

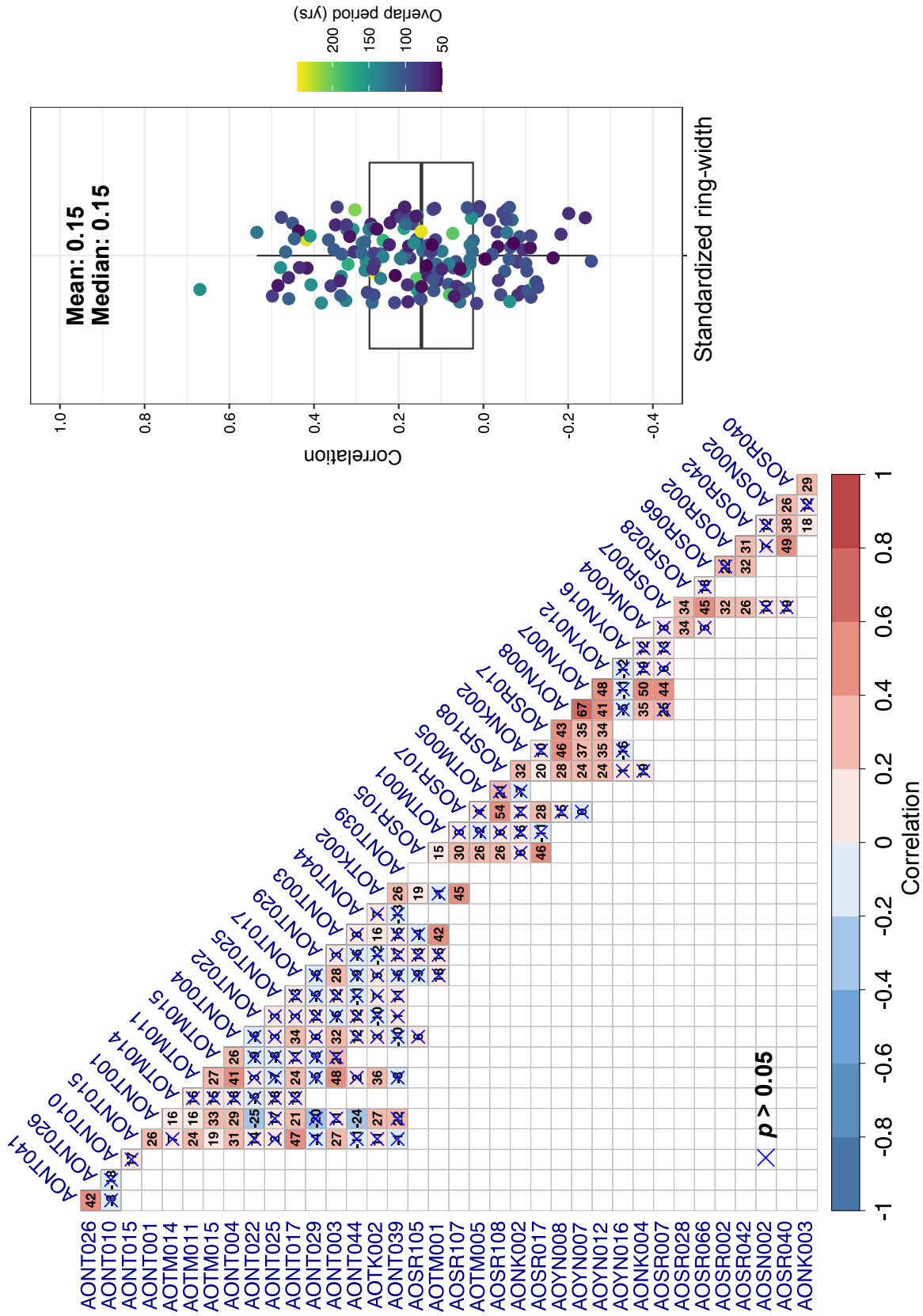
Supplementary Table 1. Statistical data for individual tree-ring $\delta^{18}\text{O}$ series used to generate the master chronology.

