



METER
ENVIRONMENT

HOW DO THE ATMOS 41 AND ATMOS 41W PERFORM UNDER BELOW FREEZING AND SNOWY CONDITIONS?

The ATMOS 41 and ATMOS 41W all-in-one [weather stations](#) are very durable, even in below-freezing and snowy conditions. There is no need to winterize the sensor suite, though we caution users about effects of snow and ice in the anemometer or on top of the pyranometer. There is no heater in the ATMOS weather station, so liquid water will only be measured once the ice and snow melt, and snow that might have overflowed the rain gauge funnel will not be accounted for. The air temperature sensor and correction model both perform well. See data below, recorded at METER's rooftop testbed during winter of 2019.



Figure 1. METER's rooftop testbed. February 13, 2019 at 14:16

WHAT TO EXPECT WHEN THE PYRANOMETER IS COVERED WITH A BLANKET OF SNOW

Solar radiation reaches the pyranometer as diffuse radiation and is suppressed until snow is removed or melts.

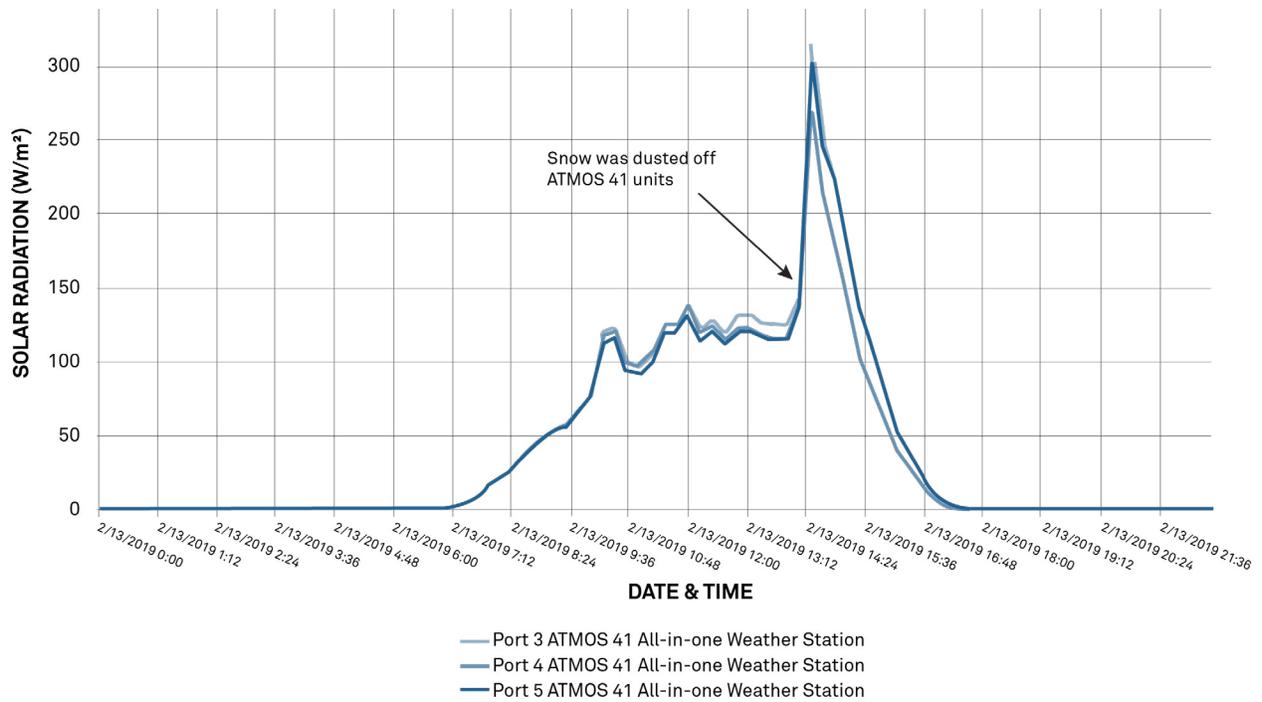


Figure 2. Atmos 41 solar radiation data

WHAT TO EXPECT WHEN THE ANEMOMETER CONTAINS ICE/SNOW

A couple of things may be observed when snow/ice are in the anemometer. One observation is that a blanket of snow shelters the opening of the anemometer, which dampens wind speed data.

