## Supplementary Information

**Table S1. Four experiments were run at the daily time scale to create time series with SD error, under the following conditions: (a) RH of all stations and QCLCD from the 18:51/52/53 hour (b) RH of all stations and QCLCD from the 19:51/52/53 hour (c) RH of all stations and QCLCD from the 19:51/52/53 hour, excluding one measurement taken at 13:30 at Location B and 4 measurements where Tw > T at Location C (10/29-11/01) (d) RH of all stations and QCLCD from the 18:51/52/53 hour, excluding one measurement taken at 13:30 at Location B and 4 measurements where Tw > T at Location C (10/29-11/01).**

| Experiment | Description | Overall Mean | SD | n |
|---|---|---|---|---|
| a | 18:51 (all) | 69.88715596 | 15.70265 | 109 |
| b | 19:51 (all) | 71.15321101 | 15.56418 | 109 |
| c | 19:51 (no 13:30 or Tw > T) | 70.41619048 | 15.13691 | 104 |
| d | 18:51 (no 13:30 or Tw > T) | 69.10190476 | 15.21847 | 104 |

**Figure S1. Daily Time Series for experiment (a) starting from Day 1 (10/28/2016) to Day 16 (11/12/2016) on the x-axis and Relative Humidity (RH) expressed in % on the y-axis. The error bars represent the SD for the given day.**

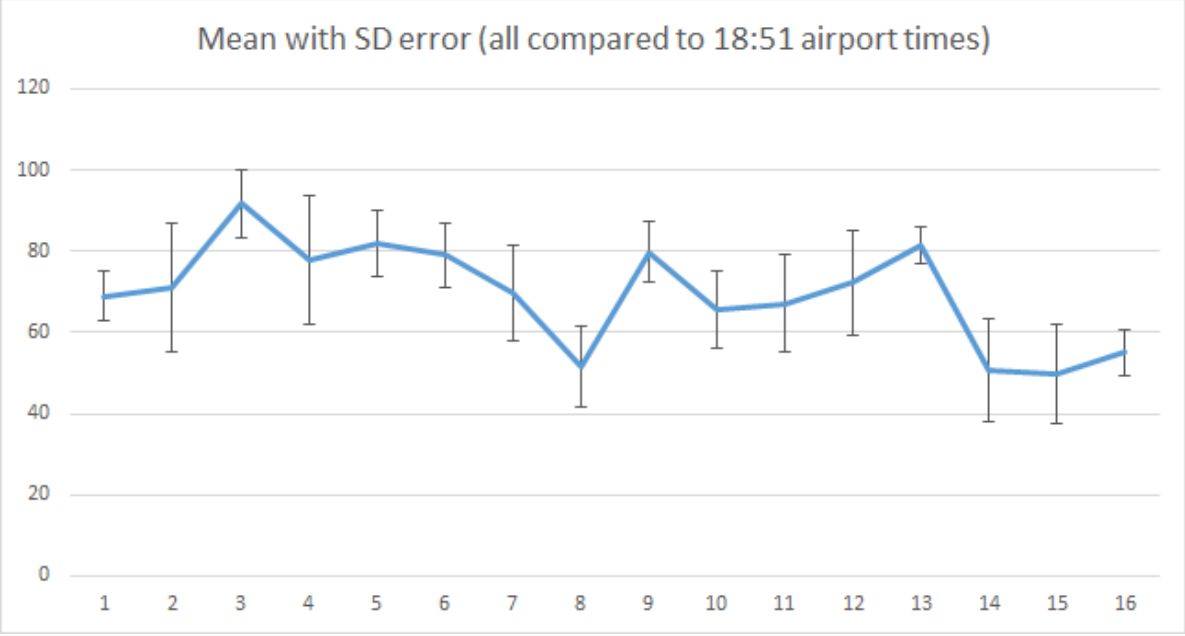

**Table S2. Daily Calculations of Mean and SD for experiment (a)**

| Date | Mean | SD | Date | Mean | SD |
|---|---|---|---|---|---|
| 10/28/2016 | 69 | 6.131884 | 11/5/2016 | 79.85714 | 7.425824 |
| 10/29/2016 | 71 | 15.73743 | 11/6/2016 | 65.71429 | 9.464218 |
| 10/30/2016 | 91.71429 | 8.40068 | 11/7/2016 | 67.14286 | 11.93634 |
| 10/31/2016 | 77.85714 | 15.84749 | 11/8/2016 | 72.28571 | 12.95781 |
| 11/1/2016 | 81.85714 | 8.275034 | 11/9/2016 | 81.28571 | 4.535574 |
| 11/2/2016 | 79 | 7.895146 | 11/10/2016 | 50.85714 | 12.66792 |
| 11/3/2016 | 69.81429 | 11.67653 | 11/11/2016 | 49.85714 | 12.26687 |
| 11/4/2016 | 51.57143 | 9.863352 | 11/12/2016 | 55 | 5.522681 |

