VII INTERNATIONAL SYMPOSIUM ON VULCANOSPELEOLOGY

La Palma - El Hierro - Tenerife
Canary Islands

4 - 11 November 1994

PROGRAM & ABSTRACTS

VII INTERNATIONAL SYMPOSIUM ON VULCANOSPELEOLOGY

La Palma - El Hierro - Tenerife
Canary Islands

4 - 11 November 1994

PROGRAM & ABSTRACTS

ORGANIZED BY

Grupo de Espeleología "Junonia"

Federación Territorial Canaria de Espeleología

Universidad de La Laguna

ORGANIZING COMMITTEE

SCIENTIFIC PRESIDENT:	Pedro Oromí Masoliver
VICE-PRESIDENT and ORGANISER:	Conny Spelbrink
VICE-PRESIDENT:	Manuel Rosales Martín
COMMITTEE MEMBERS:	Grupo Junonia Lucas Sala Manuel Arechavaleta Nieves Zurita Pérez

CREDITS

The International Symposium of Vulcanospeleology has been made possible thanks to the following organizations and institutions:

Patronato de Turismo, La Palma
Patronato de Turismo, El Hierro
Patronato de Turismo, Tenerife
Caja Canarias, La Palma
Federación Española de Espeleología
Federación Canaria de Espeleología
Grupo de Espeleología "Junonia", La Palma
GIET Universidad de La Laguna
Ayuntamiento de Santa Cruz de La Palma
Ayuntamiento de Icod de los Vinos, Tenerife
Museo de Ciencias Naturales de Tenerife
Transporte Insular de La Palma
Cooperativa de Transportes de El Hierro
Tenerifebus
Parador Nacional de El Hierro
Hotel Marítimo, La Palma
Bodegón Tamanca, La Palma
Viajes Insular, La Palma
D. Rosendo Luis Cáceres y empleados de Finca del Perdido

PROGRAM

Thursday, Nov. 3

18.00 - 20.00 Symposium registration desk in Hotel Marítimo

Friday, Nov. 4

10.00 - 12.00 Symposium registration desk in the Hotel

17.30 - 18.30 Symposium registration desk in the Symposium Hall

18.30 Official inauguration of the Symposium

20.00 Cocktail party for all participants in Palacio Salazar, invitation of the Tourist Board of the Cabildo Insular de La Palma

Saturday, Nov. 5

09.00 Conference by Francis Howarth: "A comparison of the ecology and evolution of cave-adapted faunas in volcanic and karstic caves"

10.00 Scientific communications. Session 1

11.30 Coffee break

12.00 Scientific communications. Session 2

13.00 Poster session

13.45 Lunch

16.00 Conference by Paulo Borges: "Conservation status of Azorean lava tubes and pits"

17.00 Scientific communications. Session 3

18.00 U.I.S. meeting

19.30 Conference by P. Oromí "Las Cuevas de Canarias" (in Spanish, for the general public)

Sunday, Nov. 6

09.00 Conference by Prof. Yuri Slezin: "Lava caves in Kamchatka"

10.00 Scientific communications. Session 4

11.00 Coffee break

11.30 Conference by William Halliday: "Recent vulcano-speleological progress in Hawaii"
12.30 Scientific communications. Session 5
13.20 Lunch
14.30 Excursion "Volcanoes of La Palma", departure from Hotel Marítimo.

Monday, Nov. 7
09.00 Full day excursion "Volcanic caves of La Palma", departure from Hotel Marítimo.
20.00 Cocktail party invitation by the City Council of Santa Cruz de La Palma , Club Nautico

Tuesday, Nov. 8
12.15 Departure for El Hierro from the hotel Marítimo. Transfer to the hotel Parador Nacional.
19.30 Official reception, courtesy of the Tourist Board of El Hierro, in the hotel

Wednesday, Nov. 9
09.00 Full day excursion "Volcanic caves of El Hierro", departure from the hotel
19.30 Conference by Pedro Oromí "Caves of the Canary Islands" (in Spanish, for general public), conference room Cabildo, Valverde.

Thursday, Nov. 10
08.15 Departure for Tenerife from Parador Nacional. Transfer to Hotel Meliá Puerto de la Cruz (Tenerife)
.. .. Afternoon free
20.00 Official closure of the Symposium, followed by final dinner. Invitation of the Tourist Board of Cabildo de Tenerife in Casino Taoro, Puerto de la Cruz.

