**SR30**

The SR30 is a pyranometer manufactured by Hukseflux. It measures broadband solar (shortwave) irradiance. A pair of glass domes (pair used for insulation) covers a thermopile (thermocouples in series) when the top of the thermopile is a different termperature than the bottom of the thermopile, a voltage is created. This voltage is measured and is calibrated to Wm-2. A pyranometer is designed so that solar heating of the thermopile top surface (black plate visible beneath the dome) is responsible for the temperature differential and thus the voltage. Two SR30s are installed on each ASFS station, one facing up (measuring incoming radiation termed “downwelling shortwave” SWD) and one facing down (measuring reflected radiation termed or “upwelling shortwave” SWU). It have a small fan and heater inside the body that circulate air between the two glass domes.

**Turning the system on/off:**

Connect/disconnect power source.

Fused 1A 12 VDC.

**Communications & Settings:**

The SR30 is connected to the RS485 terminal block. Refer to the wiring diagram for details.

The SR30 measurements are collected using a digital protocol, RS485. All data are polled. The only setting that needs to be applied to the sensor configuration is its address, which is 1 (downward facing, SWU) and 2 (for upward facing, SWD). The communications settings are as follows:

Baud: 19200

Parity: Even

Stop bits: 1

Data bits: 8

**Variables:**

Variables are reported in the “slow” data table file. The variable list is below. The variable names are either “swd” or “swu” where these terms refer to the measurement, not the orientation of the instrument; i.e., “swd” = downwelling shortwave, which is the upward-facing instrument. The variables for swu are shown below, but identical variables are recorded for swd.

sr30\_swu\_DegC: instrument body temperature in Celsius

sr30\_swu\_IrrC: the “science” measurement, temperature-corrected irradiance (swu) in Wm-2

sr30\_swu\_Irr: swu without temperature correction

sr30\_swu\_fantach: tachometer for the fan in Hz

sr30\_swu\_heatA: amperage of the heater

sr30\_swu\_level: instrument x/y plane level in degrees

**Post Processing:**

* Analysis of cross validation data acquired using the MARC station.
* Long and Shi (2008) quality control + manual QC
* Examination of data and camera images for signs of icing

**Daily Data Checks:**

* The instrument should be level to within 0.1 degree. Keep an eye on the level.
* Make sure that data is being collected. Note that on sunny days in summer sr30\_swd\_Irr could be > 800 Wm-2 but that at night the values will be ~ 0.
* sr30\_swu\_Irr < sr30\_swd\_Irr; over snow/ice, sr30\_swu\_Irr ~ sr30\_swd\_Irr x 0.8
* The fan should be running between 100 and 200 Hz.
* The heater amps > 0
* Check the latest images from the cameras. Note in the logs if you see ice on the dome.

**ASFS Visit Checks:**

* (1) Inspect instrument level. Note if it is off. Maybe even take a photo.
* (2) Use ethanol to clean ice/snow/salt etc from the instrument, especially the glass dome. Ice that is not on the dome but can shade the dome is a problem. Ice on the body can be a platform for more ice to build upon. Knock the ice away from the body and clear around the instrument using a brush or glove. Use a clean microfiber cloth or a Kimwipe that has been wetted with ethanol to clean the dome. The dome is glass – you don’t want to scratch it but it is not too sensitive. Treat it like a camera lens. It is better not to spray ethanol directly on the instrument because it can damage gaskets over time, but it is ok to do so if you need to. Always use the cloth to wipe the glass dome dry when you are done cleaning because if you leave liquid on the dome residual water will refreeze after the alcohol evaporates and/or the evaporating alcohol can cool the dome and attract frost.
* (3) Level the instrument. The upward-facing (swd) SR30 level is the reference and guide for the entire radiation plate. Level using the bubble level and check that the digital level agrees. The digital level should take precedence.

**Things to consider:**

* The SR30 is the *most critical* instrument on the ASFS to be level.
* The instrument is lower priority during polar night (there is no sunlight to measure), but should still be maintained during visits at night because you don’t know when you will get back.
* Avoid disturbing the surface beneath the instrument!
* Albedo = sr30\_swu\_Irr / sr30\_swd\_Irr
* Ice is bad but has complicated effects. Frost usually forms on the top of the dome first and sublimates last there as well. Ice can decrease the signal by shading the thermopile but a partially-iced dome can also enhance the signal by scattering sunlight towards the thermopile.
* The manual shows images of the SR30 with a white plastic radiation shield (i.e., a sun shade). We are not using the shield so the instruments identifiable by their aluminum body with clear-glass domes. The reason the radiation shields are not being used is that tests have shown the shields (which are unheated) can attract ice and the manufacturer’s own tests indicated that the shields do not significantly improve data quality.
* There is desiccant in the instrument body. We are not currently recording the internal RH. The desiccant should last 5 years, probably much longer in the Arctic.
* Your eyes are very sensitive to light. In low light or twilight conditions you may be able to see but the instrument might measure a very small value or even slightly negative. This is ok. There is surprisingly little light. In a lit office the instrument will only measure 1-2 Wm-2.