Site name	Sample ID	Start year	End year	n	Mean	Median	SD	Skew	Kurtosis	AC1
Sarugamori	AOSR002	1412	1493	82	28.21	28.25	0.67	0.45	0.60	0.36
Sarugamori	AOSR007	1370	1474	105	28.02	28.04	0.65	0.15	-0.70	0.17
Sarugamori	AOSR017	1175	1285	111	28.24	28.27	0.79	-0.18	0.21	0.24
Sarugamori	AOSR028	1274	1449	176	28.22	28.24	0.67	0.00	-0.26	0.24
Sarugamori	AOSR040	1436	1595	160	27.45	27.42	0.86	0.10	0.13	0.50
Sarugamori	AOSR042	1508	1584	77	27.93	27.85	0.80	0.49	0.00	0.49
Sarugamori	AOSR066	1451	1504	54	27.96	27.94	0.66	-0.05	-0.31	0.35
Sarugamori	AOSR105	1085	1178	94	27.08	27.16	0.67	-0.67	2.29	0.01
Sarugamori	AOSR107	1050	1234	185	27.55	27.55	0.64	-0.14	1.07	0.21
Sarugamori	AOSR108	1162	1341	180	26.85	26.83	0.51	0.37	0.74	0.06
Nitta	AONT001	721	968	248	26.75	26.85	0.90	-0.15	-0.51	0.53
Nitta	AONT003	897	1009	113	26.47	26.40	0.64	0.01	0.39	0.09
Nitta	AONT015	680	992	313	27.44	27.44	0.69	0.06	0.00	0.25
Nitta	AONT010	581	757	177	28.44	28.44	0.72	0.20	0.50	0.03
Nitta	AONT041	417	663	247	27.44	27.38	0.67	0.30	0.16	0.16
Nitta	AONT004	838	1016	179	26.91	26.90	0.67	0.28	0.86	0.14
Nitta	AONT026	437	654	218	26.69	26.64	0.64	0.27	0.36	0.19
Nitta	AONT017	878	1047	170	26.17	26.18	0.64	0.42	1.57	-0.01
Nitta	AONT029	726	857	132	26.70	26.71	0.75	-0.05	-0.47	0.43
Nitta	AONT039	650	745	96	26.45	26.53	0.63	-0.29	0.01	-0.07
Nitta	AONT044	907	1002	96	26.43	26.41	0.70	-0.27	-0.34	-0.06
Nitta	AONT022	828	956	129	26.16	26.21	0.80	-0.15	0.18	0.17
Nitta	AONT025	680	809	130	26.42	26.42	0.70	-0.19	-0.17	0.08
Takama	AOTM001	986	1204	219	27.13	27.13	0.65	0.04	0.04	0.21
Takama	AOTK002	909	1131	223	26.47	26.53	0.91	-0.41	0.41	0.54
Takama	AOTM005	1115	1215	101	27.57	27.52	0.62	0.18	-0.16	0.17
Takama	AOTM011	859	986	128	26.91	26.96	0.71	-0.12	0.11	0.15
Takama	AOTM014	749	940	192	26.83	26.81	0.48	0.36	0.75	0.35
Takama	AOTM015	849	946	98	26.46	26.35	0.70	0.24	0.11	0.12
Shinjo-Hiraoka	AOSN002	1440	1498	59	26.26	26.11	0.76	0.96	1.66	0.17
Yoneyama	AOYN007	1233	1382	150	26.77	26.77	0.85	-0.14	0.10	0.09
Yoneyama	AOYN008	1229	1382	154	27.64	27.67	0.94	0.03	-0.08	0.34
Yoneyama	AOYN012	1236	1366	131	27.50	27.53	0.94	0.01	0.05	0.24
Yoneyama	AOYN016	1297	1380	84	26.44	26.35	0.91	0.00	0.03	0.52
Nakamichi	AONK002	1167	1267	101	26.25	26.29	0.67	-0.29	0.24	0.30
Nakamichi	AONK003	1471	1585	115	26.55	26.46	0.72	0.30	0.13	0.31
Nakamichi	AONK004	1300	1381	82	25.67	25.69	0.78	-0.19	0.92	0.08

