Supplementary Material for "Self-potential signals related to tree transpiration in a Mediterranean climate"

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Description of the Supplementary Material

Figure S1 displays the correlation coefficients between tree data (SP and sap velocity) and meteorological data (precipitation, air temperature, actual evapotranspiration, global radiation and vapor pressure deficit) at the Font-Blanche site. The raw tree SP data were de-sampled to a 30-min interval to calculate the Pearson correlation coefficient between it with other half-hourly measured data (see Table S1).

Figure S2 shows the one-year data collected at the Larzac and LSBB sites throughout 2023, including continuous measurements of sap velocity and SP in two oaks. There are missing sap velocity data for LaQp in July. Daily meteorological data collected at the LSBB site end on July 30, 2023.

Figure S3 presents the test results of using different total numbers of modes to decompose tree SP data on the Holm oak (FBQi) at the Font-Blanche site using the VMD method. The second-last decomposed modes of tree SP data under different totals show similar amplitudes and patterns in a diurnal rhythm.

Figure S4 exhibits the frequency spectra of six decomposed modes of tree SP and sap velocity data collected on the Aleppo pine (FBPh) at the Font-Blanche site using the VMD method.

Figure S5 includes the Pearson correlation coefficients between the decomposed sub-signals collected at the Font-Blanche site within April 16-30, 2023.

Figure S6 suggests an experimental setup describing how SP electrodes equipped on the trunk may obtain duplicated measurements and analyze the electrode-related effects.

Table S1 includes different parameters of measurements and the corresponding sampling time interval.

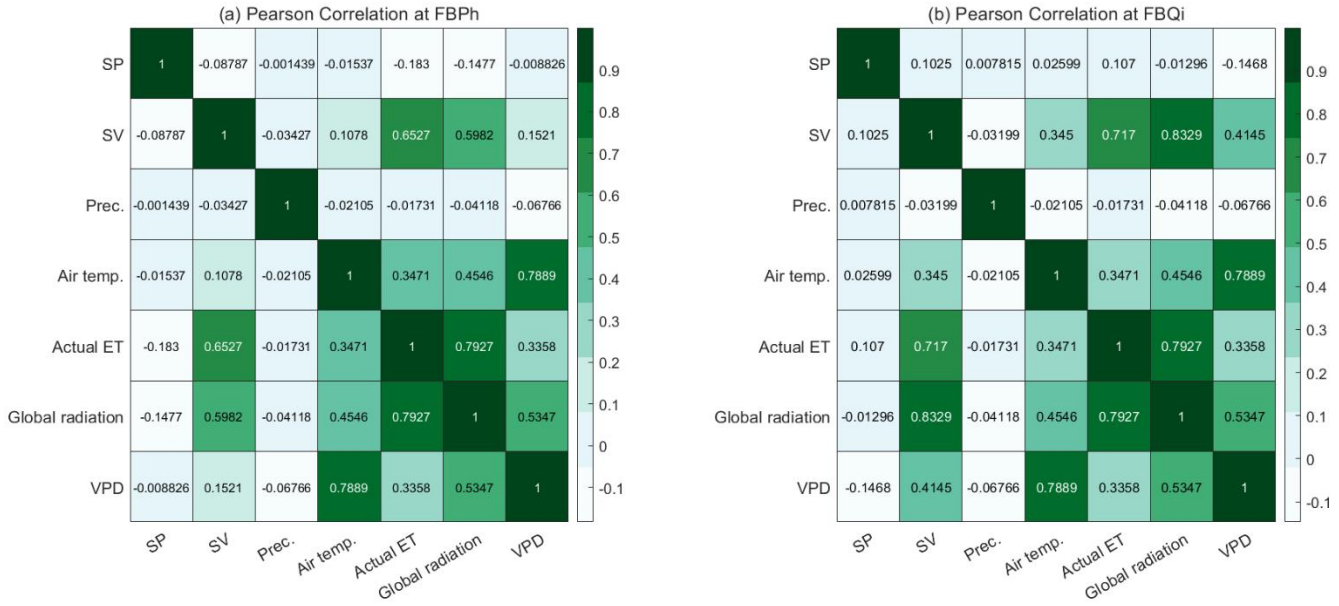

Figure S1: The correlation coefficients of the time-varying data at the Font-Blanche site. (a-b) Pearson correlations on Aleppo pine (a) and Holm oak (b), respectively

