Supplement of “Improving age-depth correlations by using the LANDO model ensemble”

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Figures

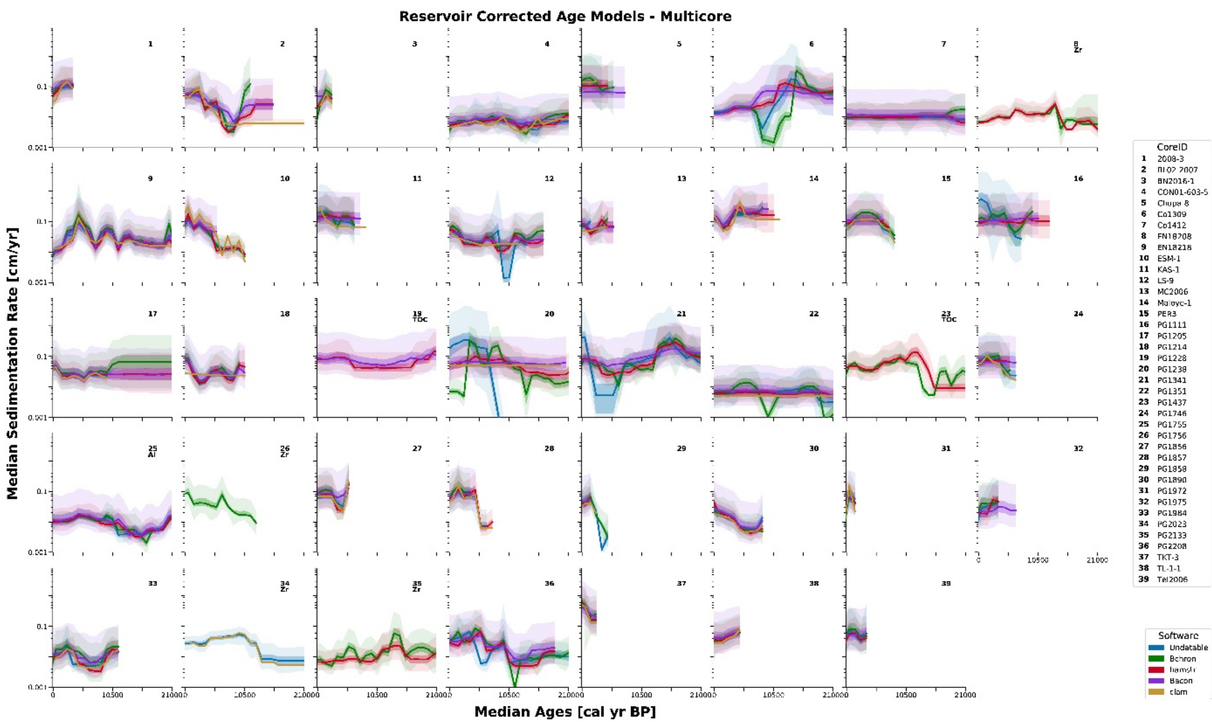

Figure S1 – Optimized models for 39 published sediment cores displayed for each modeling system as weighted average median sedimentation rate (in centimeter per year, cm/yr – y-axis) binned into 1000-year bins (in calibrated years Before Present, cal. yr BP, i.e. before 1950 CE – x-axis) for the last 21 000 years. Bold lines indicate the weighted average median sedimentation rate for all models, while shaded areas are their respective one-sigma and two-sigma ranges in the same colors with different opacities. Each grid cell contains the unique core identifier of each involved sediment core. In seven cases, the letters below each number give the name of the independent proxy used for optimization process.

