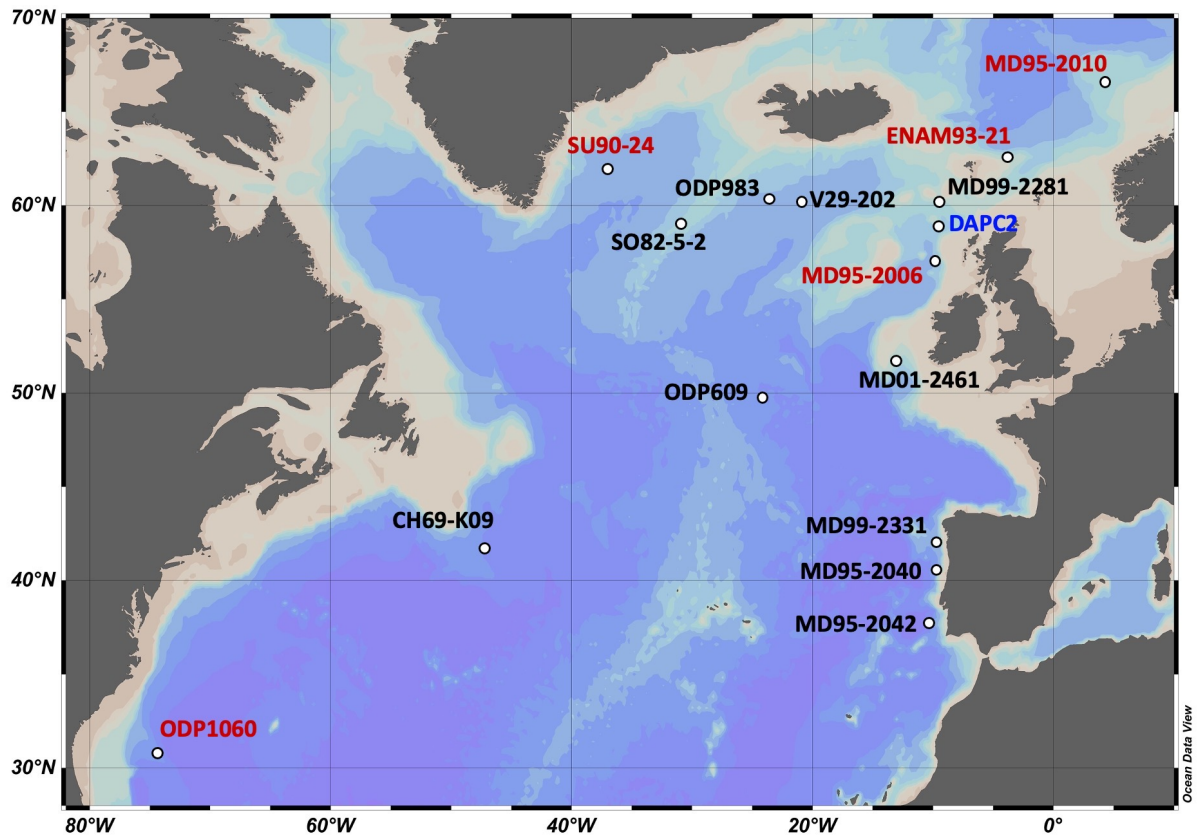
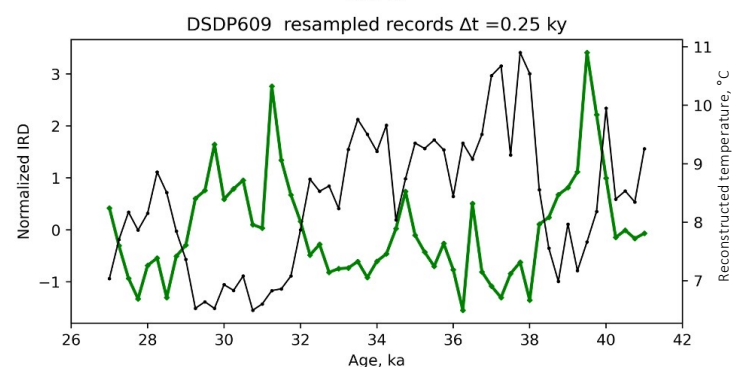
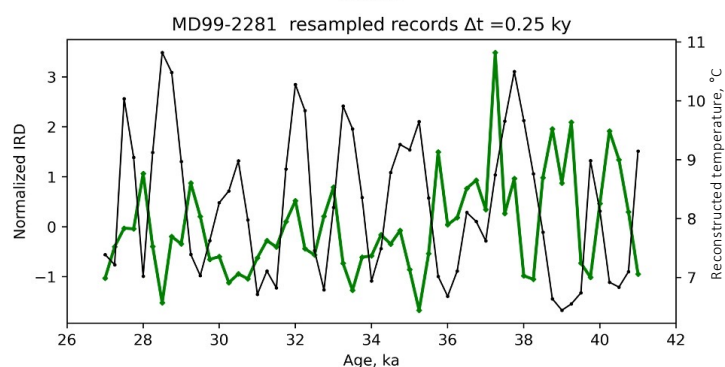
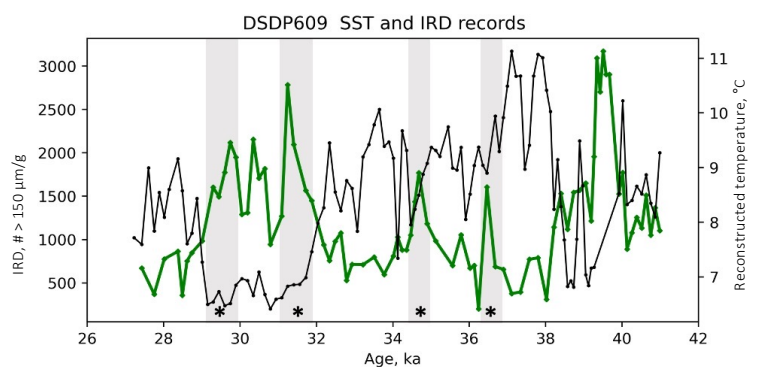
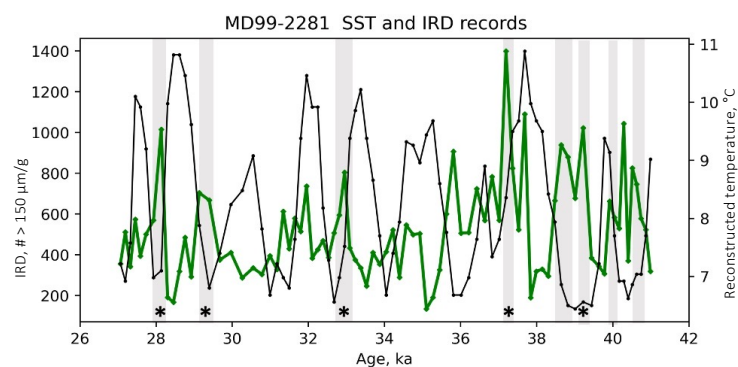
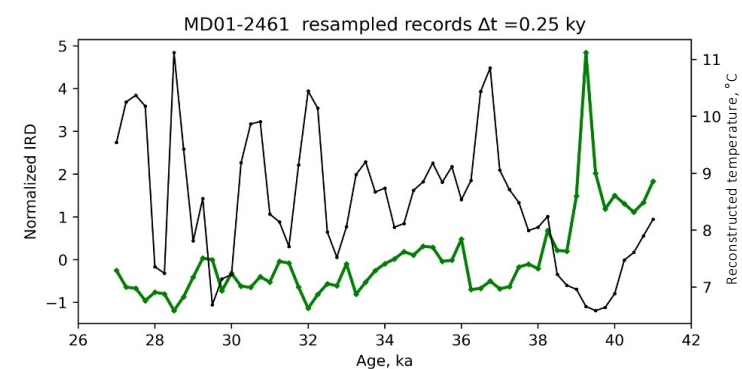
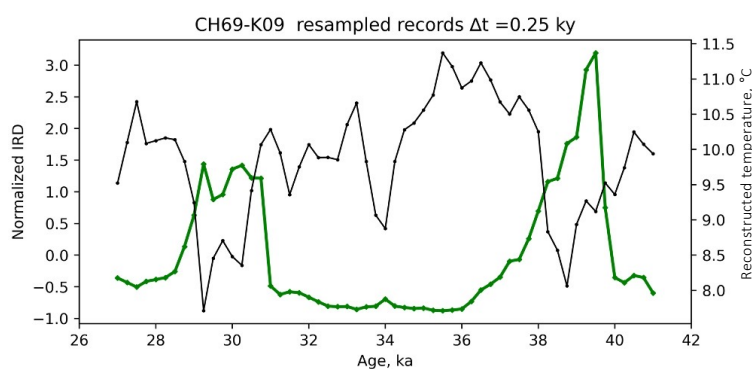
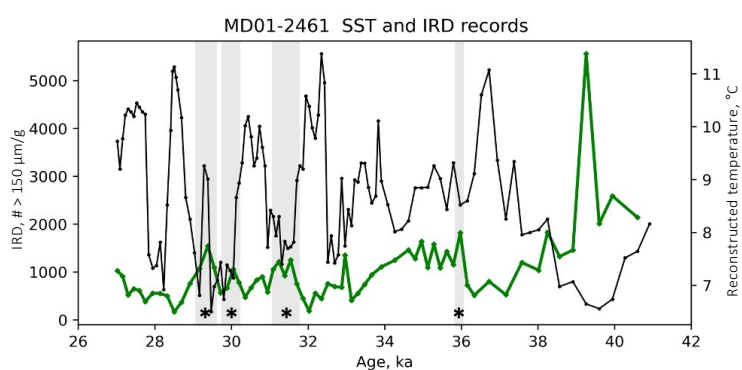
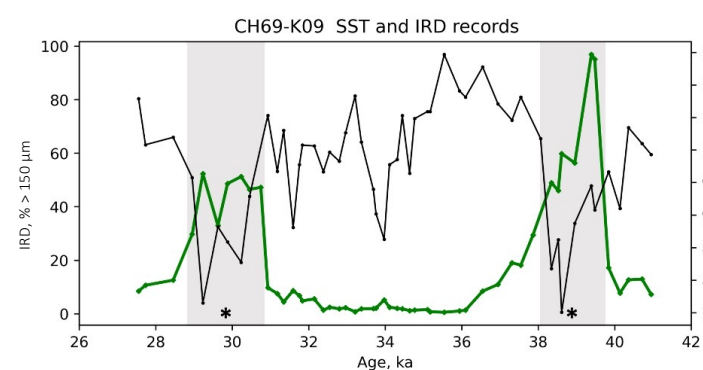
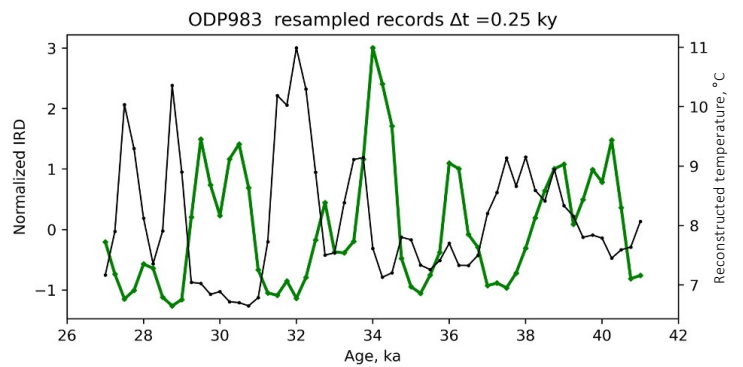
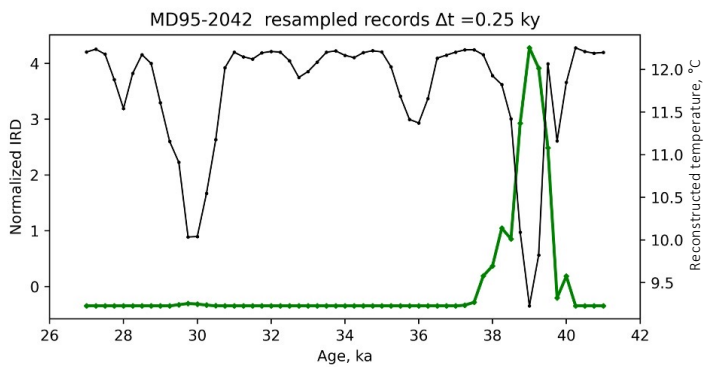
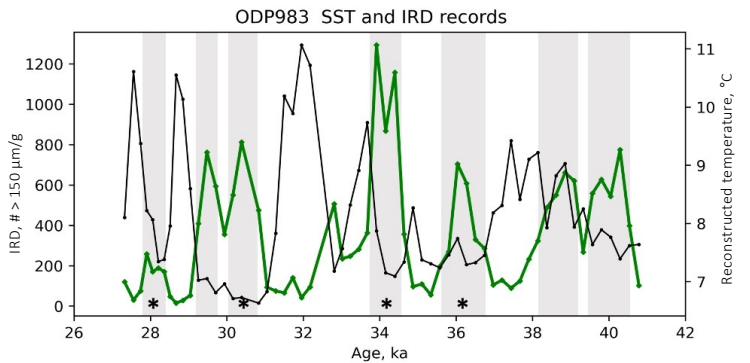
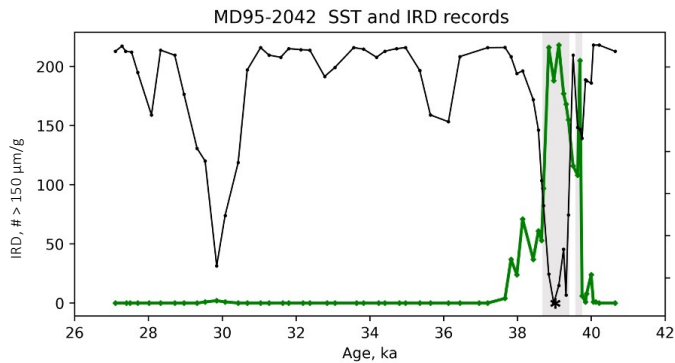
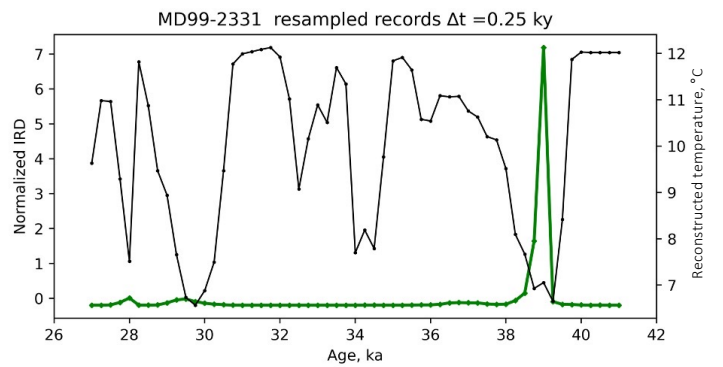
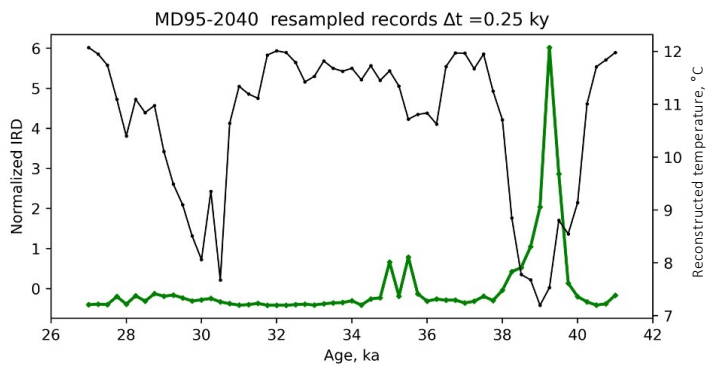
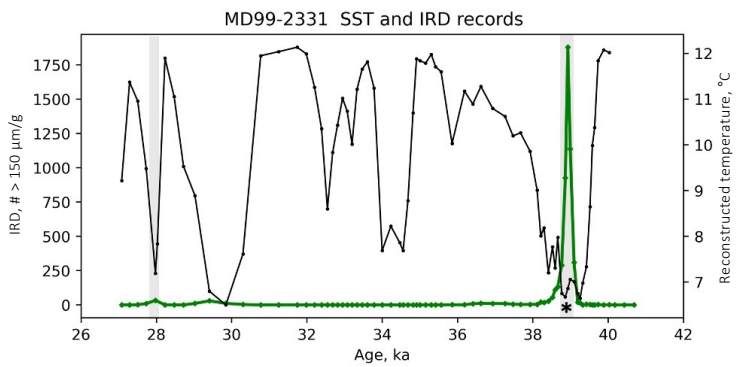
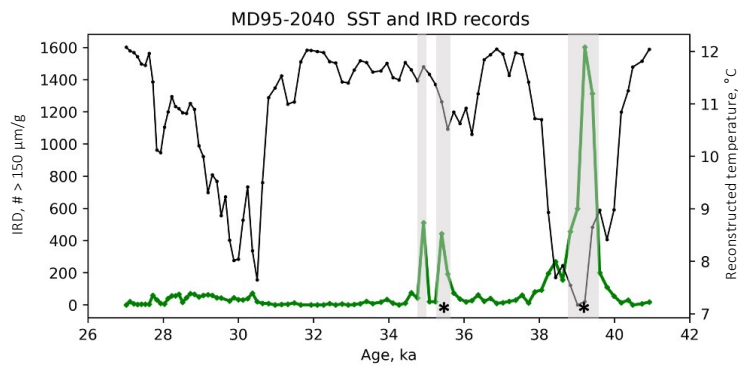
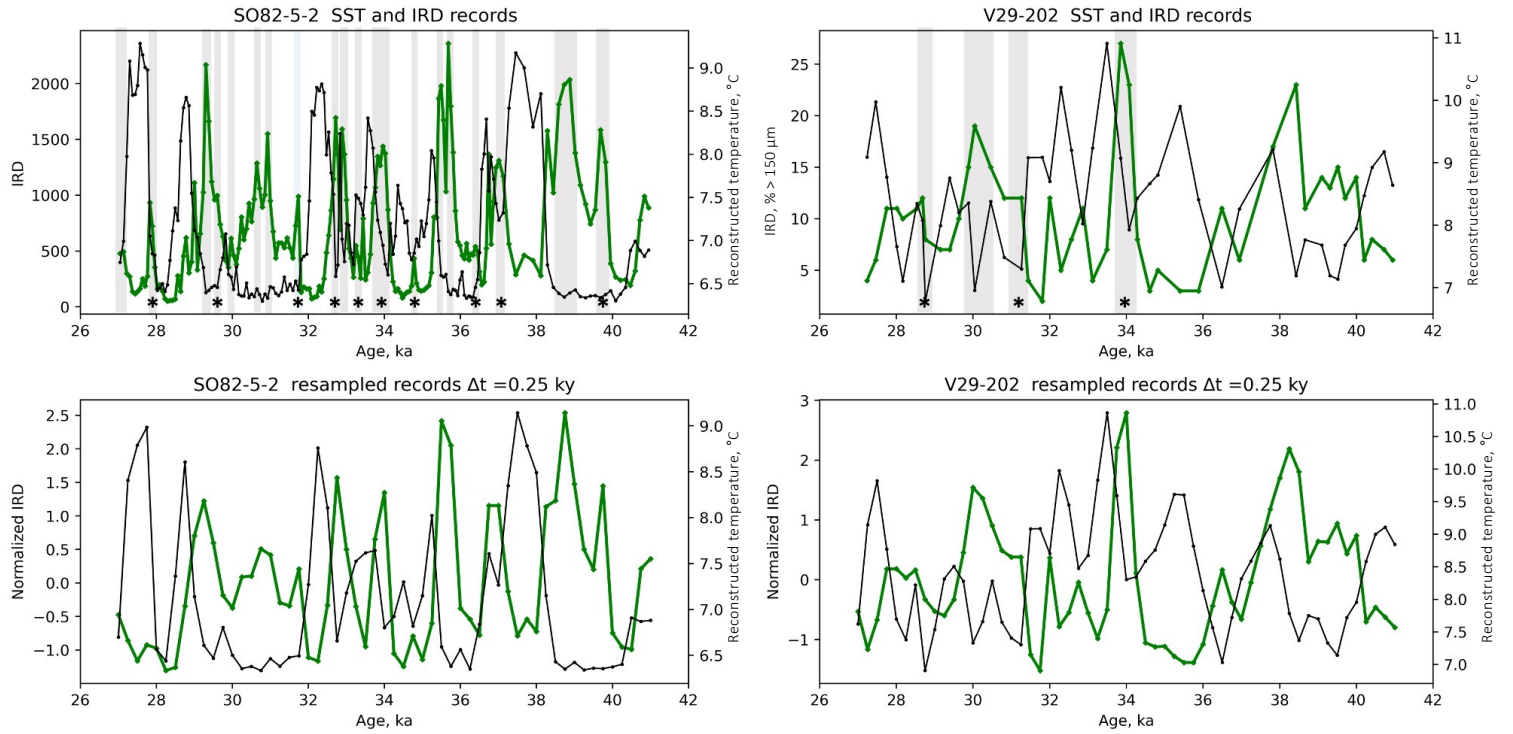




