

# Supplementary Materials

## Tree-ring chronologies from the upper treeline in the Russian Altai Mountains reveal strong and stable summer temperature signals

Alexander V. Kirdyanov <sup>1,2,3,\*</sup>, Alberto Arzac <sup>3</sup>, Alina A. Kirdyanova <sup>4</sup>, Tito Arosio <sup>1</sup>,  
Dmitriy V. Ovchinnikov <sup>2</sup>, Dmitry A. Ganyushkin <sup>4</sup>, Paul N. Katjutin <sup>4,5</sup>, Vladimir S. Myglan <sup>3</sup>,  
Andrey N. Nazarov <sup>3</sup>, Igor Y. Slyusarenko <sup>6</sup>, Tatiana Bebchuk <sup>1</sup> and Ulf Büntgen <sup>1,7,8</sup>

<sup>1</sup> Department of Geography, University of Cambridge, Cambridge, CB2 3EN, UK; ak2118@cam.ac.uk (A.V.K.); ta530@cam.ac.uk (T.A.); tb649@cam.ac.uk (T.B.); ub223@cam.ac.uk (U.B.)

<sup>2</sup> Sukachev Institute of Forest SB RAS, Federal Research Center 'Krasnoyarsk Science Center SB RAS', Akademgorodok, Krasnoyarsk, 660036, Russian Federation; dovch@mail.ru (D.V.O.)

<sup>3</sup> Institute of Ecology and Geography, Siberian Federal University, 79 Svobodnii, Krasnoyarsk, 660041, Russian Federation; aarzac@gmail.com (A.A.); v.myglan@gmail.com (V.S.M); nazar\_69@mail.ru (A.N.N)

<sup>4</sup> Institute of Earth Sciences, St. Petersburg State University, St. Petersburg, 199034, Russian Federation; akird2002@mail.ru (A.A.K.); ganushkinspbgu@mail.ru (D.A.G.)

<sup>5</sup> Botanical Institute of RAS, ul. Professor Popov 2, St. Petersburg, 197022, Russian Federation; paurussia@binran.ru (P.N.K.)

<sup>6</sup> Institute of Archaeology and Ethnography SB RAS, Pr. Akademika Lavrentieva 17, Novosibirsk, 630090, Russia; slig1963@yandex.ru (I.Y.S.)

<sup>7</sup> Department of Geography, Masaryk University, 61137 Brno, Czech Republic

<sup>8</sup> Global Change Research Centre, 61300 Brno, Czech Republic

\* Correspondence: ak2118@cam.ac.uk

**Table S1.** Site location

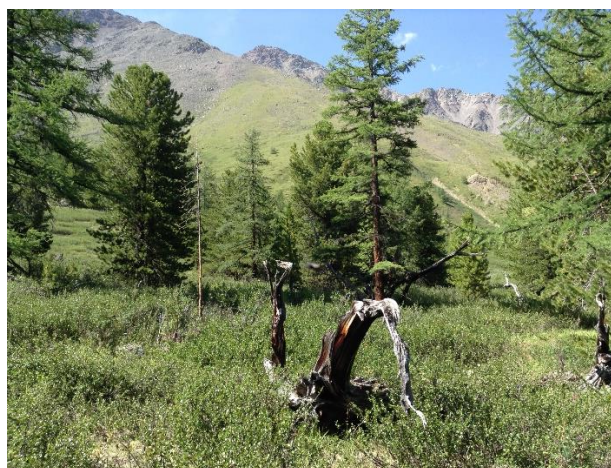
Site	Latitude	Longitude	Elevation, m a.s.l.
A1	50°05'40"N	87°48'25"E	2200–2300
A2	50°05'0"N	87°47'01"E	2100–2150
D1	49°57'23"N	87°51'03"E	2200–2300
D2	49°57'27"N	87°51'18"E	2360–2400
T	49°50'30"N	87°42'30"E	2400–2500

**Table S2.** Correlation coefficients between standard tree-ring width (TRW) and maximum latewood density (MXD) local and regional chronologies and monthly precipitation totals from the previous year September to September of ring formation. Statistically significant ( $P < 0.05$ ) correlations are marked in red.

Month	A1 TRW	A2 TRW	D1 TRW	D2 TRW	T TRW	Regional TRW	A1 MXD	D1 MXD	Regional MXD
pSep	0.00	0.04	0.08	-0.17	-0.10	-0.07	-0.01	0.04	0.00
pOct	-0.01	0.02	-0.15	0.03	-0.23	-0.08	0.09	0.01	0.04
pNov	-0.06	-0.03	-0.07	0.04	-0.18	-0.10	0.02	0.09	0.05
pDec	-0.08	-0.09	0.12	0.05	-0.05	-0.06	-0.04	0.03	-0.03
Jan	0.05	0.10	0.22	0.11	-0.01	0.11	-0.01	0.11	0.03
Feb	0.06	0.03	-0.01	0.12	-0.02	0.14	-0.11	-0.21	-0.18
Mar	-0.02	0.00	0.10	0.11	0.04	0.04	0.10	0.14	0.12
Apr	0.09	0.14	0.10	0.09	-0.07	0.07	0.10	0.13	0.11
May	-0.11	-0.05	-0.09	-0.10	-0.01	-0.06	-0.13	-0.08	-0.14
Jun	-0.12	-0.23	-0.10	-0.26	-0.28	-0.24	-0.15	-0.05	-0.15
Jul	-0.10	-0.16	-0.09	-0.07	-0.02	-0.15	-0.35	-0.45	-0.41
Aug	-0.02	0.06	-0.08	-0.14	0.13	0.01	-0.03	-0.07	-0.05
Sep	-0.08	0.05	0.09	-0.09	0.06	0.03	0.05	0.08	0.05



**Figure S1.** Site A1. Photo by D.V. Ovchinnikov



**Figure S2.** Site A2. Photos by A.V. Kirdyanov





**Figure S3.** Site D1. Photos by V.S. Myglan.



**Figure S4.** Site T. Photos by D.A. Ganyushkin.