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Abstract

During the period 1959 to 1964 recorded volcanic activity in the Azores islands (Atlantic Ocean) was manifested by fumarolic fields in S. Miguel, Terceira, Graciosa, Pico and Faial and by two submarine eruptions off Pico and S. Jorge. Fumarolic activity increased in the Faial Capelinhos vent (in eruption 1957-58) after December 1963; it is concluded that the phenomenon is related to the 1963 and 1964 eruptions in the S. Jorge Channel. During February 1964 an important seismic swarm of more than 500 earthquakes, with volcanic tremor, occurred in S. Jorge.

Volcanic Activity

S. Miguel Island

In this island long-standing fumaroles are known in Furnas Village, Furnas Lake, Caldeiras da Ribeira Grande and Serra de Água do Pau (Caldeira Velha and Lagoa do Fogo) whilst there are thermal springs in Furnas, Ladeira da Velha, São Lázaro (Mosteiros) and Ferraria. A submarine fumarole appears to be located near Vila Franca do Campo (F. MACHADO, personal communication, 1964); no watching service is at work in this area. Another fumarole exists at Pico Que Arde.

In 1959 we registered an average temperature of 108°C in the hot volcanic mud of Caldeira Velha. Water in the puddle was near 98°C. Lagoa do Fogo fumarole, perhaps the remains of an eruptions in 1563, has been in activity at intervals.

Terceira Island

Every fortnight since March 1964 temperatures have been measured at Furnas do Enxofre, an active fumarolic field (1). The temperature table for April-November 1964 shows:

Month	Day	Temperature (°C)		
		Ambient	On surface	5 cm below surf.
April	1	12	85-95	87
	15	13	80-90	85
May	1	12,5	85-95	88
	15	13	85-100	87
June	1	13	90-100	88
	15	12	80-100	85
July	1	15	85-102	87
	15	14	85-95	88
August	1	16	85-100	89
	15	15,5	90-97	86
September	1	13,5	85-100	88
	15	13	95-101	87
October	1	11	88-99	85
	15	10	84-90	84
November	1	10	88-110	89
	15	10,5	85-95	84

Graciosa Island

An active group of fumaroles is situated in the big cave (Humbolt's Cave) in the Caldeira. Temperatures for 1960 were around 95°C and an appreciable deposit of sulphur was formed in the cave.

Near the lighthouse, water vapour was recorded at times from a submarine fumarole located on the north coast.

(1) Surveying service under direction of Ing. C. FAGUNDES, Junta Geral do Distrito Autónomo de Angra do Heroismo, Terceira, Açorçes.

The thermal spring at Carapacho, in the caldeira area (south slope), continues to exist.

Pico Island

Near the top of the main mountain (2,351 m high) is situated a small group of fumaroles. They showed only slight activity during 1960 but in the following years persons who climbed to the crater saw more vapour than usual and in the mornings these clouds of vapour were observed from Cais do Pico and Lages (August, 1961, 62, 63 and 64) and at times from Faial.

A mineral water spring continues to flow near the south coast, at Silveira.