Friday, Nov. 11

09.00 Full day excursion "The volcanic caves of Tenerife", departure from the Hotel Meliá.

15.00 Lunch by invitation of the Town Council of Icod de los Vinos.

SCIENTIFIC PROGRAM

CONFERENCE 1 (Saturday 5 Nov.) Chair: P. Borges

09.00 A comparison of the ecology and evolution of cave-adapted faunas in volcanic and karstic caves. F.G. HOWARTH

SESSION 1 (Saturday 5 Nov.) Chair: P. Borges

10.00 Fauna invertebrada de dos tubos volcánicos de La Palma, Islas Canarias. R. GARCIA BECERRA & A.J. GONZALEZ DIAZ

10.30 Relation between carbon dioxide concentration and the distribution of the cave fauna in Cueva del Viento (Tenerife, Canary Islands). P. OROMI, M. ARECHAVALETA, L. SALA & C. MARTIN

11.00 Estudio faunístico de los isópodos cavernícolas terrestres de Canarias. R. RODRIGUEZ SANTANA

SESSION 2 (Saturday 5 Nov.) Chair: F.G. Howarth

12.00 Erosion by lava tubes. R. GREELEY

12.30 Relation between the volcanic activity of the Mt. Hachijo-Fuji and volcanic caves on Hachijojima Island, the seven Izu Islands, Japan. T. OHSAKO

CONFERENCE 2 (Saturday 5 Nov.) Chair: W. Halliday

16.00 Conservation status of Azorean lava tubes and pit. P.A.V. BORGES

SESSION 3 (Saturday 5 Nov.) Chair: P. Oromí

17.00 Aspectos generales sobre las cavidades volcánicas de Mt. Suswa y Tsavo (Kenia). A.L. MEDINA & J.M. GONZALEZ

17.30 New discoveries of lava tubes related to Cueva del Viento in Icod de los Vinos (Tenerife, Canary Islands). J.J. HDEZ. PACHECO & P. OROMI

CONFERENCE 3 (Sunday 6 Nov.) Chair: R. Greeley

09.00 Lava caves in Kamchatka. Y.B. SLEZIN

SESSION 4 (Sunday 6 Nov.) Chair: J.P. Van der Pas

10.00 Natur- und künstursprüngliche Risse in den vulkanischen Gestein. I. ESZTERHÁS

10.30 The peculiar mineralogic site of the Alum Cave, Vulcano, Sicily. P. FORTI, M. PANZICA LA MANNA, A. ROSSI

CONFERENCE 4 (Sunday 6 Nov.) Chair: P. Forti

11.30 Recent vulcanospeleological progress in Hawaii.
W. HALLIDAY

SESSION 5 (Sunday 6 Nov.) Chair: P. Forti

12.30 La utilización de tubos volcánicos como lugares de habitación y enterramiento por los benahoaritas. F.J. PAIS

12.55 La espeleología en Canarias. M. ROSALES

ORAL PRESENTATIONS

A comparison of the ecology and evolution of cave-adapted faunas in volcanic and karstic caves.

Francis G. HOWARTH

The recent revelations of abundant cave animals in lava tubes and tropical caves provide systems to independently test evolutionary theories developed from the historic biospeleological studies in temperate limestone caves. Limestone caves are usually old, deep, large, three-dimensional mazes, with few mesocaverns and subject to complex geological history often including uplift, folding, and subsidence. Compared to limestone caves, lava caves are usually younger, shallower, smaller, less complex mazes, with more abundant mesocaverns and with simpler history. In spite of these major contrasts resulting from differences in parent rock and mode of formation, specialized subterranean animals living in both lava and karstic caves display remarkably similar adaptations, indicating that selection pressures and ecology must be similar. Indeed, there are important ecological similarities. Once beyond the influence of entrances, the physical environment in subterranean habitats is perpetually dark, humid, and nearly isothermal; lacks most environmental cues; and often contains lethal or sublethal gas mixtures and wet barren rocky substrates. Even though the types and sources of food vary among regions and caves, the difficulties of finding food resources as well as finding mates in the dark three-dimensional mazes are similar. For both rock types, numerous cave-sized and smaller passages exist that have no entrance, and also the surface over both is often barren with food resources sinking into subterranean voids out of the reach of surface species. Troglobites evolved to exploit these resources in the harsh subterranean environment. Because of their different geological histories, lava and limestone cave communities may accumulate and lose species differently over time.

Erosion by lava flow through tubes

R. GREELEY, S. KADEL, R.S. HARRIS, D. CHALLIS
& D. WILLIAMS

The possibility of erosion of terrain by active lava flow through tubes and channels has been debated for many years. Although convincing evidence for erosion has been reported for segments of prehistoric lava tubes in Washington state (Mount St. Helens), California (Hambone flows), Hawaii (Kilauea flows), and elsewhere, the style and extent of erosion is poorly known. We have examined these and other areas, assessed the evidence for erosion by flow in active lava tube systems, conducted laboratory experiments using simulated lavas (polyethylene glycol), and developed a numerical model for lava erosion. In addition, we have developed criteria for assessing possible erosion in lava tubes. Results from these studies will be reported and related to the role of lava tubes in the emplacement lava flow fields.

