Geophysical Research Letters

Supporting Information for

Summer drought reconstruction in Northeastern Spain inferred from a tree-ring latewood network since 1734

E. Tejedor[1,2]*, M.A. Saz[1,2], J. Esper[3], J.M. Cuadrat[1,2], M. de Luis[1,2]
[1]Department of Geography and Spatial planning. University of Zaragoza, Pedro Cerbuna 12, 50009, Zaragoza, Spain
[2]Environmental Sciences Institute of the University of Zaragoza
[3]Department of Geography, Johannes Gutenberg University, 55099 Mainz, Germany
*Corresponding author: Ernesto Tejedor (etejedor@unizar.es)

Contents of this file

Introduction

This is the supporting information including:

- The tree-ring latewood network characteristics in Northeastern Spain (Table S1; Figure S3).
- Additional information in the methodology (Figure S1; Figure S2; Figure S4; Figure S5, Table S2).
- EBSDR calibration statistics (Figure S6; Figure S7; Table S3).
- Comparison between EBSDR and Old World Drought Atlas (OWDA; Cook et al., 2015) and SPI12 July (Tejedor et al., 2016). (Figure S8).

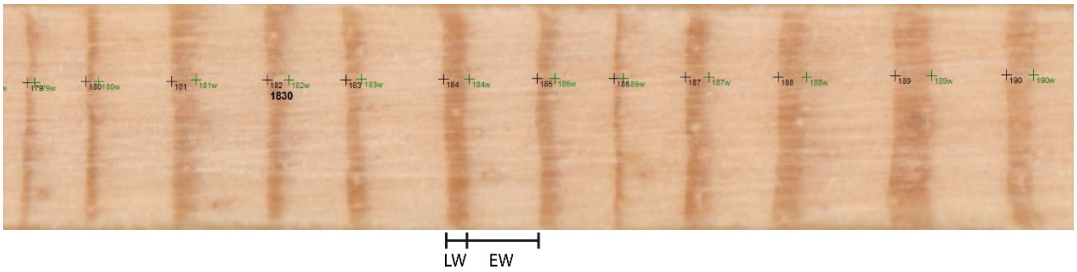

Figure S1. A sequence of annual growth rings for a *Pinus sylvestris* sample from the tree-ring network. Note the light-colored earlywood and dark-colored latewood cells differentiated by the image software Cybis CoRecorder 8.1.

