

## SUPPLEMENTARY MATERIALS

**Table S1.** Pearson correlation coefficients\* between tree-ring width chronologies of different samples.

Samples	Common period	Chronology type	
		std	res
TUIM cores / TUIM sections	1790-2011	0.89	0.88
SON1 / SON2	1873-2013	0.47	0.65
TUIM / SON	1864-2013	0.65	0.72

\*All correlations are significant at  $p < 0.05$ .

**Table S2.** First-order autocorrelation coefficients<sup>a</sup> ( $r_1$ ) of main hydroclimatic variables.

Month	Annual difference of the Shira Lake level ( $\Delta L$ )	Monthly air temperature ( $T$ )	Monthly precipitation ( $P$ )
Jan	0.55	-0.02	0.06
Feb	0.48	0.10	0.00
Mar	0.46	-0.15	0.01
Apr	0.44	-0.13	-0.10
May	0.32	0.23	-0.03
Jun	0.34	0.30	0.05
Jul	0.34	0.23	-0.04
Aug	0.39	0.24	-0.11
Sep	0.46	0.10	0.12
Oct	0.50	0.21	-0.09
Nov	0.51	-0.23	-0.04
Dec	0.54	0.31	-0.05

<sup>a</sup>Periods for analysis are 1966-2012 for temperature and 1937-2012 for water-level change and precipitation. For monthly variables, first-order refers to a one-year lag for the particular month of year.

**Table S3.** Correlations<sup>a</sup> between detrended June level of Lake Shira Lake and integral tree-ring width.

Lake level series	Z-sum chronology		
	SHIRA	SON	TUIM
after removal of linear trend ( $L_{res1}$ )	0.19	0.02	0.20
after removal of cubic trend ( $L_{res3}$ )	0.33*	0.49*	0.26*

Correlations marked with an asterisk are significant at  $p < 0.05$ ; analysis period is 1936-2012 ( $N=77$ ).