

Supplementary material of Climatic factors influencing Aleppo pine sap flow in orographic valleys under two contrasting Mediterranean climates

S1. Probe misalignment

Table S1. Probe misalignment values in the different pine along the four sites. Dashed line (-) denoted that the pine individual was not used in the transpiration calculation because of technical issues.

ID	Parameter	Dry sub humid		Semi arid	
		Inland DSH-I	Coastal DSH-C	Inland SA-I	Coastal SA-C
1	X1	0.55	0.23	-	-
	X2	0.64	0.82	-	-
2	X1	0.58	0.43	-	0.75
	X2	0.62	0.73	-	0.40
3	X1	0.61	0.68	0.67	-
	X2	0.60	0.50	0.53	-
4	X1	-	0.36	0.70	0.61
	X2	-	0.77	0.49	0.58
5	X1	0.66	0.52	0.56	0.53
	X2	0.52	0.67	0.64	0.66
6	X1	0.54	0.16	0.41	0.41
	X2	0.66	0.83	0.74	0.74

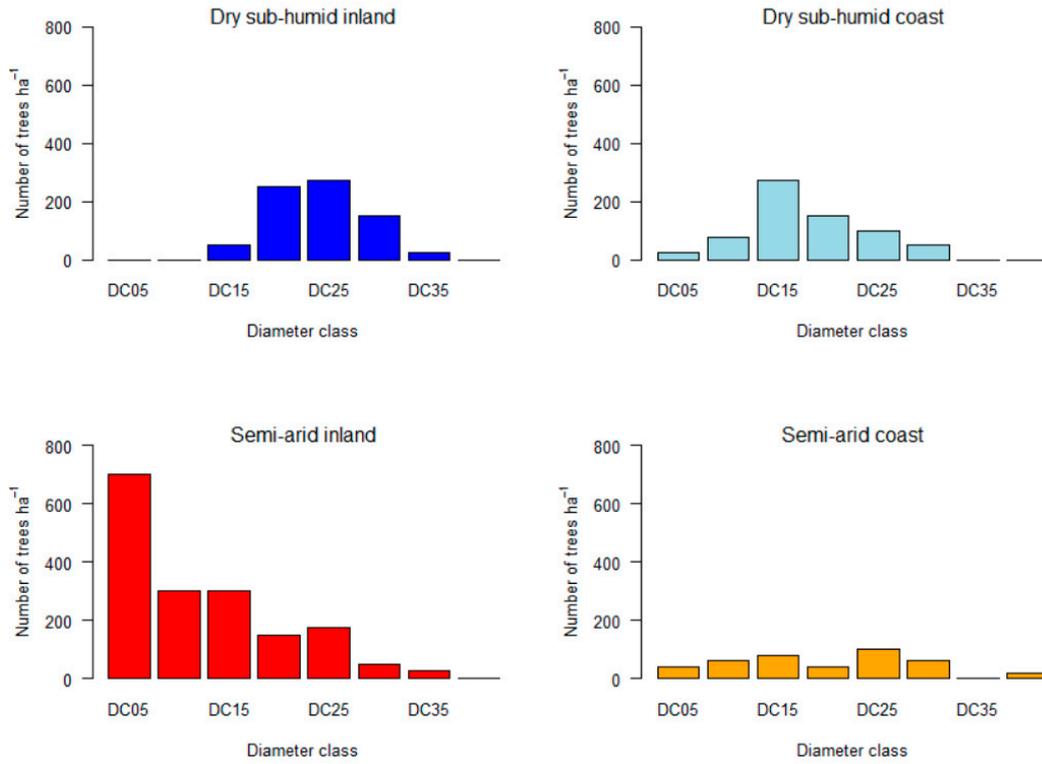


Figure S1. Number of trees per diameter class. Diameter class classification (DC): DC05: $2.5 \text{ cm} \leq \text{Diameter } (\emptyset) < 7.5 \text{ cm}$. DC10: $7.5 \text{ cm} \leq \emptyset < 12.5 \text{ cm}$. DC15: $12.5 \text{ cm} \leq \emptyset < 17.5 \text{ cm}$. DC20: $17.5 \text{ cm} \leq \emptyset < 22.5 \text{ cm}$. DC25: $22.5 \text{ cm} \leq \emptyset < 27.5 \text{ cm}$. DC30: $27.5 \text{ cm} \leq \emptyset < 32.5 \text{ cm}$. DC35: $32.5 \text{ cm} \leq \emptyset < 37.5 \text{ cm}$. DC40: $37.5 \text{ cm} \leq \emptyset < 42.5 \text{ cm}$.

