



Genesis and evolution of karst systems in the rapidly uplifting Rio La Venta Massif, Chiapas, Mexico

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The La Venta Massif is one of the main tectonic blocks of the Sierra Madre de Chiapas orogenic belt, bordered by the compressive faults of Quintana Roo, La Venta and Malpaso. The area is characterised by the eighty kilometres long canyon of Rio La Venta cutting the karstic plateaus of El Ocote and Lopez Mateos.

Due to these compressive tectonic settings during the Pleistocene, this karstic massif has been interested by a quick tectonic-induced base level drop causing the propagation of an erosion wave, which represents the limit between an upper-relict karstic landscape and the lower adjusting zone of the canyon riverbed. In this context the karstic areas surrounding the canyon tend to be preserved as well recognizable relict plateaus while the subterranean drainage deepens the karst systems to adjust to the relative lowering of the local base level at the canyon bottom. These processes are recorded by speleogenesis in cave vertical patterns, multilevel palaeo-phreatic conduits, subsurface river knickpoints and active and fossil karstic spring distribution on the canyons walls.

Following these concepts we have analysed the vertical distribution of almost ninety kilometres of cave passages and several karstic springs mapped by speleologists in the last twenty-five years in the frame of the “La Venta Project” coordinated by La Venta Association and the Centre of Karstic Studies La Venta (CEKLAV).

The results clearly show a high disequilibrium of the karst systems in relation to the actual erosion wave along the canyon. From the La Venta original plateau the underground galleries were developed over time at lower altitudes in an attempt to equilibrate the base level drop of the canyon without, however, ever being able to keep up with it. Moving away from the canyon, hydrologically active passages are increasingly higher above the base level compared to what normally occurs in other karst regions. In the specific case of the Cueva del Rio La Venta it has been possible to identify several knickpoints retreating along the subterranean river, showing subsequent phases of uplift, with the highest river sections well over 300 metres above the actual base level of the canyon. The same decreasing influence of the base level lowering is confirmed by the distribution of karst spring heights: moving from the Malpaso Lake up to the actual canyon knickpoint, karstic springs show to have an increasing trend with the highest ones (Aguacero and Hierba Santa) suspended almost two hundred metres above the canyon riverbed. These observations confirm that the uplift of the La Venta block has been so fast that, while surface karstification preserved relict landscapes limiting the surface erosion rate compared to erosional processes in the surrounding non-karstic regions of the Sierra Madre de Chiapas, an efficient underground drainage was capable to develop important speleogenetic phases but did not reach the base level equilibrium at the bottom of the canyon.