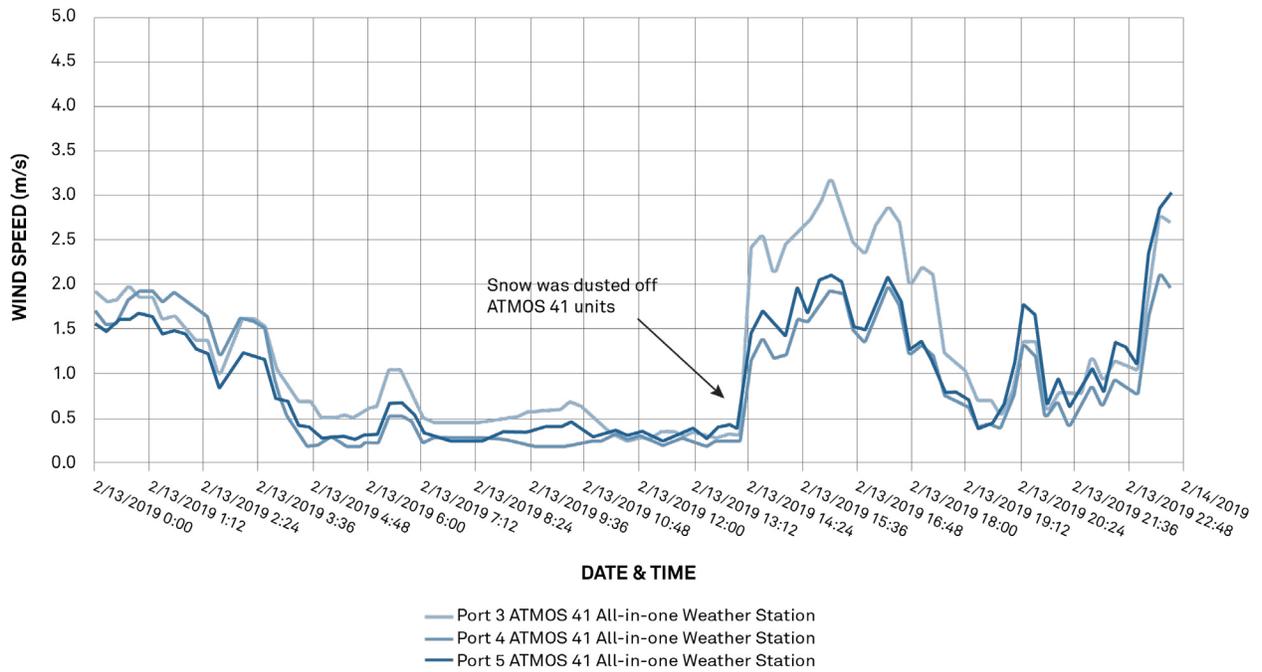


Figure 3. ATMOS 41 wind speed data

A second observation is that there could be wind speed spikes (we cap this at 30 m/s) or no sensor output (#N/A). In this case, a little data cleanup may be needed until the ice/snow buildup is removed or melts.