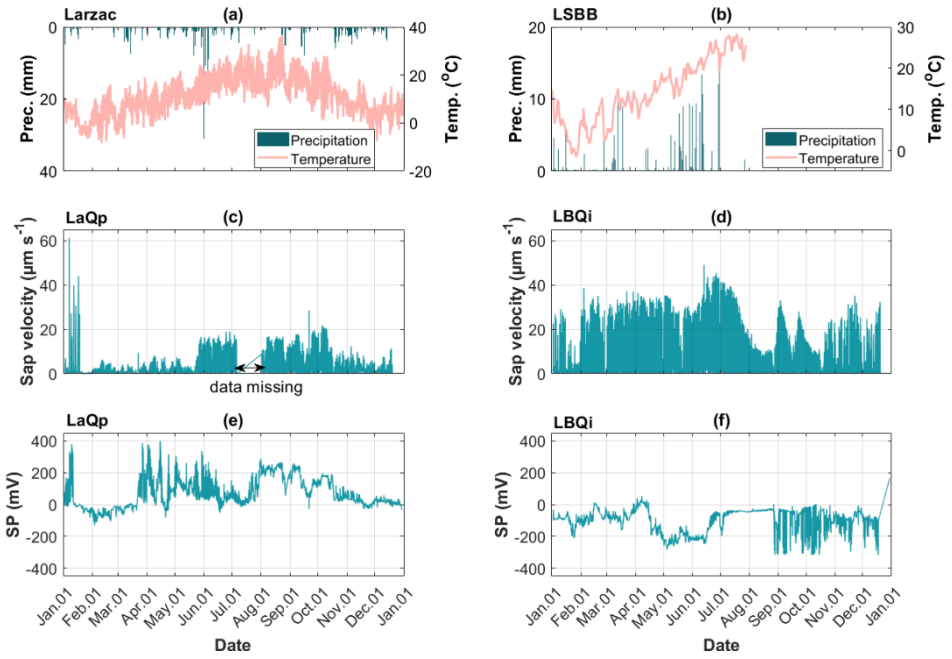

Figure S2: One-year data collected at the Larzac and LSBB sites from January 1, 2023, to January 1, 2024. (a-b) Precipitation and air temperature data; (c-d) Sap velocity for the Pubescent oak (LaQp) and the Holm oak (LSQi), respectively; (e-f) SP measurements for LaQp and LSQi, respectively.

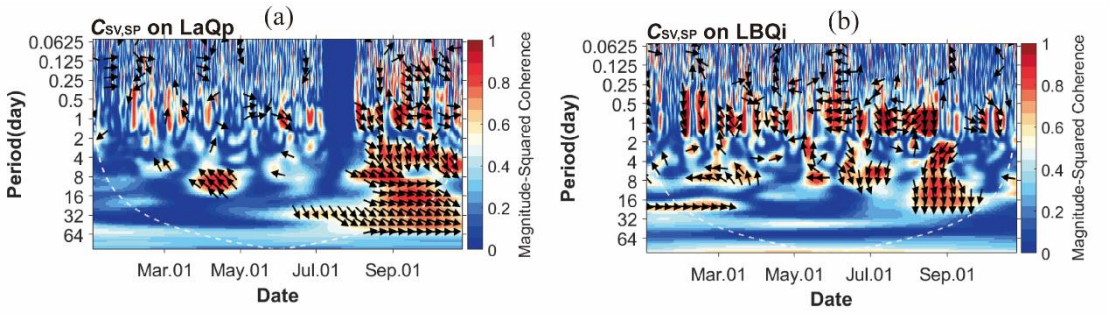

Figure S3: Wavelet coherence analysis between sap velocity and SP data on the Pubescent oak (LaQp) at the Larzac site (a), and the Holm oak (LSQi) at the LSBB site (b), respectively; Arrows denote the lag/lead phase between the two time series; White dashed lines indicate the cone of influence where edge artifacts are negligible.

