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Greenhouse gases modulate the strength of millennial-scale subtropical rainfall, consistent with future predictions

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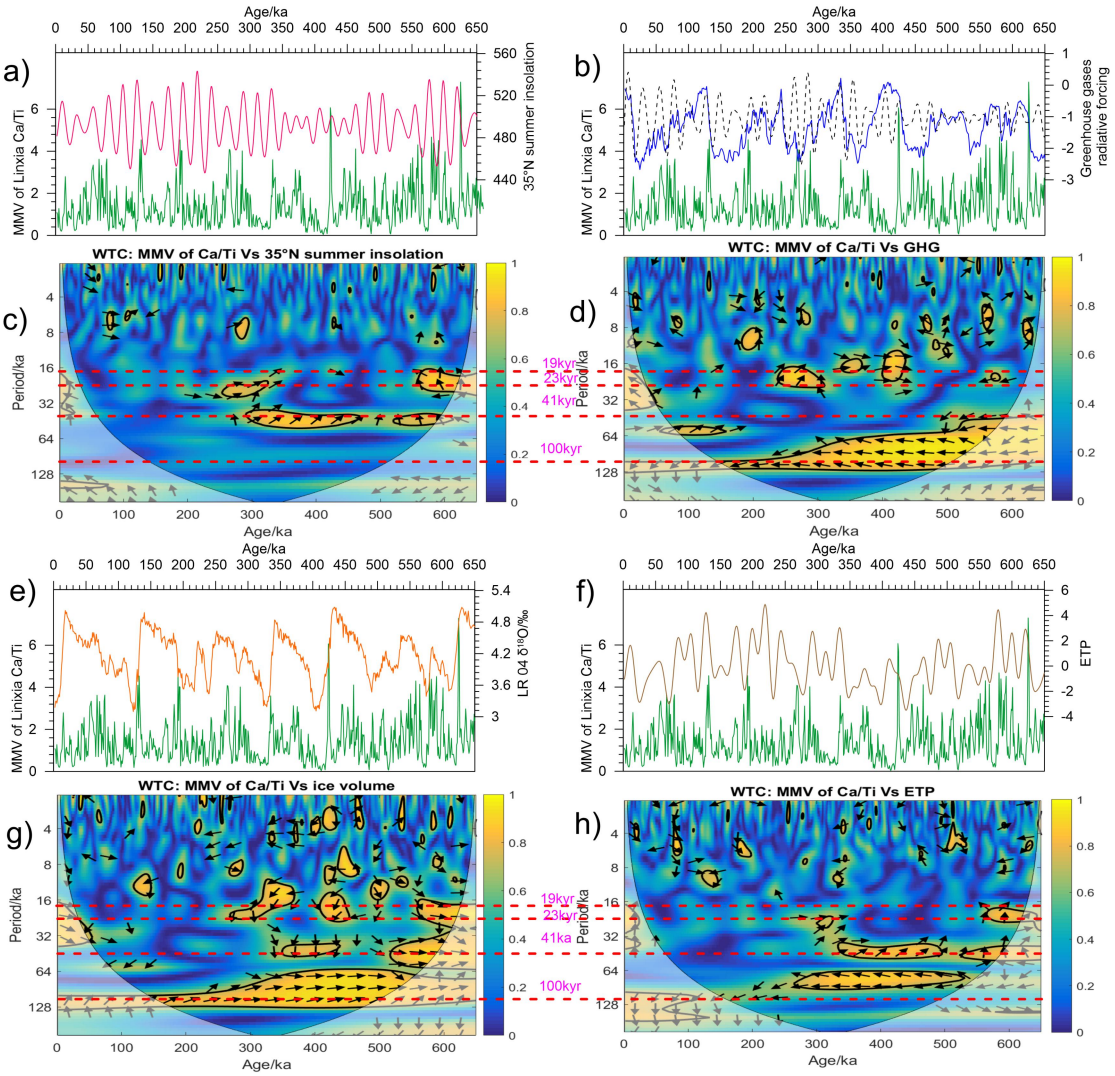

Figure S1 Comparison of a) ice volume, b) GHG forcing, c) ETP and d) local summer insolation with MMV of loess Ca/Ti over the past 650 ka on benthic $\delta^{18}O$ correlation age model for comparison to Figure 4 in manuscript. Results of analyses in this manuscript are insensitive to the small differences in the placement of the age control points; Only minor differences in phase and correlation of MMV WTC results would be anticipated at the obliquity and precession bands.