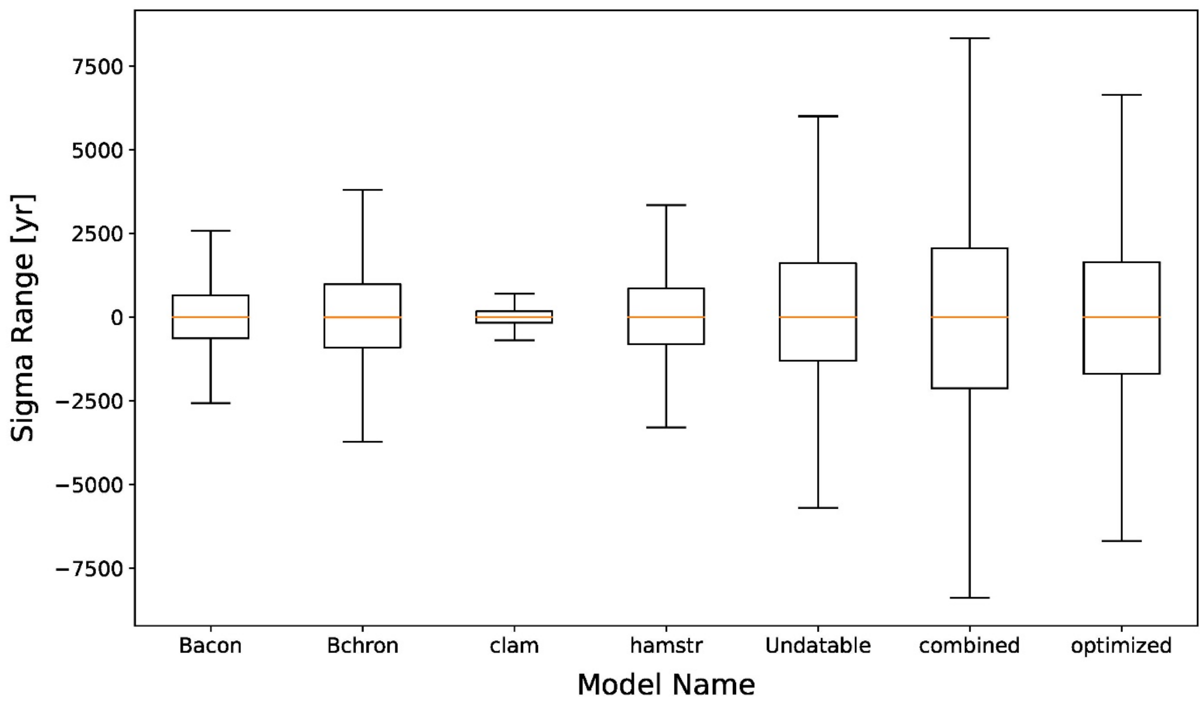

Figure S2– Boxplot representing the overall two-sigma ranges (in years) for each model within our data collection of 62 sediment cores. We examined the modeling results over the entire length of each individual sediment core.