**Figure S2. Same as Figure S1 but for experiment (b)**

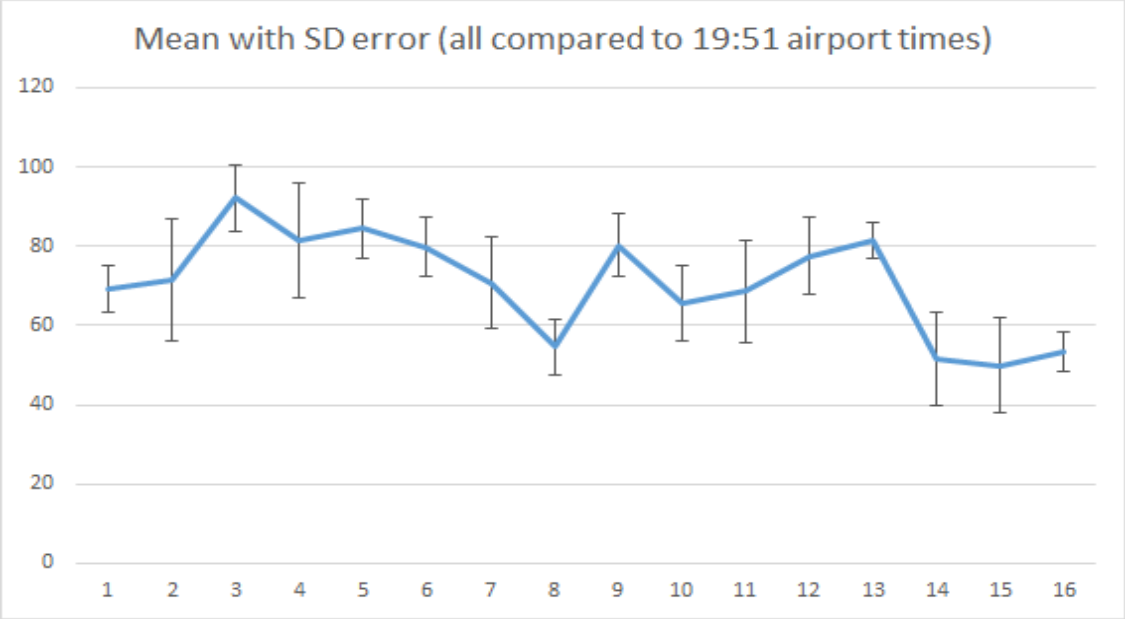


**Table S3. Same as Table S2 but for experiment (b)**

| Date | Mean | SD | Date | Mean | SD |
|---|---|---|---|---|---|
| 10/28/2016 | 69.3333 | 5.78504 | 11/5/2016 | 80.2857 | 7.91021 |

| | | | | | |
|---|---|---|---|---|---|
| 10/29/2016 | 71.4286 | 15.4365 | 11/6/2016 | 65.7143 | 9.5867 |
| 10/30/2016 | 92.1429 | 8.55236 | 11/7/2016 | 68.7143 | 12.8675 |
| 10/31/2016 | 81.5714 | 14.3626 | 11/8/2016 | 77.5714 | 9.76144 |
| 11/1/2016 | 84.4286 | 7.45782 | 11/9/2016 | 81.2857 | 4.53557 |
| 11/2/2016 | 79.8571 | 7.51506 | 11/10/2016 | 51.7143 | 11.7858 |
| 11/3/2016 | 70.8143 | 11.6379 | 11/11/2016 | 50 | 12.0968 |
| 11/4/2016 | 54.7143 | 7.06433 | 11/12/2016 | 53.6 | 4.97996 |

