Supplementary Material

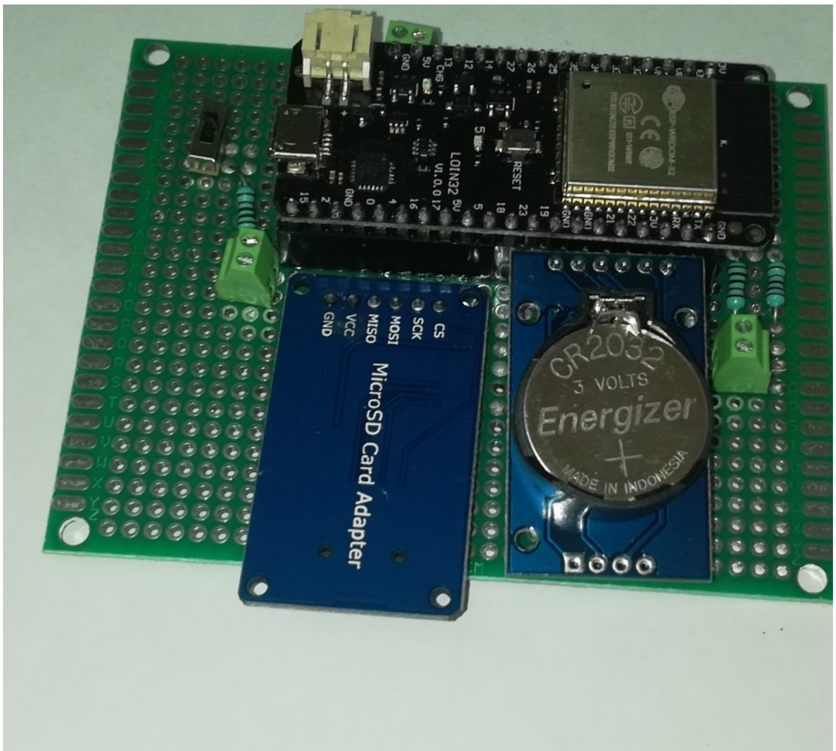


Figure S1. Finalized PCB, which does not include the sensor. We soldered all the parts and tested it for 1 week in the lab to make sure everything will work as planned during the field experiment.

Figure S2. The final product. The box that houses the system is an IP66 plastic box and the body of the station is a camera tripod (HAMA 04469 STAR BLACK TRIPOD 153-3D ALUMINIUM) embedded with aluminum corners that contain mounting holes, which are useful for placing the box in the desirable height.

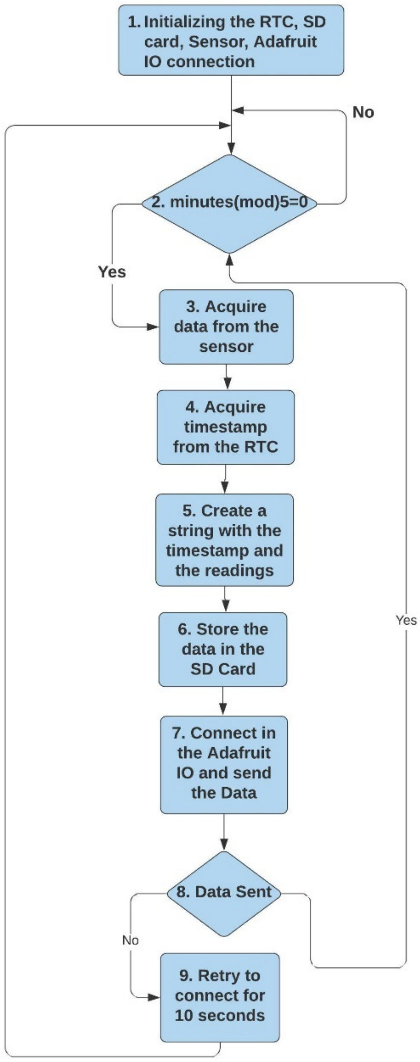


Figure S3. Flowchart that summarizes the sequence of the weather station's functions.