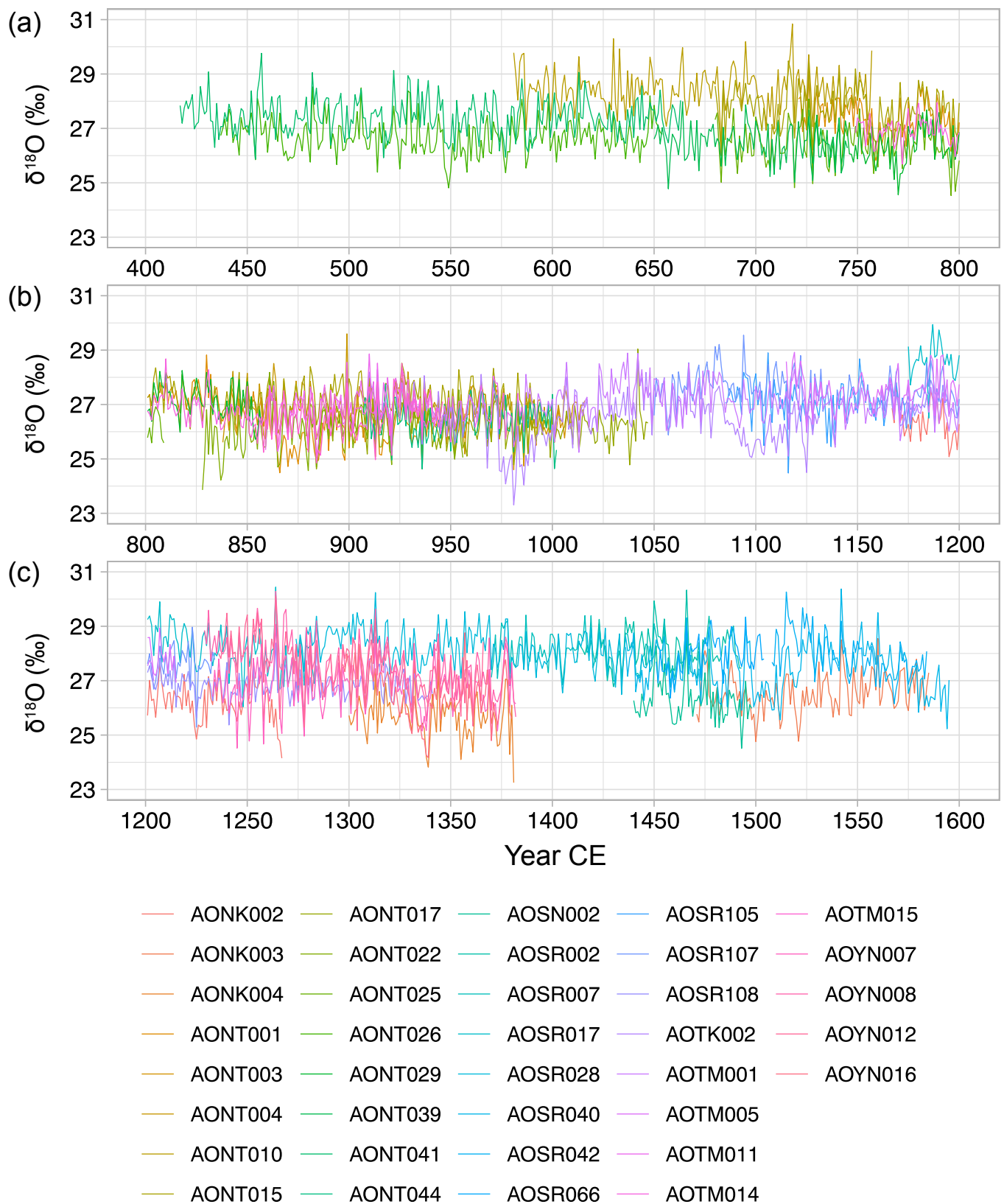
SD: Standard deviation

AC1: First-order autocorrelation

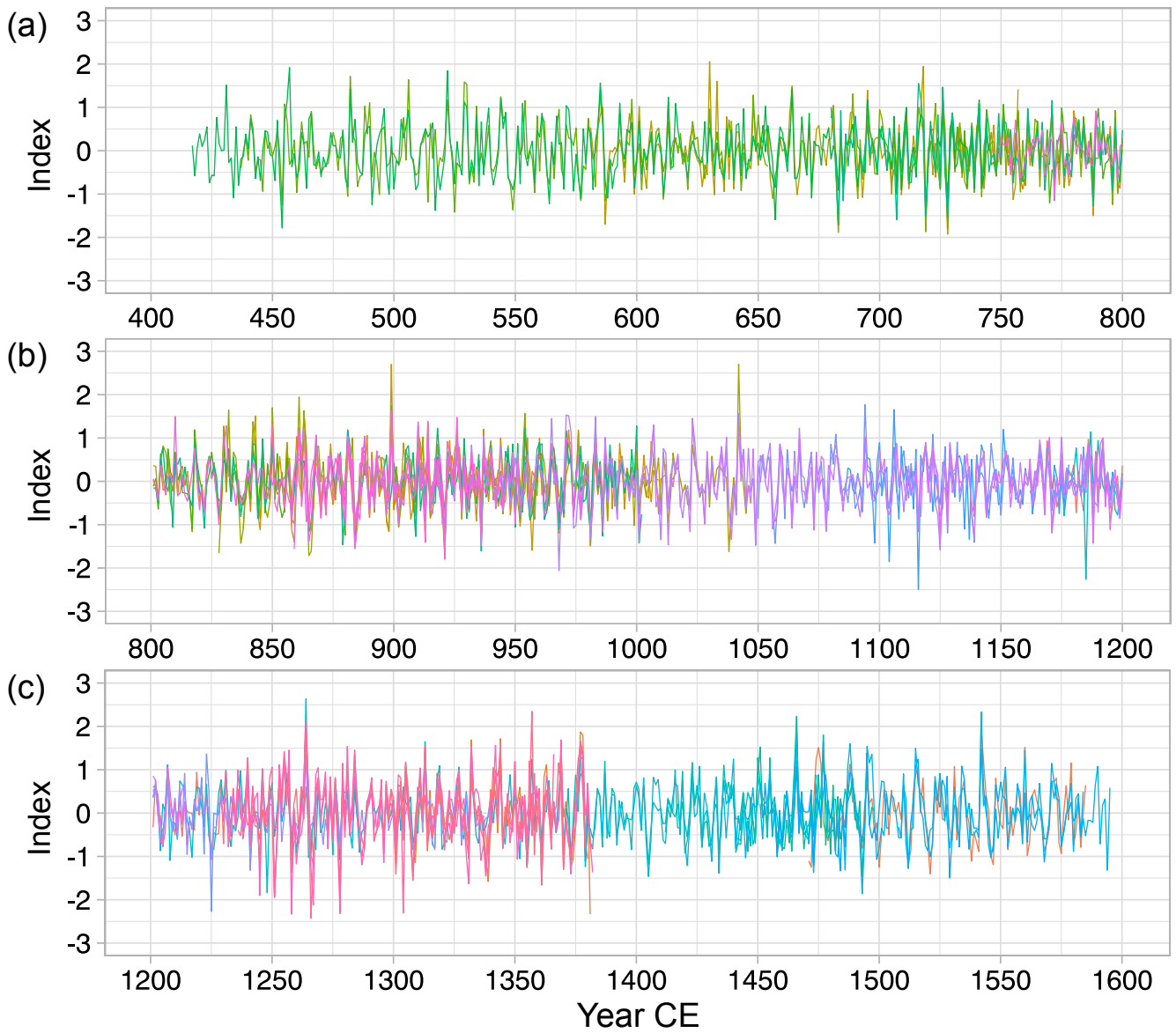
Standardized ring-width series



Supplementary Figure 1. Correlation matrix of standardized ring-width series, along with corresponding boxplot. Pairs of overlapping periods of <50 yrs are masked out. Non-significant correlations ($p > 0.05$) are indicated by a cross. The BP 5-yr filter was used for standardization (Baillie and Pilcher, 1973).