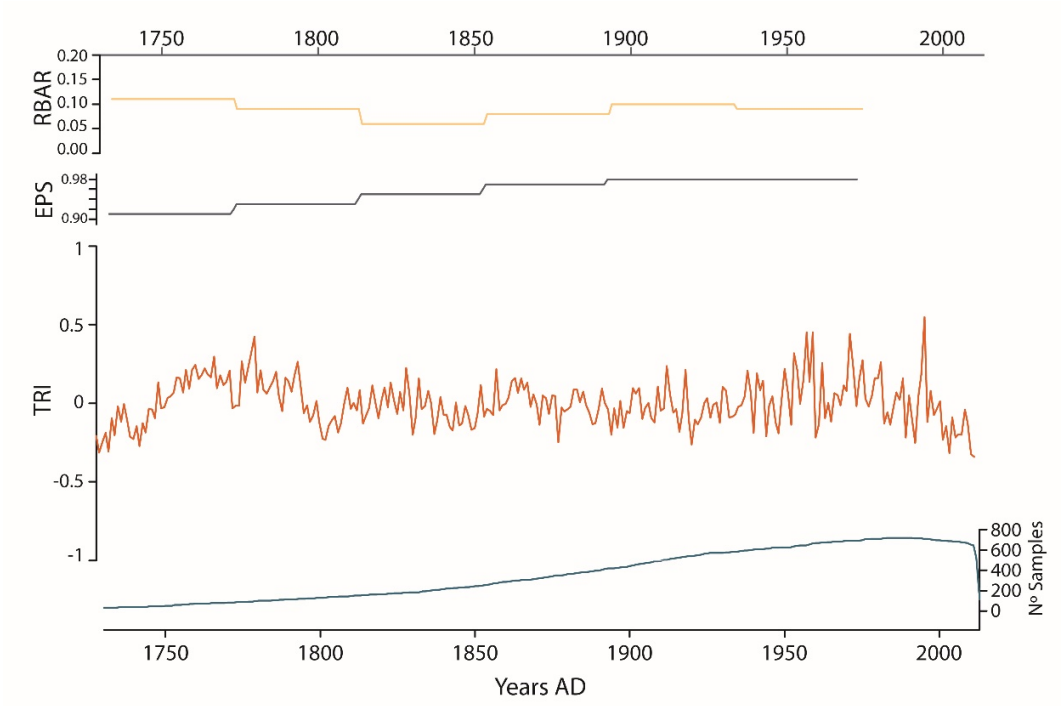

Figure S2. BasPois chronology shown together with the EPS and Rbar values (top panels) and replication (bottom panel).

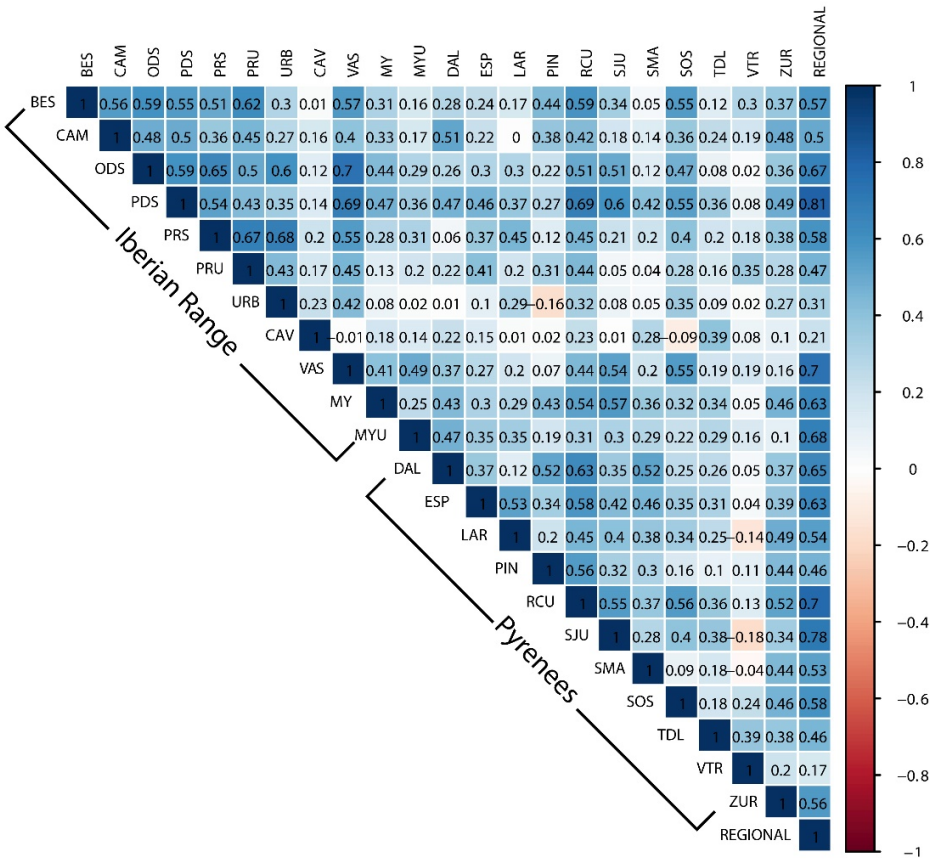

Figure S3. Correlations between detrended latewood site chronologies and regional composite over the 1969-2010 common period. Sites sorted by mountain ranges.