**Figure S3. Same as Figure S1 but for experiment (c)**

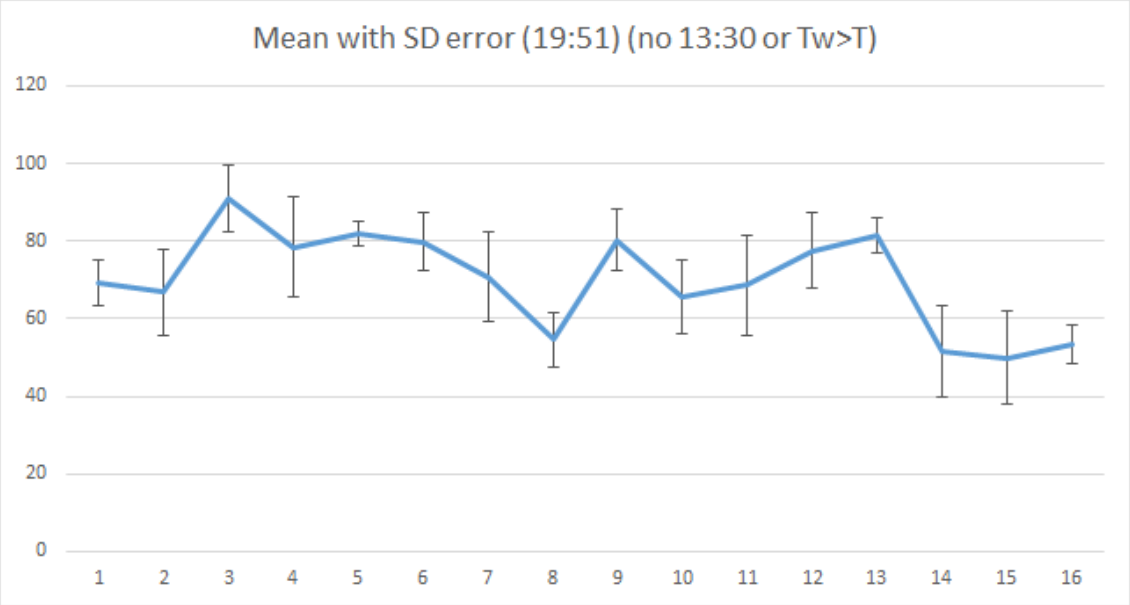


**Table S4. Same as Table S2 but for experiment (c)**

| Date | Mean | SD | Date | Mean | SD |
|---|---|---|---|---|---|
| 10/28/2016 | 69.33333 | 5.785038 | 11/5/2016 | 80.28571 | 7.91021 |
| 10/29/2016 | 66.8 | 10.91788 | 11/6/2016 | 65.71429 | 9.586697 |
| 10/30/2016 | 90.83333 | 8.565434 | 11/7/2016 | 68.71429 | 12.86746 |
| 10/31/2016 | 78.5 | 12.97305 | 11/8/2016 | 77.57143 | 9.76144 |
| 11/1/2016 | 81.83333 | 3.188521 | 11/9/2016 | 81.28571 | 4.535574 |
| 11/2/2016 | 79.85714 | 7.515064 | 11/10/2016 | 51.71429 | 11.78579 |

| | | | | | |
|---|---|---|---|---|---|
| 11/3/2016 | 70.81429 | 11.63793 | 11/11/2016 | 50 | 12.09683 |
| 11/4/2016 | 54.71429 | 7.06433 | 11/12/2016 | 53.6 | 4.97996 |

**Figure S4. Same as Figure S1 but for experiment (d)**

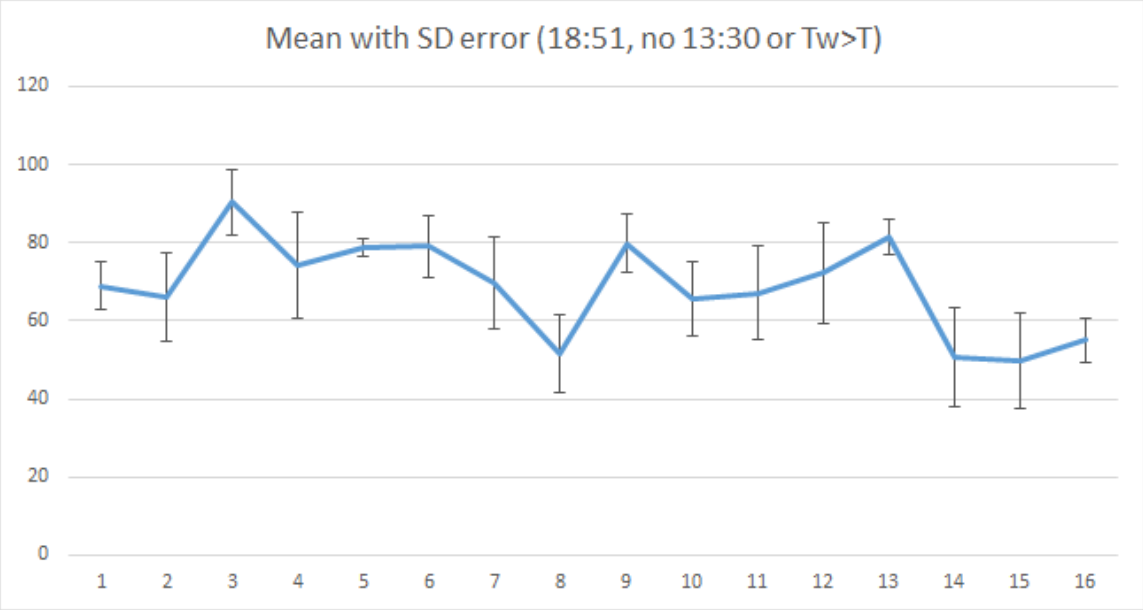


**Table S5. Same as Table S2 but for experiment (d)**

| Date | Mean | SD | Date | Mean | SD |
|---|---|---|---|---|---|
| 10/28/2016 | 69 | 6.131884 | 11/5/2016 | 79.85714 | 7.425824 |
| 10/29/2016 | 66.2 | 11.23388 | 11/6/2016 | 65.71429 | 9.464218 |
| 10/30/2016 | 90.33333 | 8.286535 | 11/7/2016 | 67.14286 | 11.93634 |
| 10/31/2016 | 74.16667 | 13.67358 | 11/8/2016 | 72.28571 | 12.95781 |
| 11/1/2016 | 78.83333 | 2.316607 | 11/9/2016 | 81.28571 | 4.535574 |
| 11/2/2016 | 79 | 7.895146 | 11/10/2016 | 50.85714 | 12.66792 |
| 11/3/2016 | 69.81429 | 11.67653 | 11/11/2016 | 49.85714 | 12.26687 |
| 11/4/2016 | 51.57143 | 9.863352 | 11/12/2016 | 55 | 5.522681 |

