

AZORES – 2004

11th International Symposium on Vulcanospeleology

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ABSTRACT

A report on the IUS Commission on Vulcanospeleology's 11th International Symposium held on Pico Island in the Azores, May 2004, and particularly field trips to Faial Island (Capelinhos volcano, Gruta do Capelo and Faial Caldera) and around Pico Island (Gruta das Torres – longest lava tube of islands at 5.2 km – to be opened to public; Gruta dos Montanheiros; Gruta do Soldão), a climb of 2351 m Mt Pico and post-symposium field trips to São Miguel I. (Gruta do Carvão, calderas and fumarole fields), Terceira Island (Furna d'Água and Furna do Cabrito – water supply caves - Algar do Carvão extraordinary showcave, Os Montanheiros headquarters, Gruta da Natal showcave, Gruta das Agulhas) and Graciosa Island (remarkable Furna do Enxofre showcave with fumarole).



Fig. 1. This striking graphic, blending the volcanic Mount Pico with a scene in one of the lava tubes beneath it, was used to promote the symposium

The 11th International Symposium on Vulcanospeleology was held on the Azores Islands, part of Portugal in the Atlantic Ocean, part way to America, 12-17 May 2004, with post-conference excursions extending to 22 May. The meeting was hosted by the Environment Department of the Azores Regional Government and GESPEA (Working Group on Volcanic Caves of the Azores), in cooperation with the Commission on Volcanic Caves of the International Union of Speleology.

Over 40 people attended, about half of whom were locals. 14 countries were represented; the author being the sole participant from the Southern Hemisphere. The organisation was well done and the weather was generally mild and fine.

THE SYMPOSIUM

The meeting was preceded by a field trip to explore the 140 m deep Algar do Montoso (Montoso volcanic pit) on the island of São Jorge. This was reported to be very successful.

The Symposium proper took place at Madalena on Pico I., overshadowed by a very impressive volcano (Fig. 1). The opening on 12 May was conducted at São Roque school auditorium. The scientific

sessions occurred at Cardeal Costa Nunes school. Thirty papers were presented on a broad range of topics relating to lava tubes, including: formation of lava cave minerals (in which Paolo Forti presented his list of the world's top ten lava caves from the point of view of mineralogy – which included Victoria's Skipton Lava Cave), biota of caves on Azores, Canaries and Cape Verde islands, ranking Azorean caves for management, visitor centre for Gruta das Torres (Pico I.), ↑

Hibashi Cave, Saudi Arabia, lava caves of Jordan, volcanic caverns of Costa Rica, a remotely-sensed entranceless lava tube in Iceland, a proposal to tunnel into a 200 m deep volcanic vent in Iceland to provide tourist access and implications for management of a beetle study in Algar do Carvão (Terceira I.).

The relative positions of the islands are shown in Fig. 2.

