Microclimate data description

Updated 2024-06-29

**Brief explanation:**

These data (“Level 4”) have been appended and lightly processed to have more friendly column names, and some basic errors are corrected (such as times when RH > 1 and VPD of NA). Also included are data from the ground-level sensors in the pastures. These have a “P” in the title (e.g. “TVP” or “ETP1”). Precipitation data from pasture stations are meant to apply to the closest trees (see tree metadata chart).

**Description of stations**

* S0 (“P”): Ground station in pasture. LWS, ATM41, and fog station.
* S1-S3: Mid-canopy stations in every tree. Each has LWS, ATM14, and PYR. One has ATM22
* S4: Inner-canopy station in every tree. LWS, ATM14, ATM22, and PYR
* S5: Station on a long pole above forest trees. LWS, ATM14
* CS: Canopy soil stations in select trees. Soil moisture and soil temperature
* Stemflow: Only in FB5 and FB6, starting March 2024. Pluviometer.

**Variable names, units, and name of instrument:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Variable name** | **Units** | **Instrument** | **Explanation** |
| **Tree** | NA | NA | TreeID, following naming conventions from this project. Ground stations also use the column name “Tree”, but that’s a bit misleading |
| **Timestamp** | “y-m-d h-m-s” | NA | Data recorded every 15 minutes. If an aggregated time interval is selected, the values are averaged together. |
| **Solar** | Watts per meter squared | PYR | Solar radiation |
| **Temp** | Degrees Celsius | ATM14 | Temperature |
| **RH** | Proportion (0-1) | ATM14 | Relative humidity |
| **Atmos\_pressure** | Kilopascals | ATM14 | Atmospheric pressure |
| **VPD** | Kilopascals | ATM14 | Vapor pressure deficit |
| **LW\_minutes\_H** | Minutes | LWS | Number of minutes that the “leaf” has been wet in the previous 15-minute interval. The “H” indicates this is using a higher count threshold for wetness, which is more appropriate for dirty sensors. |
| **Wetness** | Grams per meter squared | LWS | Quantity of water on the leaf surface. Calculated from the “Counts” output of LWS using the formula1 y = 1.54 \* e ^ 0.0058x |
| **Wind\_direction** | Compass direction (0-360) | ATM22 | Direction from which the sensor is receiving wind |
| **Wind\_speed** | Meters per second | ATM22 | Typical wind speed |
| **Gust\_speed** | Meters per second | ATM22 | Speed of wind gusts |
| **EpiMoisture** | NA- raw output | EC5 | Moisture content of epi mat- needs to be standardized |
| **EpiTemp** | Degrees Celsius | RT1 | Temperature of epi mat |

**Additional variables from Pasture stations**

|  |  |  |  |
| --- | --- | --- | --- |
| **Column name** | **Units** | **Instrument** | **Explanation** |
| **Precipitation** | Millimeters | ATM41 or ECRN-100 | Base time: Total precipitation over the last 15 minutes. If you selected hourly, daily, or weekly, the average of those periods is taken. |
| **Precip\_max** | Millimeters per hour | ATM41 or ECRN-100 | Base time: The maximum precipitation recorded over the last 15 minutes, in terms of mm/h. Higher time aggregates produces an average of these values. |

**Tree metadata**

|  |  |  |  |
| --- | --- | --- | --- |
| **TreeID** | **Design** | **Land use** | **Pasture station** |
| FB1 | Experimental | Pasture | FBP1 |
| FB2 | Control | Pasture | FBP1 |
| FB3 | Experimental | Pasture | FBP2 |
| FB4 | Control | Pasture | FBP2 |
| FB5 | Experimental | Forest | FBP2 |
| FB6 | Control | Forest | FBP2 |
| FB7 | Experimental | Forest | FBP2 |
| FB8 | Control | Forest | FBP2 |
| ET1 | Experimental | Pasture | ETP2 |
| ET2 | Control | Pasture | ETP2 |
| ET3 | Experimental | Forest | ETP2 |
| ET4 | Control | Forest | ETP2 |
| ET5 | Experimental | Pasture | ETP1 |
| ET6 | Control | Pasture | ETP1 |
| ET7 | Experimental | Forest | ETP2 |
| ET8 | Control | Forest | ETP2 |
| TV1 | Experimental | Forest | TVP |
| TV2 | Control | Forest | TVP |
| TV3 | Experimental | Pasture | TVP |
| TV4 | Control | Pasture | TVP |

**Other notes**

* In cases where RH was >1, it was changed to 1
* VPD was calculated from RH and Temp using a formula that appears in the ATMOS 14 manual.
* The minimum value for wetness is 19.96, not 0. If we want, we could easily adjust this to zero. For reference, the maximum is over 3300.
* Some variables have been removed from this dataset because they do not seem relevant. I can add back in if needed. From the tree stations, this includes: X and Y axis of ATM22, sensor temperatures, and LW\_minutes using the low threshold. From the Pasture stations, this includes the same variables plus lightning strike and distance information. From the dataloggers, I have removed battery level and voltage, as well as reference atmospheric pressure and temperatures.

**References**

1Converting Leaf Wetness Sensor output to quantity of water:

<https://publications.metergroup.com/Sales%20and%20Support/METER%20Environment/Website%20Articles/predicting-amount-water-surface-lws-leaf-wetness-sensor.pdf>