Relation between the volcanic activity of Mt. Hachijo-Fuji and volcanic caves on Hachijo Jima Island, the Seven Izu Islands, Japan.

TAKASHI OHSAKO

This report studies mainly the formation mechanism of an eruptive fissure cave and gas-blowout caves which were discovered for the first time in Japan, and tries to clarify their relation to the volcanic activity of Mt. Hachijo-fuji.

The eruptive fissure cave named Hachijo-fuji Fukestu opens on the rim of the crater of Mt. Hachijo-fuji. This cave is formed in a fissure located on the rim where crater walls do not collapse during eruptions.

The gas-blowout caves are in the lava dome with the pit crater named Koana on the summit of Mt. Hachijo-fuji. Quick cooling of the wall of the pit crater with the air causes residual stresses to be set up in the lava dome. The gas-blowout caves are formed in the plane of the maximum residual stress in the lava dome.

Fauna invertebrada de dos tubos volcánicos de La Palma (Islas Canarias)

RAFAEL GARCÍA BECERRA

Se estudia mediante un trampeo sistemático y continuado, constituido por trampas de caída, la distribución de la fauna invertebrada en dos cavidades del sureste de La Palma (Islas Canarias)

Estas cuevas muy próximas entre sí presentan un ecosistema relativamente rico en especies en comparación con el de otras cavidades de la isla, y al mismo tiempo muy diferentes entre ellas mismas.

Se colectó un total de 27 especies, de las cuales 7 son trogloxenos, 8 son troglófilos y 12 son troglobios según la terminología empleada por Martín & OROMI (1990).

Aspectos generales sobre las cavidades volcánicas de Monte Suswa y Tsavo (Kenia).

MEDINA, A.L. & J.M. GONZÁLEZ

Como resultado de la Expedición Kenia-Tanzania 92, se presentan las observaciones realizadas en varios tubos volcánicos de Kenia.

Las entradas de las cuevas, de grandes dimensiones, se distinguen por su vegetación, muy diferente a la típica de la sabana. Las higueras africanas (*Ficus salicifolia* y *F. thoningii*) constituyen los árboles más llamativos, si bien los dragos (*Dracaena* sp.) forman comunidades locales de gran densidad.

La gran abundancia de murciélagos en el interior de las cuevas, aporta el guano del que viven numerosos artrópodos.

La fauna invertebrada está compuesta por araneidos, pseudoescorpiones, isópodos, colémbolos, coleópteros y un grillomorfo. Las especies encontradas en las cuevas de Monte Suswa y Tsavo, no presentan adaptaciones muy marcadas a la vida subterránea.

Relation between carbon dioxide concentration and the distribution of the cave fauna in Cueva del Viento (Tenerife, Canary Islands).

P.OROMI, M. ARECHAVALETA, L. SALA & C. MARTIN

In caves carbon dioxide concentration is usually higher than on the surface. There are different sources of CO_2 (see JAMES 1977) and it is difficult to assess the importance of each one, which is variable among the caves. A different distribution of the concentration levels occurs depending on 1) air movements, according to the amplitude of passages and the closeness of outside connections, and 2) the presence of organic matter. Thus, the carbon dioxide concentration often is higher in deep tubes and in places with abundant organic material. On the other hand, lava tubes have lower levels than karstic caves, due to the lithological composition and the proximity to the surface of the former.

HOWARTH (1983) suggests that the low metabolic rate of troglobitic animals is a physiological adaptation to high carbon dioxide levels; consequently troglobites should be more abundant in bad air enviroments (HOWARTH 1990). In order to test the validity of the hypothesis in lava tubes of Tenerife, we made a study in Cueva del Viento complex. After dividing the main galleries in 134 longitudinal sectors, the CO_2 concentration at each one was measured, and a standarized sampling of the fauna was carried out in 59 of these sectors. Although differences of CO_2 concentrations are not very accused, a relation exists beetwen this parameter and the density and richness of troglobites.

Estudio faunístico de los isópodos cavernícolas de Canarias

R. RODRIGUEZ SANTANA

Se realiza un análisis de la fauna cavernícola de los isópodos terrestres del Archipiélago Canario a partir del material recolectado por el G.I.E.T de la Universidad de La Laguna.

Los componentes faunísticos, cavernícolas y de MSS, de los Oniscidea siguen los patrones que se presentan en la fauna epigea. Destacan las especies endémicas emparentadas con la fauna no cavernícola de origen mediterráneo, de origen centroamericano y atlántico, aunque alguna de este último es abundante y frecuente en algunas cuevas. Este es el caso de las especie *Eluma purpurascens* Budde-Lund,1885 que se encuentra en ciertas cavidades junto con *Venezillo tenerifensis* Dalens, 1984 y *Trichoniscus bassoti* Vandel, 1960, un troglobio recolectado también en cuevas del Archipiélago de Madeira.