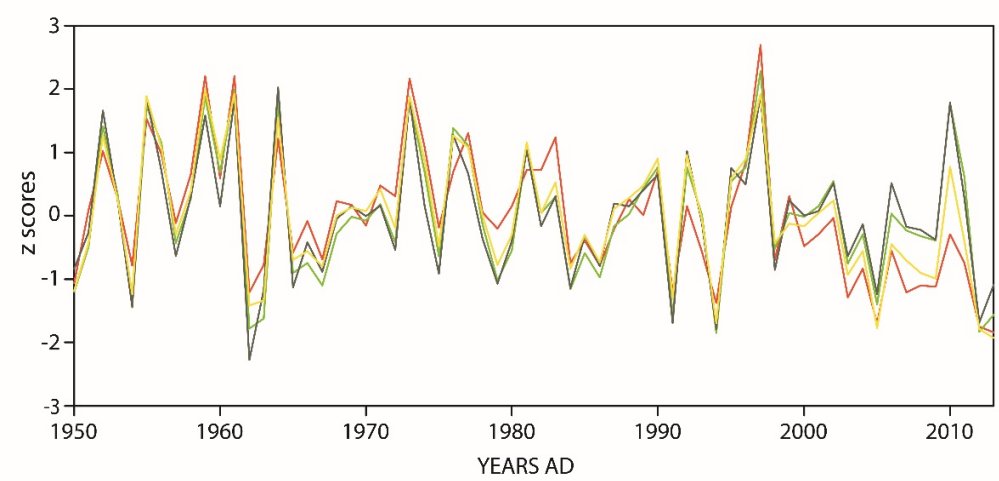

Figure S4. Tree-ring latewood width chronologies over the 1950-2013 calibration period after detrending using Splines with 50% cutoff (in green), residuals (black), RCS (yellow), BasPois chronology (red).