S2. Supplementary climatic and water fluxes description

The dynamics of SWC were quite similar between sites (Fig. 2b), but globally SWC had higher values in DSH-I and SA-C areas (p-value < 0.05; Table S2) and lower values in DSH-C (p-value < 0.05; Table S2). VPD was also similar among sites but had lower values in the DSH-I site (p-value < 0.5; Table S2; Fig. S2).

Table S2. Annual mean precipitation and temperature during the period 1991-2021 [136-139]. Annual total precipitation in 2021. Annual daily means of soil water content (SWC), air temperature and relative humidity, vapour pressure deficit (VPD), sap flow (SF) and transpiration (T) along the four study sites during the year 2021. Minimum and maximum values were respectively indicated in brackets. Different letters mean significant differences between sites at p-value < 0.05.

	Dry sub-humid		Semi-arid	
	Inland (DSH-I)	Coastal (DSH-C)	Inland (SA-I)	Coastal (SA-C)
Historical Precipitation (mm)	492	460	421	421
Historical Temperature (°C)	12.7	16.6	16.5	16.6
Precipitation (mm)	351	381	392	339
SWC (m ³ m ⁻³)	0.22 a (0.12, 0.33)	0.17 b (0.12, 0.30)	0.20 a (0.12, 0.30)	0.22 c (0.17, 0.30)
Air Temperature (°C)	12.3 a (-4.5, 30.5)	17.6 b (3.1, 31.4)	15.9 c (1.0, 32.0)	15.4 d (-0.1, 32.9)
Relative Humidity (%)	72.1 a (24.6, 100)	71.8 a (38.7, 100)	71.1 a (23.2, 100)	70.3 b (25.8, 99.8)
VPD (kPa)	0.65 a (<0.1, 3.32)	0.86 b (<0.1, 3.41)	0.93 b,c (<0.1, 3.79)	0.84 d (<0.1, 5.75)
SF _{day} (L day ⁻¹ tree ⁻¹)	3.83 a (0, 10.08)	5.77 b (0, 14.00)	20.90 c (0, 53.59)	7.10 d (0, 27.84)
T _{day} (L day ⁻¹ m ⁻² ground)	0.29 a (0, 0.76)	0.40 b (0, 0.95)	1.25 c (0, 3.22)	0.28 a (0, 1.11)