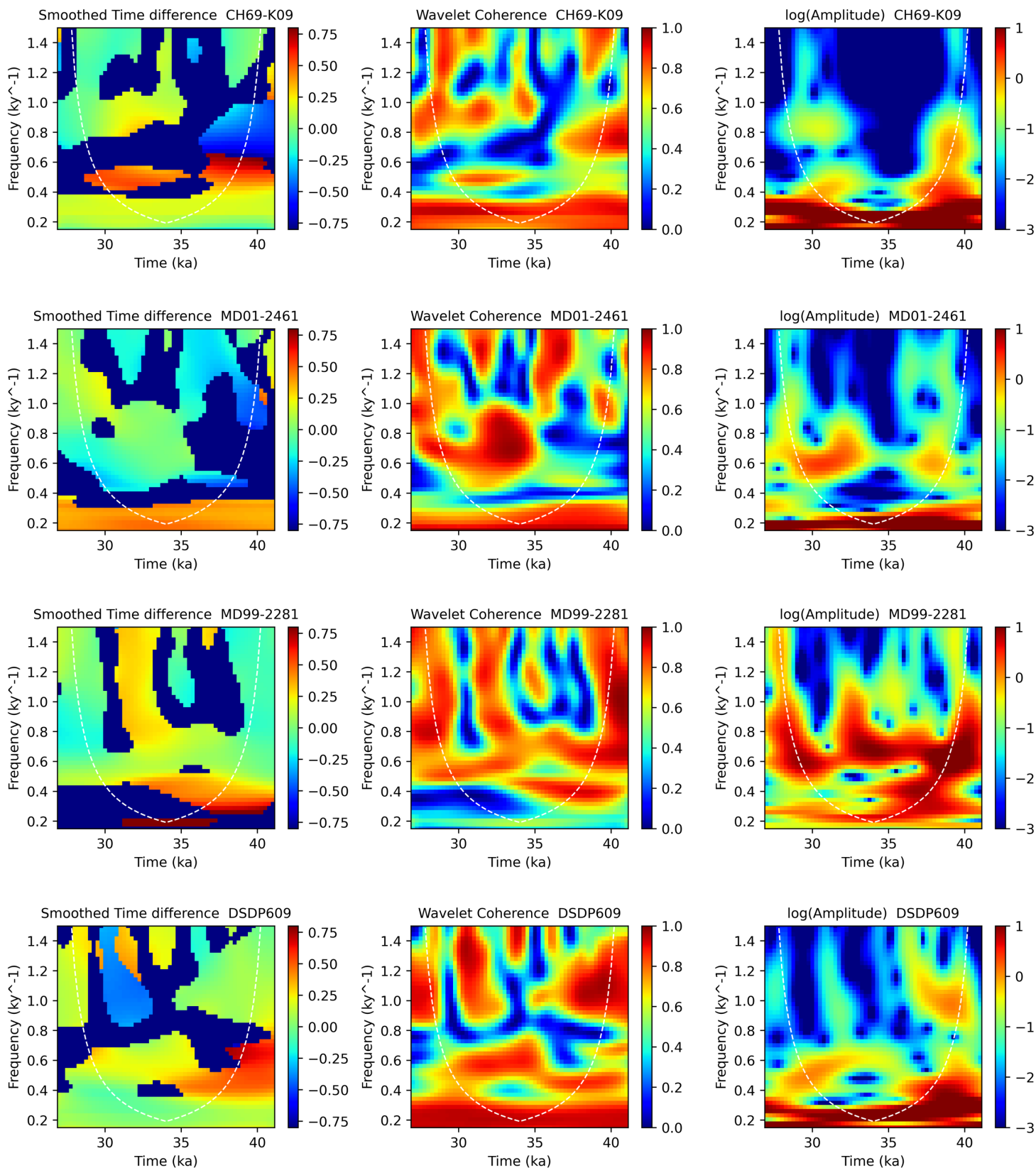
Extended Data Fig. 1. Map of all examined and cited cores. In red, the cores that were not retained. In blue, core DAPC2 exhibiting a lead of the SST cooling over IRD increase over the last deglaciation³⁴. The figure was generated using the Ocean Data View software⁵¹ and the ETOPO bathymetry⁵².