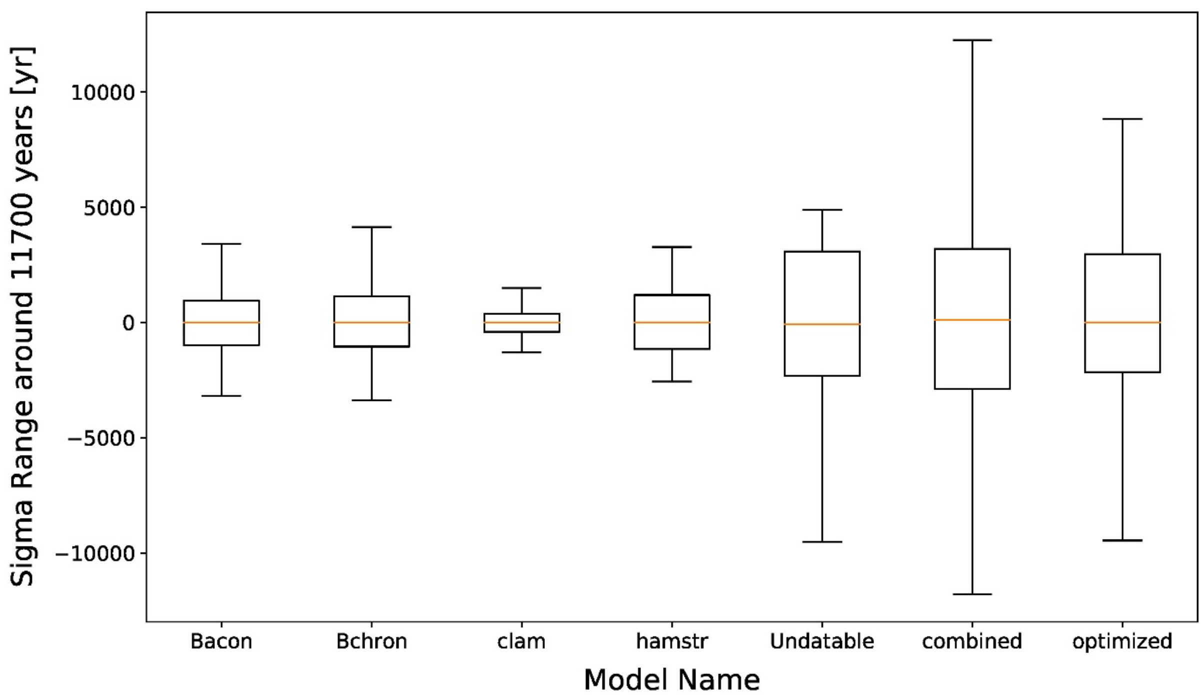

Figure S3– Boxplot representing the two-sigma ranges (in years) of each model around 11 700 yr BP for our data collection of 62 sediment cores. We examined the period from 11 600 to 11 800 yr BP to enable a comparison with the 100-year-binned model results.

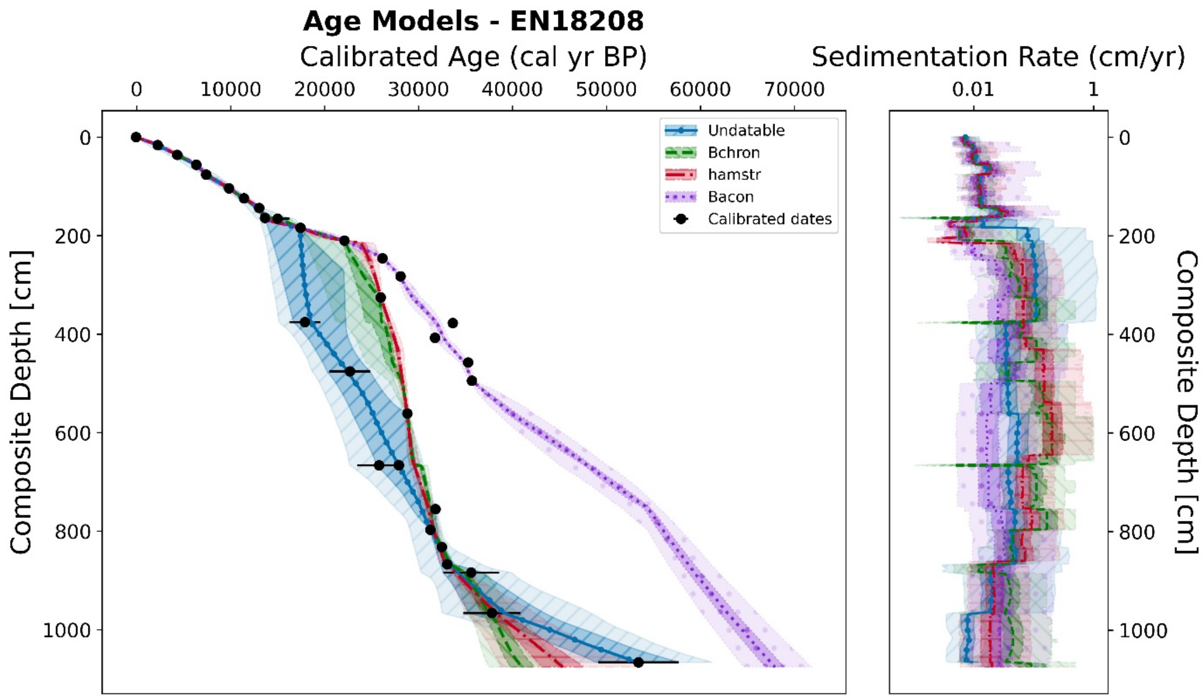

Figure S4 – Color vision deficiency plot for sediment core EN18208 (OSL and ^{14}C data from Vyse et al., 2020) generated by LANDO. Equivalent to panel (a) of Figure 3 in the main publication, the left plot shows the age-depth models for EN18208, whereas the right plot displays the results from the sedimentation rate calculation for each modeling system. The difference to Figure 3 is that each modeling system has received a different line style and shading to help differentiate between the models. Instead of representing the median age and median sedimentation rate of all models by solid lines, the various line styles shall support the interpretation of age-depth models for people with color vision deficiency. Furthermore, each shading characterizes both one-sigma and two-sigma ranges for the individual models with decreasing opacities, respectively.