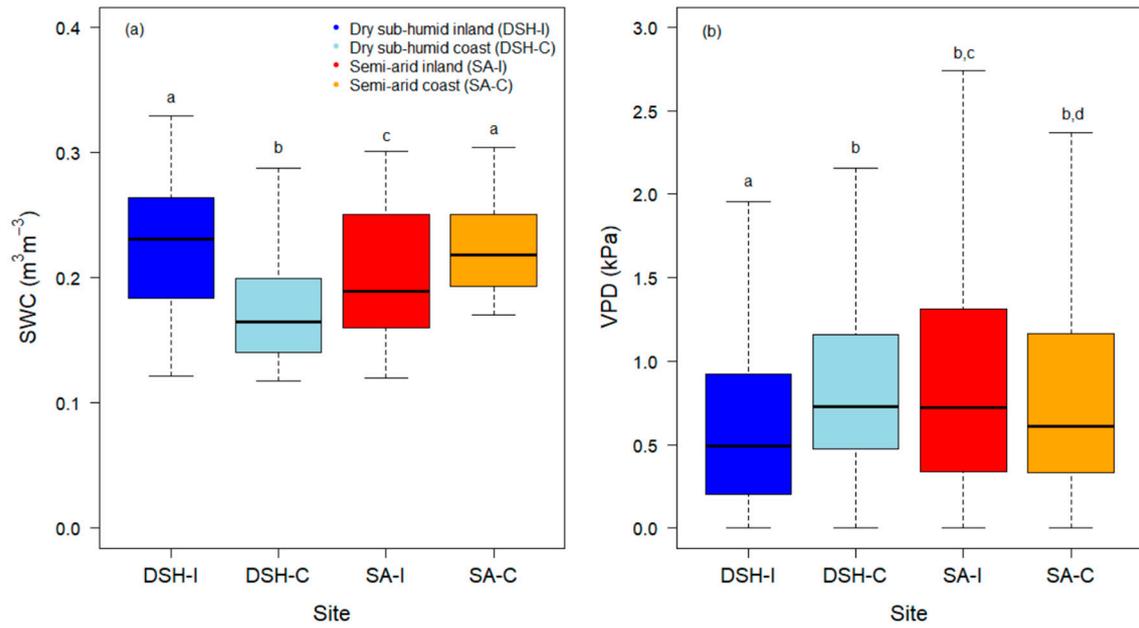


Figure S2. Boxplots of (a) daily mean soil water content (SWC) and (b) daily mean vapour pressure deficit (VPD). Boxplots show the median (horizontal line), the quartiles (boxes), the 1.5 times the interquartile range (whiskers). Different letters indicate significant differences between sites at p -value < 0.05 ; $n = 4-6$.

S.6. Comparative of SPEI between sites

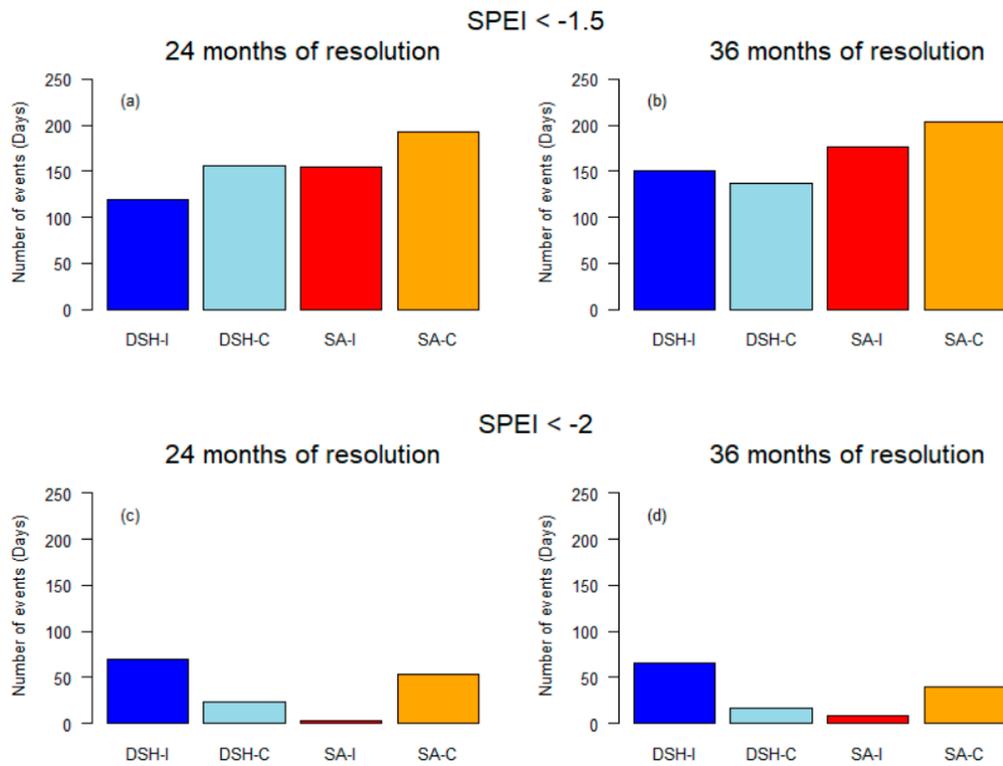


Figure S3. Number of events (days) with Standardized Precipitation Evapotranspiration Index (SPEI) values lower than -1.5 (a-b) and -2 (c-d). The time window was from 1961 to 2021 with resolution of 24 (a,c) and 36 months (b,d). The database of meteorological drought indices for the four study sites was available in [140] under the Open Database License.