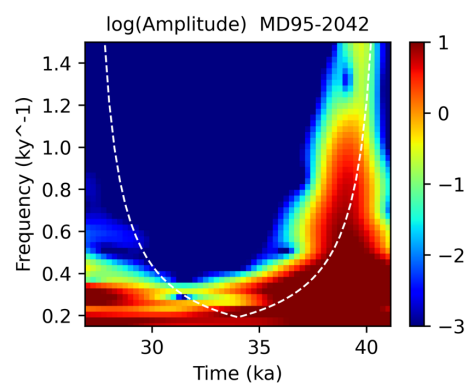
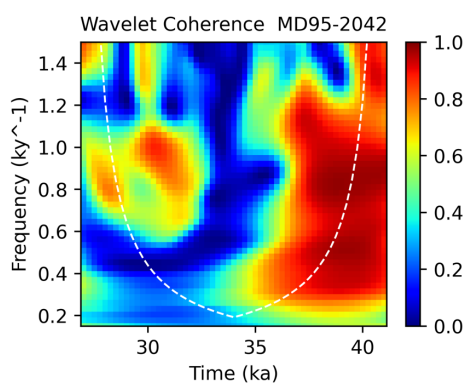
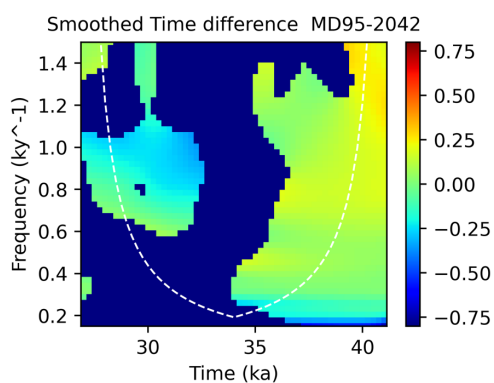
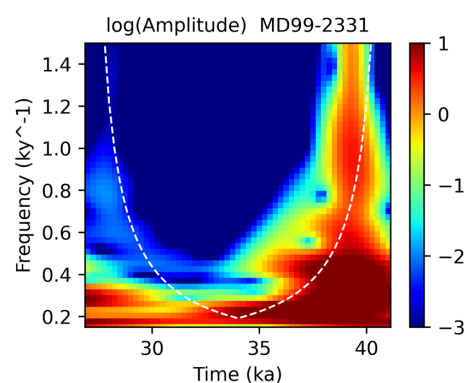
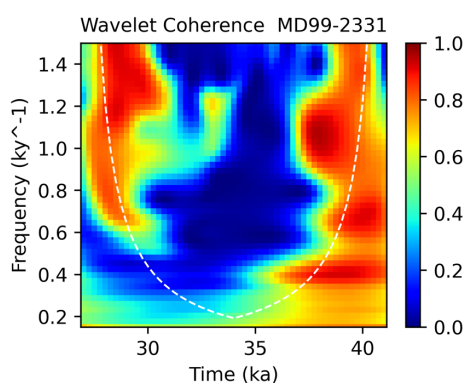
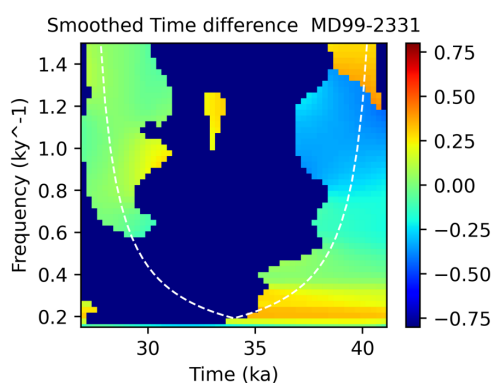
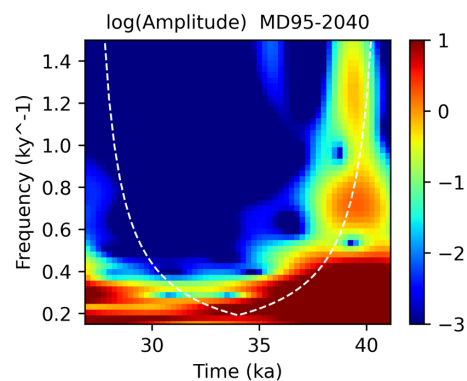
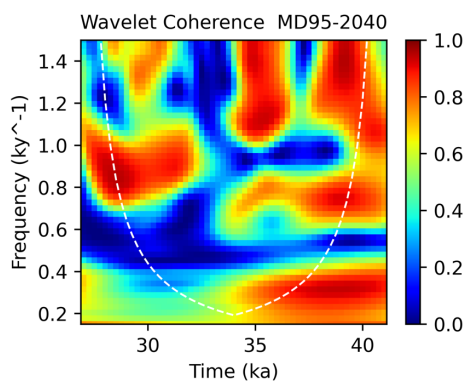
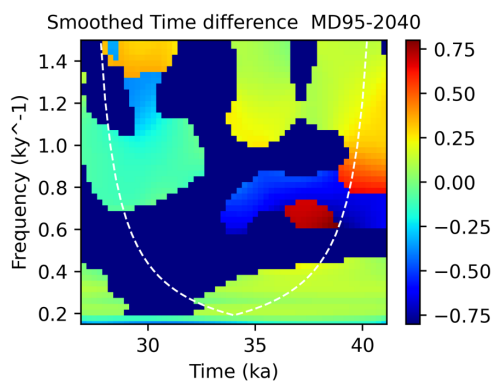


