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High resolution climate isotopic record of the Last Interglacial provided by a stalagmite in cave entrance from southwest France

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The Last Interglacial is still relatively poorly documented because of archive preservation problems. Its duration and timing depending on regions are still debated, as well as its internal evolution. Comparison between different archives from this period is often tricky because of the lack of reliable chronologies. High-resolution paleoenvironmental data associated with an independent chronology based on accurate and reliable dating are a priority in order to better understand the pattern and the cause of the Last Interglacial climate.

We studied a stalagmite from southwest France (La Chaise de Vouthon, Charente), located in a cave entrance and inserted in an archaeological filling, where Neanderthal remains have been discovered. Despite its location in the cave entrance, where hygrometry and temperature fluctuate, we show that the isotopic record can be interpreted in terms of environmental variations.

TIMS ^{230}Th/^{234}U dating constrained the growth period between 127,3 $\pm$ 3 ky to 117,2 $\pm$ 3 ky but the top being eroded, growth should have stopped around 116,5 $\pm$ 3 ky. That means growth took place during MIS 5e and stopped near MIS 5e-5d limit.

This last interglacial record shows an early climate optimum, soon after speleothem growth initiation, between 126,4 $\pm$ 3 ky and 124,1 $\pm$ 3 ky. This optimum is preceded by a short and abrupt cold event, maybe associated to the Heinrich-like event 11. After the climate optimum, a short degradation follows, for $\sim$ 2 ky, before a new mild

and humid period, until 119,5 $\pm$ 3 ky. We remark that the δ^{13}C optima are delayed compared to the δ^{18}O ones. This delay is larger for the first optimum ($\sim$ 1,3 ky), succeeding to a long and cold period at the end of stage 6.

The morphology of the isotope signal is very similar to the one of the stalagmite CC5 from Antro del Corchia (Italy), due to the presence of two periods of climate optimum during the Last Interglacial. Correlations also exist with proxy records of the Atlantic core MD99-2542. During the climate optimum recorded by calcite isotopes, temperate vegetation on Iberian peninsula increases (as it is recorded by pollens in this core) and planktic δ^{18}O decreases, and conversely during climate degradation (within age errors). Finally, we note that the δ^{18}O isotopic response to climate constraints varies in the same direction as other faraway isotopic speleothem records at the same period (Soreq and Peqiin (Israel); Dongge (China)): it decreases during climate warming and increases during deteriorations.

As a conclusion, the isotope record of this stalagmite constitutes a terrestrial paleoclimatic archive with the highest temporal resolution ($i.e.$ $\sim$ 40 yr) for this period and in this region.

This demonstrates that some speleothems developed in cave entrances can be exploited for paleoclimatological interests. In addition, when they are inserted in archeological filling, they can provide complementary information to paleoenvironmental data obtained by classical analyses ($i.e.$ palynology, paleontology, geology, etc.), allowing better knowledge of the natural context of prehistoric populations.