S3. Analysis of climate thresholds

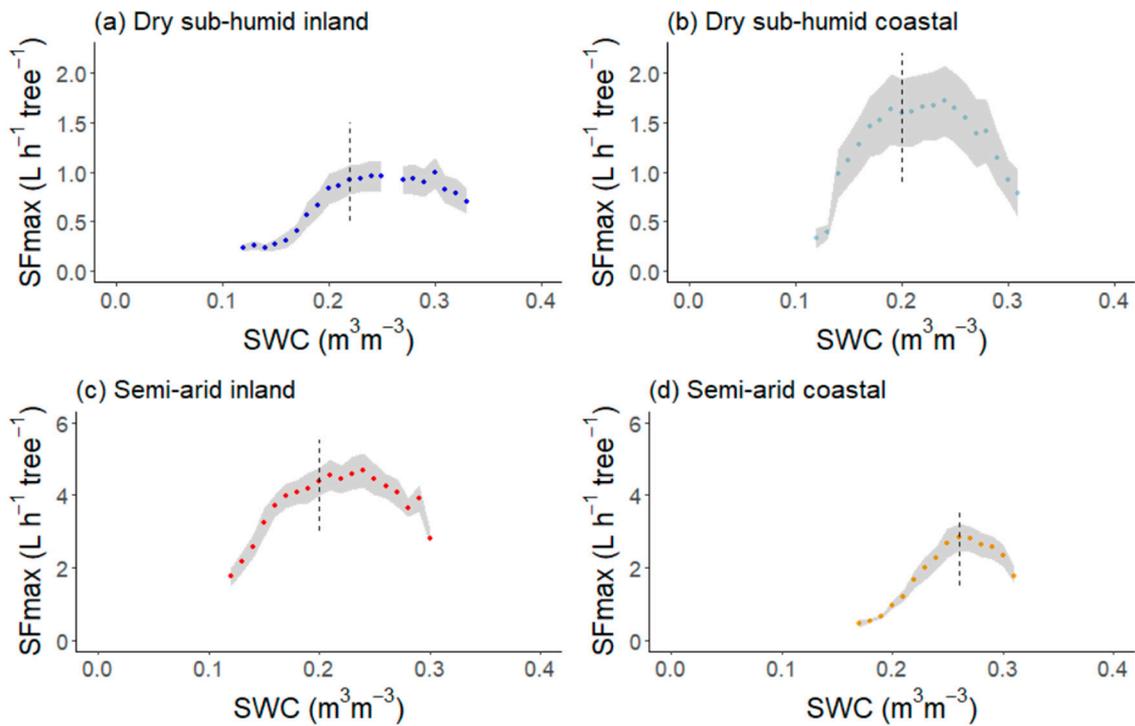


Figure S4. Maximum sap flow per individual (SF, $L h^{-1} tree^{-1}$) per each soil water content (SWC) value along the four study sites (mean \pm standard error). Dashed lines indicate mean SWC threshold.

Table S3. Summary statistics of the difference in soil water content threshold at which sap flow achieve its maximum between sites. Dry sub-humid inland (DSH-I); dry sub-humid coastal (DSH-C), semi-arid inland (SA-I) and semi-arid coastal (SA-C). Asterisk (*) denotes p-value lower than 0.05.

	DSH-I vs DSH-C	DSH-I vs SA-I	DSH-I vs SA-C
Fixed effects			
Intercept	$0.222 \pm 0.005 *$	$0.222 \pm 0.004 *$	$0.222 \pm 0.003 *$
Coefficients	$-0.018 \pm 0.007 *$	$-0.020 \pm 0.006 *$	$0.041 \pm 0.005 *$
Random effects			
Intercept	0.010	0.008	0.007
Residual	0.004	0.003	0.003
	DSH-C vs SA-I	DSH-C vs SA-C	SA-I vs SA-C
Fixed effects			
Intercept	$0.203 \pm 0.005 *$	$0.203 \pm 0.005 *$	$0.203 \pm 0.004 *$
Coefficients	-0.001 ± 0.008	$0.059 \pm 0.007 *$	$0.060 \pm 0.005 *$
Random effects			
Intercept	0.012	0.011	0.008
Residual	0.004	0.004	0.003