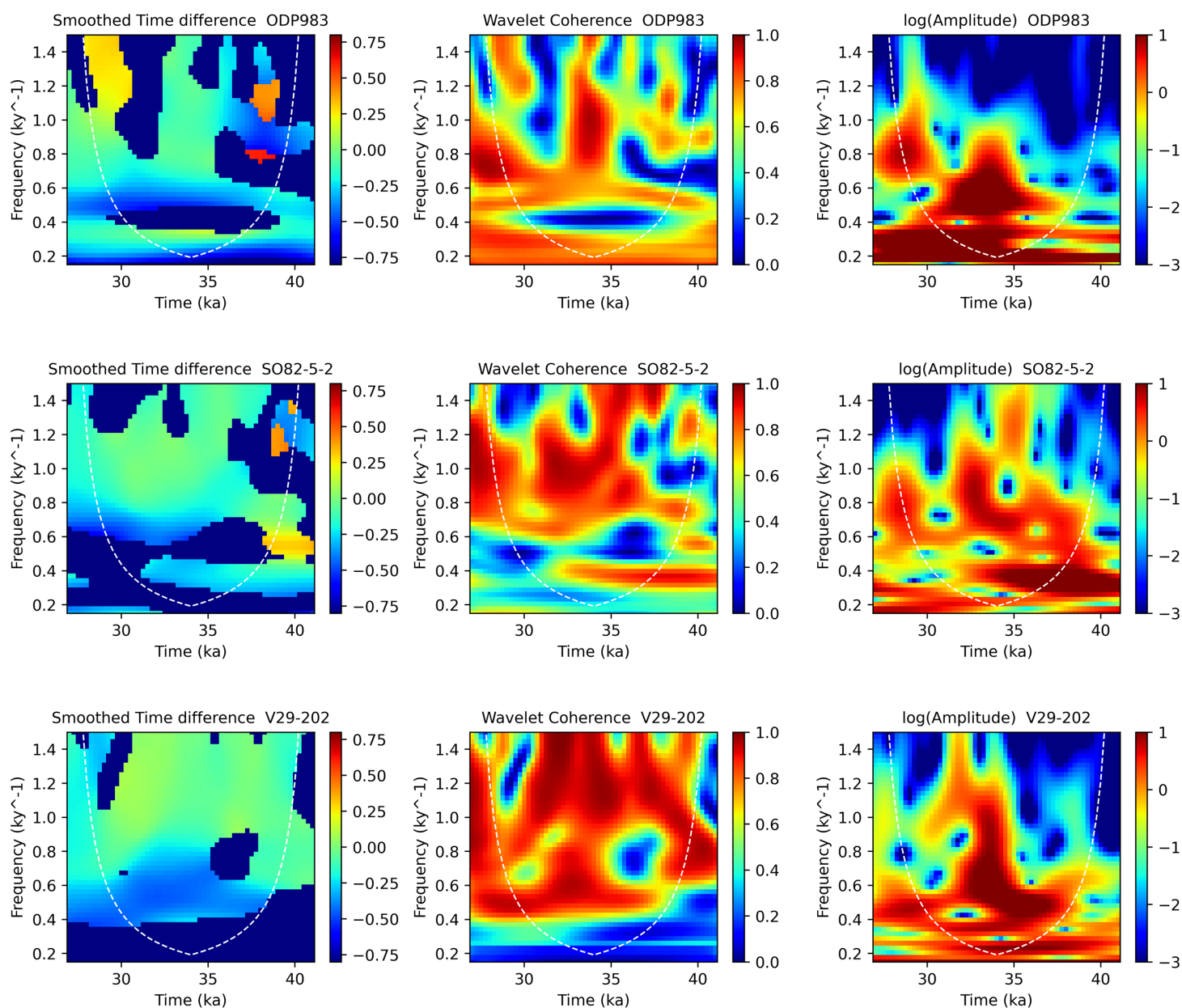




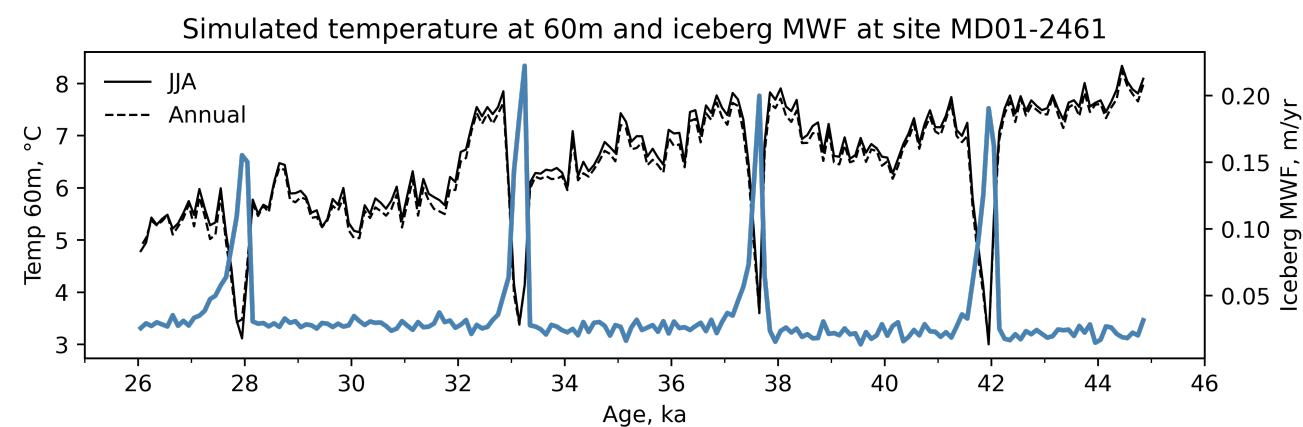
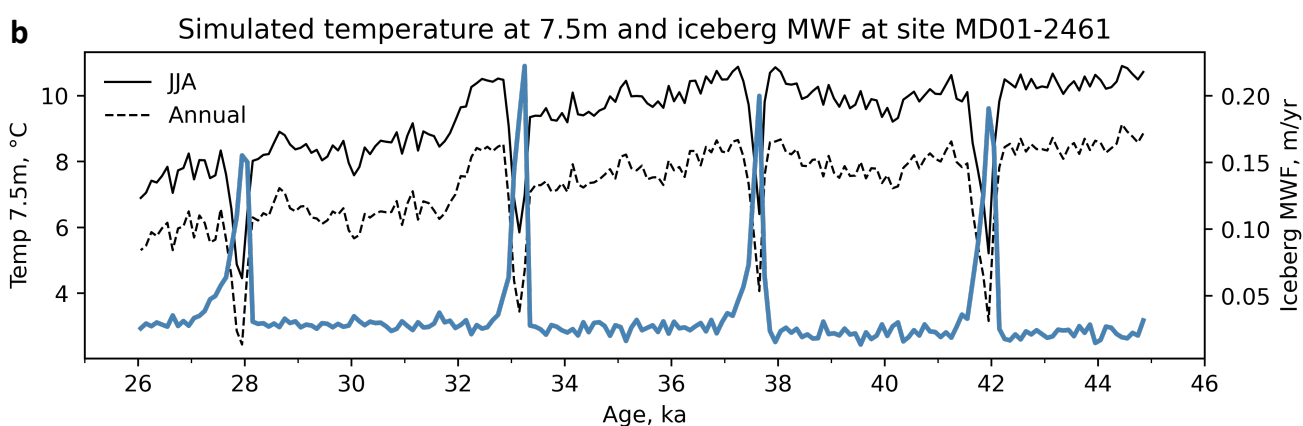
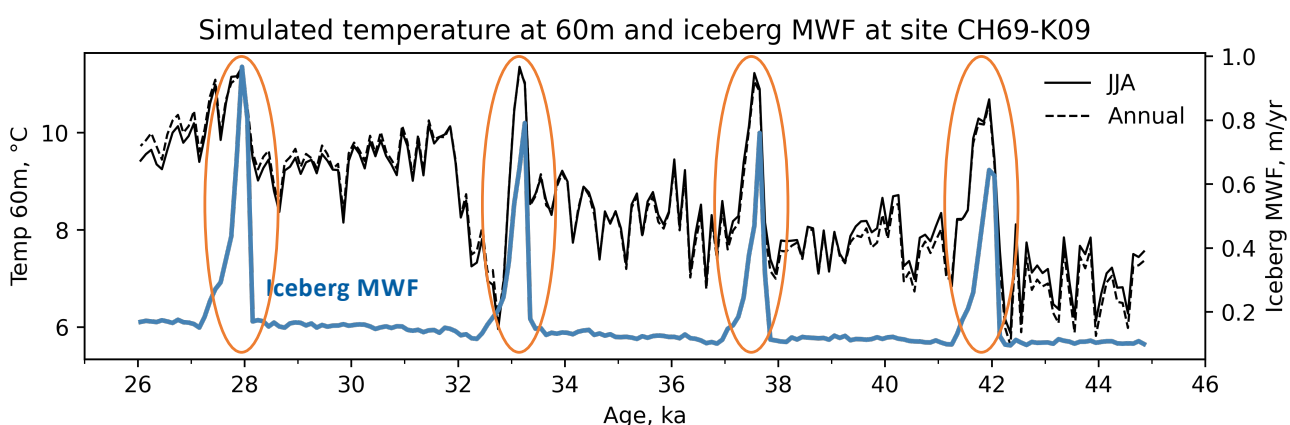
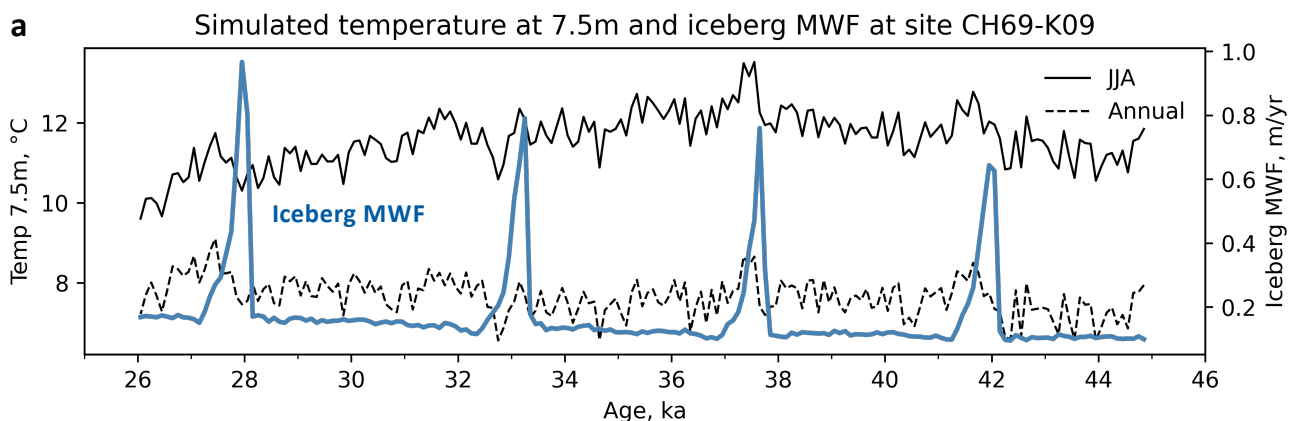
Extended Data Fig. 2. IRD and SST records of the 10 selected cores. Gray bands indicate the IRD peaks detected by the search algorithm (i.e. larger than 10% of the IRD range over the 27–41 ka time interval and lasting longer than one time step, see Methods). The transitions at the boundaries of the 27–41 ka interval are not taken into account for the computation of the phases in Ext. Tab 2. Asterisks indicate where IRD leads/lags with respect to the closest cooling have been computed.

