

S1 Glacial/Interglacial/Termination strength

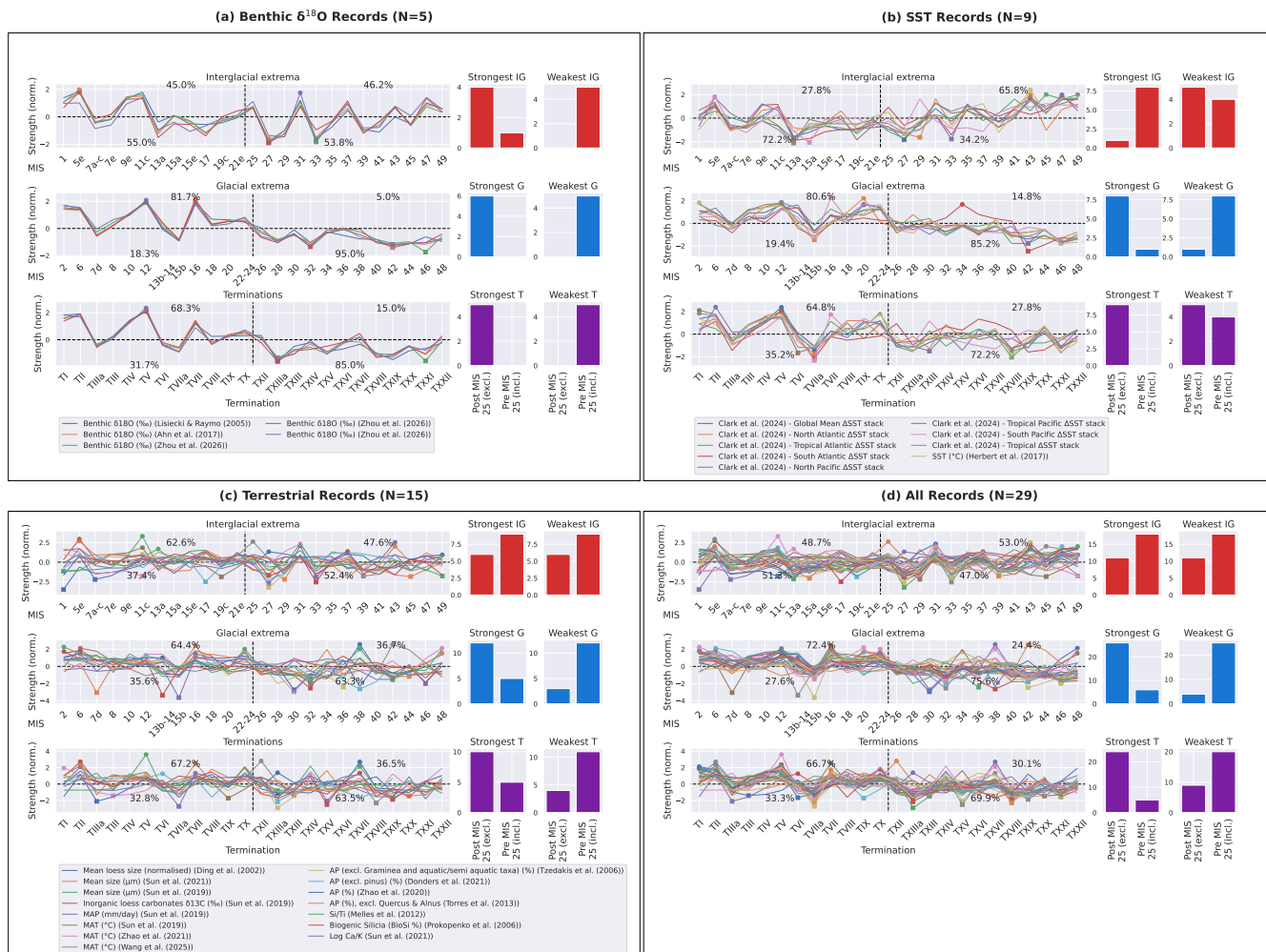


Figure S1. Normalized strength of climatic extrema across the Quaternary from various proxy compilations for **(a)** 5 benthic $\delta^{18}\text{O}$ stacks, **(b)** 9 SST stacks, **(c)** 15 terrestrial records, and **(d)** all 29 records. The coloured lines represent the individual records. For each proxy group, the normalized strength of interglacial extrema, glacial extrema, and termination extrema is shown as a function of MIS or termination number (left-hand side). The occurrence of the strongest and weakest interglacial, glacial and termination extrema is marked for each record with a dot and a square, respectively. The vertical dashed line indicates MIS 25. Percentages denote the proportion of extrema above or below the average strength in the respective periods before and after MIS 25. The bar plots highlight the occurrence of the strongest (left bars) and weakest (right bars) extrema across the entire Quaternary within each category, separated into events after MIS 25 (excl.) and before MIS 25 (incl.).