Figure S4. Temperature and humidity sensor enclosed in a radiation shield of Thygro SDI-12

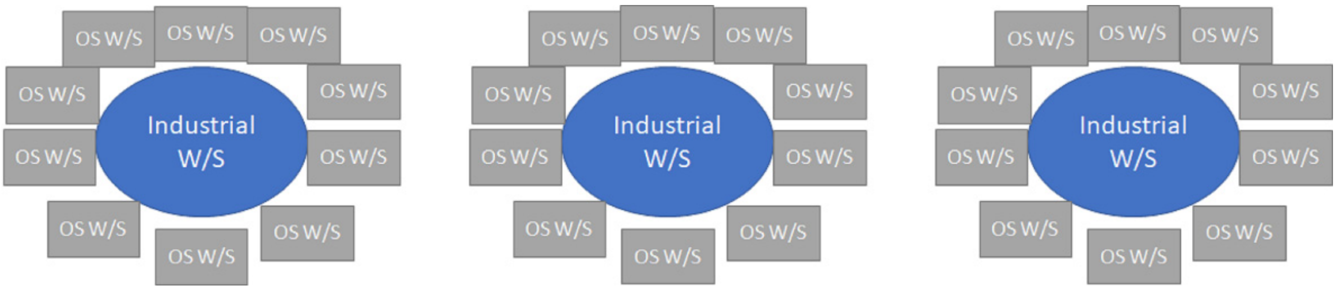
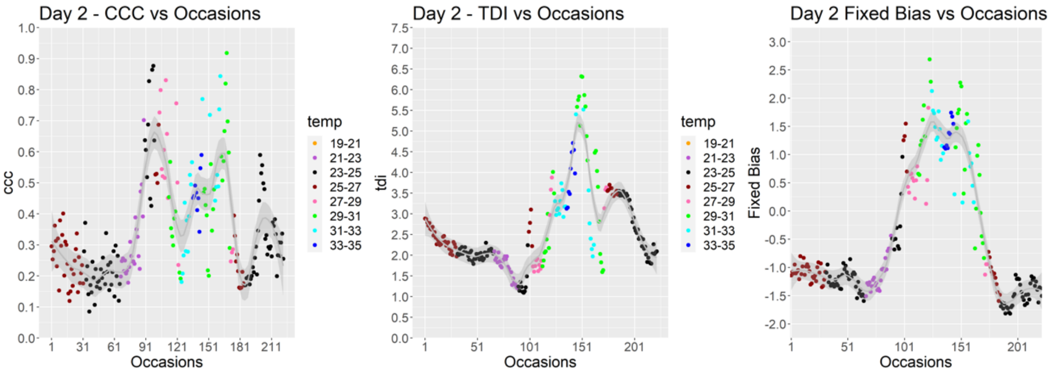
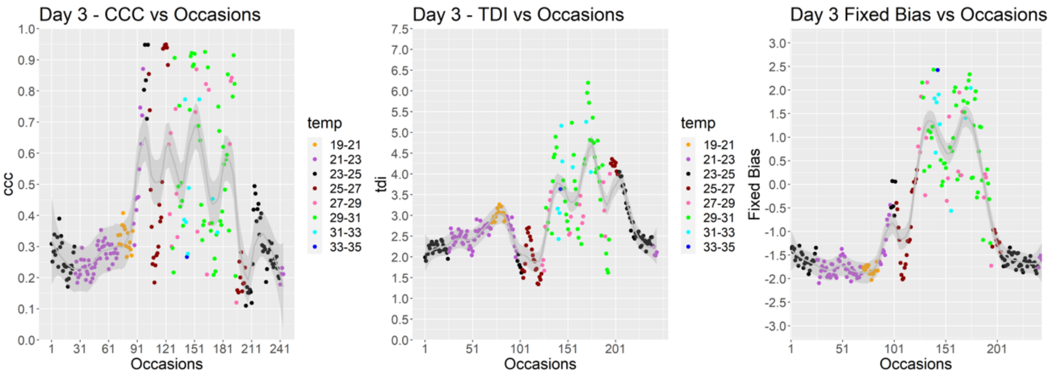


Figure S5. The topology of the experiment. Every industrial weather station creates a cluster of ten open-source weather stations.



(a) **(b)** **(c)**

Figure S6. (a) CCC vs Occasions plot for Day2 for every temperature range category. (b) TDI vs Occasions plot for Day2 for every temperature range category. (c) Fixed bias vs Occasions for Day2 for every temperature range category.