**Figure S5. Daily Time Series of Measured RH across the 3 Hygrometer stations**

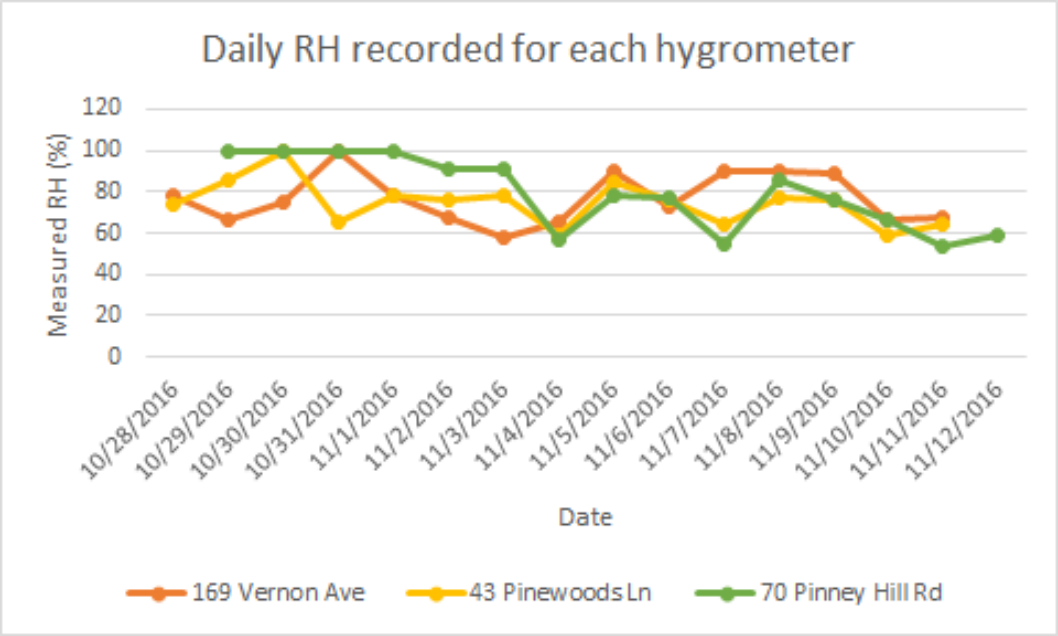


**Figure S6. Daily Time series of RH observations using 19:51/52/53 hourly data from the airports. BDL represented by the light green line, had the exact same observational values for RH as HFD (blue line) from 11/01/2016 to 11/12/2016.**

