graciosa Caldera Lava Lake and Associated Lava Caves, Graciosa Island, Azores

J.L. Gaspar

*Dep. Geociências, Univ. Açores. Rua da Mãe de Deus, 9500 Ponta Delgada, Portugal.
Centro de Vulcanologia do INIC, Pólo da Univ. Açores. CP 12, 9500 Ponta Delgada, Portugal.*

G. Queiroz

Centro de Vulcanologia do INIC, Pólo da Univ. Açores. CP 12, 9500 Ponta Delgada, Portugal.

V.H. Forjaz

*Dep. Geociências, Univ. Açores. Rua da Mãe de Deus, 9500 Ponta Delgada, Portugal.
Centro de Vulcanologia do INIC, Pólo da Univ. Açores. CP 12, 9500 Ponta Delgada, Portugal.*

The Azores archipelago is located in the Atlantic Ocean and is formed of nine volcanic islands divided into three different groups according to their geographic position: eastern, central, and western.

The geostructural environment of the Azores Plateau, defined by the 2,000-meter bathimetric curve, is dominated by the confluence of the American, Eurasian, and African lithospheric plates. This tectonic feature is responsible for a remarkable seismovolcanic activity from which the Capelinhos eruption (Faial Island, 1957/58) and the January 1, 1980 earthquake (epicentral location 30 kilometers west of Terceira Island, Magnitude 7.2) are the most recent catastrophic events.

Graciosa belongs to the central group and is located in the Terceira Rift, a fracture zone with an approximately northwest to southeast trend, thought to be the present eastern branch of the Azores triple junction. The main faults in the island also show a dominant northwest to southeast pattern with the central graben being the most important tectonic structure.

The island is composed of three distinct geomorphological units: (1) the central massif—dominated by the heights of Serra das Fontes, Serra Dormida, and Serra Branca—corresponds to the oldest volcanic complex, strongly faulted and almost completely covered by recent basaltic activity; (2) the northwest platform consists of several superimposed aa and pahoehoe lava flows erupted from different cinder and spatter cones; finally, (3) The Graciosa Stratovolcano that rises in the southeastern end of the island with a small caldera on the summit. In this volcano the deposits related to hydromagmatic activity (surges and lahars) represent an important portion.

The caldera of Graciosa Stratovolcano lies along the northwest to southeast direction with a maxi-

mum axis of 1.6 kilometers and an average depth of 200 meters. The structure resulted from the coalescence of two or three smaller craters during a complex evolutionary process.

One of the latest episodes connected with the stratovolcano evolution comprised an important intracaldera effusive activity. At that time a lava lake was formed probably in the southeast part of the caldera and successive lava level changes resulted in several stages of overflow. This process gave rise to superimposed lava flows on the caldera floor, some of which generated lava tube structures.

When the lake level reached approximately 240 meters, lava overrode the caldera rim. Related to this stage, a lava tube was developed on the northwest volcano slope which was an important path for the lava flow that covers the present Luz region to the south. Another lava flow reached the sea on the north coast.

The end of the eruption seems to be connected with the sudden lava lake collapse leaving a veneer on the caldera walls. A lava cave located at the southeast caldera bottom and controlled by northwest to southeast and northeast to southwest faults can be interpreted as a preferential drainage place during this final phase.

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