En Canarias aparecen algunos casos de especiación incipiente ejemplarizados en individuos de *Halophiloscia couchi* (Kinahan, 1958) recolectados en la Cueva de Tacande y en la Cueva de los Palmeros en la isla de La Palma y que presenta todos los caracteres somáticos modificados respecto a sus congéneres epigeos.

Conservation status of Azorean lava tubes and pits

P.A.V. BORGES

The conservation status of the diverse vulcanospeleological patrimony of the Azores is the main subject of this paper. The lava tubes and volcanic pits from the Azores are being exposed to several types of disturbance, some of them with destructive effects. Unique geological structures and some cavernicolous endemic arthropods are enough justification to establish severe measures of conservation for such patrimony. This work focuses on the types of disturbance over the Azorean volcanic cavities and their fauna and possible ways of conservation. The main types of disturbance are: deforestation, pasture management, "catle graveyard effect", touristic activities, water management and industrial and domestic waste.

La utilización de tubos volcánicos como lugares de habitación y enterramiento por los benahoaritas.

F.J. PAIS PAIS

Los benahoaritas (habitantes prehispánicos de La Palma) eligieron como lugares preferentes para vivir, así como, enterrar a sus muertos, las numerosas cuevas naturales que se abren en las márgenes de barrancos, laderas de montañas, taludes verticales de coladas lávicas, etc. Los tubos volcánicos, a pesar de la gran profundidad de muchos de ellos, no fueron desaprovechados para los menesteres anteriormente apuntados. La parte más cercana a la entrada de estos tubos, al ser más luminosa, fue utilizada en numerosos casos como lugares de habitación permanente, habiéndose localizado yacimientos de este tipo desde la zona costera a otros situados en torno a los 1.300 m de altitud.

Por otro lado, la gran profundidad de algunos tubos volcánicos, la gran oscuridad reinante en su interior, la estrechez y dificultad del tránsito por sus estrechos corredores, etc. los convertía en lugares idóneos para abandonar a sus muertos y que, en la gran mayoría de los casos, han sido saqueados por los expoliadores.

Por último, haremos una breve referencia a los peligros que entraña la visita a estos yacimientos sin ningún tipo de control y sin haber excavado, previamente, los posibles vestigios prehispánicos. Por ello debe ponerse especial cuidado a la hora de explorar los tubos volcánicos existentes en La Palma y, en general, en toda Canarias.

New discoveries of lava tubes related to Cueva del Viento in Icod de los Vinos (Tenerife Canary Islands).

J.J. HERNANDEZ PACHECO & P. OROMI

The area of Icod de los Vinos is by far the richest in lava tubes as well in Tenerife as in the whole archipelago. It is located below the northern slope of Pico del Teide, where most of the lavas of this stratovolcano flowed down during the last few thousand years. The longest lava tube is Cueva del Viento, that reached some 14 km when the inner connection with Cueva del Sobrado was discovered some years ago. At the beginning of 1994 thanks due to the intuition of J.J. Hernández Pacheco and the economical support of the Cabildo de Tenerife, important excavations started at the lower end of Cueva del Sobrado, where a natural pit had been artificially filled by stones some 80 years ago to prevent accidents. After removing many tones of debris, three new branches appeared at different depths of the pit: Cueva del Petróleo and a still unnamed branch, both going up parallel to the main gallery of Cueva del Sobrado; and Cueva Intuición, the proper downwards continuation of the latter, starting at the bottom of the pit and extending for at least 2 km away.

This main new branch is a remarkable tube with an average inner dimensions bigger than usually found in the rest of Cueva del Sobrado, but similar to those of Galería de los Ingleses, in Cueva del Viento. The floor is of extremely rough lava, the roots are scarce (probably because of the depth with regard to the surface) and the cave-dwelling fauna is in general poorer than in other parts of the Cueva del Viento complex; only in a lateral branch with very different, even substrate does occur a richer troglobitic fauna.

As it is common in newly discovered lava tubes at intermediate altitudes on Tenerife, Cueva Intuición had very abundant subfossil skeletons of the giant rat *Canariomys bravoi*, a specie already

extinguished. The presence of abundant skeletons of bats at the end of the cave indicates that another entrance was connecting the cave with the surface in the past.

