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*Supplement of*

**Technical note: Long-term probe misalignment and  
proposed quality control using the heat pulse method  
for transpiration estimations**

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## Supplementary material

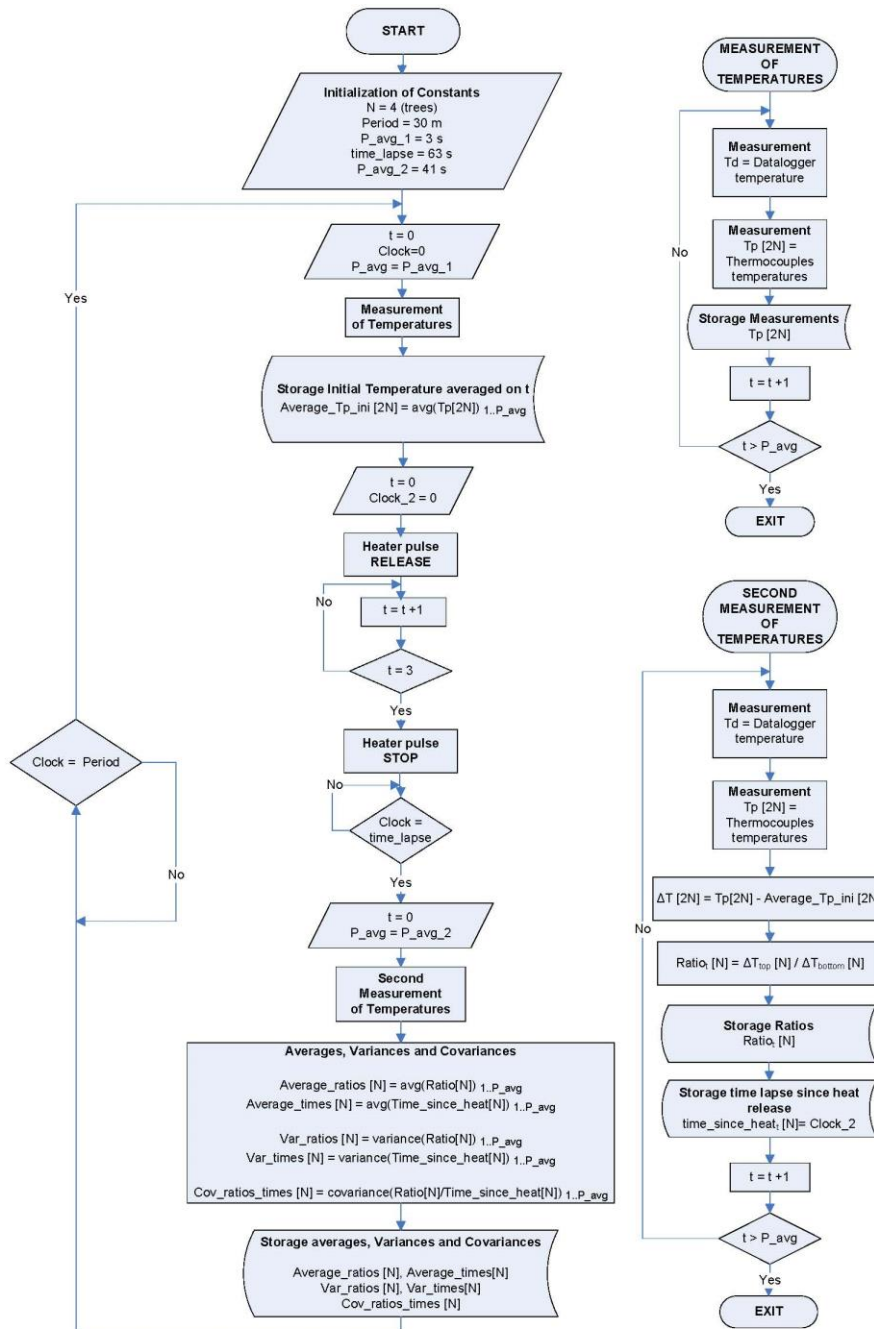


Figure. S1. Detailed flow chart of the procedure for data sampling. Each step represents a command in the script for the datalogger.

List of variables referenced in the flow chart:

N: Number of trees sampled (in our case, 4 trees).

**Period:** Time between two consecutive measurements or heat pulse releases (in our case, 30 minutes).

**P\_avg\_1:** Period to average the initial temperatures (before the heat release) by the thermocouple probes (in our case, 3 seconds).

**P\_avg\_2:** Period to average the final temperatures (after the heat release) by the thermocouple probes (in our case, 41 seconds).

**Time\_lapse:** Elapsed time from the beginning of initial temperatures to the beginning of final temperatures corresponding to the measurement of the cooling ramp at the thermocouples (in our case this lapse is 63 s).

