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First occurrence of coarsely crystalline cryogenic carbonates in the Dolomites (N Italy)

Gabriella Koltai (1), Hai Cheng (2), and Christoph Spötl (1)

(1) Institute of Geology, University of Innsbruck, Innsbruck, Austria (gabriella.koltai@uibk.ac.at, christoph.spoetl@uibk.ac.at), (2) Institute of Global Environmental Change, Xi'an Jiaotong University, Shaanxi, China (cheng021@xjtu.edu.cn)

Cryogenic cave carbonates (CCC) have been receiving increasing attention given their high potential as a quantitative indicator of palaeopermafrost thawing in the subsurface. Coarsely crystalline CCCs are particularly interesting because they can be precisely dated using the U-Th disequilibrium method. Here we report their first occurrence in a cave from the Dolomites.

The cave entrance is located at 2245m a.s.l. and seasonal ice is present at the bottom of the entrance shaft. CCCs were observed near the lower end of a descending chamber ca. 30-40 m below the entrance. Cave air temperature at the CCC site shows a mean of 2.5^{o}C with minimum (2.2^{o}C) and maximum (2.7^{o}C) values in January to March and November, respectively.

Coarsely crystalline CCCs are present in small heaps on or partly underneath breakdown blocks. The crystal aggregates are up to 1 cm in size and comprise of rhombohedral, raft- and feather-like forms. No systematic difference was found between the samples collected from the different heaps. Stable oxygen isotope values vary between -21.3 to -10.1‰ and δ^{13}C range from 1.5 to 5.4 ‰ (both vs. VPDB), characteristic of coarsely crystalline CCCs. U-Th dating indicates a Younger Dryas age for CCC formation and hence documents the presence of perennial ice in this sag-type cave during this cold period. Growth of stalagmites in the same chamber commenced in the mid-Holocene several thousand years after the degradation of the permafrost.