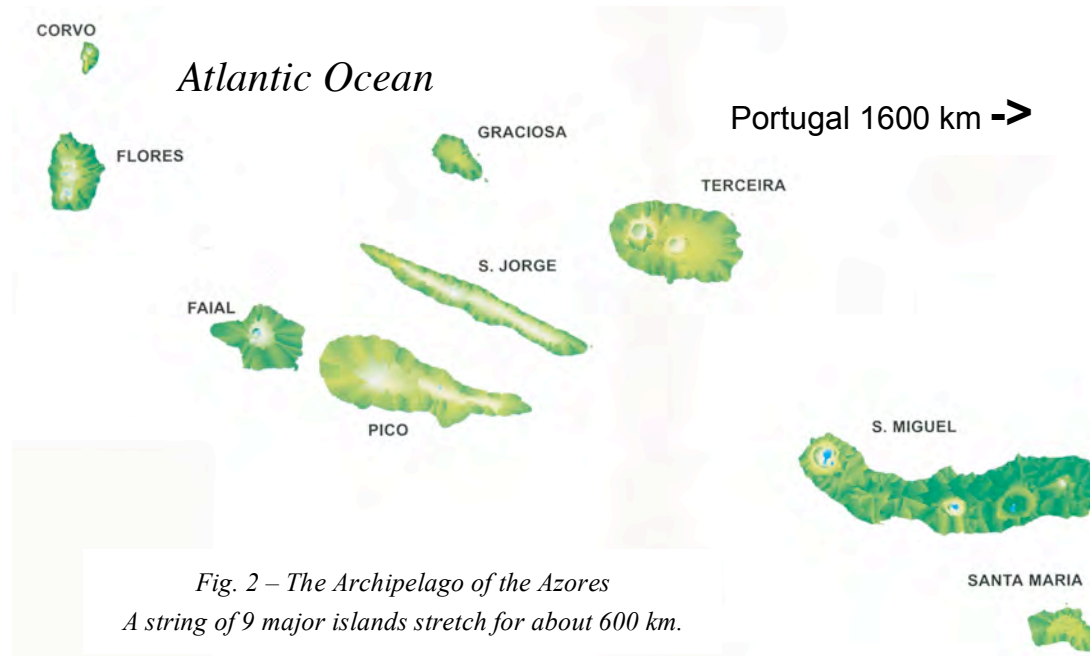


Fig. 2 – The Archipelago of the Azores
A string of 9 major islands stretch for about 600 km.

LOCAL EXCURSIONS

Faial Island

Our first excursion, on 13 May, took us by ferry to the port of Horta on the nearby island of Faial. We then travelled west by bus to Ponta dos Capelinhos where a series of eruptions in 1957 remodelled the coast and “cooked” the lighthouse. Surprisingly, the tower still stands (Fig. 3), as a memorial to the power of volcanoes and a marker to show how much extra land was created. A small museum has graphic photos of the eruption, maps, geological displays, etc.

After morning tea we were taken to see our first lava cave: Gruta do Capelo. This was a modest cave with little to recommend it, though it did create the opportunity to photograph some vulcanospeleological heavies in their natural environment (Fig. 4).

Lunch was followed by a visit to the spectacular Faial Caldera (Fig. 5) which was accessed through a tunnel drilled through the side of the volcano.

We caught the ferry back to Pico from Horta.

Pico Island

On 15 May a bus took participants on a tour of features of interest on Pico Island. First stop was made at Gruta das Torres, in a Regional Natural Monument about 5 km SW of Madalena. As we had learned from a paper (Vieira da Silva & Vieira 2004), it is planned to open this cave to tourists and to build a visitor centre on the edge of the entry pit. Lighting will not be installed; visitors will be issued with caving helmets and torches. Stairways of lava slabs have already been constructed in the entry pit which is pleasantly wooded (Fig. 6). Tourists will only be conducted through ~400 m of the cave; we saw a little more (Fig. 7), but still only a fraction of the total of over 5.2 km. This is the longest lava cave in the Azores and among the 20 or so longest in the world.

The next site visited was Frei Matias Cave, or at least the entrance to it, in the shadow of twin hornitos (Fig. 8), and then on to Gruta dos Montanheiros. This was accessed by a long fixed aluminium ladder, lying on top of an old wooden one, obviously near the end of

its days (Fig. 9). The cave runs both up and down-flow from the entry point and has some quite colourful features (Figs 10 & 11).

After lunch at Lajes do Pico and a visit to the whaling museum we went underground again at Gruta do Soldão. Interesting features of this cave included the downflow (*makai*: towards the sea) termination at an opening in a sea cliff (Fig. 12), a well-developed lateral bench (Fig. 13) and, mauka, a cold puka – that is a skylight resulting from collapse after the cave cooled (Fig. 14).

On our way back to Madalena we stopped to admire the local vineyards (Figs 15, 16). Each vine is planted in its own lava-walled enclosure. These provide protection from the wind and intensify the warmth of the sun. The labour that has gone into the building of thousands of kilometres of these walls is beyond imagination; as is how these vines grow with so little soil. But grow they do – and produce great wines! (a tasting was kindly provided). My favourite was a white known as “Terras de Lave”. The distinctive vineyard landscapes in the vicinity of Madalena are being nominated for World Heritage listing.

COMMISSION MEETING

The IUS Commission on Volcanic Caves met on 16 May with Jan Paul van der Pas in the chair. Matters discussed included the as yet unpublished proceedings of the two previous symposia, the maintenance of a list of longest/deepest lava caves and, of course, the venue for the next symposium. It was agreed this would take place on the Korean island of Jeju in 2006.