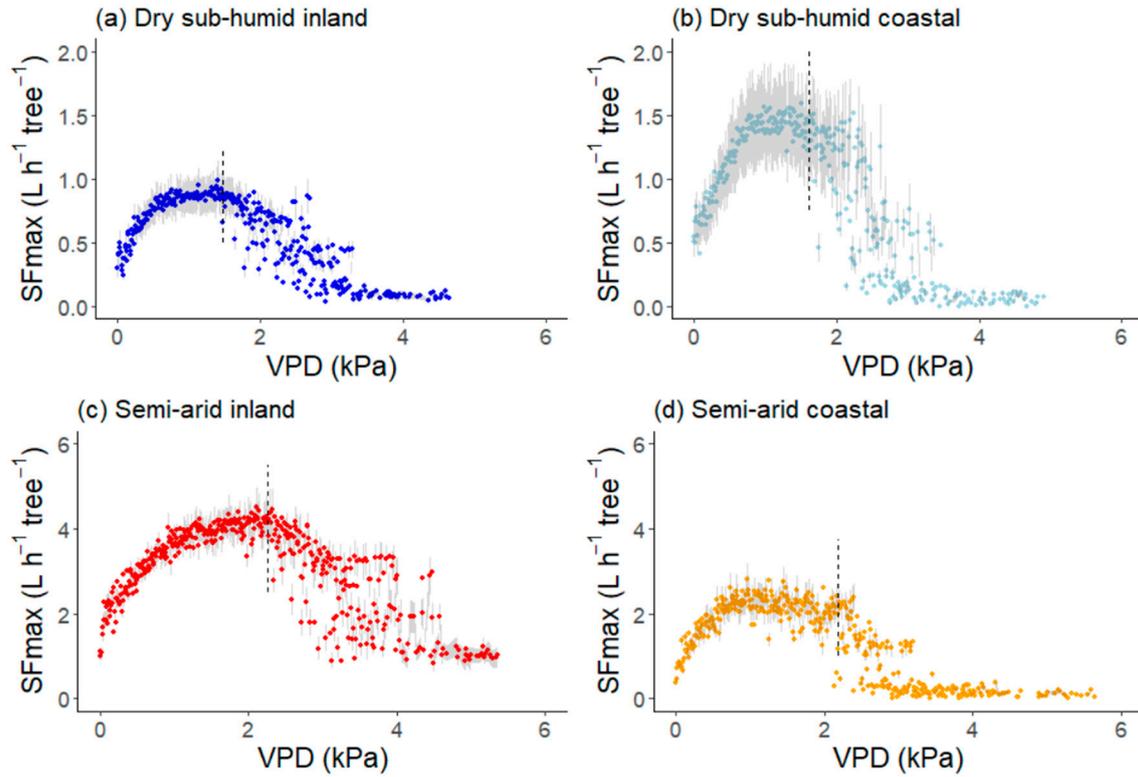


Figure S5. Maximum sap flow per individual (SF, $L h^{-1} tree^{-1}$) per each vapour pressure deficit (VPD) value along the four study sites (mean \pm standard error). Dashed lines indicate the mean VPD threshold.

Table S4. Summary statistics of the difference in vapour pressure deficit threshold at which sap flow achieve its maximum between sites. Dry sub-humid inland (DSH-I); dry sub-humid coastal (DSH-C), semi-arid inland (SA-I) and semi-arid coastal (SA-C). Asterisk (*) denoted p-value lower than 0.05.

	DSH-I vs DSH-C	DSH-I vs SA-I	DSH-I vs SA-C
Fixed effects			
Intercept	1.480 ± 0.081 *	1.48 ± 0.033 *	1.480 ± 0.032 *
Coefficients	0.081 ± 0.110	0.77 ± 0.049 *	0.695 ± 0.048 *
Random effects			
Intercept	0.170	0.069	0.067
Residual	0.064	0.026	0.025
	DSH-C vs SA-I	DSH-C vs SA-C	SA-I vs SA-C
Fixed effects			
Intercept	1.583 ± 0.076 *	1.583 ± 0.075 *	2.250 ± 0.027 *
Coefficients	0.667 ± 0.120 *	-0.592 ± 0.120 *	-0.075 ± 0.038
Random effects			
Intercept	0.175	0.174	0.051
Residual	0.065	0.065	0.019