

Figure S1. Comparison between the global and localized synchronizations of NGRIP $\delta^{18}\text{O}$ and EASM PC1. The records were cropped in segments of approximately 10 kyr and scaled between -1 and 1 before alignment. Intervals spanning 11-22 kyr b2k (a), 18-30 kyr b2k (b), 28-41 kyr b2k (c), and 38-48 kyr b2k (d). The target is always longer than the input by allowing 2 kyr on both sides of the timeseries. e. Posterior median and pointwise 95% credible intervals (of the difference ΔT between the GICC05 and U-Th timescales estimated locally (coloured lines) and globally (grey shading and black line)).

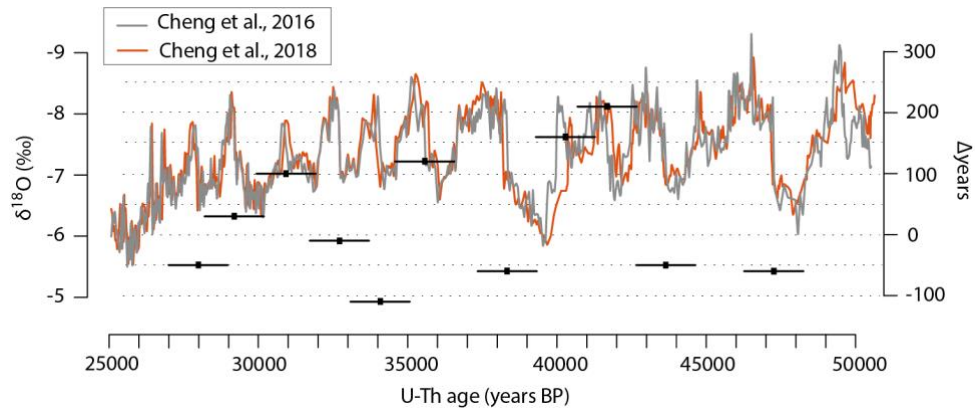


Figure S2. Comparison between the speleothem $\delta^{18}\text{O}$ stack from Cheng et al. (2016) and the Hulu Cave $\delta^{18}\text{O}$ data from Cheng et al. (2018) on the timescales published therein. Black squares and horizontal bars indicate the age shift due to the new chronology at the climate transitions identified by Buizert et al. (2015). Positive values imply that the new timescale is older than the previous chronology. Age shifts were estimated using cross-correlation, i.e. by correlating windows of 2000 years length with leads/lags of 500 years at steps of 10 years centred around the above-mentioned transitions.

References

- Buizert, C., Cuffey, K.M., Severinghaus, J.P., Baggenstos, D., Fudge, T.J., Steig, E.J., Markle, B.R., Winstrup, M., Rhodes, R.H., Brook, E.J., Sowers, T.A., Clow, G.D., Cheng, H., Edwards, R.L., Sigl, M., McConnell, J.R., Taylor, K.C., 2015. The WAIS Divide deep ice core WD2014 chronology & Part 1: Methane synchronization (68-31 ka BP) and the gas age-ice age difference. *Clim. Past.* <https://doi.org/10.5194/cp-11-153-2015>
- Cheng, H., Edwards, R.L., Sinha, A., Spötl, C., Yi, L., Chen, S., Kelly, M., Kathayat, G., Wang, X., Li, X., 2016. The Asian monsoon over the past 640,000 years and ice age terminations. *Nature* 534, 640–646.
- Cheng, H., Lawrence Edwards, R., Southon, J., Matsumoto, K., Feinberg, J.M., Sinha, A., Zhou, W., Li, H., Li, X., Xu, Y., Chen, S., Tan, M., Wang, Q., Wang, Y., Ning, Y., 2018. Atmospheric $^{14}\text{C}/^{12}\text{C}$ changes during the last glacial period from hulu cave. *Science* (80-.). <https://doi.org/10.1126/science.aau0747>