

HOW OLD ARE AUSTRALIA'S CAVES ?

Evidence from Buchan, eastern Victoria, and Chillagoe, north Queensland

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During recent years evidence has begun to accumulate that the karst landscapes in Australia may be considerably older than previously imagined. At Buchan in eastern Victoria, there are high level caves that formed as phreatic systems along vertical joints. The water table associated with these caves lay along the bed of a large ancestral river, which was at least 180 m above the present-day rivers in the area. This ancestral river was partially filled by basalt lava flows around 40 million years ago, and the caves were drained by downcutting of the river soon afterwards. Thus the high level caves at Buchan formed more than 40 million years ago.

There are also low level caves in the Buchan area. These are horizontal epiphreatic systems, characterized by very flat roofs that developed along the water table when it was stable for some period of time. The lowest level passages, which are only 2-3 m above the present water table, were filled with sediment after they had formed. Palaeomagnetic studies of this sediment indicate that it was probably deposited when the Earth's magnetic field was reversed. The last major period of reversal finished about 730,000 years ago, so the caves must be at least this old. Previously these cave systems were believed to be less than 100,000 years old.

At Chillagoe in north Queensland, there is evidence of much older karst development. The limestone landscape here is characterized by spectacular towerkarst development, and the individual towers can rise as much as 100 m above the surrounding plains. Around the bases of the towers, and very rarely close to their summits, are small outcrops of ferruginous and quartzose sandstone, all apparently in situ.

The elevations of these sandstone outcrops range from 340 m to over 400 m. This sandstone has been correlated with other outcrops further north, which contain Early Cretaceous fossils. This shows that in the Early Cretaceous, about 130 million years ago, the limestone towers were at least 60 m high, i.e. the Chillagoe towerkarst was already in existence. In the Early Cretaceous the limestone was partially or completely covered by the sandstone, which has since been largely eroded away.

The age of the caves within the towers at Chillagoe is more difficult to determine. No sandstone outcrops have been found in any of the caves, so they may have formed after the sandstone covering the towers had been removed by erosion.

The current thinking on the origin of limestone caves mainly comes from the Northern Hemisphere, where most caves were formed as a result of the major climatic and sea level fluctuations during the last two million years. However, these variations had much less effect in Australia, and as a result our landscapes are considerably older, and have developed over much longer time periods than the Northern Hemisphere examples. Thus Australian caves have much to offer in the refinement of current theories of karst formation, because they show that effect of time, a factor lacking in the younger landscapes of the world.