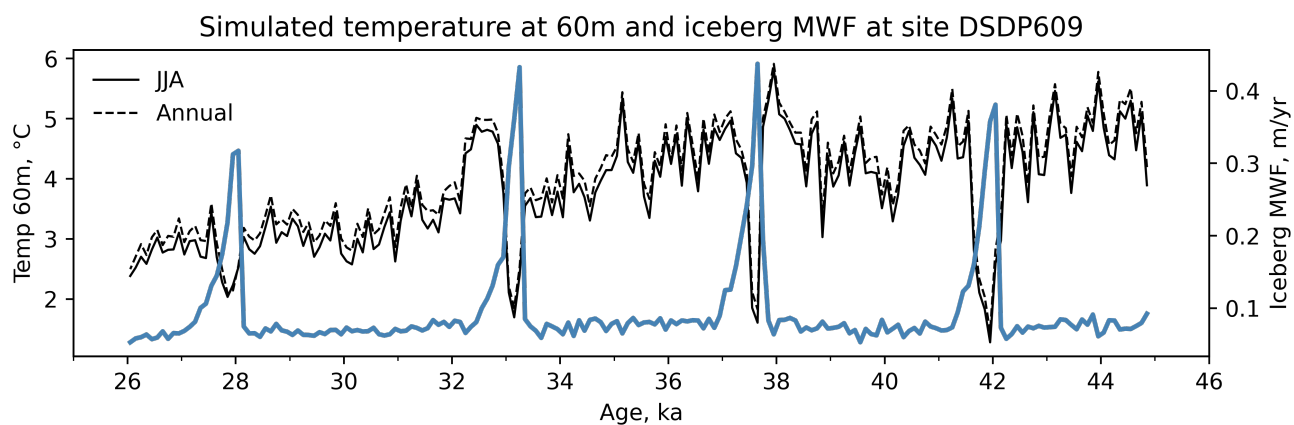
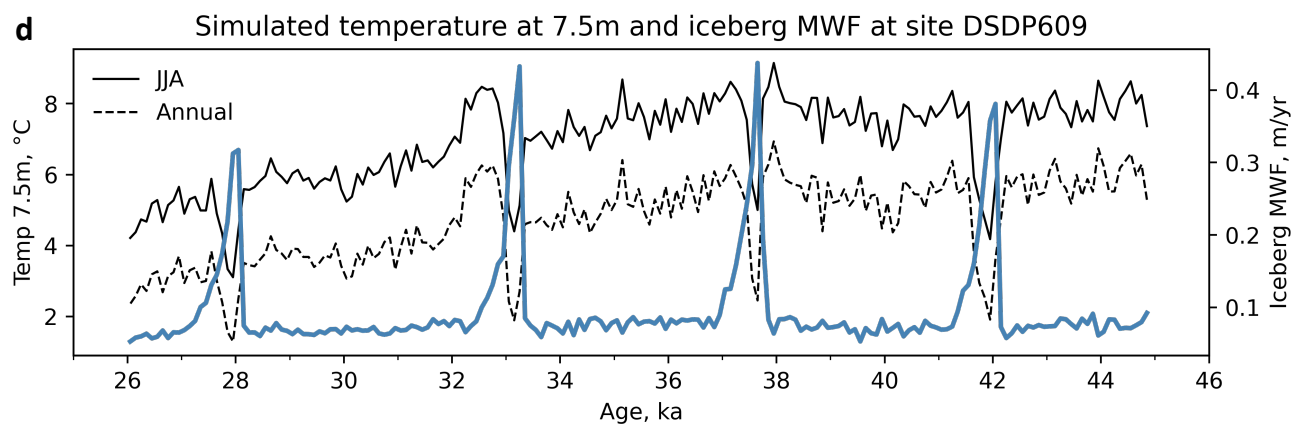
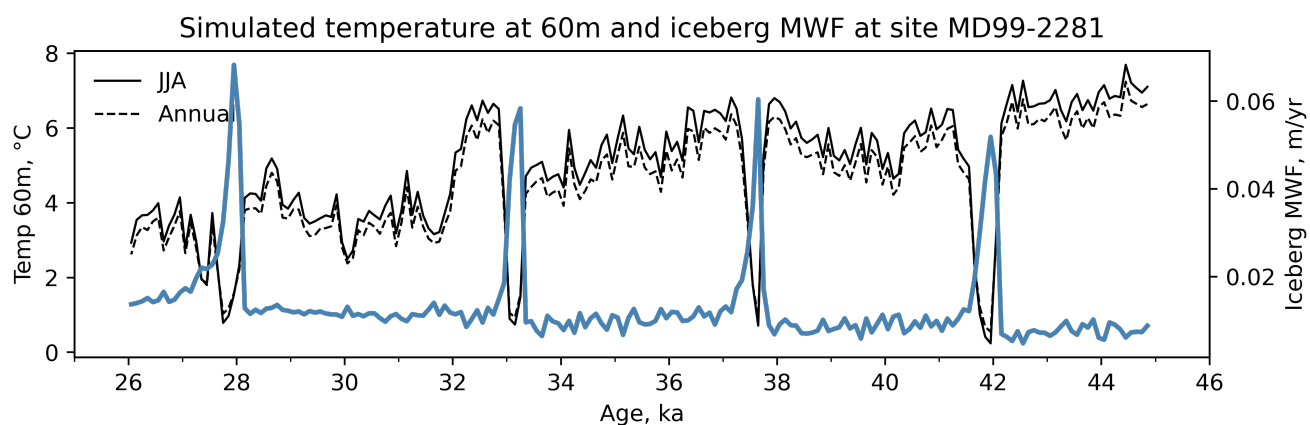
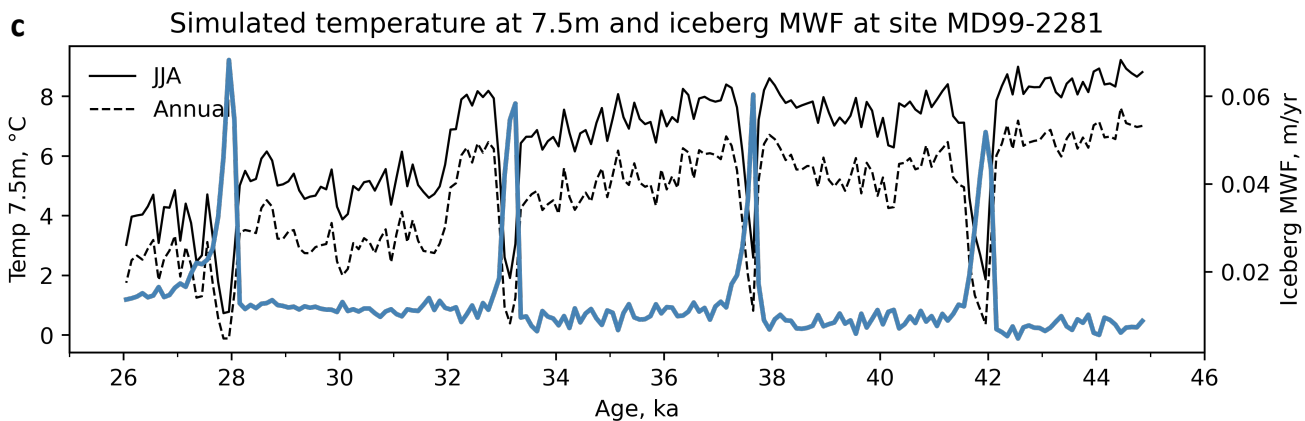