(a) **(b)** **(c)**

Figure S7. (a) CCC vs Occasions plot for Day3 for every temperature range category. (b) TDI vs Occasions plot for Day3 for every temperature range category. (c) Fixed bias vs Occasions for Day3 for every temperature range category.

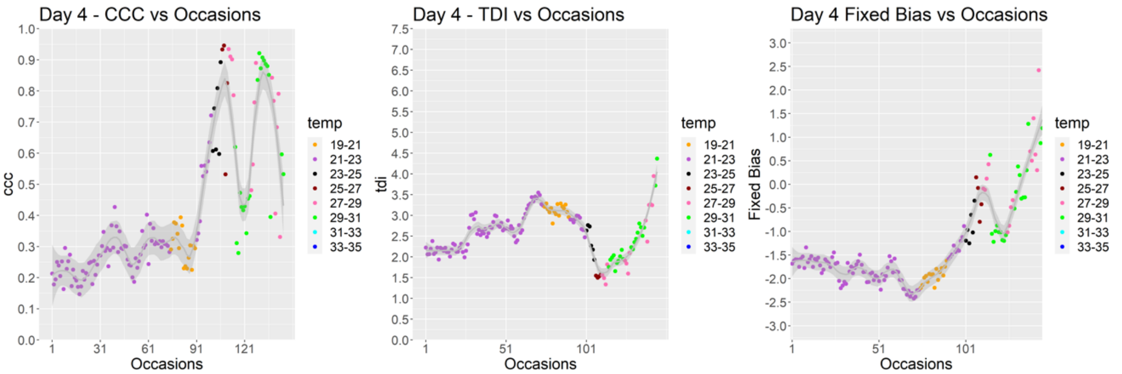


Figure S8. (a) CCC vs Occasions plot for Day4 for every temperature range category. (b) TDI vs Occasions plot for Day4 for every temperature range category. (c) Fixed bias vs Occasions for Day4 for every temperature range category.

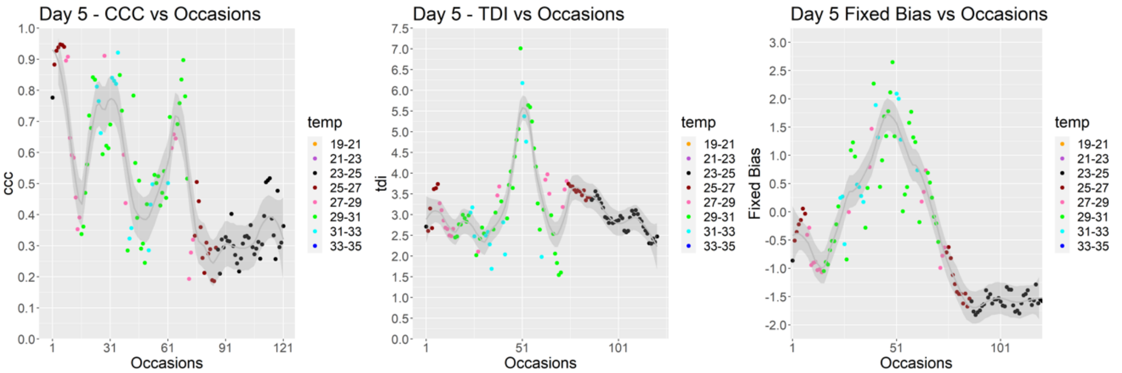


Figure S9. (a) CCC vs Occasions plot for Day5 for every temperature range category. (b) TDI vs Occasions plot for Day5 for every temperature range category. (c) Fixed bias vs Occasions for Day5 for every temperature range category.

