

## **The study of the catchment area and hydrodynamics of *Árbol de Navidad* (Chiapas, Mexico) to solve the problem of its feeding during the dry season**

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The Sumidero Canyon, and its surrounding National Park is one of the most remarkable natural sites in the State of Chiapas, Mexico. Its principal attraction is the 200 m waterfall called "*Árbol de Navidad*" (Christmas tree), situated about 175 m above the river, close to the Chicoasén dam.

The *Árbol de Navidad* is characterized by its own particular ecosystem and by the presence of a travertine formation flowing out from a little cave, with a characteristic form from which derives its name. The cave from which the *Árbol de Navidad* takes origin is a karst spring fed by water infiltration from somewhere in the highland behind.

In the last years the flow rate decreased drastically and disappeared completely during few months every years. Since the importance of this natural marvel, with high naturalistic, cultural, and touristic interests, local authorities asked La Venta Exploring Team and its Mexican branch CEKLAV (Centro de Estudios Kársticos La Venta) to lead a research aimed to understand the causes of this decreasing and to formulate suggestions to rescue and maintain the waterfall.

The project, called "*Guardianes del Árbol*" (Tree Guardian) consists of several steps: 1- inspection of the spring cave to verify the presence of possible obstructions; 2- search for the principal karst sinkholes located on highland behind; geological and hydrogeological study of the highland; 3- hydrological tracing, to understand the hydrogeological system which fed the waterfall; 4- potential solutions for rescue and maintenance.

At the moment the first step has been concluded and the second and third steps are on the way. The first results were the complete cleaning of the underground river which was rather completely filled by sand, mud and roots thus avoiding the water circulation during the dry season.

During the beginning of the second and third steps a detailed structural analysis has been carried out in order to detect the possible recharge areas for the *Árbol*. Then two dye tracing tests have been performed to define the recharge area: these experiments allowed to state that at least a part of the water springing in the *Árbol* comes from an active sinkhole 4-5 km eastward. Anyway it is still impossible to define the whole recharge area for the *Árbol*, more dye tracing test are required.

In the near future the cave feeding the *Árbol* will be equipped with automatic devices to measure temperature, conductivity and amount of springing water in order to understand the behaviour of this karst system with respect to rainfalls. Next year, when these data will be available it will be prepared a project to ensure the correct amount of water to the spring even in the dry season.