MOUNT PICO CLIMB

If some people see a mountain, they have to climb it – especially if it happens to be the highest mountain in the country. And so it was that a group of five delegates, having admired the Pico volcano for the previous five days, resolved to climb it on 17 May. An early start was indicated so at 7 am we took taxis to the appointed starting place, where we met our guide. The group comprised Gunnhildur Stefánsdóttir and Arni Stefánsson (Iceland), Marieke Meuller (Sweden), Harry Shick (Hawaii) and the author (Fig. 17), plus three Austrian tourists. We started 1200 m asl and reached to the summit, at 2351 m (Fig. 18), by 10:30. Among the volcanic features to be observed on the ascent were subsidiary cones and hornitos (Fig. 19). The weather became

progressively worse as we ascended into cloud, with rain and cold wind. At the summit, although visibility was down to about 5 m, we were delighted to be able to warm ourselves in the hot gasses from a fumarole (Fig. 20); every mountain should have one. As we descended the cloud lifted but no one had the energy to climb back up.

That evening the Symposium closed with a final banquet at a Madalena restaurant.

POST-SYMPOSIUM FIELD TRIP

On the morning of 18th we departed by plane for **São Miguel Island** flying, as one does, via Terceira Island.

After checking into our hotel in Ponta Delgada we were off, on foot, to visit Gruta do Carvão (‘Carbon Cave’) which lies beneath the streets and buildings of this city. It is said to be the longest cave on São Miguel, at 1650 m, but it is now split into three sections. In ancient times it was reported to be as long as 5 km (Costa 2002).

We trogged up in the grounds of a factory and descended a neat flight of stairs at the back of the building. This part of the cave was illuminated with a string of light bulbs. Minor works had been undertaken to dig out mud and improve the access in places. This part of the cave is used for environmental education of local students – over 1400 of whom have been conducted through it since 1998 (Braga 2004). This passage ended where large stormwater drains broke into the tube. We returned to the entrance and walked mauka to a second segment of the cave. Here were some fine examples of cave slime and we were lucky enough to have Dr Diana Northup (who has done a lot of work in Lechuguilla) to point out various types to us (Figs. 21, 22).

That evening the Mayor of Ponta Delgada hosted a cocktail party for us at the Centro Municipal de Cultura.

19 May was spent visiting Fogo and Furnas ‘poligenetic volcanoes’: Caldeira Velha fumarolic field, Ribeira Grande geothermal power station, Lagoa do Fogo caldera, Caloura lava delta, Furnas Lake and fumarolic field. A highlight was having our lunch cooked in a sealed vessel lowered into a fumarole (Fig. 23). After lunch we did a tour of the Furnas field’s fumaroles, boiling mud pools, springs and boiling pools (Fig. 24). The afternoon was spent overlooking the Furnas caldera and lake, and other

volcanic features, and visiting a tea factory.

On 20 May we flew back to **Terceira Island** where we were hosted by members of the local caving group, Os Montanheiros. We were taken by minibus to Furna d'Água – a cave which is the basis of the local water supply. Water flowing into the cave at various points is captured in a concrete and ceramic-lined trench (Figs 25, 26) and fed to a reservoir. From there it was a short drive to Furna do Cabrito (Goat Cave), another part of the water catchment. The entrance is covered by a concrete dome (probably to keep the goats out), below which there is an impressive spiral concrete staircase [see cover] giving access to a large lava tube. This tube has been sealed with a concrete wall, forming an underground reservoir. Altogether an impressive array of engineering by the local water authority.

From there we drove to the famed Algar do Carvão showcave – you can't miss the turn-off (Fig. 27). This cave was given to the Os Montanheiros group a few years ago and it has been successfully operated as a show cave since 1968. It was first entered in 1893 but not fully explored until 1963 (Costa 2002). This is a truly extraordinary and spectacular cave (see Fig. 28). It is comprised of a vertical element about 50 m deep, a volcanic conduit 15-20 m in diameter, formed in basalt which broke through the horizontal element – a large cavern in trachyte (Fig. 29) which extends down another 40 m, ending in a clear lake (Fig. 30). The walls of the trachyte chamber are heavily encrusted with amazing speleothems of amorphous silica, obsidian and limonite shaped exactly like their calcite counterparts in karst caves (Figs 31-33). Access has been provided by a tunnel dug into the vertical conduit, followed by a steep zigzag path down to the trachyte chamber. The path winds around this huge chamber, eventually ending at the edge of the lake.

