

Broadband Radiometry Instrument Focus Group

ASR PI Meeting, Potomac, MD

March 2014

Welcome!

- **Major issues to cover:**
 - **ARM Pyrgeometer calibrations and reprocessing (ECR-00781)**
 - **Ventilation issues (ECO-00991)**
 - **Cold (Arctic) climate operations issues**
 - **Surface radiation measurements ideas/recommendations for new SGP configuration**
 - **Other?**

Ventilation Issues

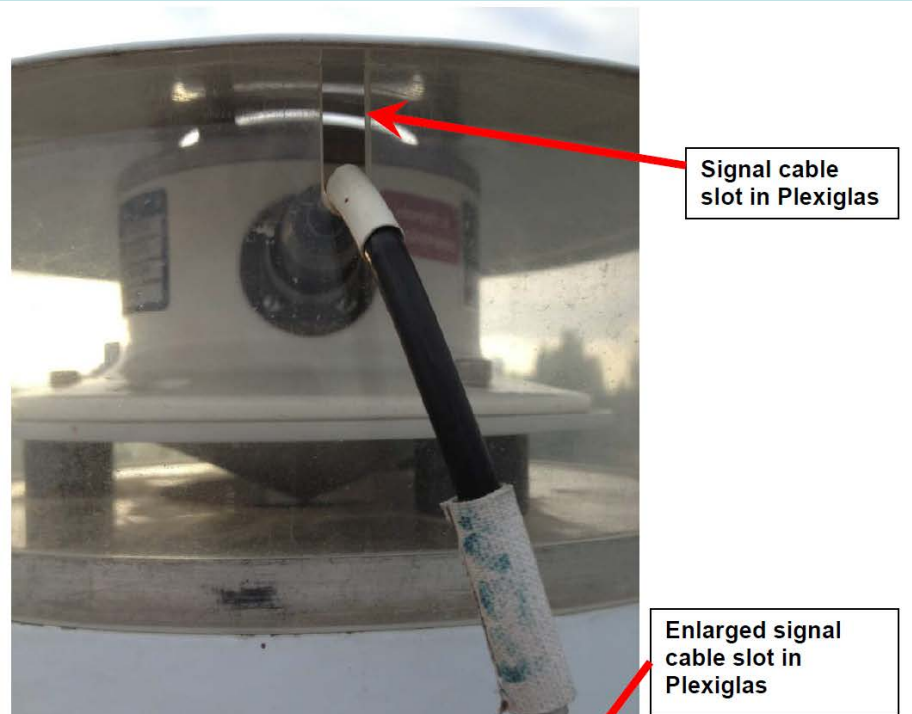
- **“ARM Radiometer Ventilation Issues: An Appeal for Diligence and Improvement” (Oct 2012)**
- **Issues:**
 - **Directing Air Flow Around the Domes**
 - **Adequate Air into the Fans**
 - **12V DC High Speed Fans**
 - **Daily Operations**

Controlling flow



We want all the air forced out around the dome...

NOT let it out the cable slot or around the sun shield, etc.