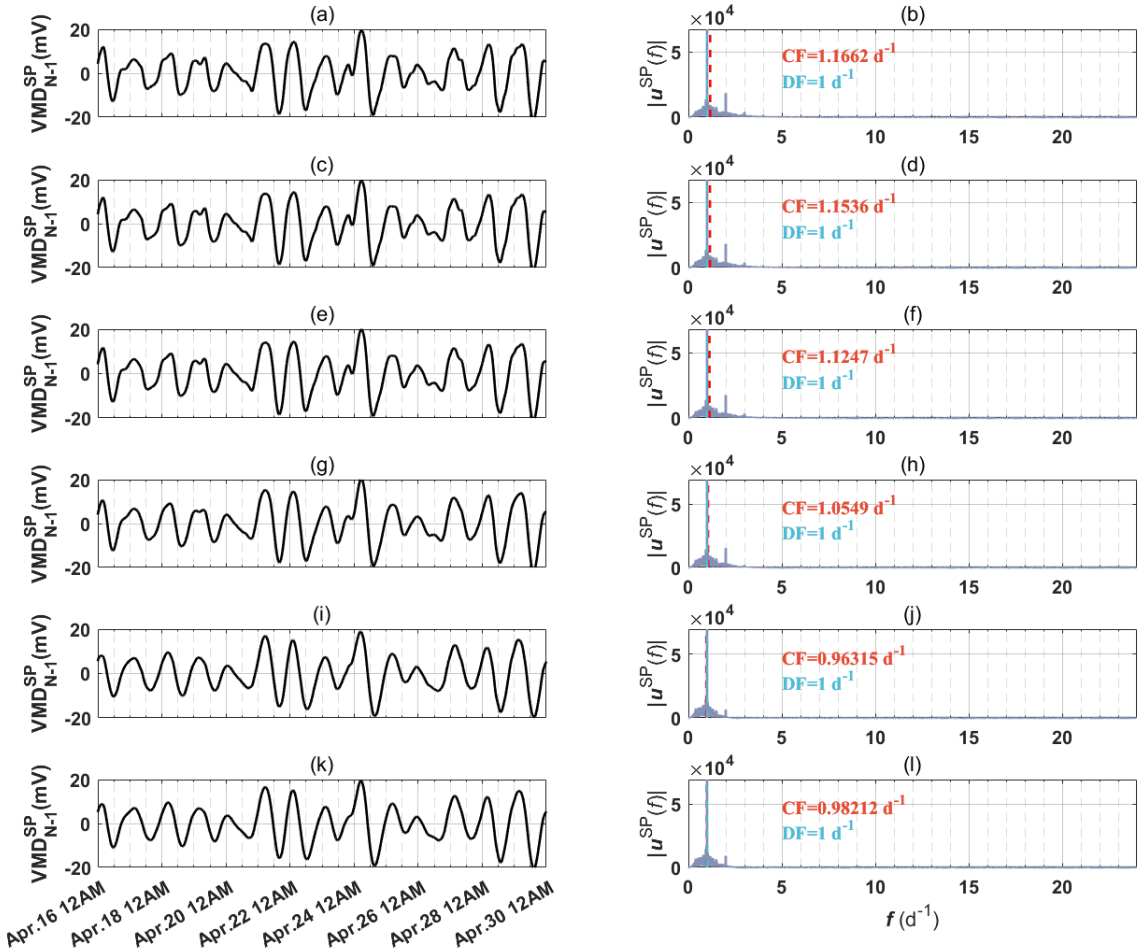

Figure S4: The second-last decomposed modes of tree SP data (left column: a, c, e, g, i, k) obtained for the Holm oak at the Font-Blanche site (FBQi) and their corresponding frequency spectra (right column: b, d, f, h, j, l). The total number of modes *N* used to decompose the data are 7, 8, 9, 10, 11, and 12 from the top (a-b) to the bottom (k-l).