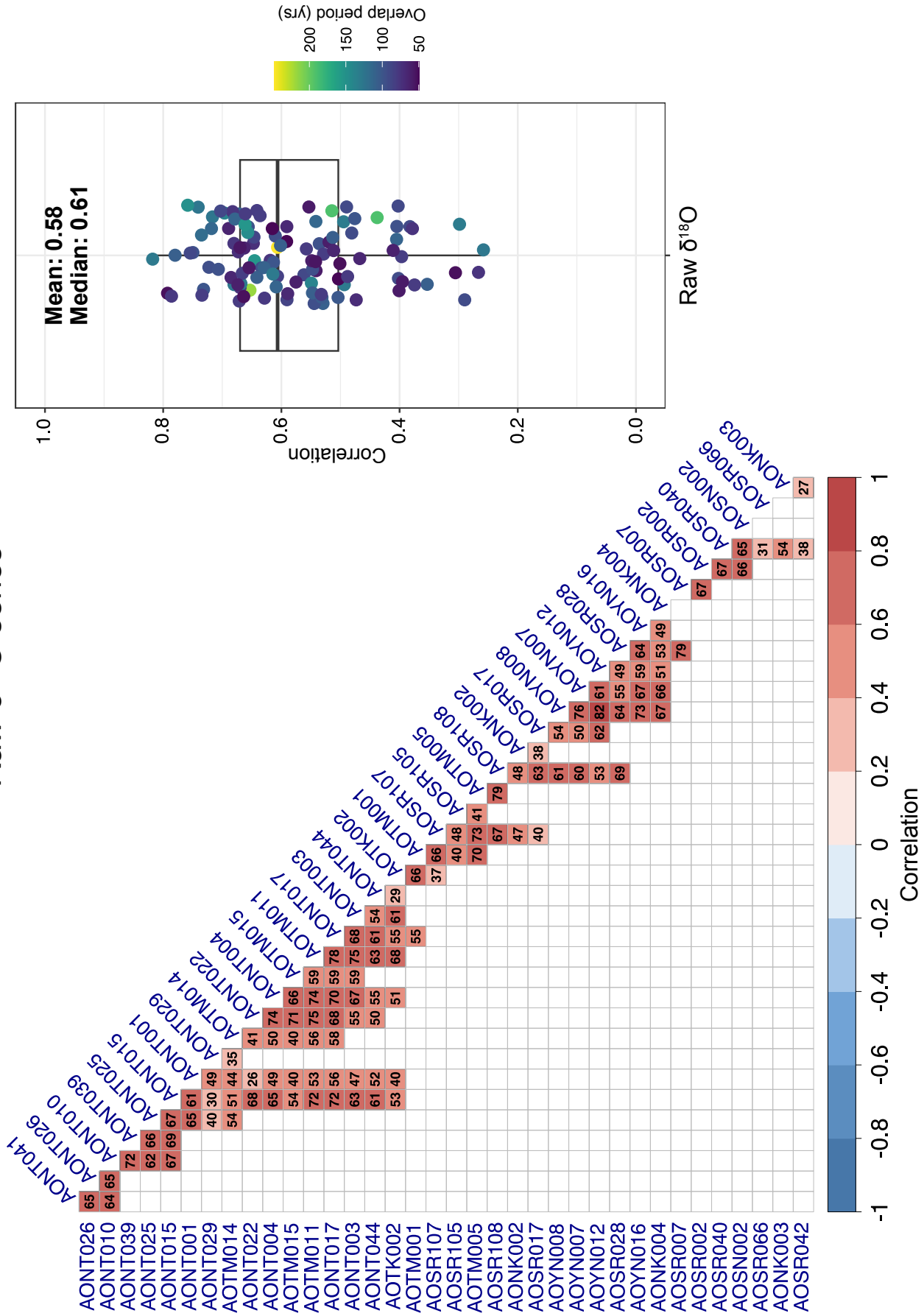
Supplementary Figure 2. Enlarged versions of the plots shown in Figure 2 along with sample legends.