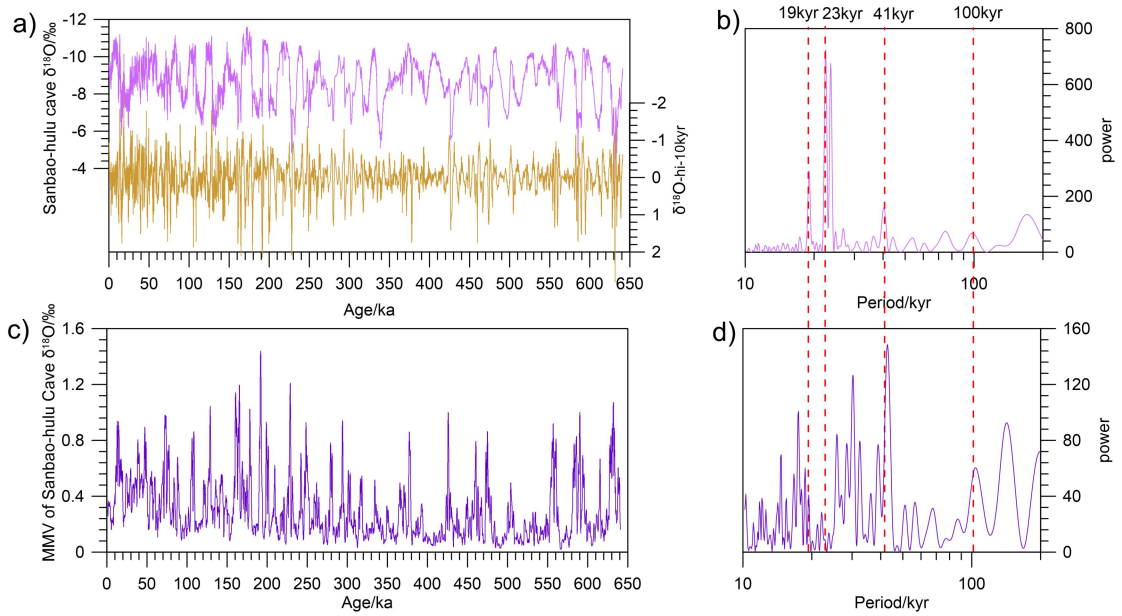

Figure S2 Raw datasets, millennial-scale components (10kyr high pass filtering signals) and MMV of the speleothem $\delta^{18}O$ record over the past 640 ka with their corresponding spectra. The orbital bands are marked with red dashed lines (eccentricity-100 kyr, obliquity-41 kyr ,precession-23 kyr and 19 kyr).