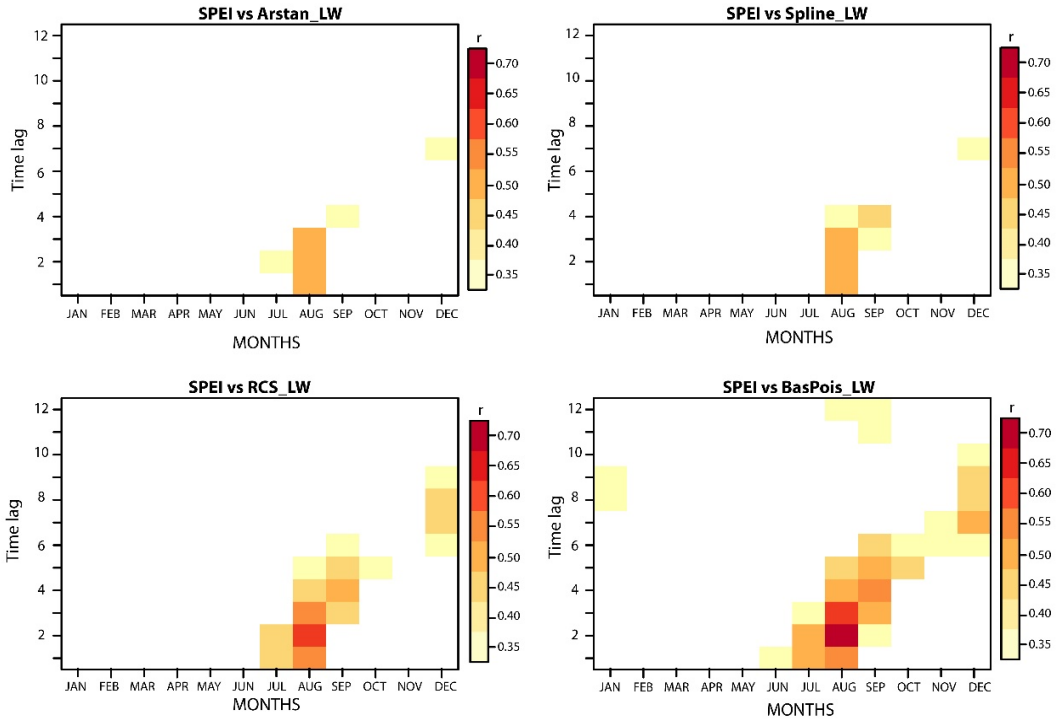

Figure S5. Relationship between the differently detrended chronologies and SPEI drought index. Only significant values ($p<0.01$) are shown.

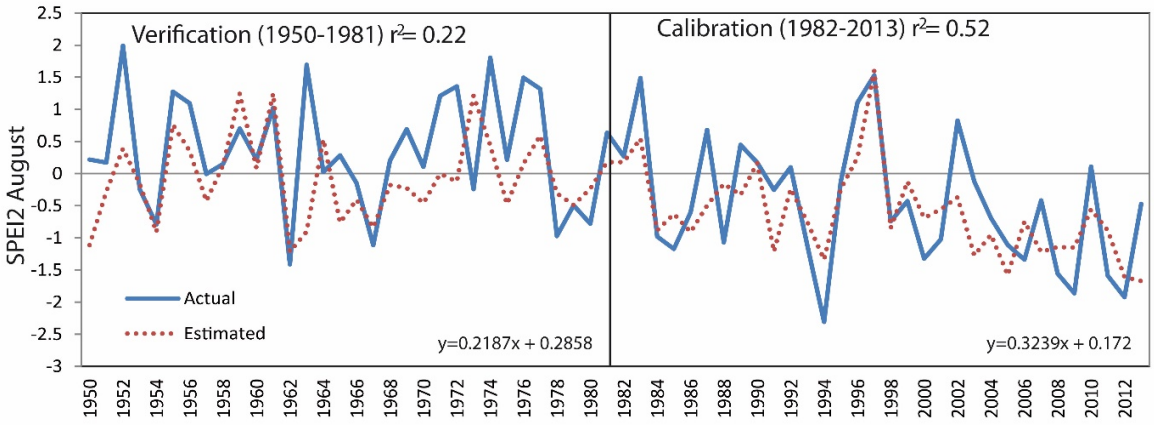

Figure S6. Calibration and verification results between the CRU based SPEI2August data and the latewood based SPEI2 reconstruction.

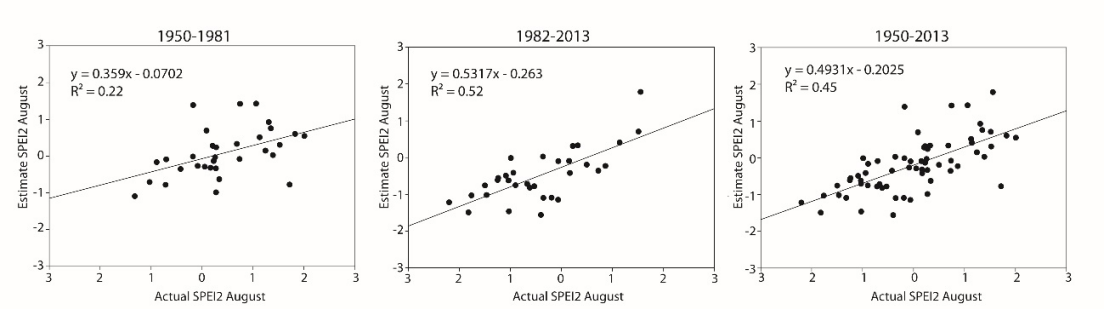

Figure S7. Model of the calibration/ verification periods and the full period finally used for developing the reconstruction.