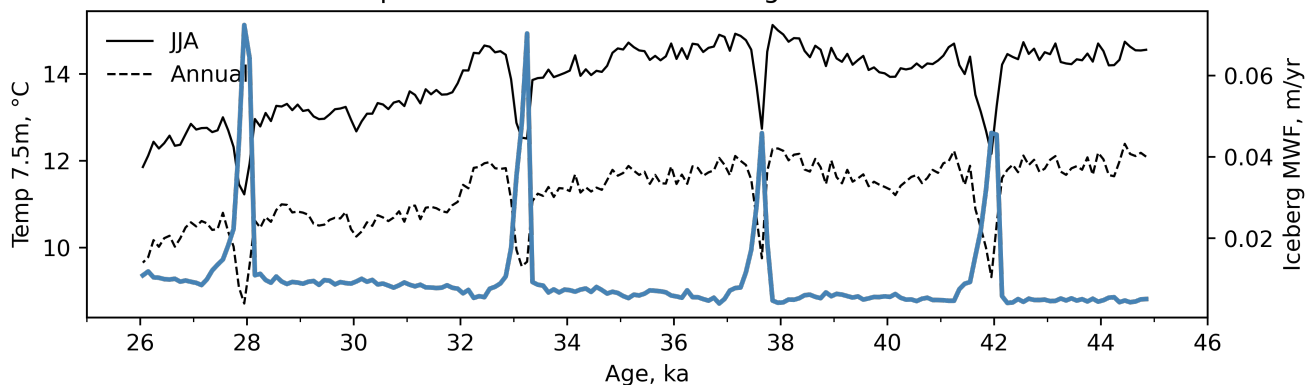


Extended Data Fig. 3. Cross wavelet transform results for the 10 selected cores. Left panels. Smoothed phase shift in ky between % *N. pachyderma*-based reconstructed temperature and IRD signals over the 27–41 ka interval. **Middle panels.** Wavelet coherence. **Right panels.** Log of the wavelet cross-spectrum amplitude used in the computation of the weighted phase shift (Methods). The phase shift is only computed for coherences higher than 0.5 (areas corresponding to coherences < 0.5 are masked as dark blue). The dashed white line delineates the cone of influence (Methods).

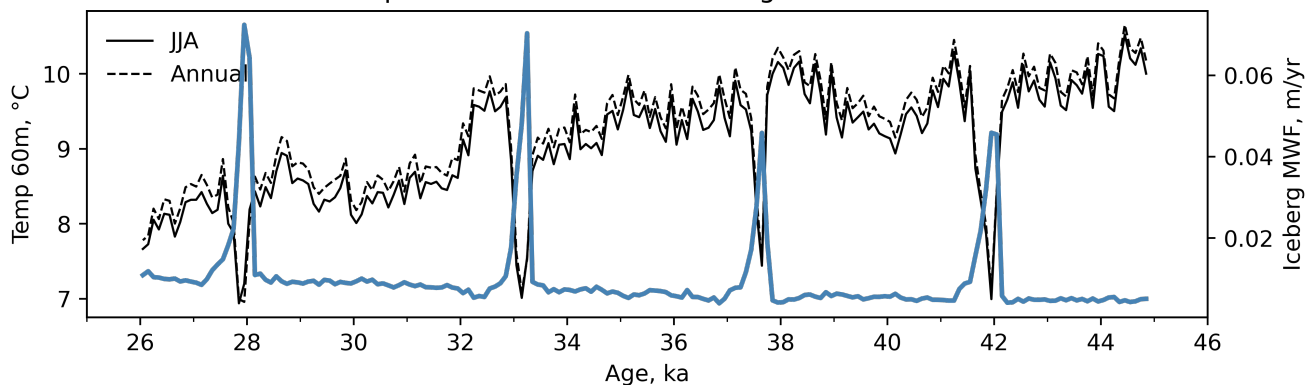




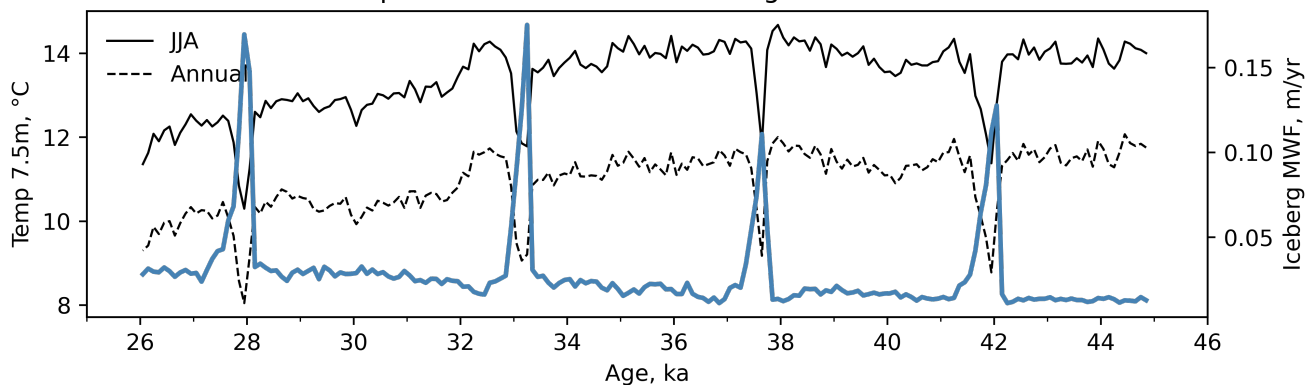
e Simulated temperature at 7.5m and iceberg MWF at site MD95-2040



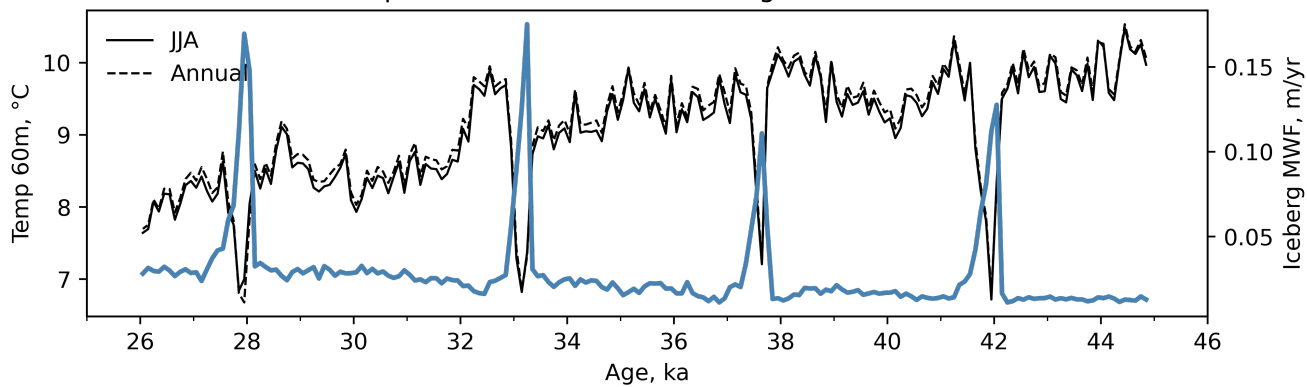
Simulated temperature at 60m and iceberg MWF at site MD95-2040