Tables

Table S1 – Overview of the screening results for whether modeling systems were able to use age determination data to create an age-depth model. Label "CHECK" refers to a successful modeling process, while label "FAIL" indicates an unsuccessful process.

CoreID	Undatable	Bchron	hamstr	Bacon	clam
16-KP-03-L10	CHECK	CHECK	CHECK	CHECK	FAIL
16-KP-04-L19	CHECK	CHECK	CHECK	CHECK	CHECK
2008-3	CHECK	CHECK	CHECK	CHECK	CHECK
BC2008	CHECK	CHECK	CHECK	CHECK	CHECK
BL02-2007	CHECK	CHECK	CHECK	CHECK	CHECK
BN2016-1	CHECK	CHECK	CHECK	CHECK	CHECK
Chupa-8	CHECK	CHECK	CHECK	CHECK	CHECK
Co1309	CHECK	CHECK	CHECK	CHECK	FAIL
Co1412	CHECK	CHECK	CHECK	CHECK	FAIL
CON01-603-5	CHECK	CHECK	CHECK	CHECK	CHECK
E4-2	CHECK	CHECK	CHECK	CHECK	CHECK
Dolgoe2012	CHECK	CHECK	CHECK	CHECK	CHECK
EN18208	CHECK	CHECK	CHECK	CHECK	FAIL
EN18218	CHECK	CHECK	CHECK	CHECK	CHECK
ESM-1	CHECK	CHECK	CHECK	CHECK	CHECK
KAS-1	CHECK	CHECK	CHECK	CHECK	CHECK
Korzhino2010	FAIL	CHECK	CHECK	CHECK	CHECK
LENDERY180-4	CHECK	CHECK	CHECK	CHECK	CHECK
LENDERY192	CHECK	CHECK	CHECK	CHECK	CHECK
LENDERY200-1	CHECK	CHECK	CHECK	CHECK	CHECK
LENDERY203-3	CHECK	CHECK	CHECK	CHECK	CHECK
LOT83-7	CHECK	CHECK	CHECK	CHECK	CHECK
LS-9	CHECK	CHECK	CHECK	CHECK	CHECK
Maloye-1	CHECK	CHECK	CHECK	CHECK	CHECK
MC2006	CHECK	CHECK	CHECK	CHECK	CHECK
Muan2018	CHECK	CHECK	CHECK	CHECK	CHECK
Okun2018	FAIL	CHECK	CHECK	CHECK	CHECK
OSIN	CHECK	CHECK	CHECK	CHECK	CHECK
PER3	CHECK	CHECK	CHECK	CHECK	CHECK
PG1111	CHECK	CHECK	CHECK	CHECK	FAIL
PG1205	CHECK	CHECK	CHECK	CHECK	CHECK
PG1214	CHECK	CHECK	CHECK	CHECK	CHECK
PG1228	CHECK	CHECK	CHECK	CHECK	FAIL
PG1238	CHECK	CHECK	CHECK	CHECK	CHECK
PG1341	CHECK	CHECK	CHECK	CHECK	FAIL
PG1351	CHECK	CHECK	CHECK	CHECK	CHECK
PG1437	CHECK	CHECK	CHECK	CHECK	FAIL
PG1746	CHECK	CHECK	CHECK	CHECK	CHECK
PG1755	CHECK	CHECK	CHECK	CHECK	FAIL
PG1756	CHECK	CHECK	CHECK	CHECK	CHECK
PG1856	CHECK	CHECK	CHECK	CHECK	CHECK
PG1857	CHECK	CHECK	CHECK	CHECK	CHECK
PG1858	CHECK	CHECK	CHECK	CHECK	CHECK
PG1890	CHECK	CHECK	CHECK	CHECK	CHECK
PG1972	CHECK	CHECK	CHECK	CHECK	CHECK
PG1975	CHECK	CHECK	CHECK	CHECK	FAIL
PG1982	CHECK	CHECK	CHECK	CHECK	CHECK
PG1984	CHECK	CHECK	CHECK	CHECK	CHECK
PG2023	CHECK	CHECK	CHECK	CHECK	CHECK
PG2130	CHECK	CHECK	CHECK	CHECK	CHECK
PG2133	CHECK	CHECK	CHECK	CHECK	FAIL
PG2135	CHECK	CHECK	CHECK	CHECK	FAIL
PG2201	CHECK	CHECK	CHECK	CHECK	FAIL
PG2208	CHECK	CHECK	CHECK	CHECK	FAIL
PG2360	CHECK	CHECK	CHECK	CHECK	FAIL
PG2367	CHECK	CHECK	CHECK	CHECK	CHECK
Tel2006	CHECK	CHECK	CHECK	CHECK	FAIL
Teriberka17	CHECK	CHECK	CHECK	CHECK	CHECK
TKT-3	CHECK	CHECK	CHECK	CHECK	CHECK
TL-1-1	CHECK	CHECK	CHECK	CHECK	CHECK
TULOMA27	FAIL	CHECK	CHECK	CHECK	CHECK
UKhau2015	CHECK	CHECK	CHECK	CHECK	CHECK