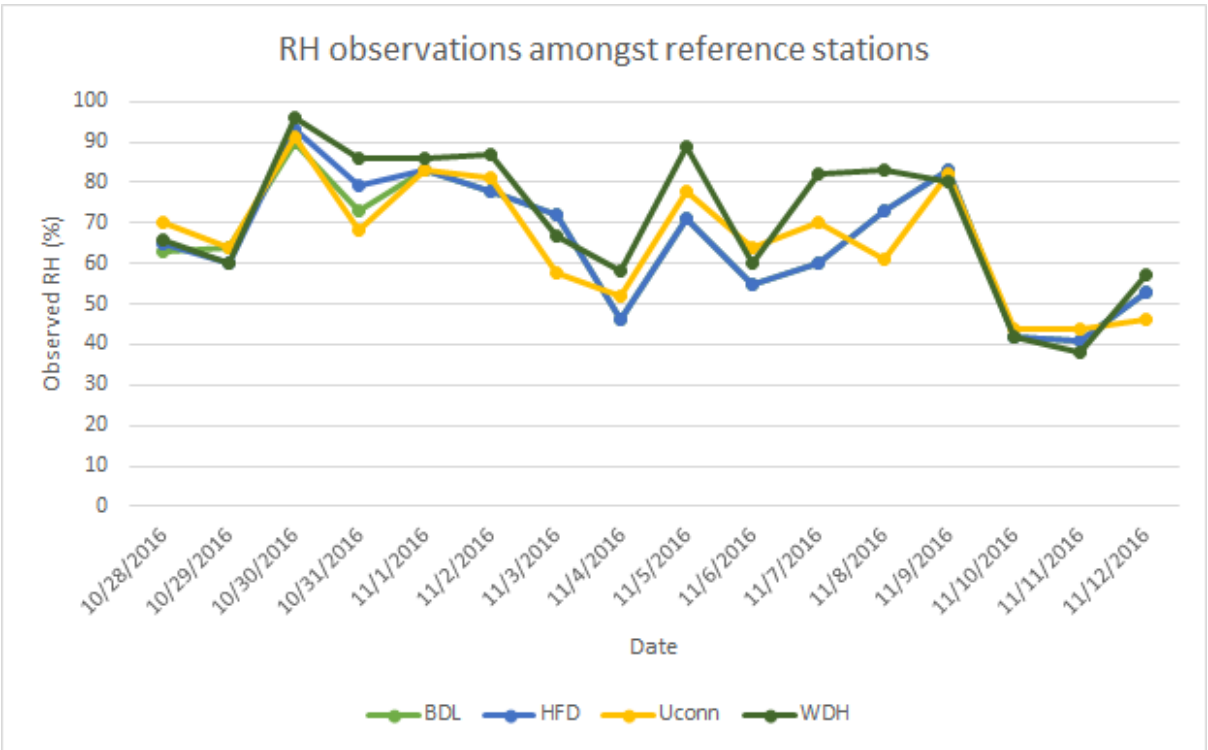

**Figure S7. Daily Time Series of Measured RH for all stations (experimental and reference)**

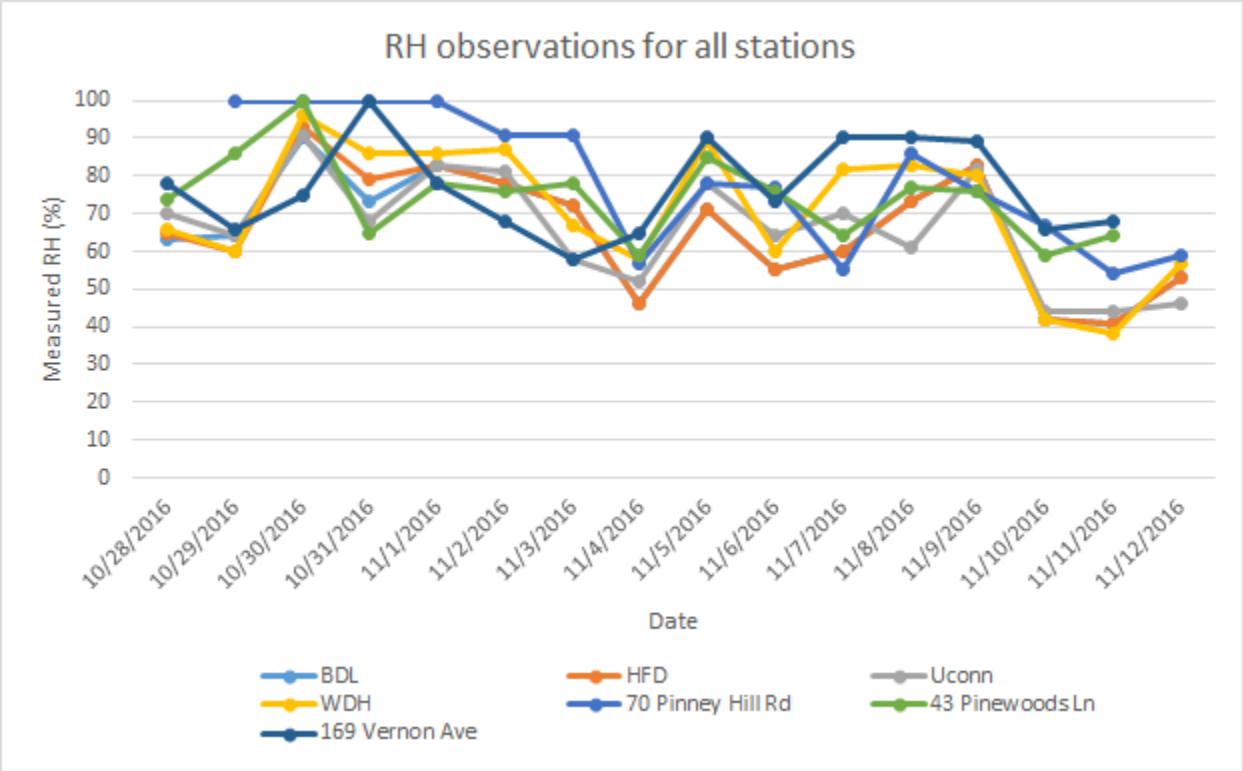


**Table S6. Distances between each individual experimental weather station and each of the four reference stations.**

| Station Location | WDH | BDL | HFD | UCONN |
|---|---|---|---|---|
| A | 4.71 km | 59.99 km | 51.53 km | 8.53 km |
| B | 19.96 km | 46.09 km | 44.36 km | 7.28 km |
| C | 34.04 km | 28.70 km | 28.51 km | 23.97 km |

**Table S7. Reference Station Coordinates**

| Reference Station | Coordinates |
|---|---|
| HFD | Lat. = 41.736, Long. = -72.650 |
| BDL | Lat. = 41.937, Long. = -72.681 |
| WDH | Lat. = 41.741, Long. = -72.183 |
| UConn | Lat. = 41.815, Long. = -72.240 |