**t:** time counter, or dummy variable, to count the elapsed time inside each of the different loops of the programme (in seconds).

**Clock:** Marks the temporal sequence of the whole process, from the beginning of the process of the measurements (instant zero) to the end of the periodic process for all measurements (the maximum number allowed is determined by the constant Period, which in our case is 30 minutes). The processing speed of the data logger must have the capacity to perform all the calculations in a time (measured by "Clock") lower than the pre-set measurement period (determined by "Period").

**Clock\_2:** Monitor the time elapsed between the release of the heat pulse and the instant when thermocouples are measured.

**Td:** Temperature at the data logger (this temperature is necessary to be known to correctly measure temperature using thermocouples).

**Tp [2N]:** Array of the temperatures measured at the 2N thermocouple probes (there are two thermocouples per tree).

**Average\_Tp\_ini [2N]:** Array of the averaged initial temperatures at the 2N thermocouple probes. Average is calculated using the P\_avg\_1 period, previous measurements to the beginning of the heat release.

**$\Delta T$  [2N]:** Array of the variations of the temperatures in the 2N thermocouples due to the heat release (variations with respect to their initial temperatures).

**Ratio<sub>t</sub> [N]:** Ratio between the temperature variations in the thermocouple above the heater ( $\Delta T_{top}$  [N]) and those below the heater ( $\Delta T_{bottom}$  [N]). Sub index indicates the time corresponding to the ratio (in our case the ratios are measured at the 60s second after the beginning of the heat release and for the next 40 seconds).

**Time\_since\_heat<sub>t</sub> [N]:** Storage of the time elapsed between the start of the heat pulse release and the instant when thermocouples are measured. Sub index indicates the time corresponding to each measurement, this sub index matches this variable with Ratio<sub>t</sub> [N].

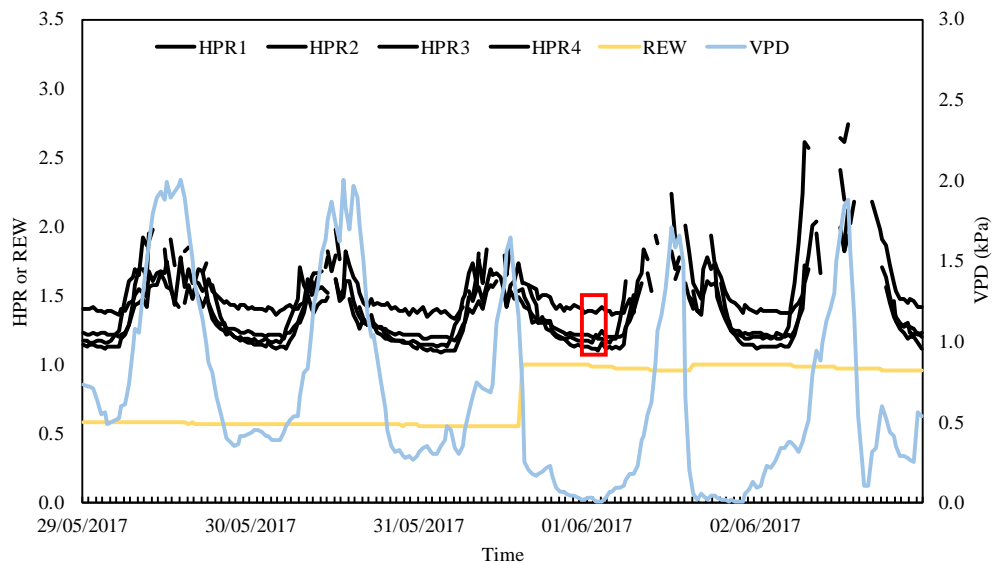
**Average\_ratios [N]:** Array of the averaged ratios for each tree (N). Average is calculated for the period determined by P\_avg\_2; in our case for 41 seconds (from second 60 to second 100 after the heat release).