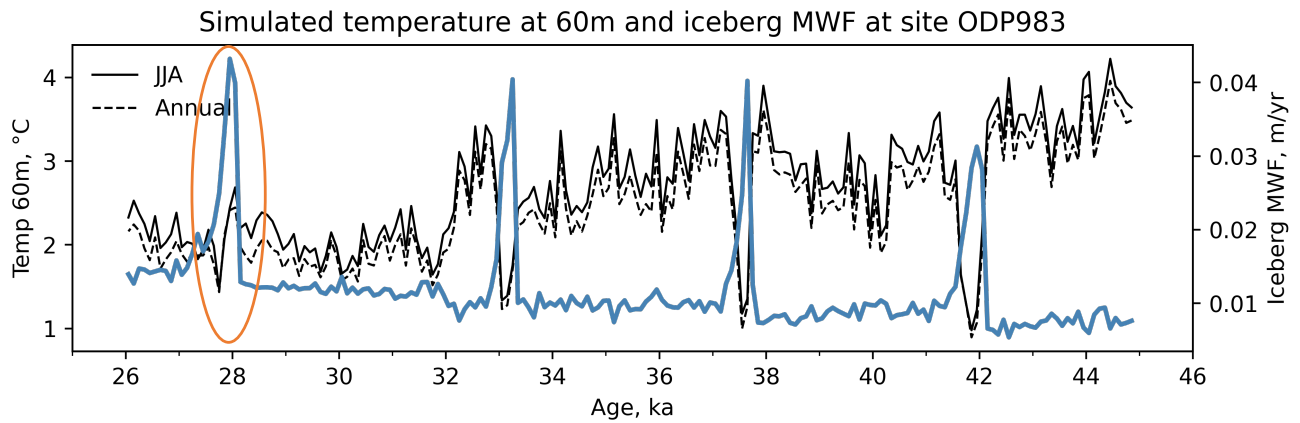
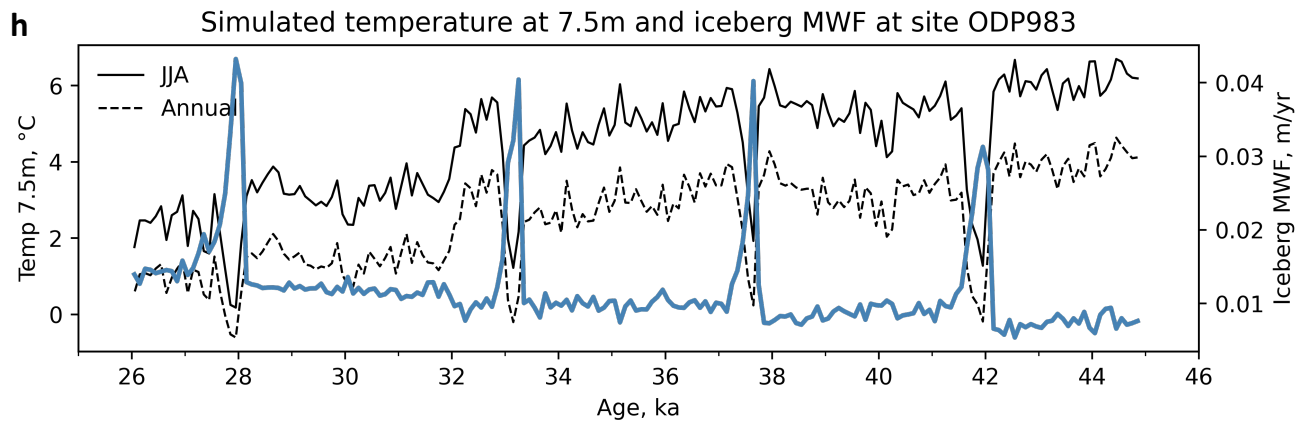
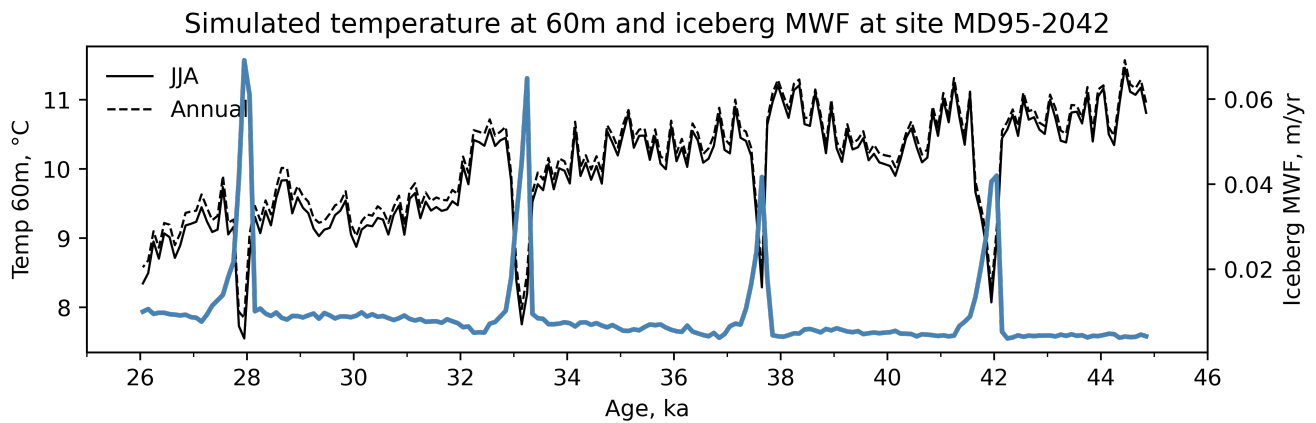
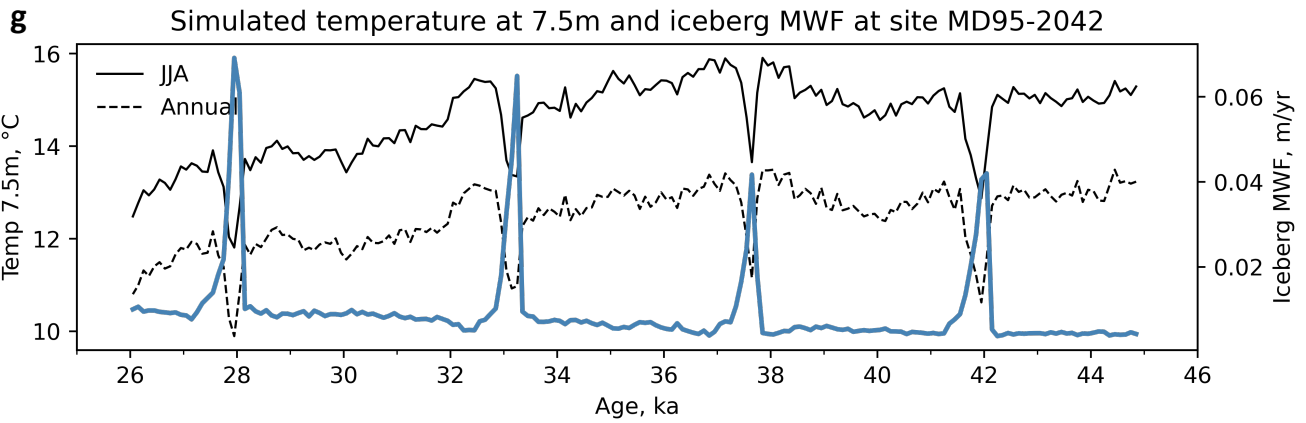


f Simulated temperature at 7.5m and iceberg MWF at site MD99-2331



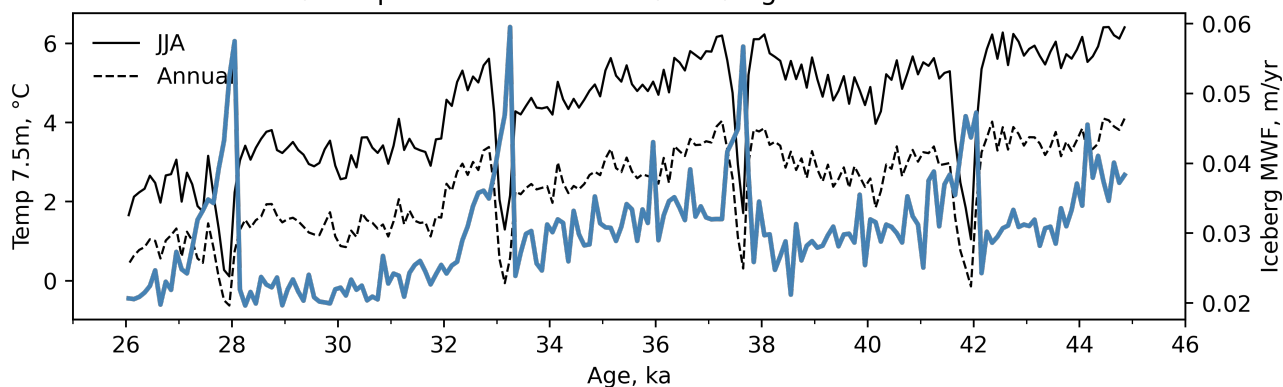
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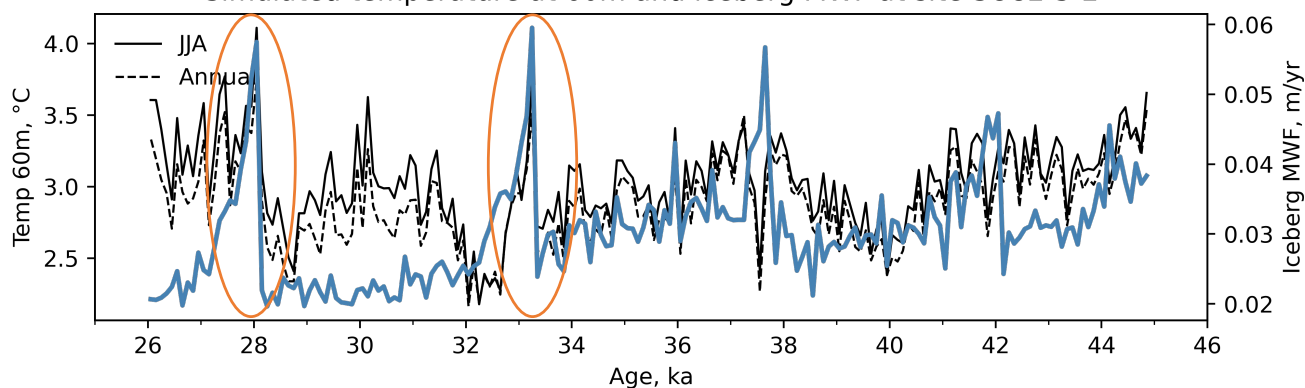


i

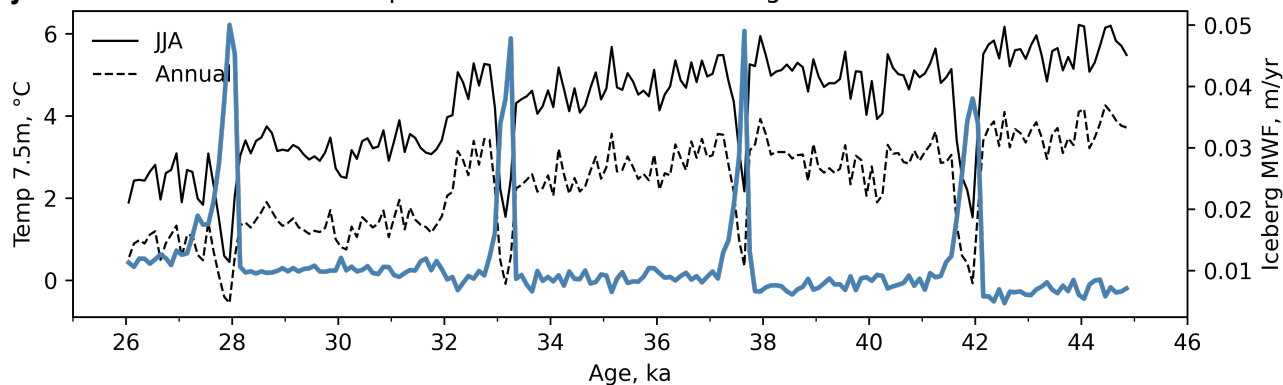
Simulated temperature at 7.5m and iceberg MWF at site SO82-5-2



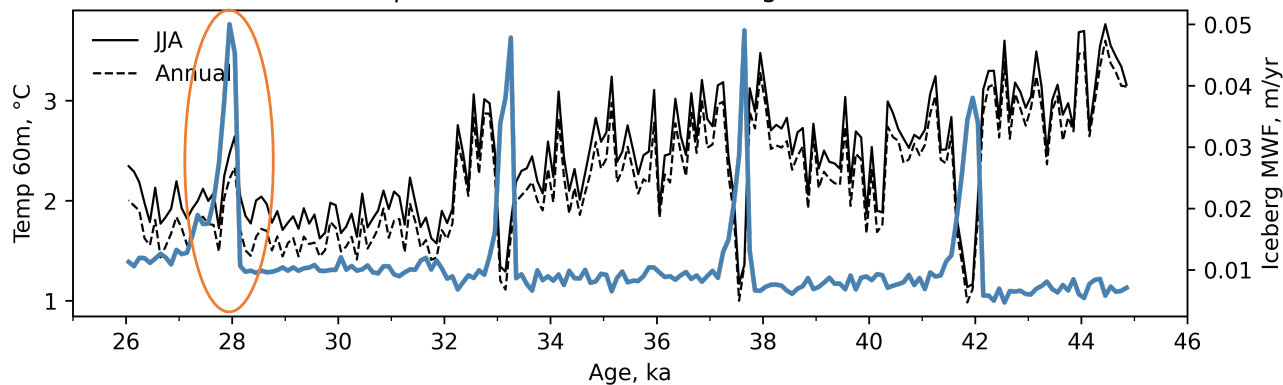
Simulated temperature at 60m and iceberg MWF at site SO82-5-2

**j**

Simulated temperature at 7.5m and iceberg MWF at site V29-202



Simulated temperature at 60m and iceberg MWF at site V29-202



Extended Data Fig. 4. Simulated iceberg MWF, surface (7.5 m depth) and subsurface (60 m depth) temperature time series at the sites of the 10 selected cores. Orange contours highlight MWF in phase with a warm events.