**Figure S8. Daily Time Series of Measured T across the 3 Hygrometer stations**

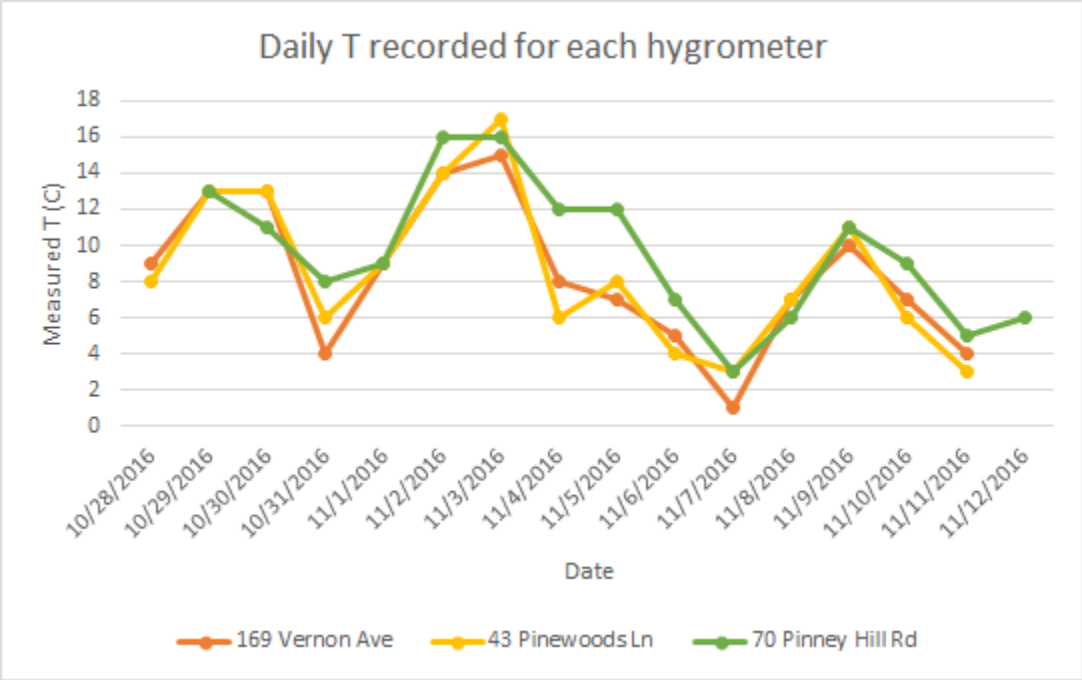


**Figure S9. Daily Time series of Temperature observations using 19:51/52/53 hourly data from the airports. BDL represented by the light orange line, had the exact same observational values for T as HFD (yellow line) from 11/01/2016 to 11/12/2016.**

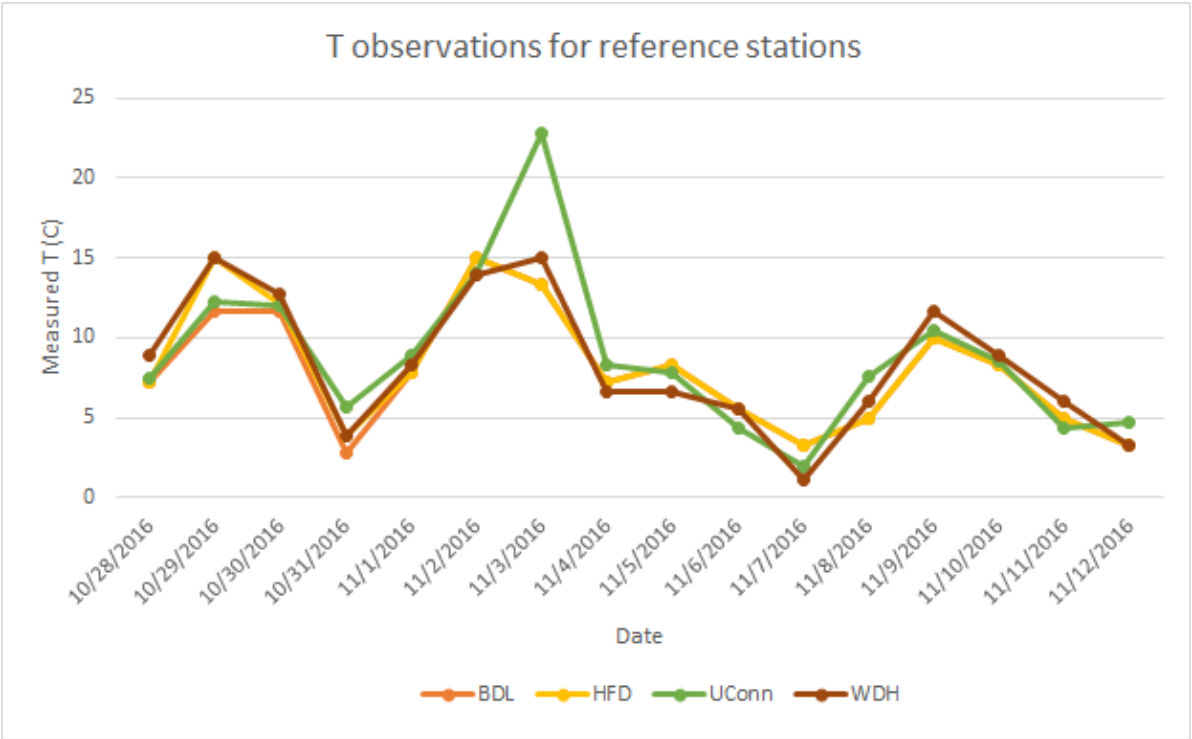

**Figure S10. Comparison of measured T and Tw for Station A. In general, RH was on the higher side, as shown by the generally low differences between T and Tw (1 or 2 degrees C).**