This unique cave is a Regional Natural Monument, due to its volcanic features (Forjaz et al. 2004) it probably merits World Heritage listing.

That evening we were accommodated in the town of Angra do Heroísmo, enjoyed a fabulous hosted dinner and then visited the headquarters of the Os Montanheiros group. This 4-storey stone building is probably the finest 'clubhouse' of any caving group anywhere. One floor is devoted to reception,

office and meeting room, another to a geological and natural history museum, another to historical displays, topped off with a large library, map cabinets, computers and archives. All the visitors were astonished that such a place existed, evidently the result of a very hard-working, dedicated group over many years, backed by the income from two show caves.

On 21 May we had an opportunity to look around the town with its impressive botanical gardens and museum, before visiting the other show cave run by Os Montanheiros, an unextraordinary lava cave called Gruta da Natal, on our way to the airport.

From Terceira we flew to the small island of **Graciosa**, where we stayed in the main village, Santa Cruz.

On 22 May we took a minibus tour around the island, viewing various volcanic features. Eventually we reached a tunnel giving access to the main caldera. From the carpark we walked down to the large opening to the cave at the lowest part of the caldera – the Furna do Enxofre (Sulphur Cavern). While we waited for the guide to unlock the door, we could see down the entry shaft (Fig. 34) from which arose the sound of a siren which we were led to believe indicated excessive foul air in the lowest part of the cave. Once through the door we started down the long stone spiral staircase (Fig. 35) to a huge single cavern (Fig. 38) 194 m long and 40 m high (Costa 2002) terminating in a lake (Fig. 37). The access tower is a striking feature of the cave. It was built early in 20th century and is 37 m high.

At the back of the chamber was a bubbling fumarole (Fig. 36) – the only one in an Azorean cave – and probably the source of the foul air. We felt no ill-effects from foul air but apparently the siren had been installed because a few years ago two men had dived into the lake and on surfacing had died from lack of oxygen immediately above the water.

That evening we flew back to Terceira and the field trip ended. Most people flew home that evening. As I had an extra day I hired a car and, on 23rd, drove right around the island. In particular I visited the Furnas de Enxofre (sulphur fumaroles), an area where there are numerous steam and sulphur vents, and the Gruta das Agulhas, a lava tube opening onto the sea (Figs 39, 40, 41).

Next day I flew back to Australia via Lisbon, London and Hong Kong.



Fig. 3. Lighthouse ruin, Ponta dos Capelinhos; the 1956 volcano and new land to the right – Faial Island



Fig. 4. Profs. Woo (Korea) and Kempe (Germany) with JP Van der Pas (Commission Chair) in Gruta do Capelo, Faial Island



Fig. 5. Caldera of Faial – 2 km in diameter and 400 m deep



Fig. 6. Entry pit, Gruta das Torres, Pico Island



Fig. 7. Inspecting Gruta das Torres



Fig. 8. Twin hornitos above Frei Matias Cave



Fig. 9. Old and new access to Gruta dos Montanheiros



Fig. 10. Colourful lava tongue and drain, Gruta dos Montanheiros



Fig. 11. Unusual rock column in lava tube with subsequent red lava flow on floor.



Fig. 12. Makai entrance to Gruta do Soldão, overlooking the sea



Fig. 13. Lateral lava bench, Gruta do Soldão – John Pint



Fig. 14. A cold puka, mauka Gruta do Soldão – Ken Ingham



Fig. 15. Typical lava-walled vineyards of Pico with Mount Pico behind



Fig. 16. This area of vineyards near Madalena is up for World Heritage nomination



Fig. 17. Pico climbers: Arni, Harry, Greg, Gunnhildur, Marieke; our guide in front.