Extended Data Table 1. Selected North Atlantic cores

Core	Latitude	Longitude	Depth	Young end, ka	Old end, ka	SST ave Δt , y	IRD ave Δt , y	IRD unit	Approx. IRD range over 27-41 ka	IRD data references	%Np data references
CH69-K09	41.76	-47.35	4100	23	48	278	273	% in the > 150 μ m fraction	0 - 100 %	Ref. ¹	Ref. ¹
MD01-2461	51.75	-12.92	1153	23	48	122	217	# > 150 mm/g	100 - 5000	Ref. ²	Ref. ³
MD99-2281	60.34	-9.46	1197	23	41	169	169	# > 150 mm/g	200 - 1400	Ref. ⁴	Ref. ⁴
DSDP609	49.88	-24.23	3883	27	45	132	179	# > 150 mm/g	100 - 3000	Ref. ⁵	Ref. ⁵
MD95-2040	40.58	-9.86	2465	23	48	149	153	# > 150 mm/g	0 - 1600	Ref. ⁶ ; this study	Ref. ⁶
MD99-2331	42.15	-9.68	2120	23	41.5	183	188	# > 150 mm/g	0 - 1800	Ref. ⁷	Ref. ⁷
MD95-2042	37.80	-10.17	3146	23	47	245	241	# > 150 mm/g	0 - 200	Ref. ⁸	Refs. ^{8,9}
ODP983	60.40	-23.64	1984	27	47	234	234	# > 150 mm/g	0 - 1200	Ref. ¹⁰	Ref. ¹⁰
S082-5-2	59.17	-30.91	1416	23	48	79	79	# > 150 mm/g	0 - 2000	Ref. ¹¹	Ref. ¹¹
V29-202	60.38	-20.97	2658	23	47	311	311	% in the > 150 μ m fraction	0 - 25 %	Ref. ¹²	Ref. ¹²
=> common time interval:				27	41						

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7. Naughton, F. *et al.* Present-day and past (last 25 000 years) marine pollen signal off western Iberia. *Marine Micropaleontology* **62**, 91–114 (2007).
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12. Oppo, D. W. & Lehman, S. J. Suborbital timescale variability of North Atlantic deep water during the past 200,000 years. *Paleoceanography* **10**, 901–910 (1995).

Extended Data Table 3. Phases of simulated temperature decreases with respect to simulated iceberg MWF increases

Core	Latitude	Longitude	Surface temperature (7.5 m)					Subsurface temperature (60 m)				
			Phase 1, y	Phase 2, y	Phase 3, y	Mean		Phase 1, y	Phase 2, y	Phase 3, y	Mean	
						phase*, y	SD, y				phase*, y	SD, y
CH69-K09	41.76	-47.35	-300	-200	0	-167	153	300	400	500	400	100
MD01-2461	51.75	-12.92	0	0	100	33	58	0	0	100	33	58
MD99-2281	60.34	-9.46	0	0	0	0	0	0	0	0	0	0
DSDP609	49.88	-24.23	0	0	100	33	58	0	0	0	0	0
MD95-2040	40.58	-9.86	0	0	0	0	0	0	0	100	33	58
MD99-2331	42.15	-9.68	0	0	0	0	0	0	0	100	33	58
MD95-2042	37.80	-10.17	0	0	0	0	0	0	0	100	33	58
ODP983	60.40	-23.64	0	0	100	33	58	0	0	300	100	173
SO82-5-2	59.17	-30.91	0	0	100	33	58	100	100	--	100	0
V29-202	60.38	-20.97	0	0	100	33	58	0	0	300	100	173

*Negative phases indicate that SST decrease lead IRD increases

Extended Data Table 4. Sensitivity of the cross wavelet transform results to smoothing parameters

Smoothing: ns = 6, nt = 0.25

Core	Latitu de	Longitu de	Depth	mean phase, ky	phase SD, ky	weighted mean phase, ky	weighted phase SD, ky	Nbr of points
CH69-K09	41.76	-47.35	4100	0.121	0.386	0.099	0.391	498
DSDP609	49.88	-24.23	3883	0.146	0.242	0.180	0.215	531
MD01-2461	51.75	-12.92	1153	-0.079	0.147	-0.088	0.158	572
MD95-2040	40.58	-9.86	2465	-0.161	0.418	-0.064	0.538	375
MD99-2281	60.34	-9.46	1197	0.154	0.165	0.154	0.166	660
MD99-2331	42.15	-9.68	2120	-0.069	0.179	-0.128	0.152	225
MD95-2042	37.80	-10.17	3146	-0.007	0.152	0.102	0.052	524
ODP983	60.40	-23.64	1984	-0.222	0.212	-0.201	0.184	599
SO82-5-2	59.17	-30.91	1416	-0.190	0.141	-0.196	0.147	655
V29-202	60.38	-20.97	2658	-0.241	0.155	-0.292	0.143	771

Smoothing: ns = 7, nt = 0.25

Core	Latitu de	Longitu de	Depth	mean phase, ky	phase SD, ky	weighted mean phase, ky	weighted phase SD, ky	Nbr of points
CH69-K09	41.76	-47.35	4100	0.097	0.391	0.089	0.398	447
DSDP609	49.88	-24.23	3883	0.141	0.237	0.178	0.205	513
MD01-2461	51.75	-12.92	1153	-0.074	0.135	-0.085	0.143	543
MD95-2040	40.58	-9.86	2465	-0.187	0.409	-0.109	0.545	356
MD99-2281	60.34	-9.46	1197	0.153	0.163	0.154	0.166	646
MD99-2331	42.15	-9.68	2120	-0.079	0.187	-0.144	0.156	213
MD95-2042	37.80	-10.17	3146	-0.009	0.157	0.106	0.05	511
ODP983	60.40	-23.64	1984	-0.226	0.211	-0.209	0.174	567
SO82-5-2	59.17	-30.91	1416	-0.189	0.138	-0.197	0.142	646
V29-202	60.38	-20.97	2658	-0.239	0.161	-0.294	0.148	776

Smoothing: ns = 5, nt = 0.25

Core	Latitu de	Longitu de	Depth	mean phase, ky	phase SD, ky	weighted mean phase, ky	weighted phase SD, ky	Nbr of points
CH69-K09	41.76	-47.35	4100	0.129	0.396	0.115	0.398	512
DSDP609	49.88	-24.23	3883	0.137	0.265	0.177	0.236	531
MD01-2461	51.75	-12.92	1153	-0.090	0.149	-0.100	0.156	603
MD95-2040	40.58	-9.86	2465	-0.161	0.43	-0.047	0.561	386
MD99-2281	60.34	-9.46	1197	0.155	0.172	0.156	0.172	655
MD99-2331	42.15	-9.68	2120	-0.070	0.188	-0.143	0.149	242
MD95-2042	37.80	-10.17	3146	-0.01	0.161	0.108	0.053	534
ODP983	60.40	-23.64	1984	-0.228	0.222	-0.205	0.204	628
SO82-5-2	59.17	-30.91	1416	-0.190	0.148	-0.195	0.154	672
V29-202	60.38	-20.97	2658	-0.239	0.163	-0.293	0.149	792

Extended Data Table 4 (continued)

Smoothing: ns = 6, nt = 0.30

Core	Latitu de	Longitu de	Depth	mean phase, ky	phase SD, ky	weighted mean phase, ky	weighted phase SD, ky	Nbr of points
CH69-K09	41.76	-47.35	4100	0.109	0.391	0.091	0.394	462
DSDP609	49.88	-24.23	3883	0.154	0.232	0.188	0.200	509
MD01-2461	51.75	-12.92	1153	-0.076	0.144	-0.084	0.154	547
MD95-2040	40.58	-9.86	2465	-0.17	0.41	-0.091	0.529	357
MD99-2281	60.34	-9.46	1197	0.156	0.161	0.154	0.163	649
MD99-2331	42.15	-9.68	2120	-0.075	0.176	-0.132	0.152	209
MD95-2042	37.80	-10.17	3146	0	0.151	0.102	0.052	508
ODP983	60.40	-23.64	1984	-0.225	0.198	-0.203	0.178	586
SO82-5-2	59.17	-30.91	1416	-0.191	0.134	-0.200	0.139	637
V29-202	60.38	-20.97	2658	-0.242	0.153	-0.292	0.141	768

Smoothing: ns = 6, nt = 0.2

Core	Latitu de	Longitu de	Depth	mean phase, ky	phase SD, ky	weighted mean phase, ky	weighted phase SD, ky	Nbr of points
CH69-K09	41.76	-47.35	4100	0.129	0.382	0.106	0.388	531
DSDP609	49.88	-24.23	3883	0.135	0.253	0.169	0.231	560
MD01-2461	51.75	-12.92	1153	-0.079	0.150	-0.089	0.162	595
MD95-2040	40.58	-9.86	2465	-0.164	0.425	-0.032	0.549	401
MD99-2281	60.34	-9.46	1197	0.155	0.167	0.153	0.167	668
MD99-2331	42.15	-9.68	2120	-0.062	0.184	-0.124	0.153	242
MD95-2042	37.80	-10.17	3146	-0.011	0.155	0.102	0.052	528
ODP983	60.40	-23.64	1984	-0.209	0.232	-0.196	0.192	617
SO82-5-2	59.17	-30.91	1416	-0.190	0.150	-0.196	0.156	672
V29-202	60.38	-20.97	2658	-0.238	0.158	-0.291	0.144	774