S2 Box plot of SST records

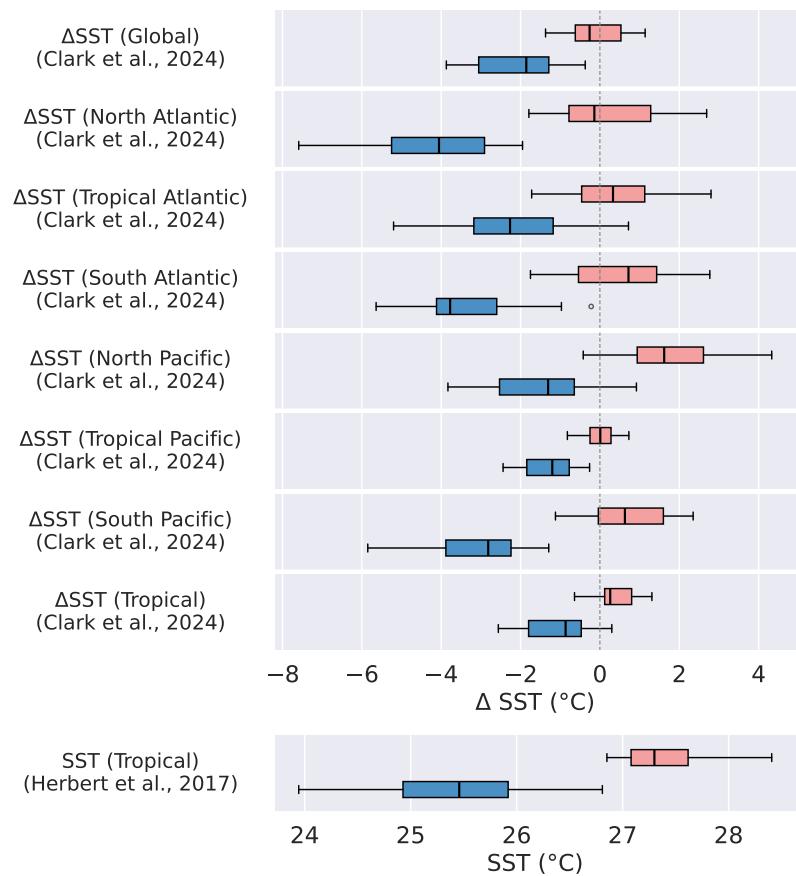


Figure S2. Box plots of SST extrema during glacial (blue) and interglacial (red) stages for each record. Boxes span the first to third quartile, with the vertical black line marking the median. Whiskers (horizontal black lines) extend to the most extreme data points within 1.5 times the interquartile range from the box edges. Outliers beyond this range are shown as circles.