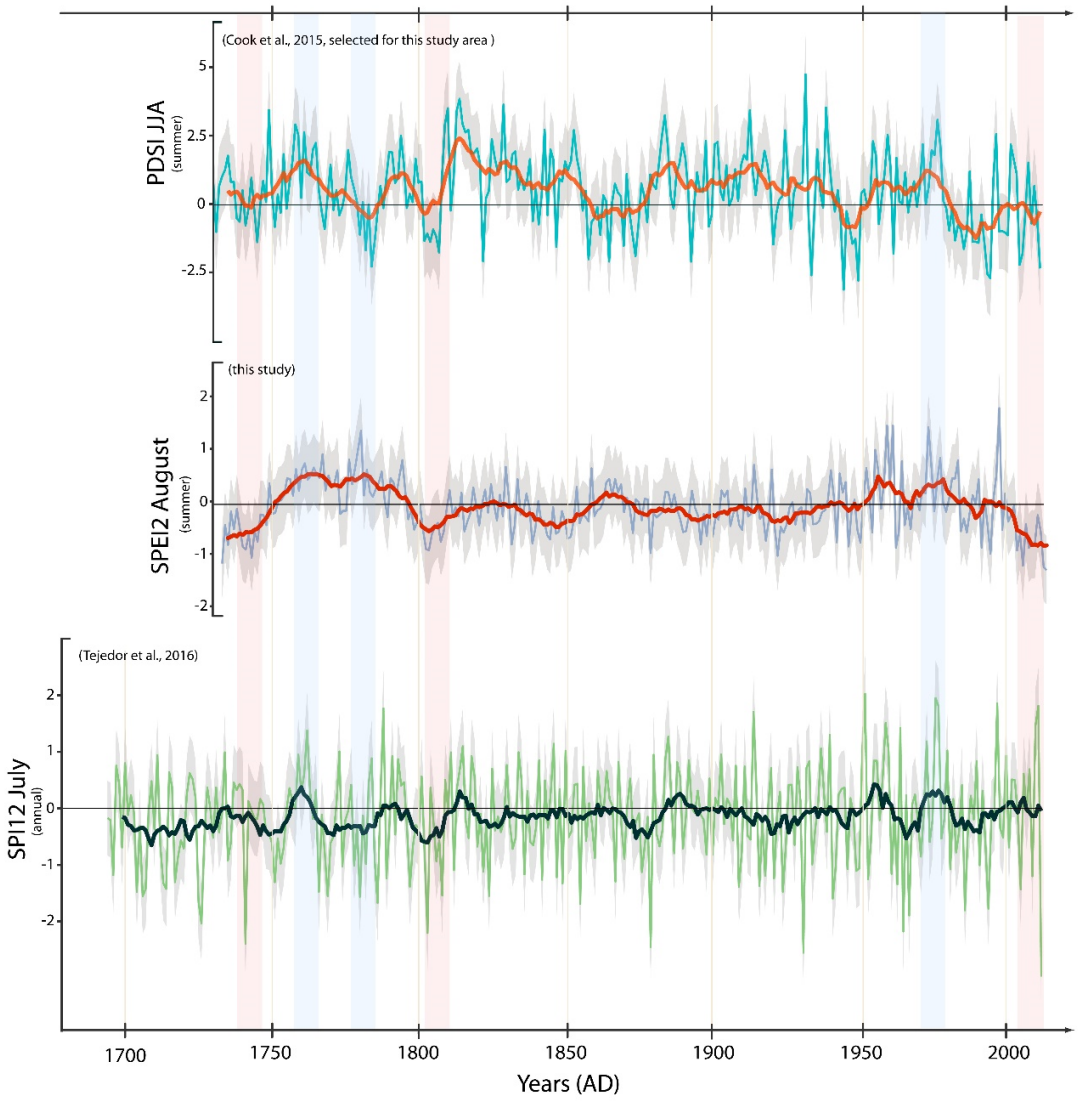

Figure S8. Comparison of drought reconstructions from northeastern Spain from 1694-2013. Grey shading indicates the mean square error while vertical shading indicates extremely wet (in blue) and dry (in red) common periods. Although the Cook et al., 2015 reconstruction spans the 870-2012 we have just represented the common period with SPEI2 August.