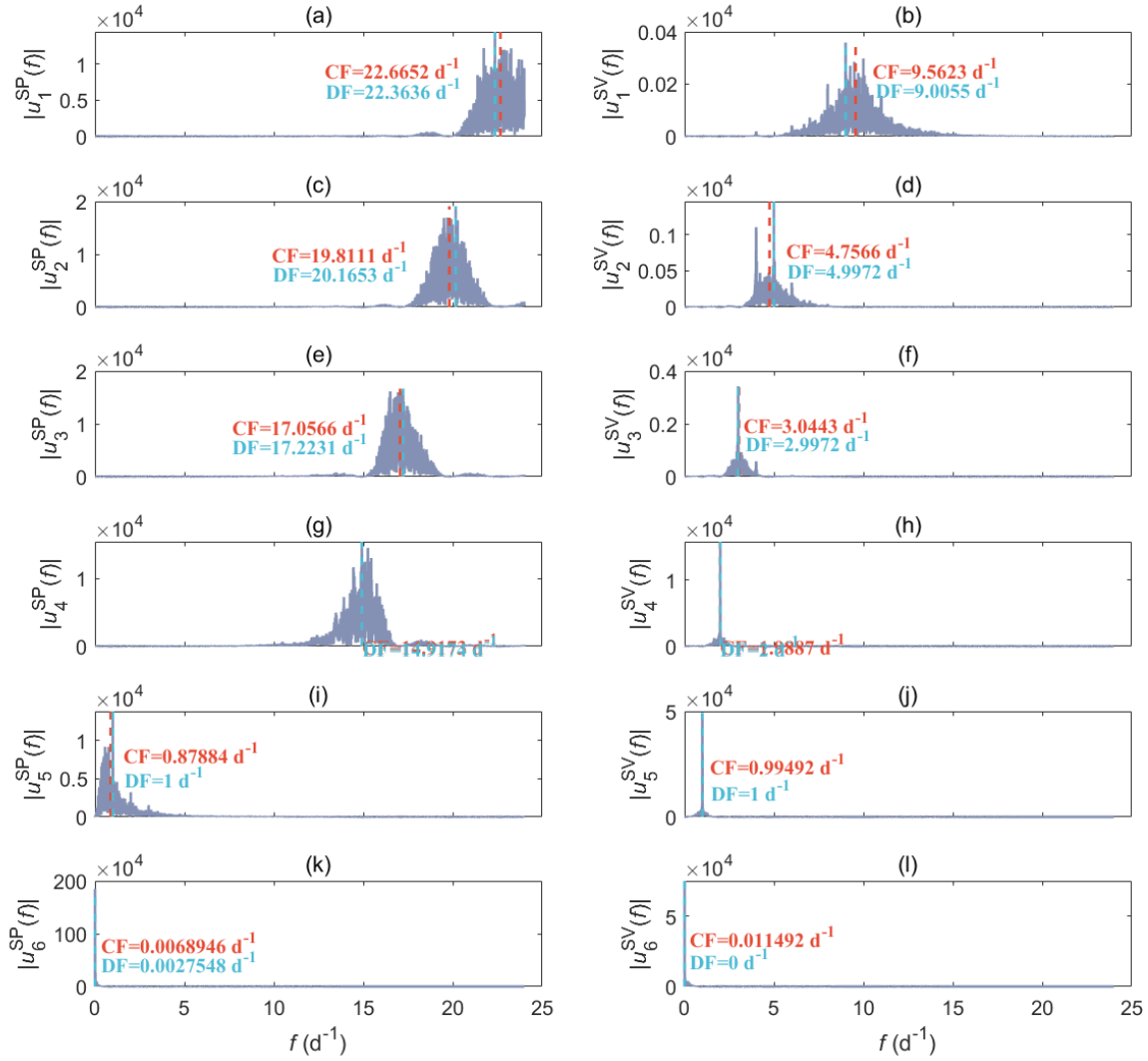

Figure S5: Frequency spectra of six decomposed modes of tree SP (left column: a, c, e, g, i, k) and sap velocity (right column: b, d, f, h, j, l) data obtained on the Aleppo pine at the Font-Blanche site (FBPh) within 2023 using VMD; Different rows correspond to different modes, where "CF" and "DF" indicate the central frequency and dominant frequency of the corresponding mode, respectively.

Figure S6: The correlation coefficients of the VMD-based data in diurnal time scales at the Font-Blanche site in April 16-30, 2023

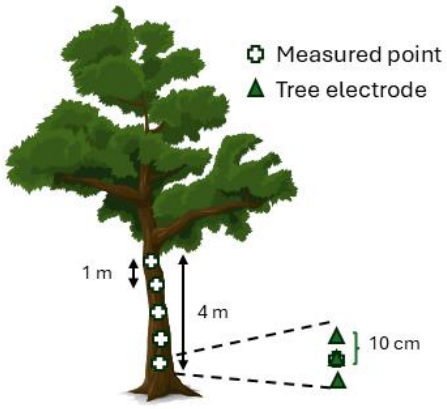

Figure S7: Schematic diagram of tree electrode configuration

Table S1 Parameters of measurements and the corresponding sampling time interval and units.

Site / Parameter	Larzac		LSBB		Font-Blanche	
	Time interval	Unit	Time interval	Unit	Time interval	Unit
Tree SP	1 min	mV	1 min	mV	10 min	mV
Sap velocity	30 min	μm/s	30 min	μm/s	30 min	μm/s
Precipitation	1 h	mm	24 h	mm	30 min	mm
Air temperature	1 h	ºC	24 h	ºC	30 min	ºC
VPD	/	/	/	/	30 min	Pa
Actual ET	/	/	/	/	30 min	mm