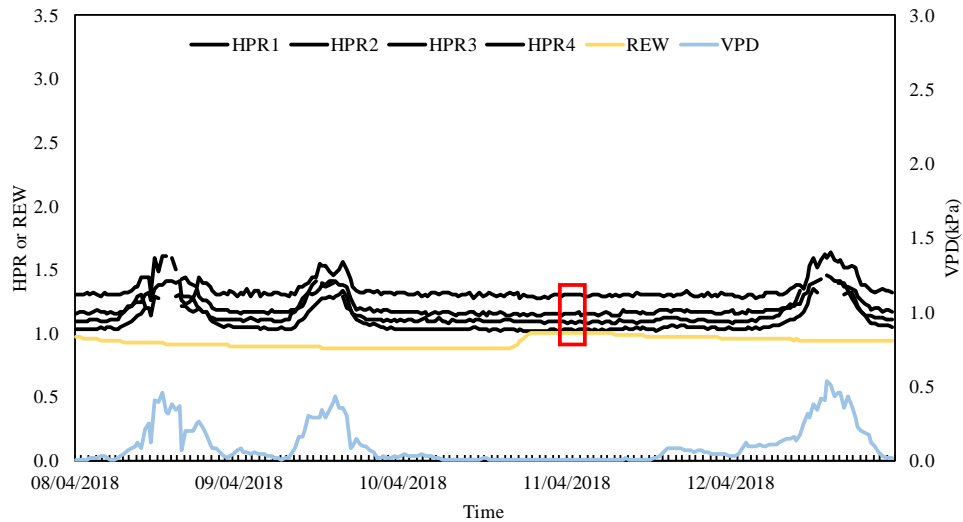
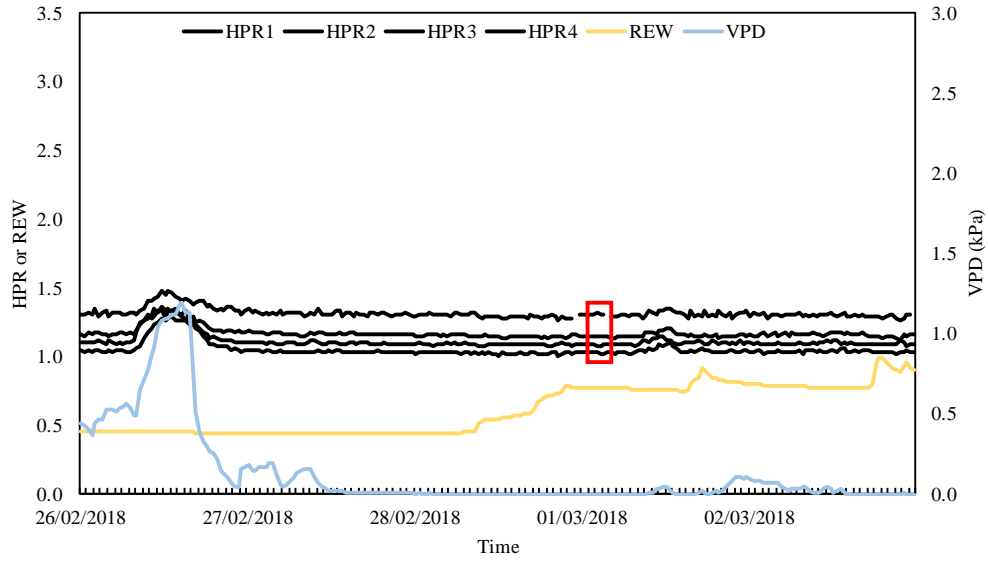
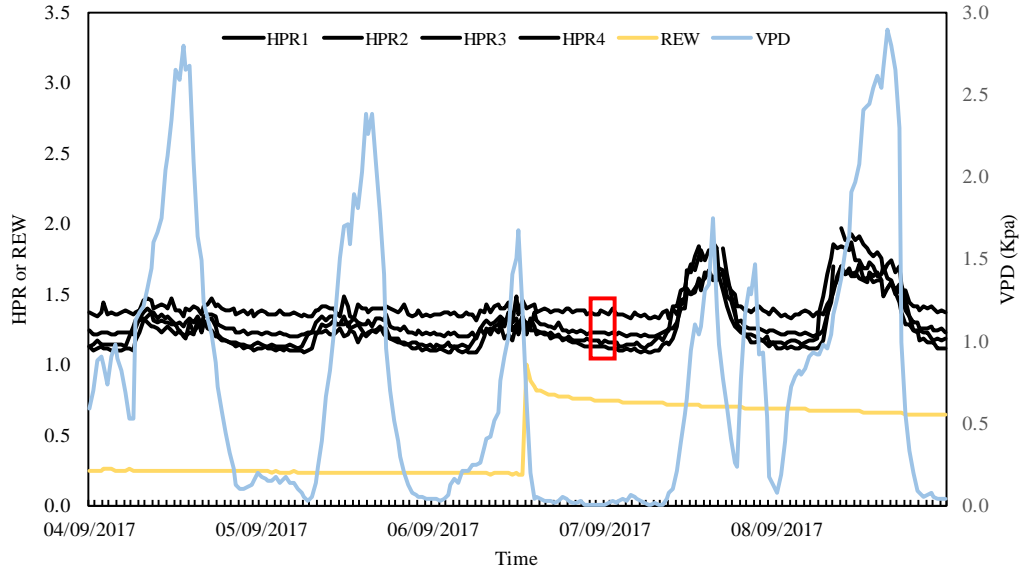
**Average\_times [N]:** Array of the averaged time elapsed between the release of the heat pulse and the instant when thermocouples are measured. Average is calculated for the period determined by P\_avg\_2; in our case for 41 seconds, from second 60 to second 100 after the heat release). If everything works well, this value will be constant and, in our case, equal to 80 seconds (median measurement time, between 60 and 100 seconds).