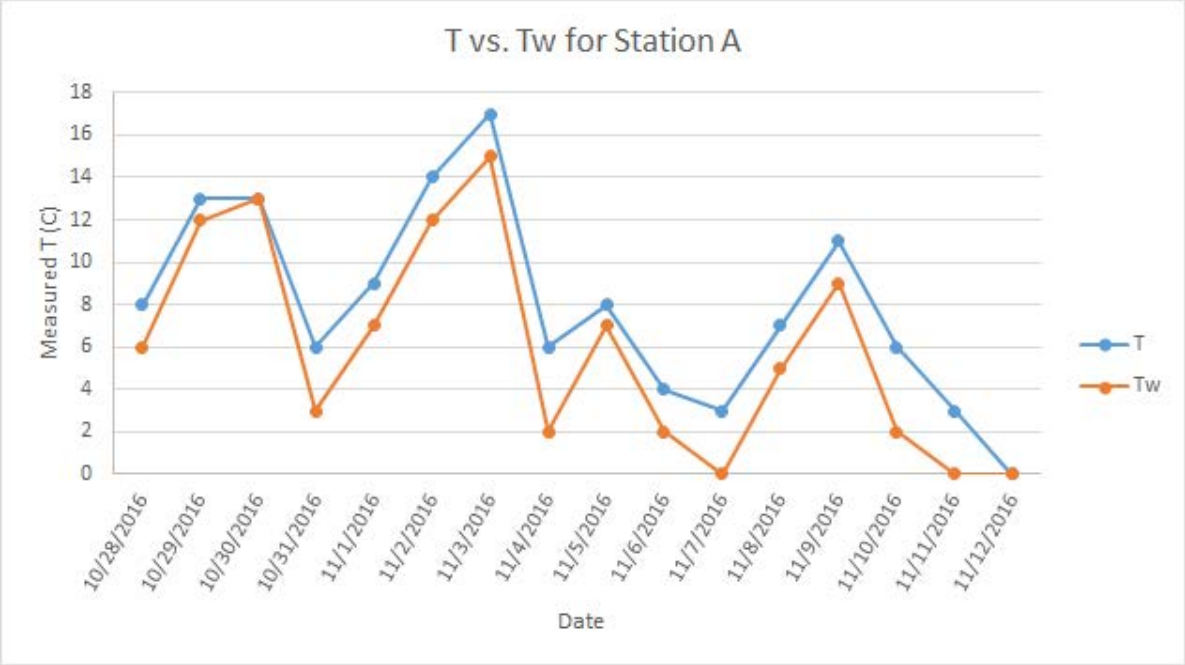


**Figure S11. Same as Figure S10 but for Station B.**

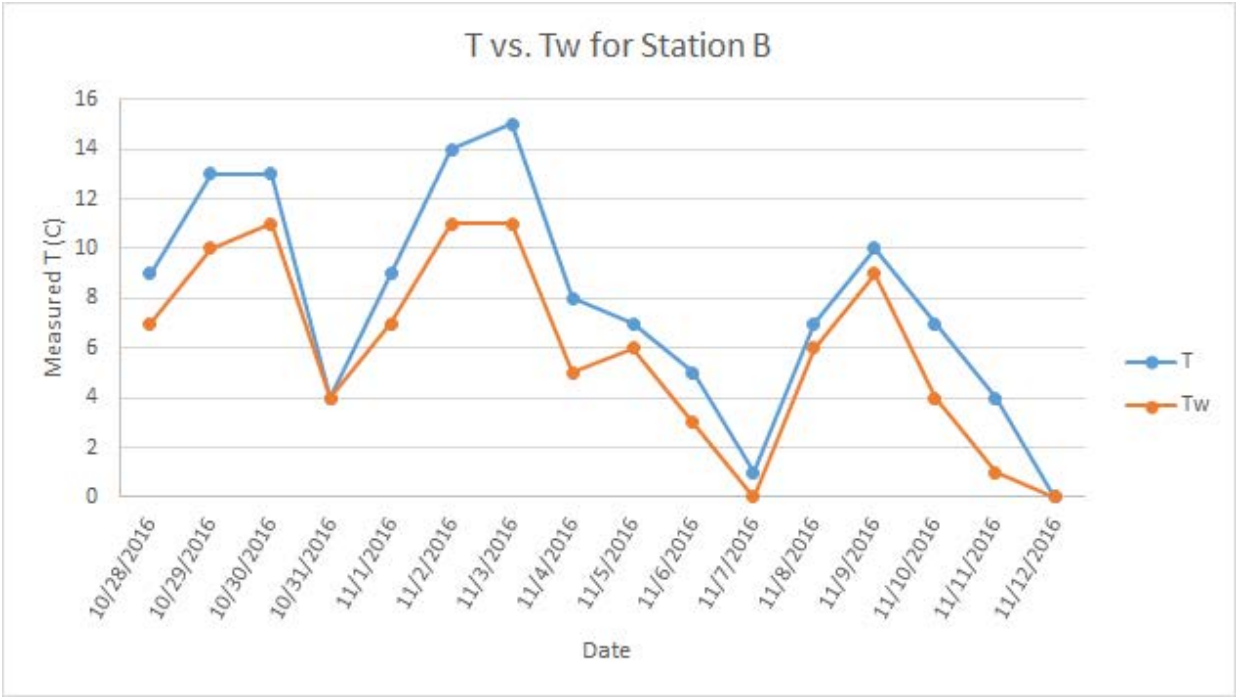

**Figure S12. T and Tw comparison for Station C. Erroneous values are shown where Tw > T (10/29 - 11/1/2016) which had slight impact on overall statistical comparison, making station C less accurate than A and B.**