— AONK002	— AONT017	— AOSN002	— AOSR105	— AOTM015
— AONK003	— AONT022	— AOSR002	— AOSR107	— AOYN007
— AONK004	— AONT025	— AOSR007	— AOSR108	— AOYN008
— AONT001	— AONT026	— AOSR017	— AOTK002	— AOYN012
— AONT003	— AONT029	— AOSR028	— AOTM001	— AOYN016
— AONT004	— AONT039	— AOSR040	— AOTM005	
— AONT010	— AONT041	— AOSR042	— AOTM011	
— AONT015	— AONT044	— AOSR066	— AOTM014	

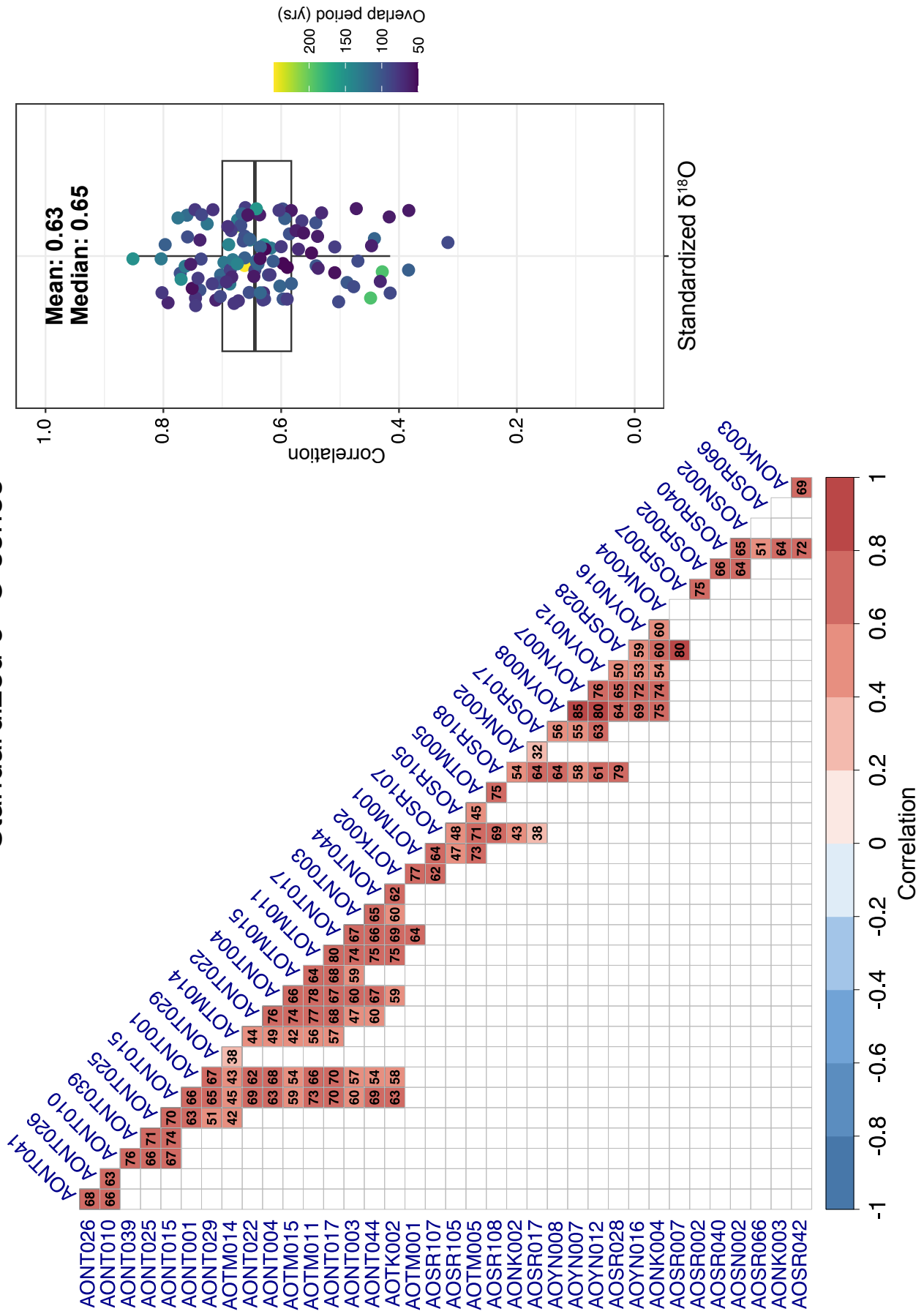
Supplementary Figure 3. Enlarged versions of the plots shown in Figure 3 along with sample legends.