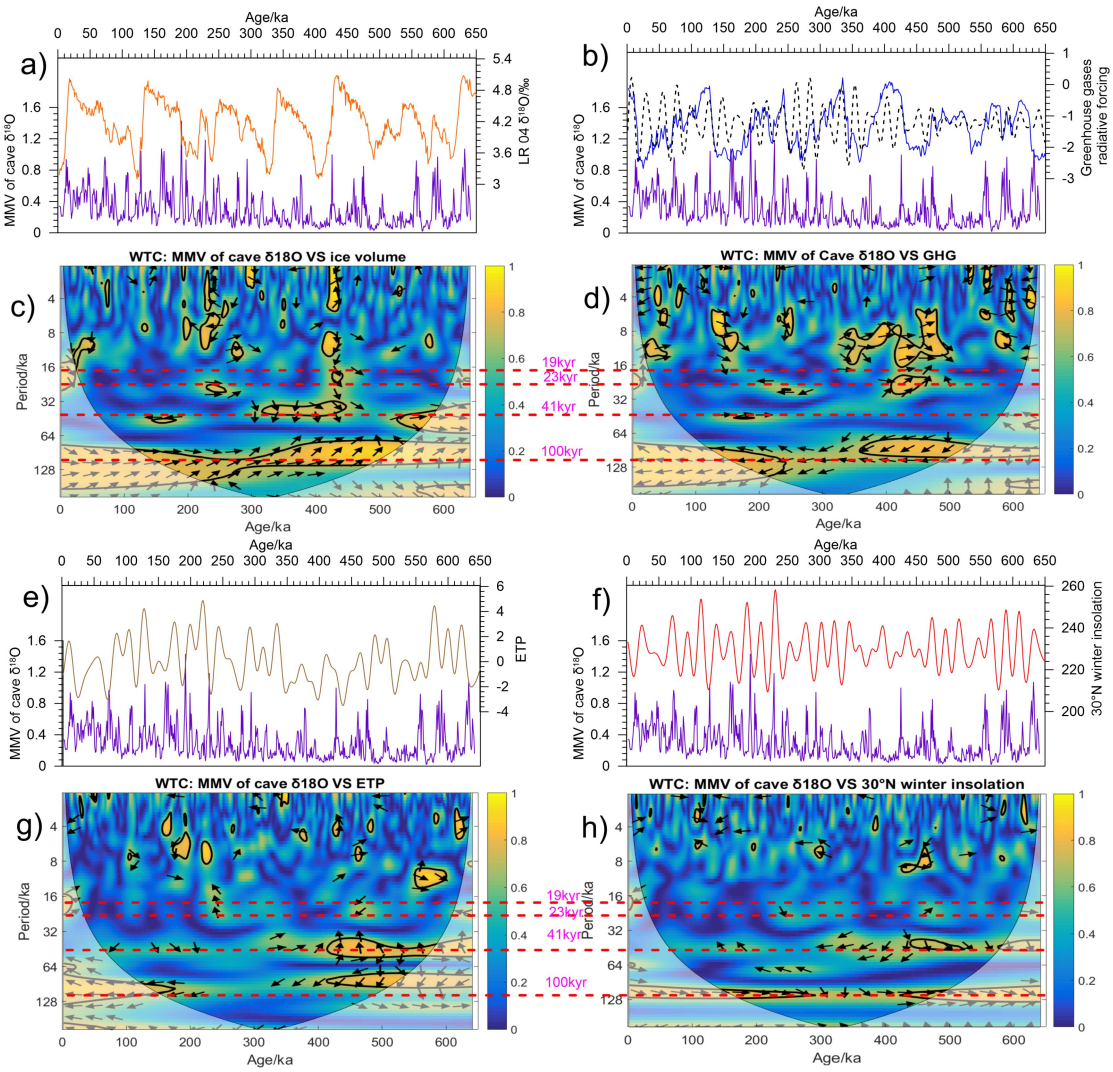

Figure S3 Comparison of a) 30°N winter insolation, b) GHG radiative forcing (black dashed line denotes the precession band-pass filtering results of ΔRF_{GHG}), e) ice volume and f) ETP forcing for MMV of speleothem $\delta^{18}O$; Wavelet coherence between c) 30°N winter insolation, d) GHG radiative forcing, g) ice volume, h) ETP and MMV of speleothem $\delta^{18}O$ over the past 640 ka. The orbital bands are marked with red dashed lines (eccentricity-100 kyr, obliquity-41 kyr , precession-23 kyr and 19-kyr). The black outlines denote coefficients of determination greater than 0.76. The black arrows represent the phase relationship with rightward, upward and downward arrows indicating in-phase, leading and lagging phase, respectively. Strong ice volume, GHG and winter insolation modulation at 100 kyr band, relative weak ice volume and winter insolation forcing at the 41 kyr band as well as unclear precession band modulation are observed for MMV of speleothem $\delta^{18}O$.