Lava caves in Kamchatka

YURI B. SLEZIN & A.I. TSYURUPA

The lava caves in Kamchatka are known mainly within the so-called "megaplagiophyric" basaltic and basaltic-andesite lavas. Lavas of this "cave-bearing" type are widely spread in the Klyuchevskaya volcano group. The recent lava tubes are located within Tolbachik Dol, the slightly inclined (4° to 1.5°) lava plain south of the main Tolbachik volcanoes. Here we observed the process of generation of lava tubes during the Large Tolbachik Eruption 1975-76, and studied and mapped some caves in the lavas erupted by the nearest Zvezda cone in 1739.

We registered interruptions in lava flow motion, whereas lava supply was constant. When lava flow stopped, swelling of its surface began, creating tumuli and elongated cupolas. In due time the secondary lava sources opened along the front rampart thus giving rise to the next step of lava field. Lava outflow evacuated chambers under the swellings and so originated caves. Up to 4-5 steps could be generated along the flow 9-10 km long. We suppose that this mechanism of lava tube generation is connected with the relatively high significance of the yield strength in the rheology of cave-bearing lavas.

The connection of lava caves with the steps of lava flow topography can help discover them.

Natur- und künstursprüngliche Risse in den vulkanischen Gesteine

ISTVÁN ESZTERHÁS

In Mitteleuropa haben auch die Funktion der jüngsten Vulkane zirka vor 2 Millionen Jahren beendet. Ansehnlich Teil der Urorberfläche der Vulkane sind sich schon abgedorben. Aus diesem ging sind hervor im venigern Verhältnis die syngenetische Höhlen und sind mehr postgenetische Hohlräume.

Eine Gruppe der postgenetischen Höhlen bilden die Versturzhöhlen (oder Aufrißhöhlen). Der Entstehung ist notwenig primär ein reletiver größer Hohlraum. Dieser größer Hohlraum ist möglich durch natürliche Entstehung, als Lavatunnel, oder karstische Lösungshöhle im kalkhaltigen Grundgestein - aber ist möglich auch künstliche Hohlräume, als alte Stollen.

Die Aufriße der naturursprünglichen Höhlen nennt man Versturzhöhlen, oder "jameo"-s. Ihre Behandlung bekannt in der Fachliteratur. Wenn künstliche Hohlräume der alten Stollen (oder Keller, Kasematten usw.) sind durch Weiterentwicklung ein natürliche Art gestürzen, so ich diese Konsequenzhöhlen nennen schlage. Dieser Höhlentyp kommt in der frühern Fachliteratur nicht vor.

The peculiar mineralogic site of the Alum Cave, Vulcano, Sicily.

P. FORTI, M. PANZICA LA MANNA, A. ROSSI

The Alum Cave is a small tectonic cavity hosted in the volcanic tuff close to the pier of the Vulcano island: it has several entrances all few metres above the sea level.

This cave was well known since the last century due to the abundance and variety of the minerals growing inside: for a period the cave was partially transformed into a quarry to exploit the alum.

Without any doubt the Alum Cave is one of the most important sites for the cave mineralogy in the world, hosting more than 10 different and rare minerals, nevertheless up to present no topographic map of this cave was done and no photographic documentation was available. More over in the last eighty years nobody made a control on the minerals still present inside the cave.

This is the reason why we decided to explore this cavity, whose map is here presented.

During the exploration we did also a detailed analysis of the hosted cave minerals, which still cover a large part of the cave walls: about 80% of the minerals described in the past have been observed still growing inside the cavity.

In the present paper all the observed cave minerals are shortly described and the genetic mechanisms discussed.

Quite all the chemical deposits of the Alum Cave are generated by the reaction of the fumarolic fluids over the volcanic tuff in presence of sea sprays and aerosols.

Recent vulcanospeleological progress in Hawaii

WILLIAM R. HALLIDAY

In 1993 and 1994, the length of Kazumura Cave was extended to a total of 31.7 km and an unnamed pit on Hualalai Volcano was bottomed at -263 m. Exploration and study also have been extensive elsewhere on Kilauea, Mauna Loa, and Hualalai Volcanoes of Hawaii Island and elsewhere in Hawaii. In three additional caves of the Kazumura system, aproximately 17 km is explored and mostly mapped, and several other pits on Hualalai and Mauna Loa volcanoes will be explored when permision is received from private landowner.

La espeleología en Canarias

M. ROSALES

Se hace un repaso histórico de las actividades llevadas a cabo por espeleólogos canarios desde que hay constancia de ello. Las actividades formales comenzaron en la década de 1960, cuando fue constituida en Tenerife una sección de Espeleología dentro de la Federación de Montaña, y fueron desarrollándose cada vez más con la fundación de la Federación Territorial Canaria de Espeleología, la aparición de diversos grupos federados, la formación de una escuela, organización de campamentos, cursos de aprendizaje, etc. La actividad fue extendiéndose, hasta llegar a la actualidad en que hay grupos constituidos en casi todas las islas del archipiélago, se ha catalogado la mayoría de las cavidades volcánicas existentes, y se ha levantado topografía de un gran porcentaje de ellas.