Raw $\delta^{18}\text{O}$ series

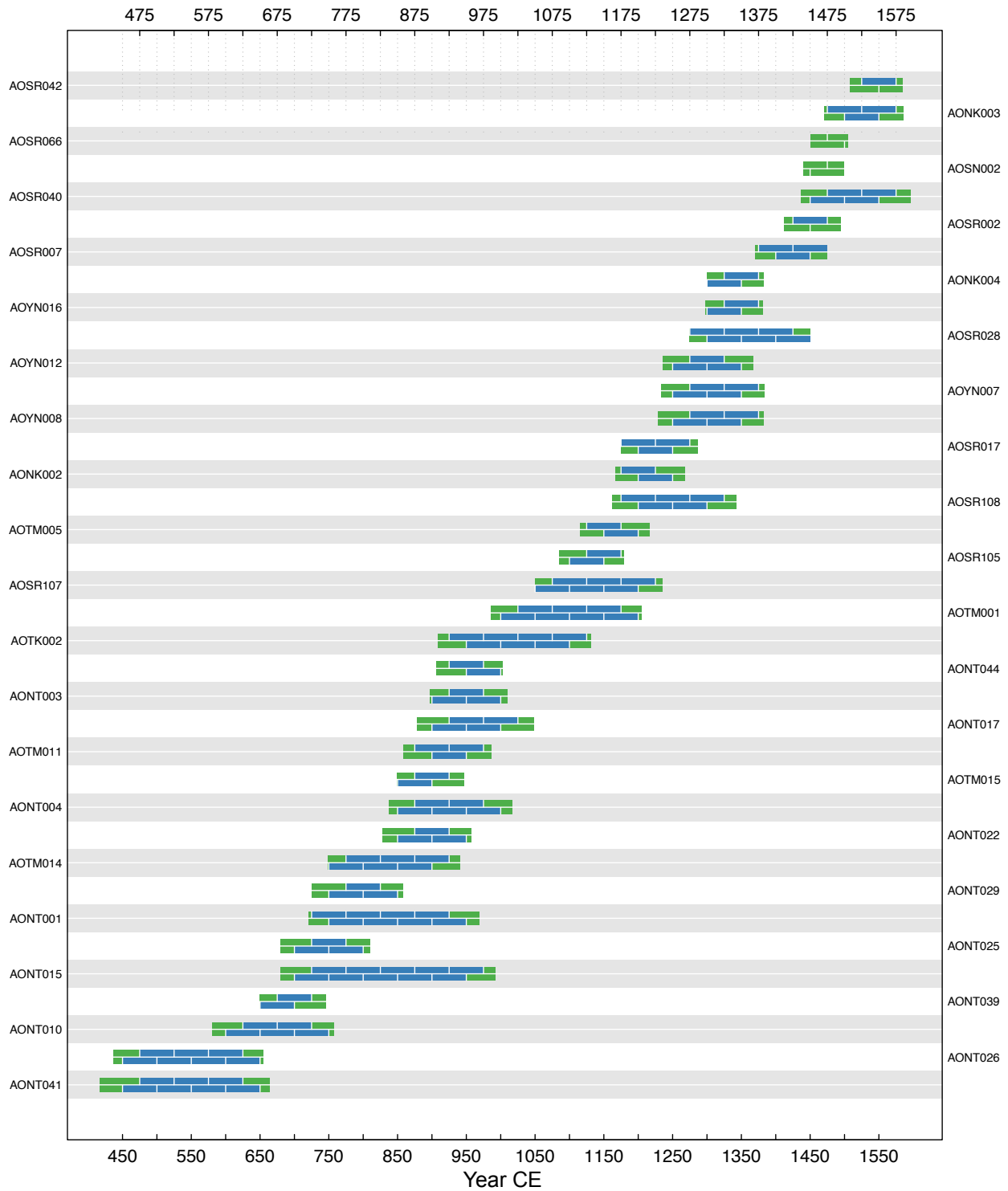


Supplementary Figure 4. Correlation matrix of raw tree-ring $\delta^{18}\text{O}$ series, along with corresponding boxplot. Pairs of overlapping periods of <50 yrs are masked out. All pairs are significant at $p < 0.05$.

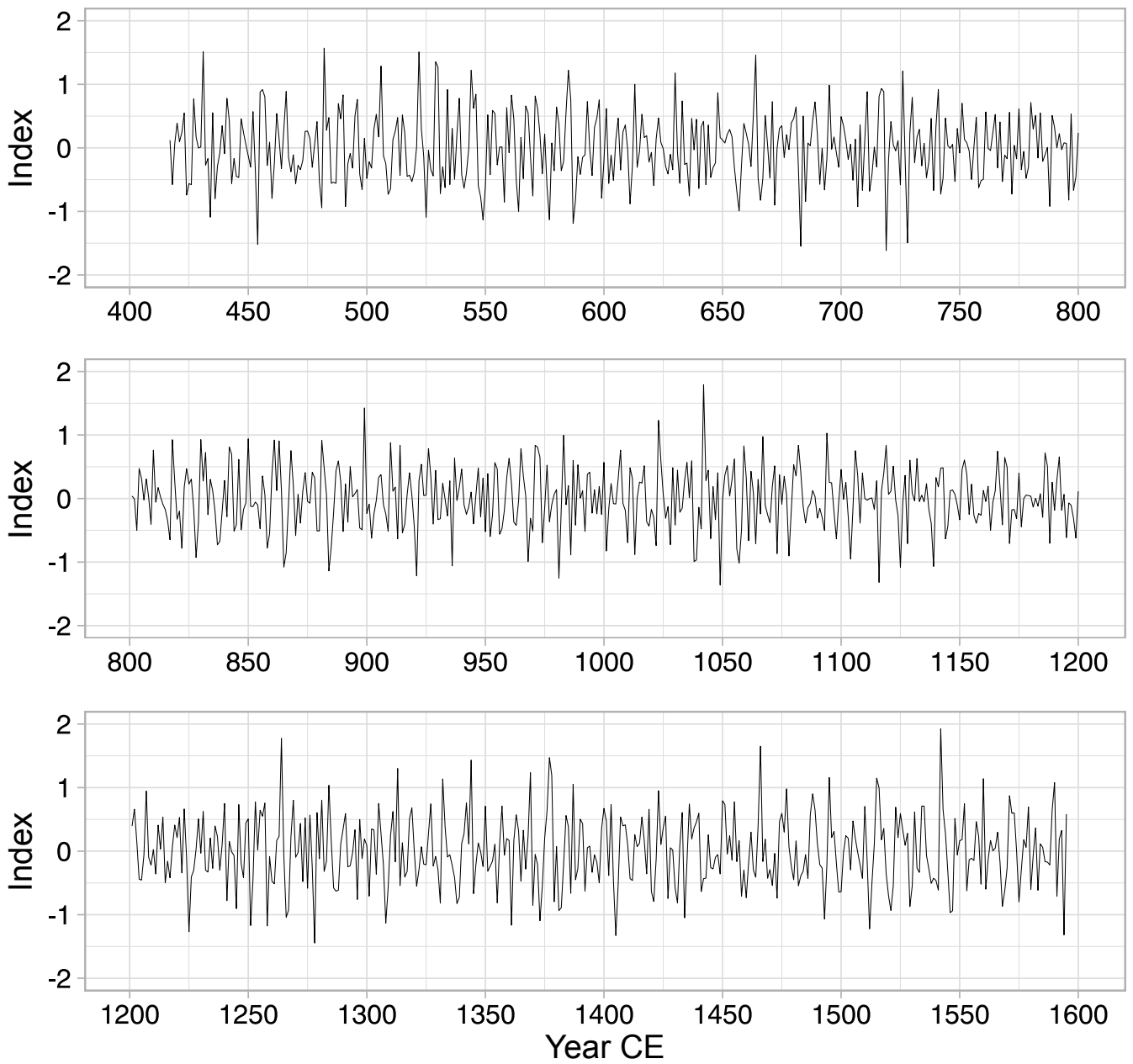
Standardized $\delta^{18}\text{O}$ series