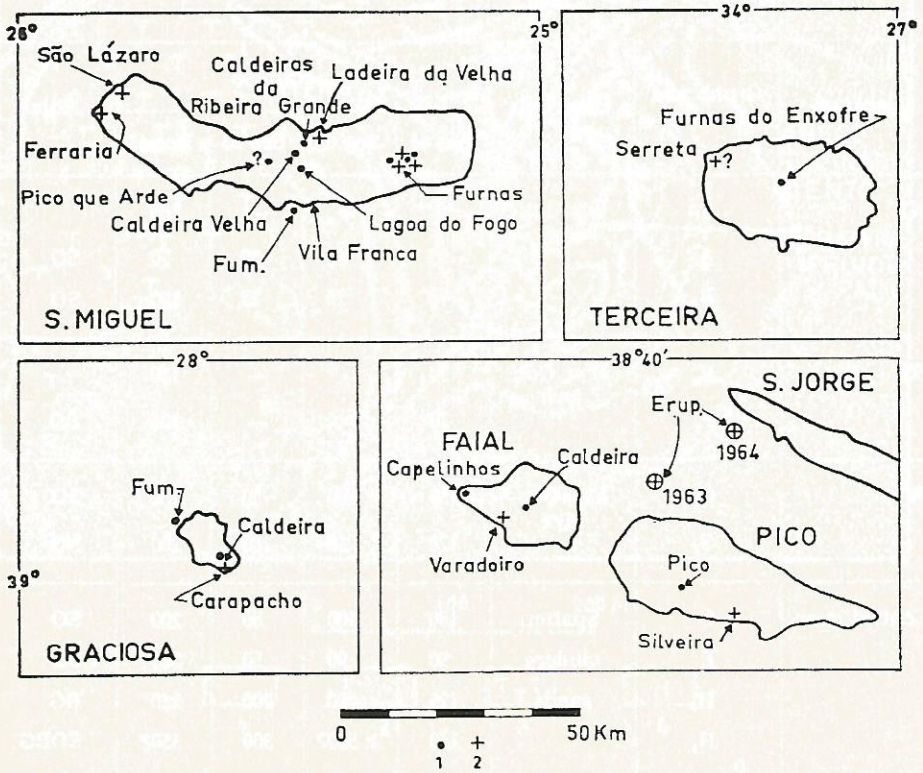

FIG. 1 - Azores Islands. Solfatara fields (1) and springs (2).

Faial Island

Since the end of the 1957-58 eruption, only fumarolic activity has occurred in the Capelinhos vents and since August 1959 no special

activity has been observed in the Caldeira, where manifestations ceased in 1958, perhaps during October.

However, at Capelinhos, temperatures were highest after December 1963 when an increase of fumarolic activity was observed and volcanic tremor was registered in Faial on December 13th and 14th (MACHADO and FORJAZ, 1964). Sketching new isothermal lines we observed that their embraced area was much larger after this date. The main temperature table of the Capelinhos vent is an example (Fig. 2).

TABLE 1 - Capelinhos: temperatures measured in the vents.

Location	Group and number	Outcropp	Temperatures				Notes
			Sep 61	Sep 62	Sep 63	Dec 63	
NE	A_1	Jun-Oct. lava	—	—	—	100	
	A_4		85	60	50	70	SO
	B_4		90	70	75	160	SO
SW	F_1	21 st Oct. lava	70	—	—	120	
	F_3		70	—	—	100	BG
W	G_2	May-Oct. lava	150	100	50	250	SO
	G_5		120	80	80	200	SO
Central cone	C	Spatter	100	100	80	200	SO
	E_1	cinders	90	90	50	300?	SO
	H_3	sands	125	80	200	250	BG
	H_4		130	$\geqslant$ 500?	300	350?	SOBG
NW	K		100	60	65	200	BG
	M		110	80	100	350	BG

SO: sulphurous odour; BG: bluish gases.

This increase of activity is probably related to a very small eruption that occurred at sea, off Cachorro (Pico). Reliable persons from Faial and Pico observed typical volcanic clouds on the surface of the Faial-Pico-S. Jorge Channel, at a point where sea depth was