S3 Average strength index for all records

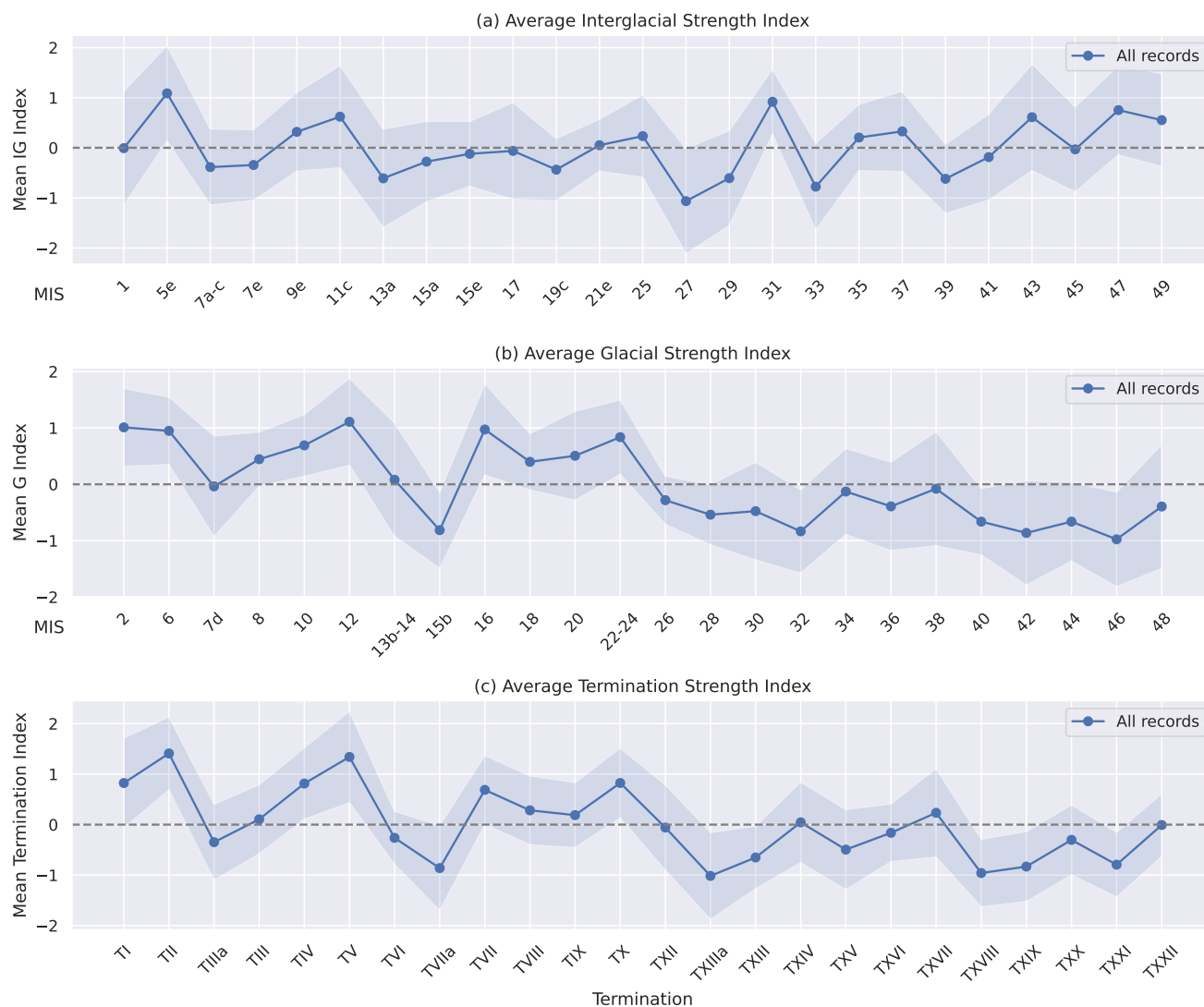


Figure S3. Average strength indices of all 29 records for (a) interglacials, (b) glacials, and (c) terminations over the last 1.5 Myr. All 29 records were first normalized and then averaged over the individual MIS stages to obtain an average strength index (blue lines). The shaded areas denote ± 1 standard deviation (σ).

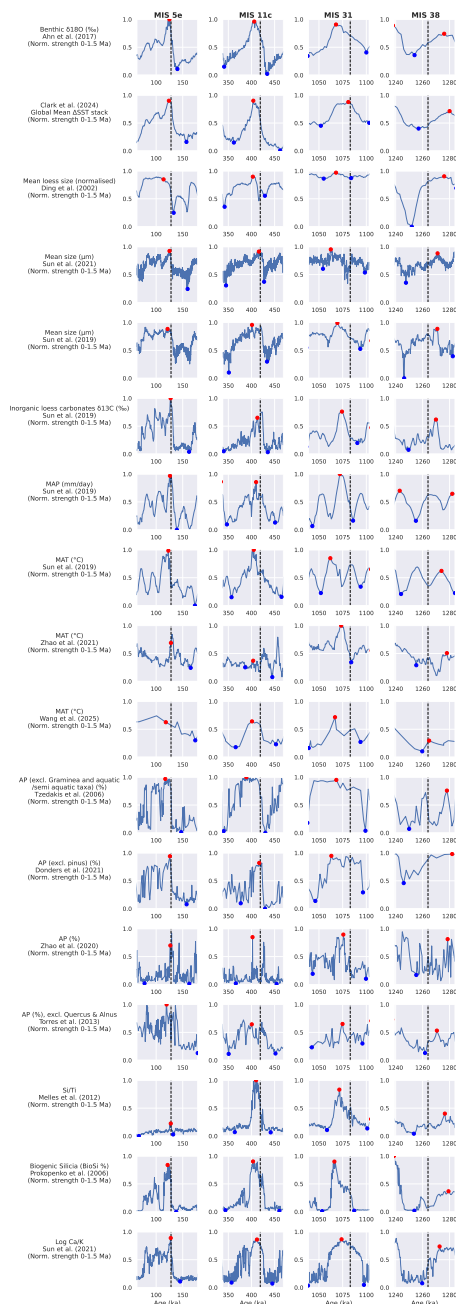


Figure S4. Morphology of two selected marine records and all terrestrial records for **(a) MIS 5e, (b) MIS 11c, (c) MIS 31, and (d) MIS 38.** Boundaries for glacial terminations (vertical black dotted lines) are given in Table 2 of the main manuscript. Interglacial (red dots) and glacial strength (blue dots) are defined as absolute extrema during each stage. Each record has been normalized between 0 and 1, such that a larger value refers to a stronger (weaker) interglacial (glacial) and vice versa.