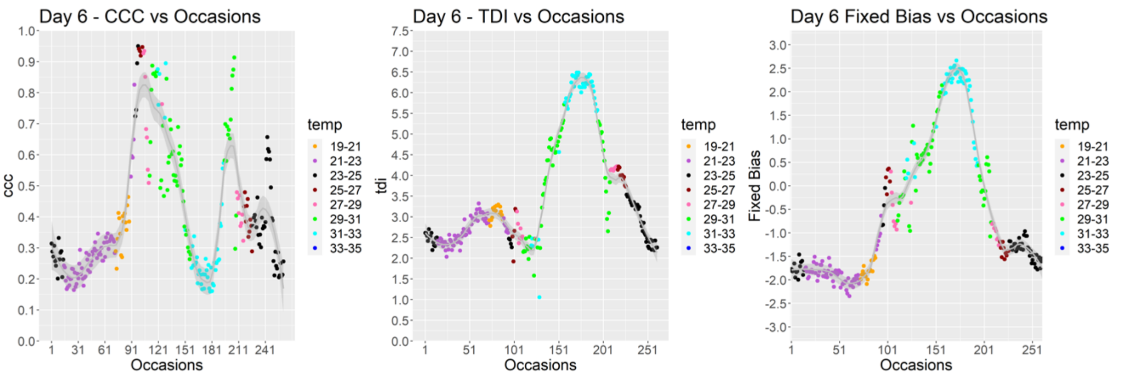


Figure S10. (a) CCC vs Occasions plot for Day6 for every temperature range category. (b) TDI vs Occasions plot for Day6 for every temperature range category. (c) Fixed bias vs Occasions for Day6 for every temperature range category.

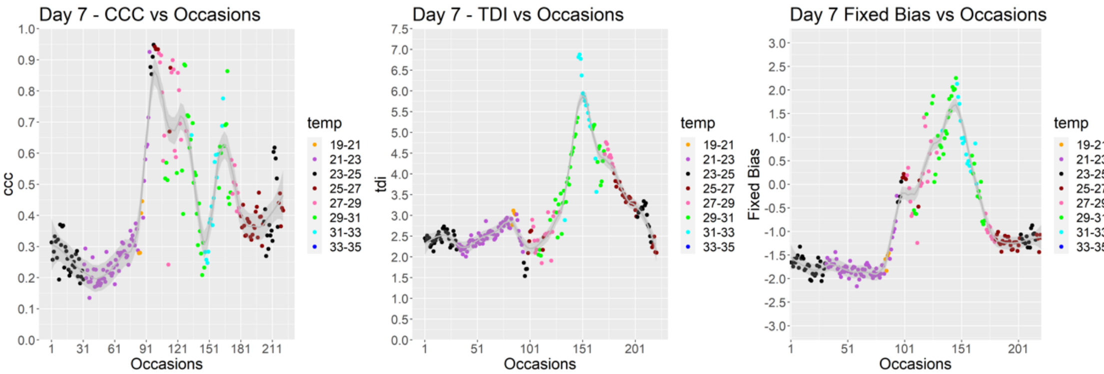


Figure S11. (a) CCC vs Occasions plot for Day7 for every temperature range category. (b) TDI vs Occasions plot for Day7 for every temperature range category. (c) Fixed bias vs Occasions for Day7 for every temperature range category.

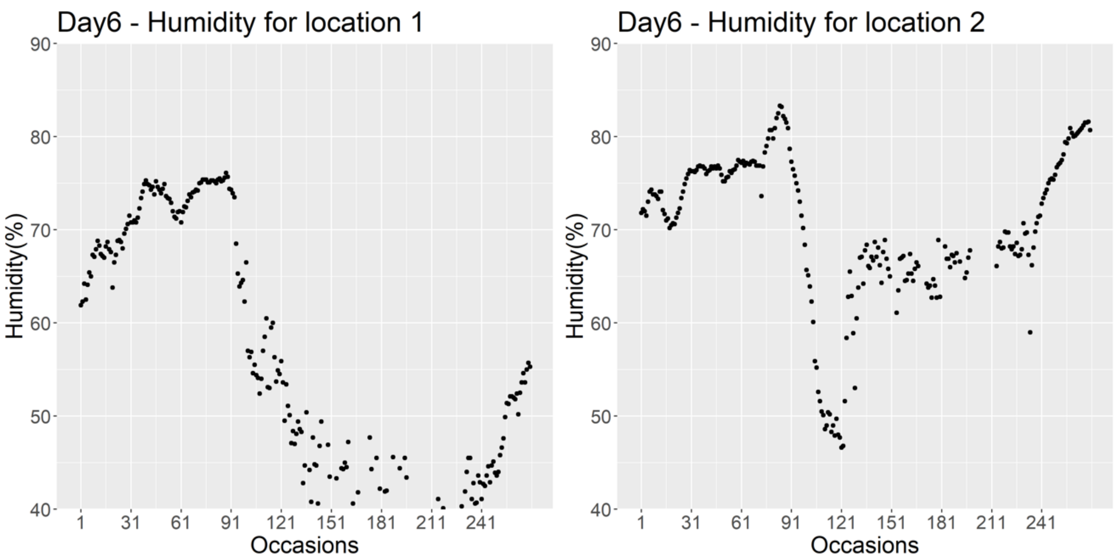


Figure S12. (a) Humidity for greenhouse chamber 1. (b) Humidity for greenhouse chamber 2.