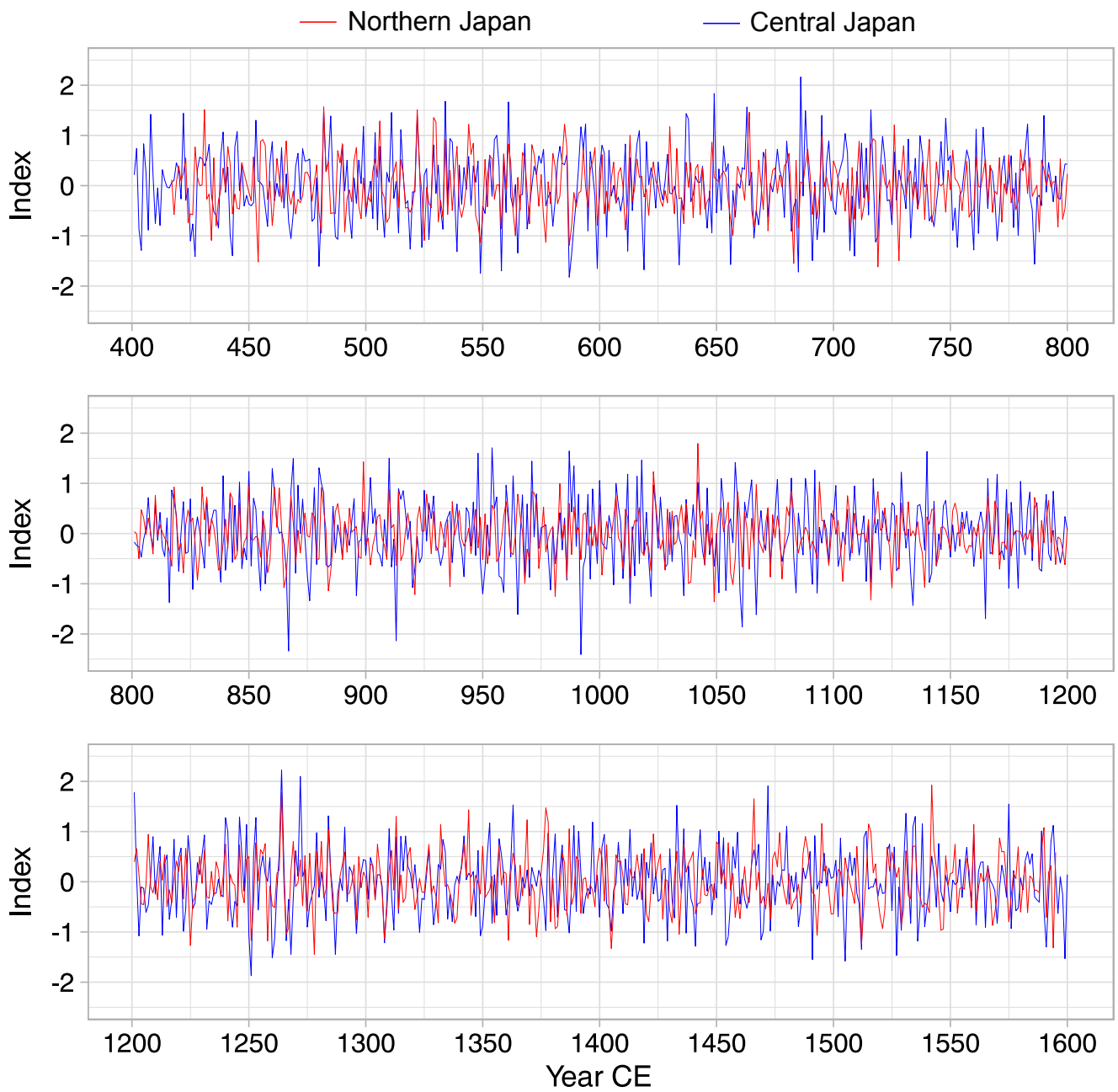
Supplementary Figure 5. As for Supplementary Figure 4, but for standardized tree-ring $\delta^{18}\text{O}$ series. All pairs are significant at $p < 0.01$.



