

# MINERALOGY OF CENTRAL AMERICAN CAVES: PRELIMINARY RESULTS

**Andrés Ulloa<sup>1,2\*</sup>, Fernando Gázquez<sup>3</sup>, Fernando Rull<sup>4</sup>, Aurelio Sanz-Arranz<sup>3</sup>, Jesús Medina<sup>4</sup>, José Antonio Manrique<sup>4</sup>, José María Calaforra<sup>5</sup>, Jo de Waele<sup>6</sup>.**

1. ZRC SAZU Karst Research Institute, Postojna, Slovenia.
2. Centro de Investigaciones en Ciencias Geológicas, Universidad de Costa Rica
3. Department of Earth Sciences. University of Cambridge. UK
4. Unidad Asociada al Centro de Astrobiología (ERICA) CSIC-UVA, Universidad de Valladolid. España.
5. Departamento de Biología y Geología. Universidad de Almería. España.
6. Department of Biological, Geological and Environmental Sciences, Bologna, It

\*Contact mail: grupopangeas@gmail.com

## Abstract

In the NW section of Irazú volcano, the highest volcano in Costa Rica, (3400 m.a.s.l.), three volcanic caves have been located: *Minerales*, *Mucolitos* and *Pizote Espantado* caves. The origin of these caves is complex, associated to many different process, i.e. collapse, erosion, tectonic activity, high temperature degasification and possible dissolution of volcanic rocks by very acidic waters. The exceptional environmental conditions of the surroundings of the caves, such as an active volcano with a recently dried crater lake and the presence of fumaroles and active faults, allowed the precipitation of unique worldwide minerals in their inside. The hosting rocks are pyroclastic with high degree of hydrothermal alteration, silicification and tectonically affected by the central trace of the active Central Rio Sucio Fault. The area were caves are located was totally covered by volcanic material (30 to 160 m thickness) before the debris avalanche of December 8<sup>th</sup>, 1994. For this reason, it is suggested that minerals and the access to the cave are relatively recent (<22 years). The caves show important environmental conditions variations, e.g. temperature ranges from 9 to 30 °C, relative humidity from 74.2 to 96.8 % and pH of infiltration waters from 1 to 2. Herein we present preliminary results of the mineralogy of speleothems of Irazú caves, based on diverse analytical methods such as Raman spectrometry, LIBS, XRD/XRF and scanning electronic microscopy (SEM) coupled to a microprobe EDX. Preliminary results suggest the presence of more than 54 diverse minerals, mostly hydrated sulfates, 20 of those has never been reported in cave environments before. Presence of hydrated sulfates has also been detected on Mars (i.e. jarosite and gypsum), which makes these caves a natural laboratory for astrobiologic studies and a potential Mars analogue.