POSTERS

The MC1 Cave on the Mt. Etna and its peculiar metastable speleothems

P. FORTI, G. GIUDICE, A. MARINO & A. ROSSI

On the Mt. Etna volcano, at the top of the Bove Valley, a new cave was found in the lava flow of 1991-93 and explored when its internal temperature was still high (over 80°C). This allowed to discover some peculiar speleothems, whose development was strictly controlled by temperature and humidity.

The cave is a classic lava tuve, its total length is about 800 meters with diameters ranging between 5 and 8 meters and the entrance is a small hole opened at 1900 m a.s.l. reaching the ceiling of the main gallery.

When the first cavers entered the cave found the walls and the ceiling rather completely covered by large speleothems (stalactites, stalagmites, helicites) normally snow white in colour, but in some places blue, pale green, orange to reddish formations have been seen.

The preliminary analyses proved that thenardite was practically the single component of all these speleothems; the same mineral we observed some years ago in another still hot lava tube on Mt. Etna.

The thernadite is metastable in the normal metheorologic conditions of Mt. Etna changing to mirabilite and therefore we decided to keep under control the evolution of MC1 speleothems with respect to temperature and humidity in order to achieve new data on the stability range for this mineral and the natural conditions which cause its transformation into mirabilite.

Beside this research it was possible also to make interesting observations on the aerosol induced speleothems: in fact in this cave plenty of very thin helictites (needle like filaments) clearly related to aerosols were still growing at the time of our explanations.

This research is still in progress and it will be ended in the spring of 1995, therefore in the present paper the first preliminary results are presented.

Using remotely-sensed images to study the vulcanology of the Canary Islands

ALLISON REID

The present day landscapes of the Canary Islands vary dramatically, predominantly with age, and result from a long period of erosion and deposition of the original volcanic outpourings followed by a more recent series of eruptions a few million years ago. A complex climate, including a strong East-West gradient in rainfall, adds further variety to the surface appearance of the islands.

Since the early 1970s satellite remote sensing of the Earth's surface has routinely enabled synoptic views of relatively inaccessible areas to be used in resource studies. The Landsat Thematic Mapper (TM) records images of the surface at seven wavelengths and has a ground resolution of 30 m. The sensor's infra-red response has been used in monitoring temperatures of hot volcanic features as fumaroles, lava flows and lakes. The spectral resolution of TM has made it a useful tool for surveying mineralogy in semi-arid environments, where the ground response is not confused by vegetation. These features make TM data particularly interesting for studies in the Canary Islands.

Recently the Instituto Geográfico Nacional has released a series of posters at a scale of 1:100.000 of geometrically corrected TM images of the islands. These false colour composites are selected to display information from the red, near infra-red and middle infra-red bands. They

clearly distinguish vegetation from rock and show differences of mineralogy. This paper will describe the identification and mapping of features from the images and discuss the usefulness of these data as input to a Geographic Information System, where it can be combined with other data sets such as hydrological, sociological and economic information.

Cueva de Petrólea, a newly discovered branch of Cueva del Viento system: survey and fauna.

N. ZURITA, L. SALA, M. ARECHAVALETA, E. MUÑOZ & P. OROMI

During the excavations carried out some months ago at the lower end of Cueva del Sobrado, an unknown branch was discovered. A volcanic pit of 15 m has been emptied after removing a remarkable amount of stones, and the connection to the branch referred herein (Cueva de Petrólea) is left over 7 m above the actual bottom of the pit.

This is a rather narrow tube which after several meters diverging from the pit, turns right upwards and continues in a parallel direction to the formerly known Cueva del Sobrado, reaching a total of 152 meters before the upper end. After surveying the whole branch and measuring the temperature, the relative humidity and the CO_2 concentrations, a standard sampling of the cave fauna was carried out by means of traps and visual searching, with a satisfactory result taking in account the reduced extension of this lava tube.

Life history of *Schrankia* sp. (Lepidoptera, Noctuidae) in Cueva de Felipe Reventón (Tenerife, Canary Islands)

L. SALA, M. ARECHAVALETA & P. OROMI

Abundant specimens of *Schrankia* sp. (Lepidoptera, Noctuidae) have been observed and collected in Cueva de Felipe Reventón, Tenerife. In this cave the presence of this insect is almost permanent either as adults, caterpillars or both, depending on the season. The adults are found all along the lava tube, perching at the walls or sitting on the benches or the floor. They fly easily when disturbed, and some mating couples have been observed, as well as females laying eggs. Caterpillars feed on tender roots hanging from the ceiling; after growing up they pupate in cocoons made with fragments of the same roots. These cocoons are hanging from the ceiling and become dark brown as the fragments get dry. A few pupae and dead adults have been observed in some other lava tubes on the island.

