LUMINESCENCE DATING OF PSEUDOKARST SPELEOTHEMS: A FIRST APPROACH. J . Sanjurjo-Sánchez[1] and J. R. Vidal Romaní[2], [1]University Institute of Geology "Isidro Parga Pondal", University of A Coruña, Campus de Elviña, 15071 A Coruña, Spain, jsanjurjo@udc.es, [2]University Institute of Geology "Isidro Parga Pondal", University of A Coruña, Campus de Elviña, 15071 A Coruña, Spain, xemoncho@udc.es.

Introduction: Speleothems are secondary mineral deposits formed in limestone or dolostone solutional caves. In granitic massifs, water trickling through the rock discontinuities causes a slow chemical and physical weathering of the rock related to biological activity [1]. The weathered materials are first eroded and later deposited in either fissures or the water output of fissures. The formed speleothems are comparable to their congeners in karstic (limestone) systems although always smaller in size and volume. Geochemical studies of such deposits have reported three different types of speleothems regarding the mineral composition: pigotite, evansite-bolivarite, opal-A.

Pigotite speleothems are composed of alumina and organic acids. They grow by rhythmic accretion of concentric layers as it occurs in calcite speleothems. The different layers alternatively show cream light (Al prevails) and reddish dark colours (Fe prevails) that seem to correspond to seasonal stages (winter-summer) similar to the varves of lake deposits. They have been studied and dated by ^{14}C, as they contain abundant organic mater [2]. The only absolute ages know for this kind of speleothems in NW Spain indicate their formation during the late Holocene.

Opal-A speleothems are the most common speleothems in acid rocks and they are episodically formed by accretion of new layers of precipitated opal-A. They show two main morphological types: cylindrical (stalactites, anti-stalactites and stalagmites) and in crusts or sheets (flowstone and microgours). Opal-A speleothems are a suitable microenvironment for the settlement and development of microorganisms as bacteria, fungi, algae, diatoms, polychetes, mites, etc., and different spores and pollen grains are frequently found trapped in the opal layers or on the speleothem surface [2], [3]. Thus, they can be interesting paleoclimatic records if they were dated. However, organic carbon is not abundant or absent, and other methods than ^{14}C must be tested.

Evansite-bolivarite are yellowish to brown-reddish speleothems frequently found in well diaclased rocky massifs with development of sheet structure [2]. They show a layered structure (flowstone) and they are some centimetres thick, covering surfaces of various square metres. Evansite is amorphous and massive and forms botryoidal or reniform coatings. Chemical analyses indicated that there are composed of hydrous aluminium phosphates. Some authors [4], [5] believe that under the name of evansite-bolivarite there may be represented transition terms between alumina silicates and alumina phosphates where the phosphorous that appears in them increases progressively as Si diminishes till substituting it completely. They also contain some detritic quartz and feldspar grains transported from the weathered rock.

Aim of the work: In this work, the luminescence characteristics of opal-A and evansite-bolivarite speleothems, and of other minerals contained in their layered structures, are investigated to apply a dating procedure for this kind of deposits. As they are very frequent in NW Spain (but also in other parts of the World such as Venezuela, Australia, Argentina or Slovakia), an opal-A flowstone sample from Monte Louro and an evansite-bolivarite flowtone from Monte Costa Grande (Muros, A Coruña, NW Spain) have been taken and studied to test for luminescence dating. As scarce detritic quartz content have been found, polymineral aliquots have been studied and dated.

Results: First tests, showed luminescence characteristics typical of high feldspar content and both thermoluminescence (TL) and post-IR OSL (Infra-Red Optically Stimulated Luminescence) [6] have been used to obtain a reliable ages. Results indicated an Holocene age for the opal-A speleothem sample. The Evansite-Bolivarite sample correspond to the Upper Pleistocene. Thus, they can be used as paleoclimatic records in areas of acid rocks.

References:

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