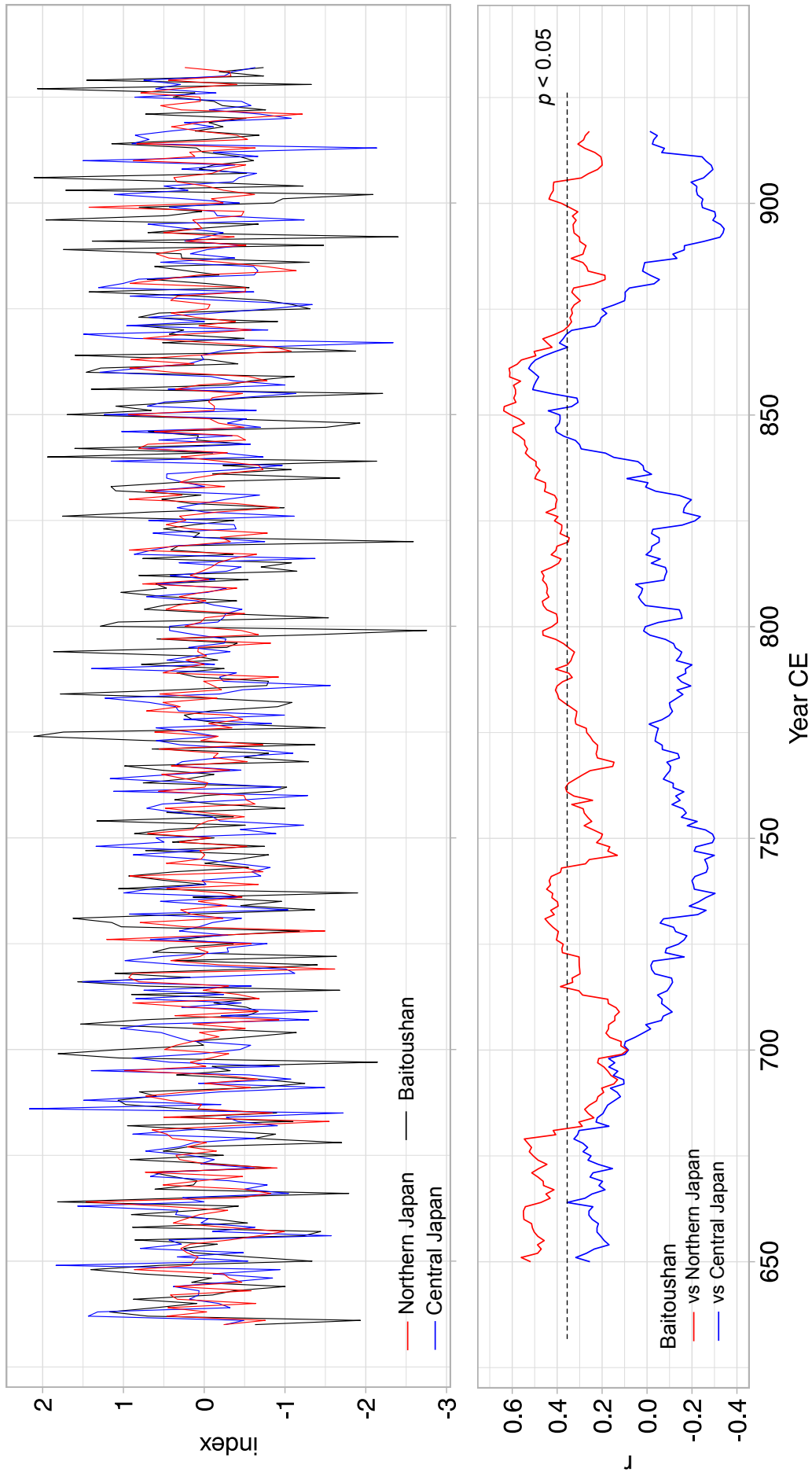
Supplementary Figure 6. Correlation of each standardized tree-ring $\delta^{18}\text{O}$ series against a chronology constructed using the remaining series (i.e., the leave-one-out principle). Correlations were calculated for each 50-yr segment of the individual series, lagged by 25 yrs. Blue segments indicate significance at the 1% level, and green segments indicate the end of samples with a <50-yr overlap.



Supplementary Figure 7. Enlarged versions of the plots shown in Figure 4a.



Supplementary Figure 8. Enlarged versions of the plots shown in Figure 6a.



Supplementary Figure 9. Enlarged versions of the plots shown in Figure 10.

Reference

Baillie MGL, Pilcher JR. 1973. A simple crossdating program for tree-ring research. *Tree-Ring Bulletin* 33:7-14.