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MORPHOGENETIC EVOLUTION OF THE TÊT RIVER VALLEY (EASTERN PYRENEES) USING ^{10}Be/^{21}Ne COSMOGENIC BURIAL DATING.

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Introduction: The rates and chronologies of valley incision are closely modulated by the tectonic uplift of active mountain ranges and were controlled by repeated climate changes during the Quaternary. The continental collision between the Iberian and Eurasian plates induced a double vergence orogen, the Pyrenees, which has been considered as a mature mountain range in spite of significant seismicity [1] and evidence of neotectonics [2]. Nevertheless, recent studies indicate that the range may have never reached a steady state [3]. One option for resolving this controversy is to quantify the incision rates since the Miocene by reconstructing the vertical movement of geometric markers such as fluvial terraces. However, the few available ages from the Pyrenean terrace systems do not exceed the middle Pleistocene. Thus, to enlarge the time span of this dataset, we studied alluvium-filled horizontal epiphreatic passages in limestone karstic networks. Such landforms are used as substitutes of fluvial terraces because they represent former valley floors [4; 5]. They record the transient position of former local base levels during the process of valley deepening.

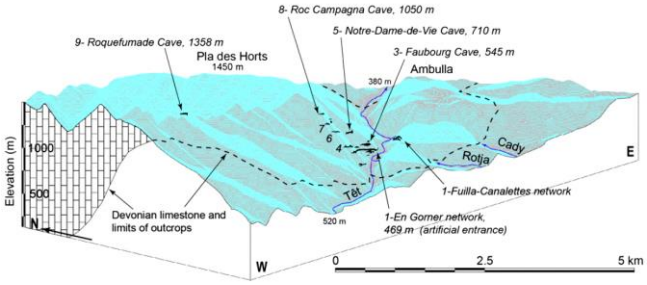

Figure 1 : Global view from the SW of the multi-level cave networks of the Villefranche karst, numbered 1 to 9 [6].

Settings: The Têt river valley (southern Pyrenees) was studied near the Villefranche-de-Conflent Devonian limestone gorge where 8 cave levels have been recognized over a vertical height of 600 meters (Fig.1). We took of the alluvial sediments (pebbles, gravels, sands) in 7 of these 8 floors.

Methods: Given that ^{26}Al/^{10}Be cosmogenic burial dating in this setting was limited to the last ~5 Ma [6], here we used the cosmogenic ^{10}Be/^{21}Ne method in order to restore a more complete chronology of valley incision [7; 8]. Furthermore, the use of the cosmogenic neon allowed us to mitigate problems related with lithologies, in particular due to the abundance of muscovites. Indeed, these aluminum-rich minerals are sometimes complex to eliminate, entailing to low ^{26}Al/^{27}Al measurements.

We performed fifteen ^{21}Ne measurements on the Helix-SFT™ mass spectrometer of the CRPG (Nancy, France), and so many measurements on the Accelerated Mass Spectrometer ASTER of the CEREGE (Aix-en-Provence, France). For this application, neon was extracted in one single heating step at 1450°C, but atmospheric contamination was low enough to ensure a proper estimate of the non-cosmogenic component.

Results and discussion: Burial age results for alluvial deposits from 12 caves document incision rates since the Langhian (~14 Ma). Preliminary results indicate a history of valley deepening in successive stages. The data show a regular incision rate of 70–80 mm/ka from the Langhian to the Messinian, then a decrease to a mean incision rate of ~15 mm/ka. Together with these burial ages, pre-burial catchment denudation rates were estimated and do not exceed 21 mm/ka. Moreover, no acceleration during the Quaternary is recorded.

This method also allows to infer that the Pla des Horts plateau (elevations ranging between 1450 and 1250 m) is of Burdigalian age.

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