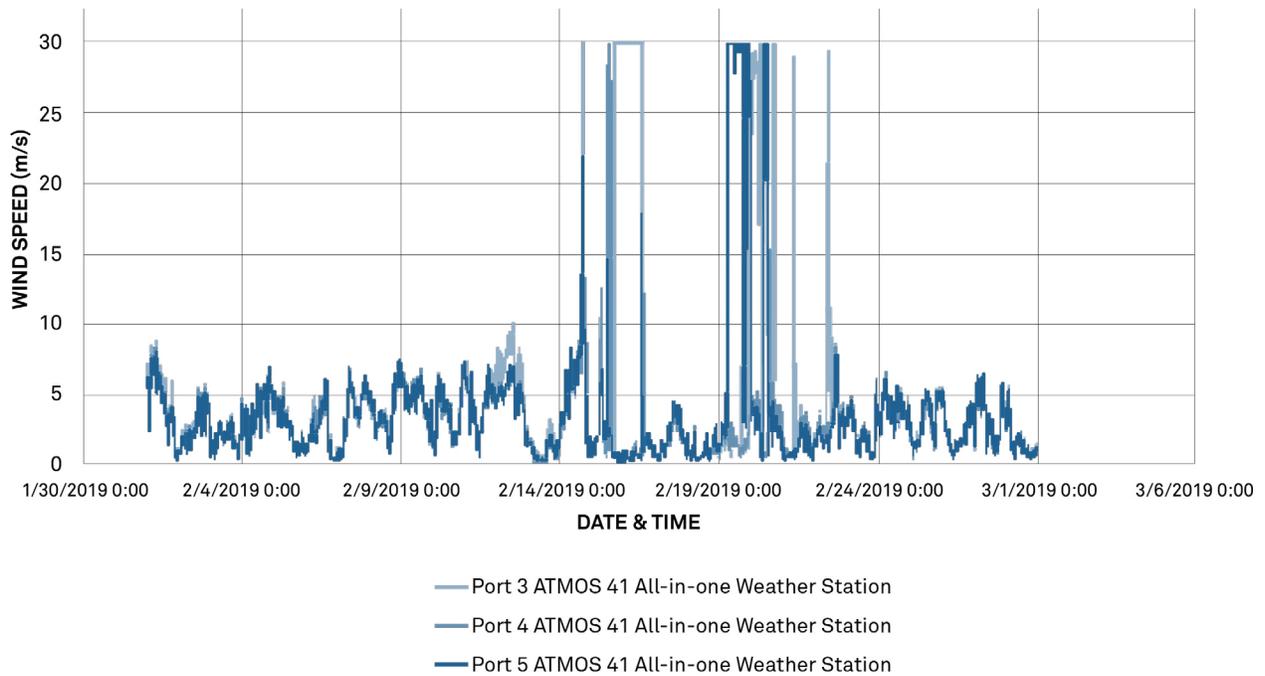


Figure 4. ATMOS 41 wind speed data with wind speed spikes

AIR TEMPERATURE AND CORRECTION MODEL PERFORMANCE

We observed that a blanket of snow covering the ATMOS 41 insulates the unit, and a warmer air temperature will result until the snow is removed.

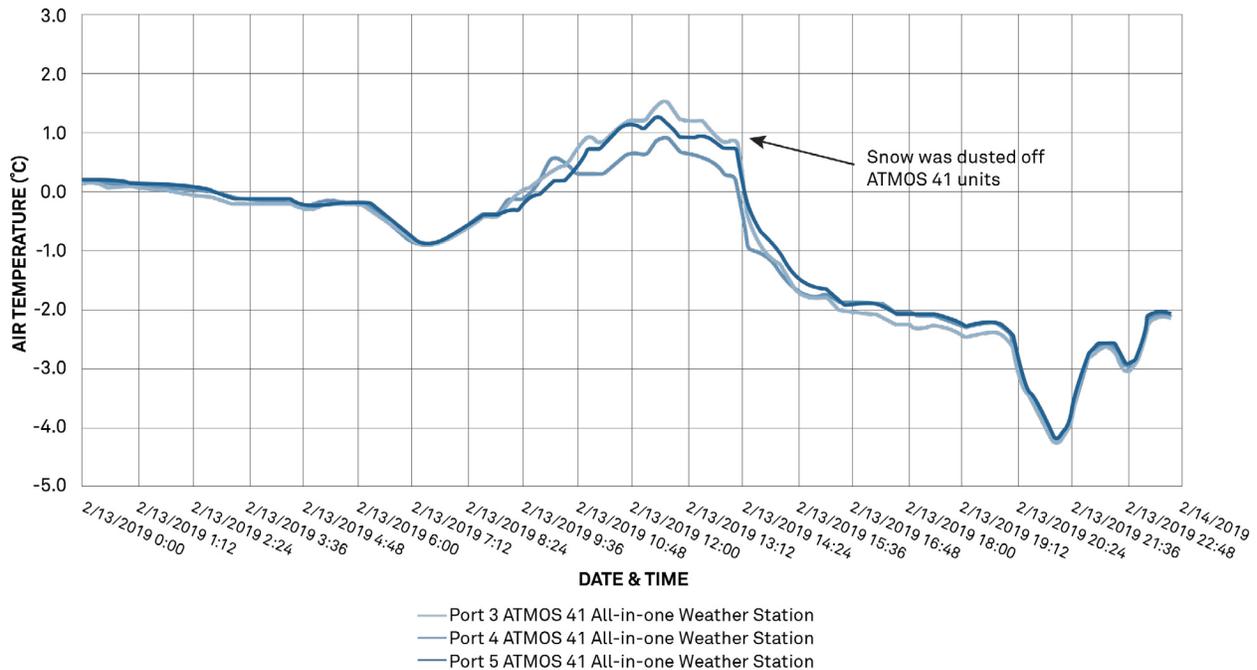


Figure 5. ATMOS 41 air temperature data

Overall, air temperatures track well when compared to a non-METER reference sensor (Apogee TS-110 fan-aspirated radiation shield with ST-100 thermistor), which was colocated on METER's rooftop testbed and connected to a CR1000 data logger. Air temperature measurements over snow on clear-sky days range up to about 2 °C high under low wind speed conditions. This magnitude of error is expected due to the substantial increase in reflected shortwave radiation from snow with albedo near 1, and is much smaller than the error expected from air temperature measurements in a non-aspirated radiation shield (Figure 6).