Table S1. Overview of records used in this study with link to data repositories.

Record/Site	Proxy/Variable	Location	Paper/Reference	Data/Repository
Benthic $\delta^{18}\text{O}$ records				
LR04 stack	Benthic $\delta^{18}\text{O}$	Global stack	Lisiecki and Raymo (2005)	https://lorraine-lisiecki.com/stack.html
Prob-stack	Benthic $\delta^{18}\text{O}$	Global stack	Ahn et al. (2017)	https://github.com/seonminahn/HMM-Stack
BIGSTACK _{mixed}	Benthic $\delta^{18}\text{O}$	Global stack	Zhou et al. (2026)	https://doi.org/10.5281/zenodo.15728047
BIGSTACK _{mixedA}	Benthic $\delta^{18}\text{O}$	Atlantic stack	Zhou et al. (2026)	https://doi.org/10.5281/zenodo.15728047
BIGSTACK _{mixedP}	Benthic $\delta^{18}\text{O}$	Pacific stack	Zhou et al. (2026)	https://doi.org/10.5281/zenodo.15728047
SST records				
Global ΔSST stack	ΔSST	Global stack	Clark et al. (2024)	In SI of Clark et al. (2024)
Regional ΔSST stack	ΔSST	North Atlantic	Clark et al. (2024)	In SI of Clark et al. (2024)
Regional ΔSST stack	ΔSST	Tropical Atlantic	Clark et al. (2024)	In SI of Clark et al. (2024)
Regional ΔSST stack	ΔSST	South Atlantic	Clark et al. (2024)	In SI of Clark et al. (2024)
Regional ΔSST stack	ΔSST	North Pacific	Clark et al. (2024)	In SI of Clark et al. (2024)
Regional ΔSST stack	ΔSST	Tropical Pacific	Clark et al. (2024)	In SI of Clark et al. (2024)
Regional ΔSST stack	ΔSST	South Pacific	Clark et al. (2024)	In SI of Clark et al. (2024)
Regional ΔSST stack	ΔSST	Tropics	Clark et al. (2024)	In SI of Clark et al. (2024)
Regional SST stack	SST	Tropics	Herbert et al. (2010)	https://doi.org/10.1594/PANGAEA.874752
Terrestrial records				
Chiloparts stack	Loess size	Chinese Loess Plateau (CLP)	Ding et al. (2002)	Data provided by authors
Gulang Loess	Loess size	Gulang Loess (NW CLP)	Sun et al. (2021)	In SI of Sun et al. (2021)
Jingyuan Loess	Loess size	Jingyuan Loess (NW CLP)	Sun et al. (2019)	Data provided by authors
Jingyuan Loess	$\delta^{13}\text{C}_{\text{IC}}$	Jingyuan Loess (NW CLP)	Sun et al. (2019)	Data provided by authors
Jingyuan Loess	MAP	Jingyuan Loess (NW CLP)	Sun et al. (2019)	Data provided by authors
Jingyuan Loess	MAT	Jingyuan Loess (NW CLP)	Sun et al. (2019)	Data provided by authors
Zoige Basin	MAT	Paleolake at Zoige Basin	Zhao et al. (2021)	In SI of Zhao et al. (2021)
(Core ZB13-C2)		(Eastern Tibetan Plateau)		
Heqing Basin	MAT	Paleolake at Heqing Basin	Wang et al. (2025)	https://doi.org/10.6084/m9.figshare.29877254.v1
		(SE Tibetan Plateau)		
Tenaghi Philippon	AP %	NE Greece	Tzedakis et al. (2006)	Data provided by authors
Lake Ohrid	AP %	Lake Ohrid (Balkan Peninsula)	Donders et al. (2021)	In SI of Donders et al. (2021)
(DEEP core 5045-1)				
Zoige Basin	AP %	Paleolake at Zoige Basin	Zhao et al. (2020)	In SI of Zhao et al. (2020)
(Core ZB13-C2)		(Eastern Tibetan Plateau)		
Bogota Basin	AP %	Paleolake at Basin of Bogota	Torres et al. (2013)	Data provided by authors
(Funza09)		(Colombia)		
Lake El'gygytgyn	Si/Ti	Lake El'gygytgyn	Melles et al. (2012)	https://doi.org/10.1594/PANGAEA.783305
(ICDP 5011-1)		(Siberia, NE Russia)		
Lake Baikal	BioSi %	Lake Baikal	Prokopenko et al. (2006)	https://doi.org/10.25921/23kk-bz56
(Composite BDP-96)		(Siberia, Russia)		
Lake Ohrid	Log Ca/K	Lake Ohrid	Sun et al. (2021)	In SI of Sun et al. (2021)
(DEEP core 5045-1)		(Balkan Peninsula)		

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