Table S2 – Runtime for each model for case study CS1 ("*Undisturbed sequence*") and CS2 ("Inconsistent sequence") split into their individual steps. Both case studies ran ten times in our test setup. The presented values are the mean value and their standard deviation. Note: a) Within our test setup, we let *Bacon* adjust the default values automatically. For the "Undisturbed sequence" case study (CS1), *Bacon* changed the accumulation rate prior mean ("acc.mean") to 50 yr/cm and the thickness to 4. In the "Inconsistent sequence" case study (CS2), *Bacon* adjusted the "acc.mean" to the same value (50 yr/cm), but increased the thickness to 10 to account for the length of the sediment core, which resulted in a reduction of runtime. b) For both case studies, we used our "best fit" option within *clam*. For the "Inconsistent sequence" case study, LANDO could not find a best fit with the *clam* models, hence, our program skipped both "Aggregation" and "Sedimentation Rate Calculation" (SRC) step.

Case Study		**"Undisturbed sequence" – CS1**	**"Inconsistent sequence" – CS2**
Length of selected sediment cores [m]		6.53	10.76
Execution time [s]			
Reservoir correction		39.87 ± 0.39	45.39 ± 0.55
Undatable			
	Preparation	0.40 ± 0.01	0.40 ± 0.02
	Execution	8.58 ± 0.16	10.39 ± 0.43
	Aggregation	0.36 ± 0.01	0.55 ± 0.01
	SRC	18.35 ± 0.18	34.62 ± 0.12
Bchron			
	Preparation	0.10 ± 0.00	0.10 ± 0.00
	Execution	166.89 ± 0.55	193.42 ± 1.94
	Aggregation	1.86 ± 0.02	3.07 ± 0.10
	SRC	18.82 ± 0.13	35.77 ± 0.95
hamstr			
	Preparation	0.10 ± 0.01	0.10 ± 0.01
	Execution	93.37 ± 0.58	118.90 ± 1.90
	Aggregation	2.93 ± 0.02	4.21 ± 0.01
	SRC	18.70 ± 0.08	35.48 ± 0.66
Bacon			
	Preparation	0.10 ± 0.01	0.11 ± 0.01
	Execution	[a] 1220.62 ± 4.08	[a] 657.46 ± 3.48
	Aggregation	2.99 ± 0.01	4.25 ± 0.03
	SRC	18.71 ± 0.14	36.07 ± 0.91
clam			
	Preparation	0.05 ± 0.01	0.05 ± 0.01
	Execution	193.72 ± 2.88	217.64 ± 4.43
	Aggregation	1.96 ± 0.06	[b] 0.04 ± 0.00
	SRC	19.39 ± 0.40	[b] 0.04 ± 0.00
Overall execution time [min]		30.46 ± 0.16	23.30 ± 0.26