**Var\_ratios [N]:** Array of the variances calculated for the ratios measured for the period determined by P\_avg\_2; in our case for 41 seconds (from second 60 to second 100 after the heat release).

**Var\_times [N]:** Array of the variances calculated for the times elapsed between the release of the heat pulse and the instant when thermocouples are measured. Variance is calculated for the period determined by P\_avg\_2; in our case for 41 seconds (from second 60 to second 100 after the heat release).

**Cov\_ratios\_times [N]:** Array of the covariances calculated with the ratios of temperature variations and the times elapsed between the releases of heat pulse and the instants when thermocouples are measured.





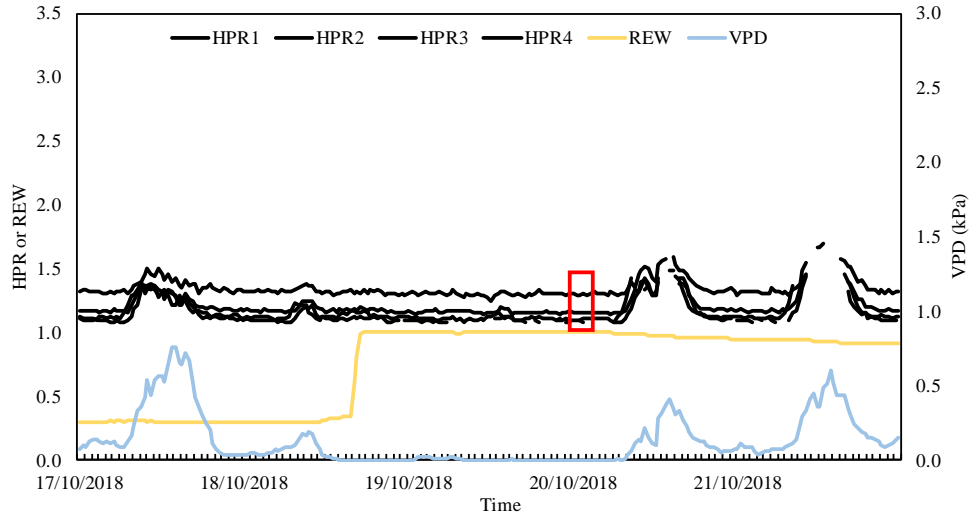


Figure. S2. Vapour pressure deficit (VPD), relative extractable water (REW) and heat pulse ratio (HPR) for all trees at five different events assuming zero flow conditions. Squares indicate the HPR readings used for zero flow estimations, between 22:00 and 03:00 solar hours. Each panel includes five days of data.

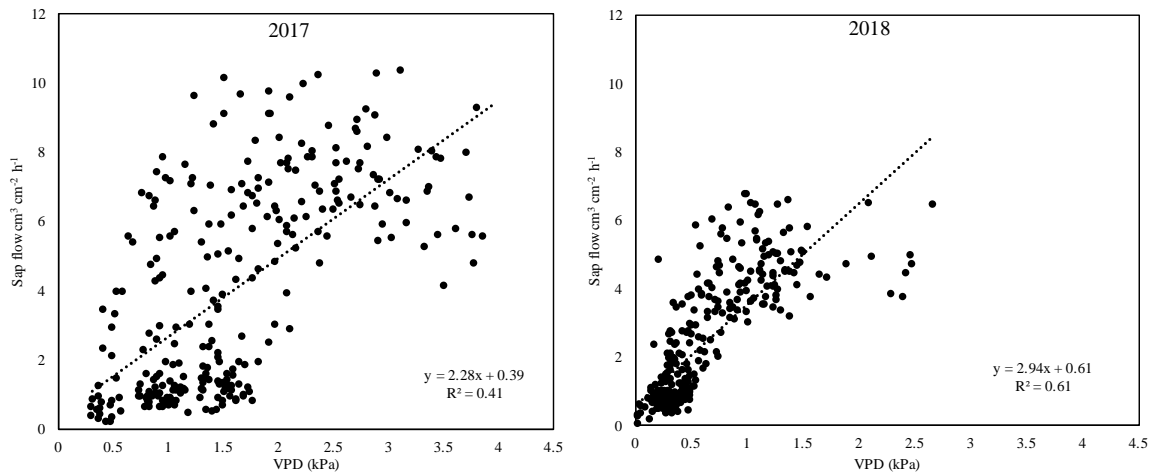


Figure S3. The observed relationship between averaged sap flow for four *Pinus halepensis* and vapour pressure deficit (VPD), between June 9 and June 15, for 2017 and 2018. Each point represents measurements every 30-minute.