La galería de Hernández Pacheco, un nuevo descubrimiento en el Complejo de la Cueva del Viento.

HERNANDEZ PACHECO, J.J., A. LAINEZ, F. RIJO, F.J. TRUJILLO, J.S. LOPEZ RONDON, L. HERNANDEZ PEREZ.

Dentro del fascinante mundo de las cavidades volcánicas destacan varias de ellas a nivel mundial. Una de éstas es el Complejo de la Cueva del Viento (Tenerife), en la que las exploraciones han deparado hallazgos de tipo geológico, biológico y paleontológico. Durante las excavaciones realizadas con ocasión del "Anteproyecto Cueva del Viento" (1994), subvencionado por el Cabildo Insular de Tenerife, en la sima de la Cueva del Sobrado se descubrieron dos nuevos tubos. El primero de ellos localizado a unos 7 m de profundidad, con unos 150 m de desarrollo se denominó Cueva de Petrólea. El segundo se localizó durante el mes de junio a unos 15 m de profundidad, y tiene una longitud total de 2,5 km. En el interior de esta última se encontraron restos fósiles de mamíferos como rata gigante, murciélagos, etc. Dedicamos en homenaje este póster a J.J Hernández Pacheco, bioespeleólogo, amante de la naturaleza que gracias a su tenacidad propia de una gran persona y entrañable compañero, se puso a cargo de este gran proyecto. Se presenta aquí la topografía de este nuevo ramal, al que hemos decidido denominar Galería de Hernández Pacheco.

Cueva del Bucio lava tube (Tenerife, Canary Islands): mapping, environmental features and animal communities

L. SALA, P. OROMI & J.C. RANDO

Cueva del Bucio is a small, unbranched lava tube (116 m long) situated in Aguamansa, Tenerife, at 1000 m a.s.l. in a terrain covered by mixed pine forest. It was an isolated cave with no entrances, discovered during an excavation and immediately closed with a dark metallic door. The cave was surveyed nine years after being closed; temperature, relative humidity and other environmental data were taken several times along one year; and a study on the animal communities was carried out.

A complete map of the cave is presented herein. In spite of the door and the short distance between the entrance and the deepest point of the cave, there were estimable differences in the physical conditions. A complete list of the species collected is presented, being remarkable the richness in troglobitic fauna for such a short lava tube. The distribution of the species is also commented, in relation of the different environmental conditions.

PARTICIPANTS

Alonso Díaz, José
C/ El Rincón s/n
Breña Baja, La Palma
Canary Is. - Spain

Alvarez Hernández, C. Mª
Vista Alegre 316
Breña Baja, La Palma
Canary Is. - Spain

Antognini, Marco
Via Madonna della Salute
10 A 6900 Lugano, Massagno
Switzerland

Arechavaleta, Manuel
Depto. Biología Animal
Universidad de La Laguna
38205 La Laguna, Tenerife
Canary Is.- Spain

Barker, Stuart
RGO Office
Apartado 368
38780 Santa Cruz de La
Palma, Canary Is.- Spain

Bengesser, Rudolf
Obersee 36
A-4822 Bad Goisern
Austria

Borges, Paulo A.V.
Dept. de Ciências Agrárias
Universidade dos Açores
9702 Angra do Heroísmo
Terceira - Açores
Portugal

Bosák, Pavel
Hlavni 2732
14100 Praha 4
Czech Republic

Bueno, Miguel
Fed. Española Espeleología
Avgda. Francesc Cambó 14,
9º B, 08003
Barcelona, Spain

Buzzini, Roberto
Passetto 12
6604 Locarno
Switzerland

Choppy, Jacques
182 Rue de Vaugirard
Paris 75015
France

Ciabatti, Mario
Dipto. di Geografia
Via Zamboni, 67
40127 Bologna
Italy

De Swart, Herman
Koolstraat 56
NL-2312 PT Leiden
Netherlands

De Vries, Els
Palmasol 223
Breña Alta
La Palma
Canary Is. - Spain

Dubois, Paul
Les Inerlets
Rue des Grèzes
34070 Montpellier
France

Eszterhás, István
Köztársaság u 157
Isztimér H-8045
Hungary

Forti, Paolo
Ist. Italiano di Speleologia
Via Zamboni, 67
40127 Bologna
Italy

Francavilla, Franco
Dipto. Scienze Geologiche
Via Zamboni 67
40127 Bologna
Italy

García Becerra, Rafael
El Pilar, 8 3º1ª
38700 Santa Cruz de La Palma
Canary Is. - Spain