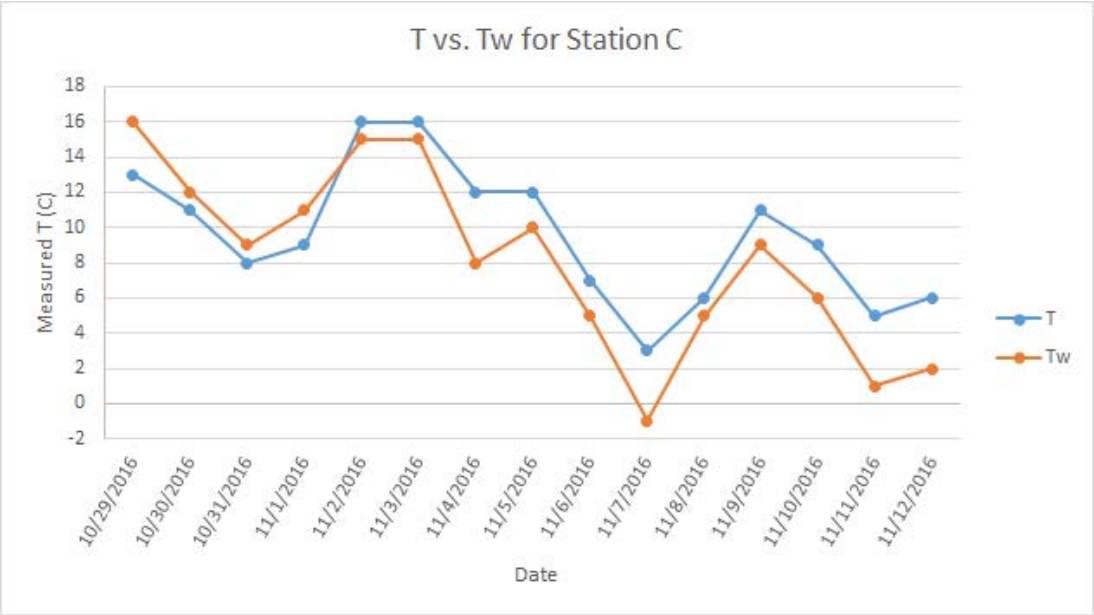


**Figure S13. Measured T and Tw values at Station A and Observed Values at its nearest reference data station, WDH. As shown, despite the higher disparity between measured air temperature values, the wet bulb measurements at Station A were fairly close to those measured at WDH (with the exception of 11/03/2016). This could help explain why the measured RH at Station A had a higher correlation with its nearest reference station, compared to the other two experimental stations. Temperature plays a major role in determining RH.**

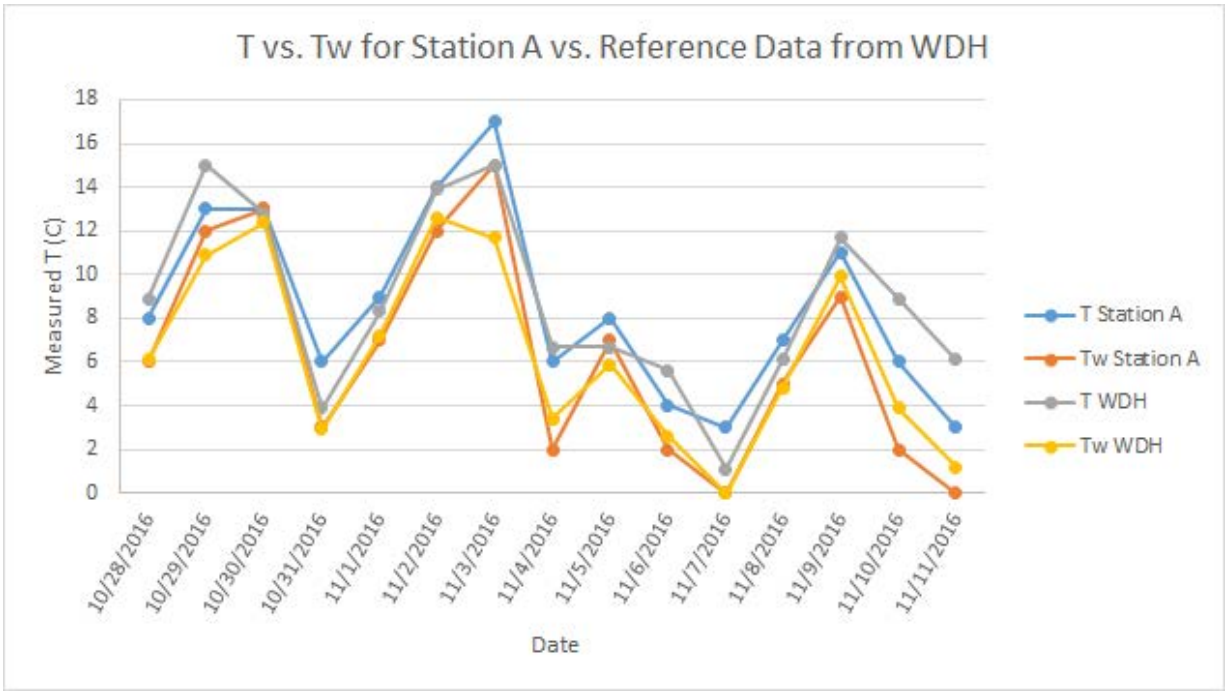

**Table S8. Mixing Ratios determined from the Skew T - ln P chart for each Temperature measured in this experiment. These values were used for consistency when calculating RH.**

| Temperature | Mixing Ratio (g/kg) | Temperature | Mixing Ratio (g/kg) |
|---|---|---|---|
| -5 | 2.6 | 7 | 6.1 |
| -4 | 2.8 | 8 | 6.8 |
| -3 | 3 | 9 | 7 |
| -2 | 3.4 | 10 | 7.6 |
| -1 | 3.6 | 11 | 8 |
| 0 | 3.8 | 12 | 8.7 |
| 1 | 4 | 13 | 9.3 |
| 2 | 4.4 | 14 | 10 |
| 3 | 4.7 | 15 | 10.5 |
| 4 | 5 | 16 | 11 |
| 5 | 5.5 | 17 | 11.9 |
| 6 | 5.8 | | |