Geophysical Research Abstracts
Vol. 20, EGU2018-4026-1, 2018
EGU General Assembly 2018

Burial time of granitic cave sediments from the Brenta Massif: implications for the exhumation of the Adamello Complex (Italy)

Francesco Sauro (1), Philipp Häuselmann (2), Jo De Waele (1), and Walter Bronzetti (3)

(1) University of Bologna, Department of Biological, Geological and Environmental Science, Italy (cescosauro@gmail.com), (2) Swiss Institute for Speleology and Karst Studies SISKA (praezis@speleo.ch), (3) Gruppo Speleologico Trentino SAT Bindesi Villazzano, (walterbronzetti@hotmail.com)

The Raponzolo Cave is a palaeo-phreatic passage discovered in 2011 in the Brenta Dolomites (Trentino, Italy), at the remarkable altitude of 2600 m a.s.l. This cave has the unique characteristic, compared to other caves of the area, to be almost completely filled with well cemented sands and conglomerates of granitic composition (quartz, micas, feldspars and pyroxenes). This suggests a source of the sediment infilling from the Adamello complex that is separated from the actual Brenta massif by the Giudicarie Line featuring the deep valley of Madonna di Campiglio. This has important implications on the timing of speleogenesis of this palaeo-phreatic level and on the palaeogeographical connection of the two massifs, in relationship also to the tectonic evolution of this area of the Alps.
In order to provide answers to these questions, the fine conglomeratic sediment with quartz pebbles was sampled from the cave in order to determine its burial time using cosmogenic nuclides.
In the sample from Raponzolo cave the 26Al is completely depleted while the ratio 10Be/9Be is very low (7.8 x 10-15). This result shows that the sediment was indeed once at the surface, but that the burial time is so long that all 26Al already decomposed due to its shorter mean half-life. Since there is no 26Al present, the exact age of the sample cannot be given, because we cannot recalculate the initial concentration of isotopes prior to burial.
Nonetheless we can estimate a maximum and minimum age based on the presumed production rate of isotopes above the cave area and the mean lifetime on the surface of similar sediments in this area of the Alps. If we multiply the production rate (for a mean altitude of 3000 m a.s.l., we can estimate this rate in 43.5 atoms for 10Be and 295 atoms 26Al per gram of quartz) with the mean surface lifetime of 9300 years for comparable alpine samples, we can tentatively calculate a burial age of 7.6 Ma. If we reduce the surface lifetime to the minimum ever measured in the Alps (1300 years), then the sample would have been buried since 3.7 Ma.
This time range, and especially its older limit, could be of considerable interest to correlate the speleogenetic phase and the sediment infilling with a significant increase in the uplift of the Adamello batolith and accelerated erosion that has been estimated to have occurred between 8.5 and 6.5 Ma by previous thermochronological studies. Future studies on the thermochronology of zircons and apatites from the Raponzolo cave sediments could help to integrate these results to better define the palaeogeographic and tectonic evolution of the Brenta Massif speleogenesis in relationship to the Giudicarie Line and the Adamello mountain uplift.