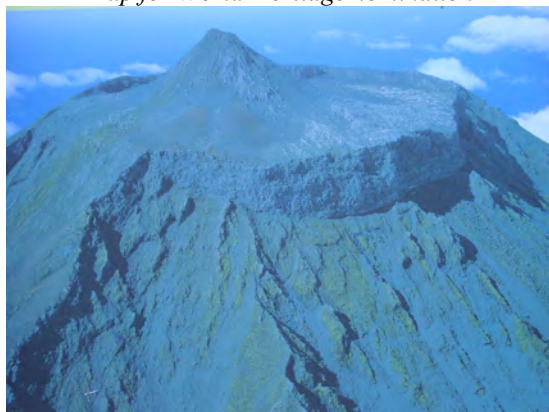


Fig. 18. Pico's summit – on a good day – it wasn't as difficult an ascent as it looks.



Fig. 19. Impressive hornito part way up Mount Pico.



Fig. 20. Lunch in the misty summit fumarole, Pico [Photo: Marieke Mueller]



Fig. 21. Dr Diana Northup points out cave slime on lava stalactites – Gruta do Carvão



Fig. 22. 'Leopard-spot' slime is widespread in Gruta do Carvão, São Miguel I.



Fig. 23. The group's lunch is retrieved from a steaming pit in Furnas fumarole field



Fig. 24. One of numerous boiling pools, Furnas fumarole field



Fig. 25. Concrete channel, Furna d'Água, Terceira



Fig. 26. Ceramic-lined trench, Furna d'Água, Terceira



Fig. 27. Eye-catching sign and statue, Algar do Carvão

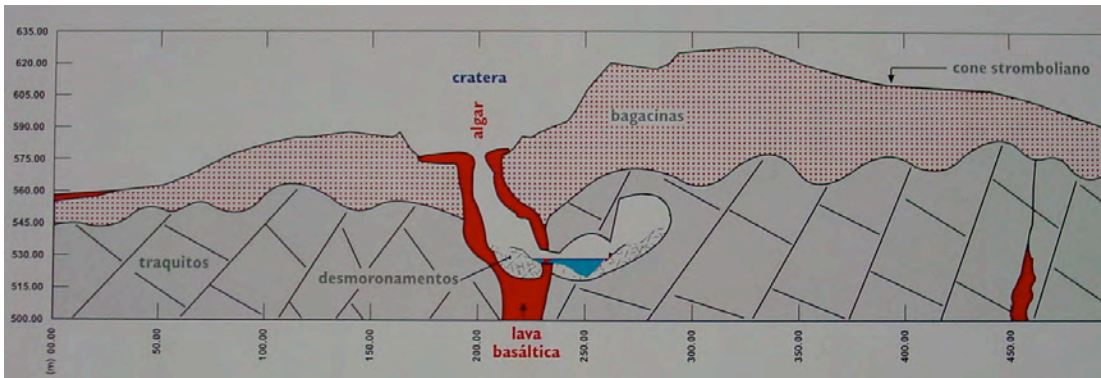


Fig. 28. Diagram showing structure of Algar do Carvão [from a sign at the site]



Fig. 29. Part of the huge 'big room' in trachyte which forms the horizontal part of Algar do Carvão



Fig. 30. The lake in the lowest part of the trachyte chamber of Algar do Carvão



Figs 31, 32, 33. A selection of the abundant speleothems of amorphous silica, obsidian and limonite in the trachyte chamber, Algar do Carvão, Terceira I.



Fig. 34. Looking down into Furna do Enxofre



Fig. 35. Access tower, Furna do Enxofre



Fig. 36. Fumarole in cave

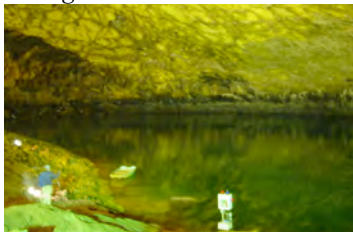


Fig. 37. Lake in F. do Enxofre



Fig. 38. 194 m long chamber, Furna do Enxofre; base of access tower in centre; lake to left



Fig. 39. Direction sign for Gruta das Agulhas



Fig. 40. Inside Gruta das Agulhas lava tube

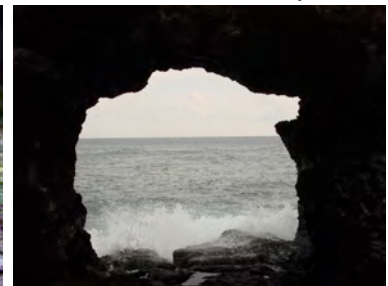


Fig. 41. Gruta das Agulhas opens to the Atlantic Ocean

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