González Díaz, Antonio J.
Avda. El Puente 29, 2º
38700 Santa Cruz de La Palma
Canary Is. - Spain

Greeley, Ronald
Dept. of Geology
Arizona State University
Tempe, Arizona
USA 85287 - 7045

Halliday, William
101 Aupuni St., #911
Hilo, HI 96720
USA

Hosinsky, Celia
Las Tricias
38787 Garafía
La Palma
Canary Is. - Spain

Hosinsky, Anton
Las Tricias
38787 Garafía
La Palma
Canary Is. - Spain

Howarth, Francis G.
Bishop Museum
P.O. Box 19000 A
Honolulu HI 96817
USA

Karkabi, Sami
BP 70
811 Antelias
Lebanon

Kawamura, Kazuyuki
1-19-2-302, Aobadai 2
Chome, Meguyo-Ku
Tokyo 153
Japan

López Cabrera, Anacleto
Bajamar 3, Puntallana
38715 La Palma
Canary Is. - Spain

López Cabrera, Candelaria
Bajamar 3, Puntallana
38715 La Palma
Canary Is. - Spain

López Cabrera, José C.
Bajamar 3, Puntallana
38715 La Palma
Canary Is. - Spain

Magdalena Díaz, Felipe N.
Vista Alegre 316
Breña Baja, La Palma
Canary Is. - Spain

Medina, Ana Luisa
Depto. Biología Animal
Universidad de La Laguna
38205 La Laguna
Tenerife - Canary Is.
Spain

Membrado, José Luis
Federación Española
Espeleología
Av. Francesc Cambó, 14
08003 Barcelona
Spain

Molina Rodríguez, José
Lomo Quiebre 29 A 2° iz
Playa de Mogán
Gran Canaria - Canary Is.
Spain

Mrkos, Heinrich
Rudolf Zellergasse
50-52/3/1
Wien (Plz 1230)
Austria

Ogawa, Takanori
2-170-4 Asumigaoka
1125 Oujicho, Midoriku
Chiba City 267
Japan

Ohsako, Takashi
52-7-103 Matsugaya
Hachioji-Shi
Tokyo, Japan

Oromí Masoliver, Pedro
Depto. Biología Animal
Universidad de La Laguna
38205 La Laguna
Tenerife - Canary Is.
Spain

Pais Pais, Felipe J.
Gallegos, 26
38727 Barlovento
La Palma - Canary Is.
Spain

Pérez Camacho, Pedro
La Montaña 34
Breña Baja
La Palma
Canary Is. - Spain

Pino Granado, Francisco
Policía Municipal
38780 Santa Cruz de La
Palma
Canary Is. - Spain

Reid, Alison
San José, 11
Breña Baja
La Palma, Canary Is.
Spain

Rodríguez Santana, Rafael
Galileo 12, 2°
35010 Las Palmas de
Gran Canaria
Canary Is. - Spain

Rosales, Manuel
Federación Territorial
Canaria de Espeleología
C/ Los Silos, 13 Salud Alto
38008 Santa Cruz de Tenerife
Canary Is. - Spain

Rudd, Philip John
RGO Office
Apartado 368
38780 Santa Cruz de La
Palma
Canary Is. - Spain

Sala, Lucas L.
Depto. Biología Animal
Universidad de La Laguna
38205 La Laguna
Tenerife - Canary Is.
Spain

Schroder, Iain
Thorrudgt. 9
3031 Drammen
Norway

Semmelrath, Gerhard
Schlossbergstrasse 22
A-2130 Mistelbach
Austria

Shaw, David
Bradford & Ilkley Community
Coll. (Security Department)
Great Horton Road
Bradford, West Yorkshire
England

Slezin, Yuri
Abel st., 27-30
Petropavlovsk
Kamchatsky
Russia

Spelbrink, Conny
Carretera de Martín Luis 32,
38715 Puntallana
La Palma - Canary Is.
Spain

Toshimichi, Hirose
1404 Ohshikakubo
Shibakawa-Cho, Fujigun
Shizuoka
Japan

Trimmel, Hubert
Draschestrasse 77
A-1230 Wien
Austria

Valencia Martín, Isidro
El Melonar, 65
San Andrés y Sauces
La Palma, Canary Is.
Spain

Van der Pas, Jan Paul
Vauwerhofweg 3
6333 CB Schimmert
Netherlands

Vargaz Zarraga, Reinaldo
Miranda Abajo 15
Breña Alta
La Palma
Canary Is. - Spain

Zurita Pérez, Nieves
Depto. Biología Animal
Universidad de La Laguna
38205 La Laguna
Tenerife - Canary Is.
Spain