Code	SP	Lat	Long	Altitude	Start	End	Extension	Trees	Samples	Tree rings	RBAR
MYU	PIUN	41.75	-1.80	1900	1969	2011	41	10	20	692	0.38
SJU	PISY	42.48	-0.10	800	1958	2012	54	5	10	484	0.53
MY	PISY	41.80	-1.83	1765	1935	2011	76	10	20	1311	0.41
SMA	PISY	42.47	0.51	1300	1898	2012	114	10	20	1854	0.45
SOS	PISY	42.72	0.77	1600	1861	2013	152	17	34	3490	0.37
VAS	PISY	40.29	-1.41	1600	1853	2012	159	18	36	2548	0.43
PDS	PISY	40.72	0.18	1200	1837	2012	175	16	34	2983	0.35
PRS	PISY	40.39	-0.67	2000	1830	2011	181	20	38	4797	0.45
ODS	PISY	40.52	-1.65	1750	1828	2011	183	20	41	5255	0.41
BES	PISY	40.56	-0.46	1700	1821	2012	191	13	25	3255	0.37
VTR	PIUN	42.42	2.26	2100	1787	2013	226	21	41	4663	0.19
LAR	PIUN	42.97	-0.76	1900	1778	2012	234	29	56	5697	0.20
DAL	PISY	42.36	1.16	1500	1746	2013	267	17	34	5237	0.22
TDL	PIUN	42.44	1.65	2100	1745	2013	268	20	43	6503	0.19
URB	PISY	41.96	-2.83	1700	1733	2012	279	30	60	11328	0.45
ESP	PISY	42.42	0.55	1900	1728	2012	284	21	40	3075	0.28
ZUR	PISY	42.85	-0.78	1400	1700	2012	312	21	42	9162	0.21
CAS	PISY	40.11	-1.02	1800	1696	2012	316	19	38	6221	0.27
PIN	PIUN	42.72	-0.51	2000	1645	2012	367	20	41	7788	0.33
RCU	PISY	42.69	-0.47	1600	1610	2012	402	12	26	3420	0.38
PRU	PIUN	40.39	-0.67	2000	1607	2011	404	20	39	5751	0.39
CAV	PIUN	42.01	-2.75	1900	1593	2012	419	18	36	9236	0.18
							Total	**387**	**774**	**104750**	

Table S1. Tree-ring latewood network sorted by extension. SP (Species), PIUN (*Pinus uncinata*), PISY (*Pinus sylvestris*).

The relationship between EW and total ring width is r=0.97, while the relationship between EW and LW is r=0.67. The low rbar values are common when different sites and species are included (Briffa et al., 2008).

	Nº of series	Correlation between trees (RBAR)	Correlation within trees	EPS	SNR	First Eigenvector	Mean sensitivity
Latewood width chronology	774	0.10	0.49	0.96	23.7	27.6%	0.14
Tree-ring width chronology	774	0.19	0.61	0.98	21.7	31.1%	0.09

Table S2. Chronologies characteristics. EPS (Expressed population signal); SNR (Signal to Noise Ratio).

	Calibration 1950-1981	Verification 1982-2013	Calibration 1982-2013	Verification 1950-1981	Period 1950-2013
Years	32	32	32	32	64
Correlation	0.47	0.72	0.72	0.47	0.67
R^2	0.21	0.52	0.52	0.21	0.45
MSE	0.67	0.58	0.43	0.71	0.65
Reduction of error	0.36	0.36	0.59	0.17	0.53
Sing test	22+/10-	26+/6-	26+/6-	22+/10-	48+/16-
Durbin-Watson	2.04	1.91	1.91	2.04	1.98

Table S3. Calibration/verification statistics.