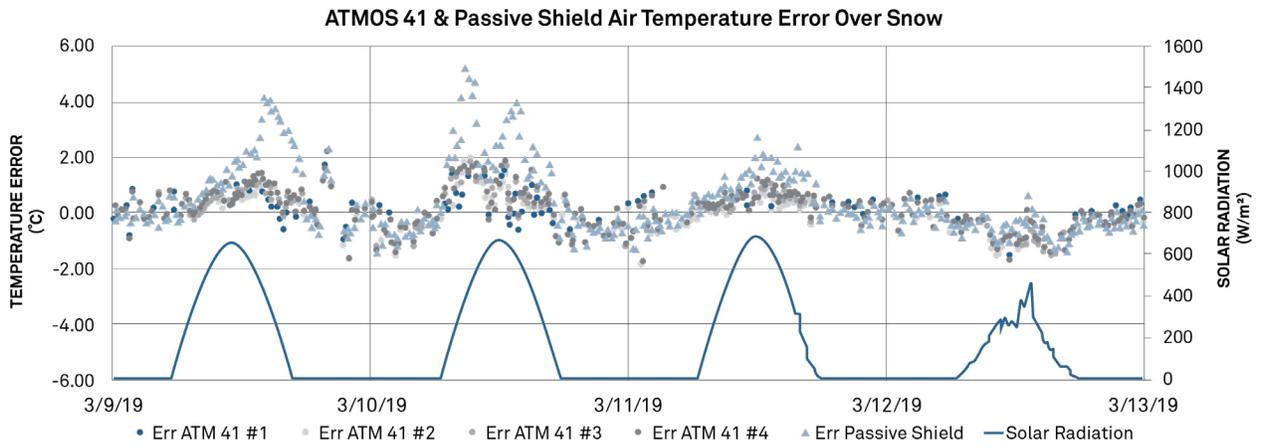


Figure 6. ATMOS 41 and non-aspirated radiation shield air temperature error over snow. March 9 and 10 had low wind speeds, giving a worst-case air temperature accuracy.

