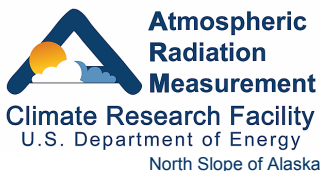


A Total Precipitation Sensor at the Barrow ACRF Site



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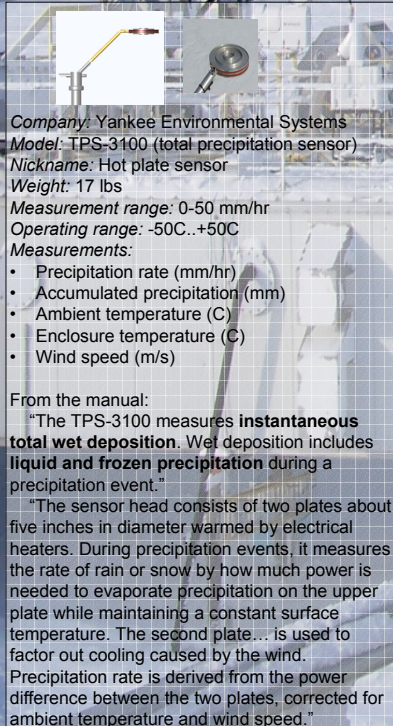
Photos by: Yankee Environmental Systems, Cisco, Google, Walter Brower, Mark Ivey, Dana Truffer Moudra

ABSTRACT

A Yankee Environmental TPS-3100 Total Precipitation Sensor was installed near the Barrow ARM Climate Research Facility (south of the NOAA facility and east of the Great White shelter) in September 2006. Data ingest software was completed by the end of 2006. Precipitation data from the TPS-3100 are being collected and archived at present.

The sensor head of the TPS-3100, the "hotplate" sensor, consists of two heated plates about five inches in diameter. The plates are oriented parallel to the ground, one facing upward and the other downward (see image attached). The rate of rain or snow precipitation is derived from the difference in the amount of electrical power required to keep the two plates at the same temperature.

Data from the TPS-3100 Total Precipitation Sensor at Barrow will be presented in this poster. An upcoming data analysis effort will compare data from this sensor with other precipitation sensors near the Barrow ARM facility.



Company: Yankee Environmental Systems
Model: TPS-3100 (total precipitation sensor)
Nickname: Hot plate sensor
Weight: 17 lbs

Measurement range: 0-50 mm/hr
Operating range: -50C...+50C
Measurements:

- Precipitation rate (mm/hr)
- Accumulated precipitation (mm)
- Ambient temperature (C)
- Enclosure temperature (C)
- Wind speed (m/s)

From the manual:

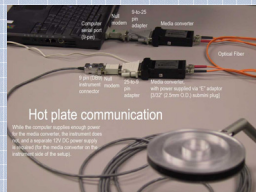
"The TPS-3100 measures **instantaneous total wet deposition**. Wet deposition includes **liquid and frozen precipitation** during a precipitation event."

"The sensor head consists of two plates about five inches in diameter warmed by electrical heaters. During precipitation events, it measures the rate of rain or snow by how much power is needed to evaporate precipitation on the upper plate while maintaining a constant surface temperature. The second plate... is used to factor out cooling caused by the wind.

Precipitation rate is derived from the power difference between the two plates, corrected for ambient temperature and wind speed."

Original deployment (fiber)

9.20-25.2006, 10.25.2006-1.15.2007



Communication: in the field similar to above: instrument to computer via optical fiber

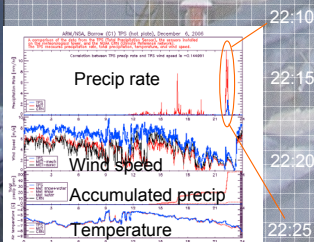


Original location: ~250m SE of Great White Head of TPS



Communication problem: fiber chewed by lemmings (Sep 25 2006), then by foxes (Jan 15 2007)

Sample data:



Snow on radiometer covers

Current temporary deployment

2.10.2007-Present



On upper level of user deck, via optical fiber.

Firmware upgrade

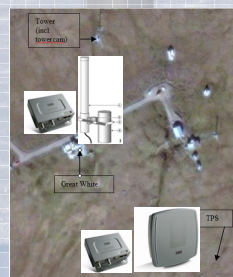
In two weeks, the manufacturer will send a firmware upgrade for the TPS.

Future permanent deployment

Location: At original location in the field

Communication:

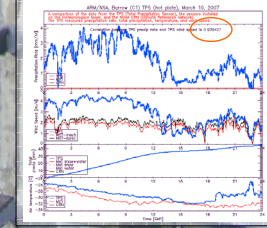
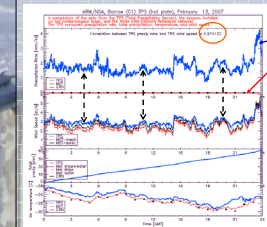
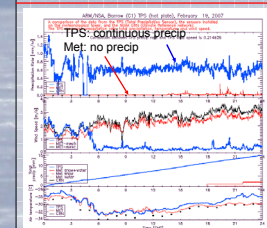
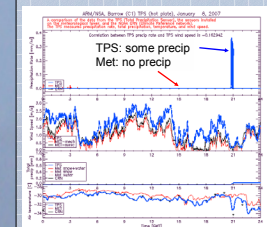
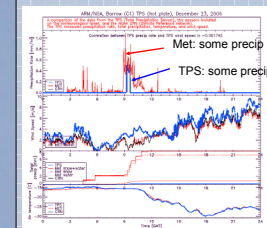
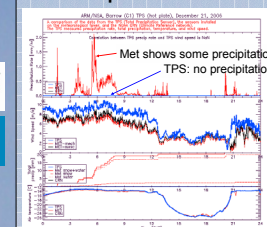
- cisco wireless Aironet 1300 access pt
- 5.2dbi omni-directional Antenna at Great White (2.4-2.83 GHz)
- 13 dbi directional antenna at the TPS (antenna specs at <http://tinyurl.com/cibf>)



Camera 250m from TPS



Other sample data



After reinstall, and more snow on the ground (and apparently a lot of diamond dust in the air): nearly continuous precipitation according to TPS

In the last month, there is a high correlation between TPS wind speed and TPS precip rate, while met tower does not show any precipitation.

Upcoming plans for the TPS (Total Precipitation Sensor):

1. compare TPS data with Met and CRN (clim. res. network) data
2. work with snow researchers in Barrow to ascertain the quality of the data
3. evaluate the feasibility of adding a second hotplate sensor on the tower or other elevated surface to address issue of measurement bias from blowing snow