



## **SECONDARY CARBONATE ACCUMULATIONS ON STONES AT GÖBEKLI TEPE (SE TURKEY): COMPOSITION, $^{14}\text{C}$ AGE AND POTENTIAL FOR PALEOENVIRONMENTAL RECONSTRUCTIONS**

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The northern Fertile Crescent is presumed to have been decisive to the origin of agriculture in southwest Asia. Our understanding of the driving forces of the Neolithization processes is challenged by limited data on late Quaternary environments in the region. One of the reasons for that is that the sediments in arid climates are mostly comparatively poor in pollen. In contrast, secondary (pedogenic) carbonate is common in soils and cultural layers of arid regions and can serve as a paleoecological proxy.

I studied pedogenic carbonate accumulations (also known as coatings, cutans or rinds) in megalithic constructions at the PPN site Göbekli Tepe (SE Turkey). The site represents an artificial hill about 15 m in height on the top of a limestone ridge. The megalithic architecture (enclosures with T-shaped pillars) was intentionally covered by fill (mostly limestone boulders) prior to the abandonment of the site. As a result of pedogenesis, secondary carbonate accumulated on the undersides of stones in Bk horizons in form of laminations with a maximum thickness of about 5 mm.

Pedogenic carbonate coatings were examined by following methods: micromorphology, SEM, mass spectrometry ( $^{13}\text{C}/^{13}\text{C}$  and  $^{18}\text{O}/^{16}\text{O}$  ratios) and radiocarbon dating. Most of secondary carbonate is presented by sparitic and microsparitic calcite crystals, which are radially or randomly arranged. An interesting morphological feature of the carbonate laminations are dark coloured particles of the order of 0,05 mm in length with a distinct biogenic structure and optically isotropic margins. They represent most

probably (non-charred ?) plant remains which should be investigated in further detail. The stable isotopic composition was determined in a sequence of 32 microlayers within one carbonate coating. The  $\delta^{13}\text{C}$  and  $\delta^{18}\text{O}$  values vary within the range from  $-11,03$  to  $-8,92\%$ , and from  $-10,98$  to  $-7,49\%$ , respectively. From the oldest to the middle microlayers there is a general trend with decreasing  $\delta^{13}\text{C}$  values (increase in root respiration ?) and increasing  $\delta^{18}\text{O}$  values (temperature growth ?), which might reflect an Early Holocene climatic amelioration. 6 radiocarbon ages measured on the carbonate fraction the oldest 0,2-0,25 mm thick microlayers are in reasonably good agreement with the age ranges of the PPNA and PPNB periods (i.e. the  $^{14}\text{C}$  ages of pedogenic carbonate are in a systematic manner slightly younger than the ages of stone constructions). Two further  $^{14}\text{C}$  dates from the middle and the outer microlayer of one of the coatings suggest its reducing growth rate. Secondary carbonate accumulations at Göbekli Tepe thus show a potential as a local archive of the late Quaternary environmental change in the region.