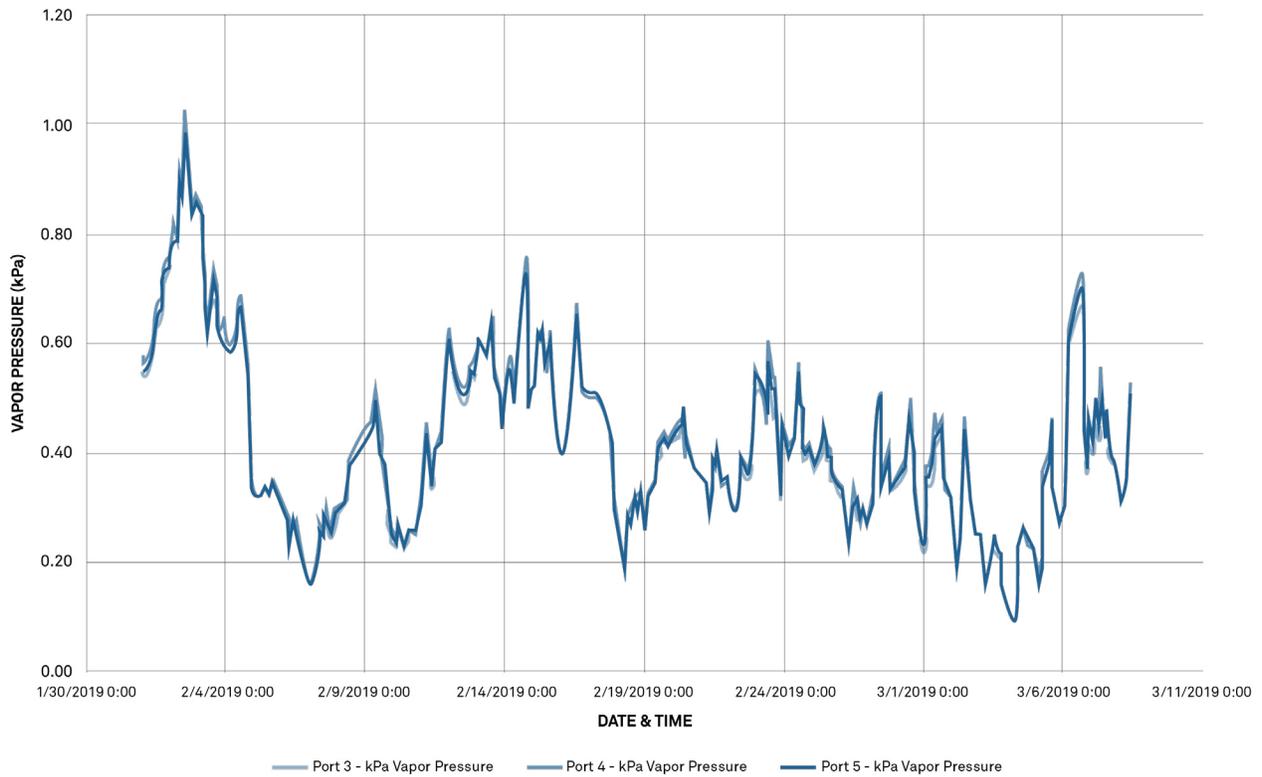


Figure 7. ATMOS 41 vapor pressure (kPa) – performs well

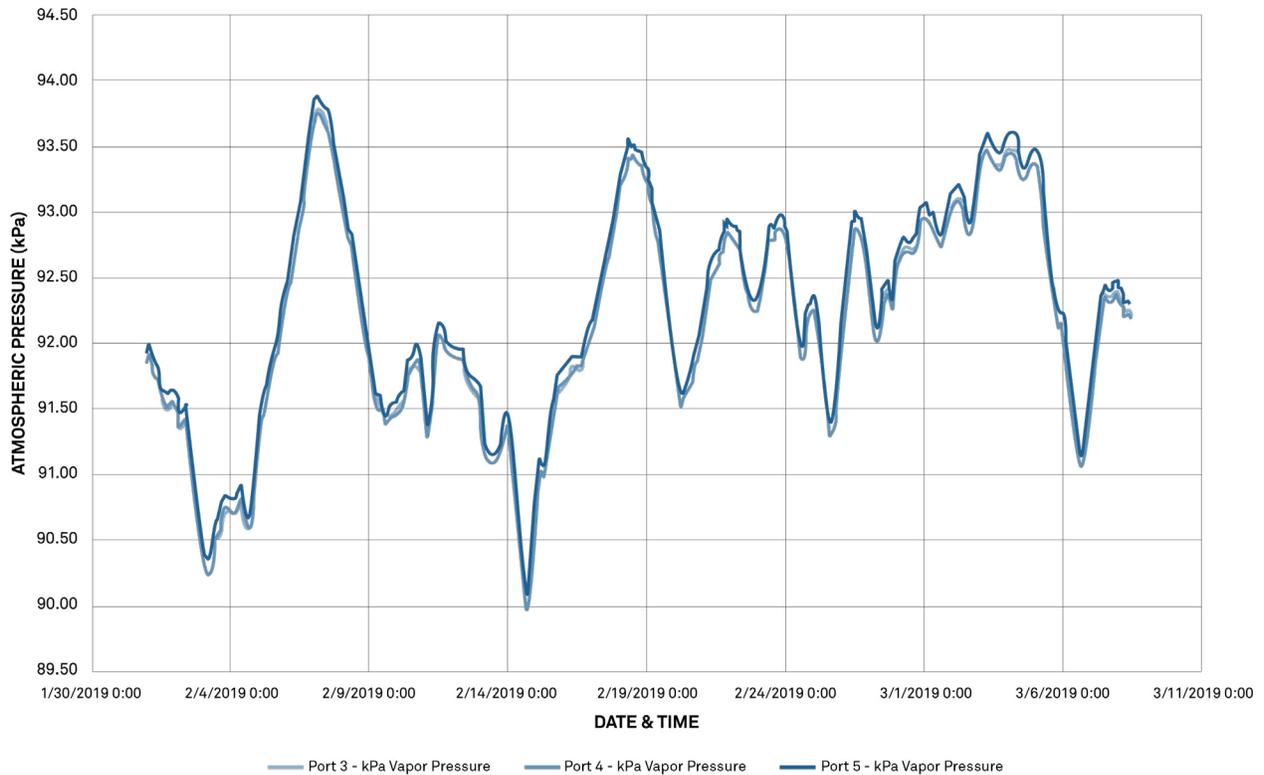


Figure 8. ATMOS 41 atmospheric pressure (kPa) – performs well

GET EXPERT ADVICE

Explore questions and ideas with an ATMOS 41 expert. Our scientists have decades of experience helping researchers measure the soil-plant-atmosphere continuum.

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