Table S1. The components used to construct the open-source weather station.

Component	Details
ESP-WROOM-32 microcontroller, wemos-lolin evaluation board.	The main board for coordinating the station's functions. It is embedded in a wemos lolin evaluation board. It is equipped with Bluetooth and Wi-Fi wireless technology.
Sd-Card Module	A module that enables the weather-station to record the measurements.

Real Time Clock – DS3231	A real time clock, that adds a timestamp for every measurement taken. It contains a coin cell battery to maintain the current time even if there is a power failure.
Adafruit Sensirion SHTC3Temperature/Humidity Sensor.	Temperature/Humidity sensor with accuracy $\pm 0.2°C$, response time 8 seconds and $0.01°C$ resolution.
Lipo Battery	A Lipo 2500 mah battery used as a back-up mechanism in case of power failure.
IP66 plastic box	An enclosure for the device that protects the electronic parts from dust, sunlight and water.
HAMA 04469 Star Black Tripod 153-3D Aluminum	The body of the weather station. It elevates up to 1.5 meters.
Printed Circuit Board	The main board where we solder all the components
Headers	The headers are soldered on the printed circuit board to make it easy to replace any broken or burnt electronic parts.
DIY plastic radiation shield	The sensor's radiation shield is custom made, using inexpensive and widely available materials to the public. We used four flowerpot plates, painted them white using spray-paint and 3 cm nylon stand-offs for the plates to be separated and air to flow freely throughout it avoiding direct sunlight exposure of the sensor to prevent biased readings.

Table S2. Cost per component of the open-source weather station.

Component	Cost (In Euros)
ESP-WROOM-32 module	10
SHTC3	3.5
SD-Card	1
Real Time Clock	1
Box enclosure	5
PCB	2
Tripod	20
Material for the radiation shield	5
Angle Brackets	2
Screws and Nuts	1
Wires	2
Screw Terminals	0.6
Resistors	0.5
Switch	0.25
Total	53.85

Table S3. Libraries used in the code and their functionality

Library	Functionality
FS	Data Storage
SD	Data Storage
RTCLib	Real Time Clock
SHTC3	Sensor
AdafruitIO_WiFi	Connecting to Adafruit IO

Table S4. Inadequate or misleading practices to compare two different methods/devices in our setting.

Method	Description
Test of zero correlation	A significant result of this test is taken as evidence of "agreement". This, however, is clearly inadequate since correlation is a measure of linear relationship and not agreement. Besides, two methods designed to measure the same quantity will rarely be uncorrelated
Paired t-test	If the null hypothesis of no difference in means is not rejected, it may be because its mean is not estimated precisely due to large variability in the differences or due to small sample size. In other words, the test may simply be underpowered.
Test of zero intercept and unit slope	This test suffers also from low power for the same reason as the test described above and tests only the biases but not their precisions.
Simple scatter plot	The simple scatterplot of the pairs of measurements (reference vs new) integrated with the line of equality reveals the structure of the data but may not reveal important trends. However, it can be used as a supplement along with the agreement graphs.
Bland-Altman Limits of Agreement	Even though it is straightforward and easy to implement, some of the assumptions are rarely verified in practice.

Table S5. Model adapted for the analysis

Formula	Description
$Y_{i1} = b_i + e_{i1}$	For the reference method, where $i = 1, \ldots, 30$. We denote as i, the number of the open-source weather stations. The true values b_i follow independent $N_1(\mu_b, \sigma_b^2)$ distributions. The random errors e_{ij} follow independent $N_1(0, \sigma_{e_j}^2)$ distributions, $j = 1,2$.
$Y_{i2} = \beta_0 + b_i + e_{i2}$	β_0, is the fixed bias.

Table S6. Number of occasions per day.

Days	Occasions
1	221
2	222
3	244
4	145
5	124
6	261
7	221