

## **Holocene solar cycles revealed by spectral analysis of a stalagmite $\delta^{18}\text{O}$ record from central-southern Anatolia, Turkey**

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Speleothems, especially stalagmites, have gained a special role in palaeoclimate studies in Turkey. Many of these studies have been conducted in central Anatolia because of the vast extension of karst areas and caves in the Taurids Mountain Belt at the south. In this study,  $\delta^{18}\text{O}$  record of a <sup>230</sup>Th dated stalagmite from Incesu cave, located in southern of central Anatolia, is analysed to determine Holocene solar cycles, such as, Gleissberg cycle (~87 yr) and de Vries/Suess cycle (~210 yr). The stalagmite covers the time span 45 kyr before present (BP). Because of possible hiatus zones during growth period, between ~14 kyr BP and present time interval is used for spectral analysis. Spectral analysis has performed to extract the cyclical variability in  $\delta^{18}\text{O}$  time series. Spectral analysis has been conducted by using REDFIT program [1] that uses Lomb-Scargle Fourier transform for unevenly spaced time series. The analysis revealed the presence of 8000, 320, 222, 195 and 174 yr periodic peaks above 90 % confidence level. Significant periodicities at 320, 222 and 195 yr are close to previously reported findings from spectral analysis of several records of the Holocene solar activities [2, 3]. The existence of these centennial periodicities indicates the de Vries/Suess cycle (~210 yr) in the Incesu cave stalagmite. The Holocene centennial-scale changes in  $\delta^{18}\text{O}$  record from Sofular cave (northwestern Turkey) displays the climate variability corresponding to de Vries/Suess solar cycle [2]. Solar activities play a significant role in driving centennial scale typical Holocene Asian monsoon periodicities (80, 200, 340 yr) [3] which seem to be reflected on the  $\delta^{18}\text{O}$  record of Incesu cave stalagmite. The stalagmite  $\delta^{18}\text{O}$  records which is determined by the variations in the isotopic composition of precipitation also indicate the changes in hydrologic conditions that are linked with solar activities. Moreover, a modeling study of the paleohydrology around Incesu cave during the last 15 ky revealed dominance of positive water balance conditions prior to early-Holocene. [1] Schulz&Mudelsee (2002) *Comp.&Geosc.* **28**, 421-426. [2] Knudsen *et al.* (2011) *The Holocene* **22(5)**, 597-602. [3] Duan *et al.* (2015) *Quat. Res.* **83**, 360-369