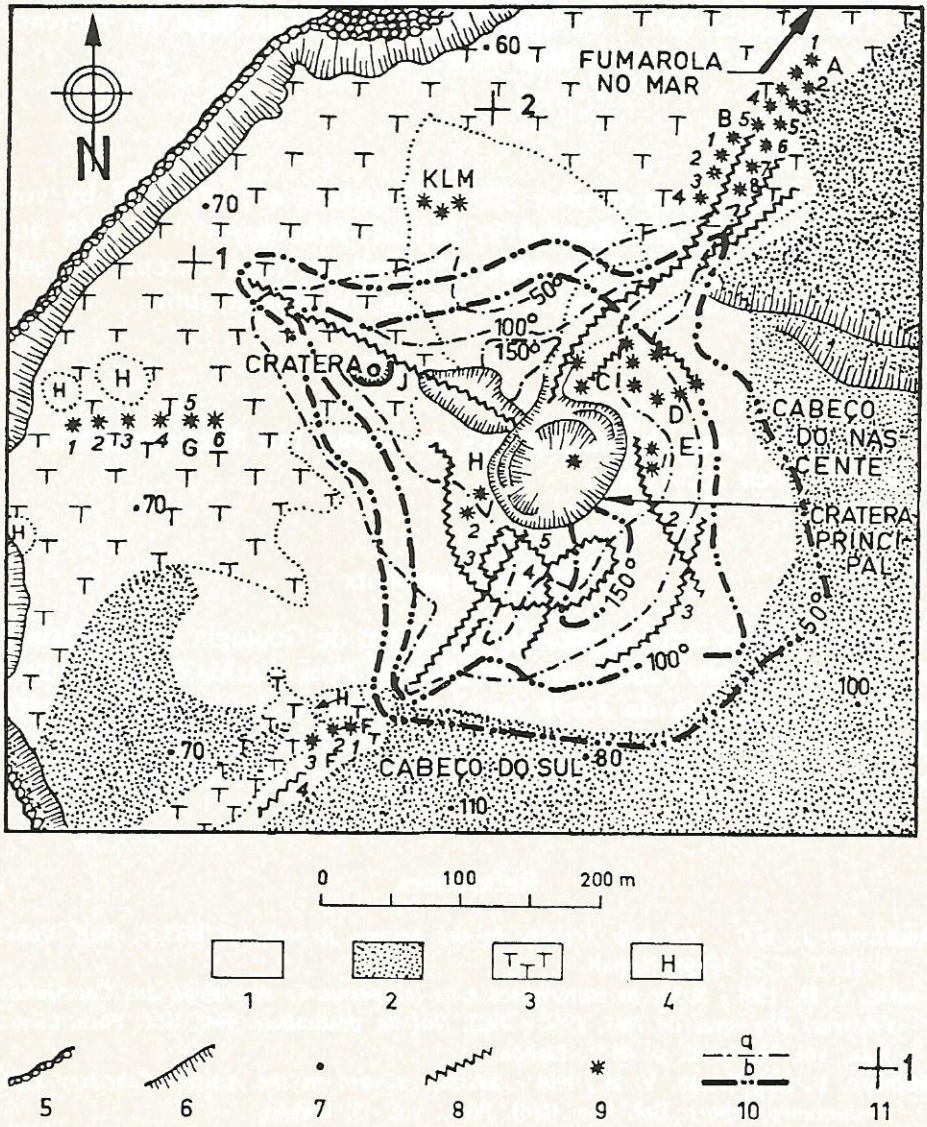

FIG. 2 - Capelinhos vent: (1) Spatter cone - (2) Cinders and sands - (3) Lava - (4) Hornito - (5) Coast line - (6) Scarp - (7) Altitude - (8) Main fissure - (9) Active fumarole - (10a) Isothermal line (1962, September) - (10b) Isothermal line (1963, September) - (11) Coast line surveying point.

about 1,000 m. The eruption (December, 1963) was undoubtedly connected with another that occurred near S. Jorge coast, where sulphurous odour and volcanic tremor were reported on February 18 th 1964. This latter eruption is suspected to have occurred at sea depth somewhere between 500 and 1,000 meters (MACHADO and FORJAZ, 1964).

The thermal spring at Varadoiro continues to flow. An increase of sea temperatures near them was reported.

S. Jorge Island

A seismic swarm of over 500 earthquakes accompanied by volcanic tremor was experienced in January-February-March 1964 but no volcanic manifestations were recorded on land except the sulphurous odour of an eruption at sea, as mentioned above.

Flores Island

At Flores some thermal springs are known but their temperatures have not been recorded.

Acknowledgements

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