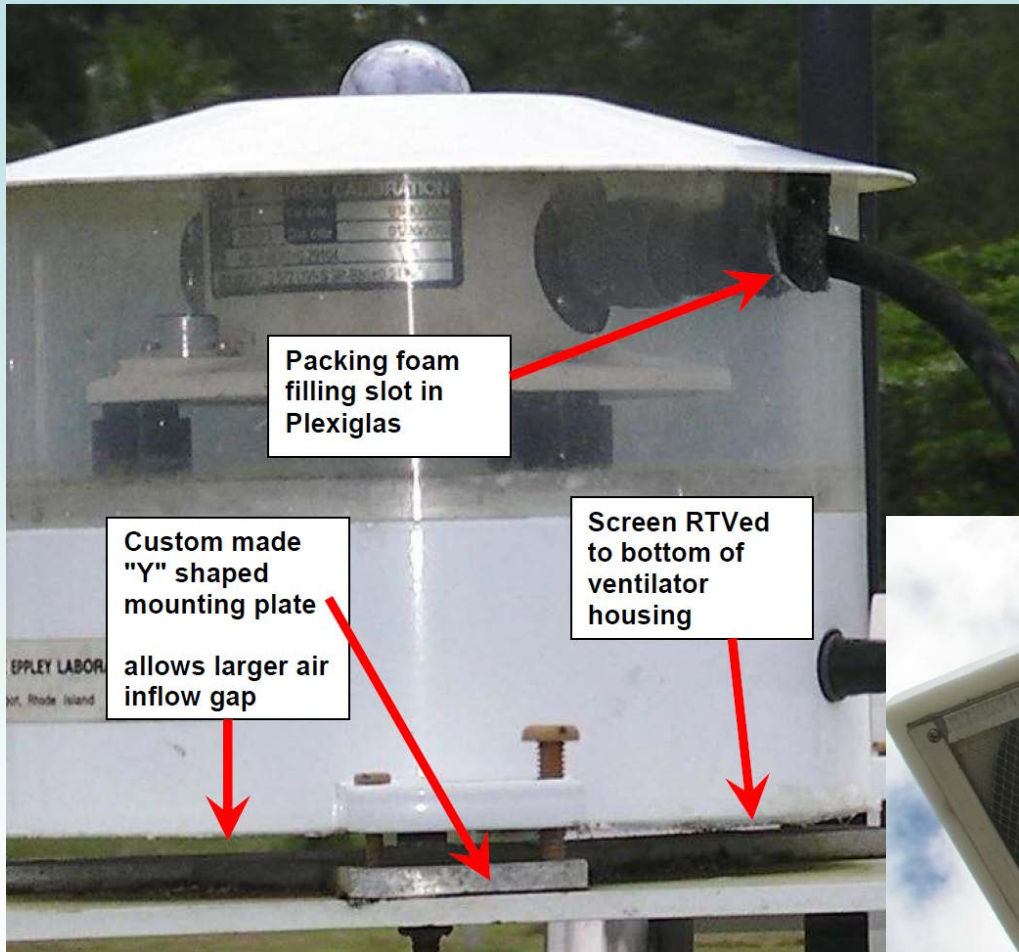


Fan and air flow

**Fan cannot
blow air if
flow to it is
blocked!**



Some solutions:



Plug the cable slot

Replace sun shield if not tight seal

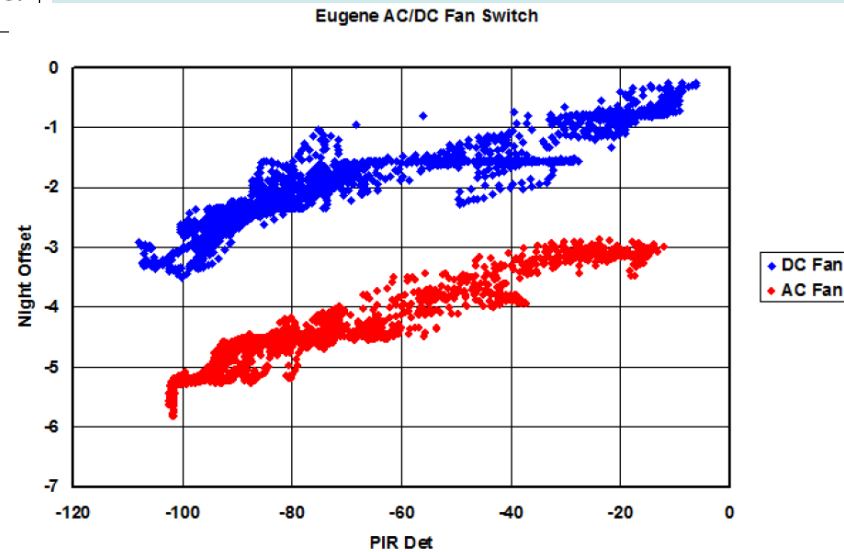
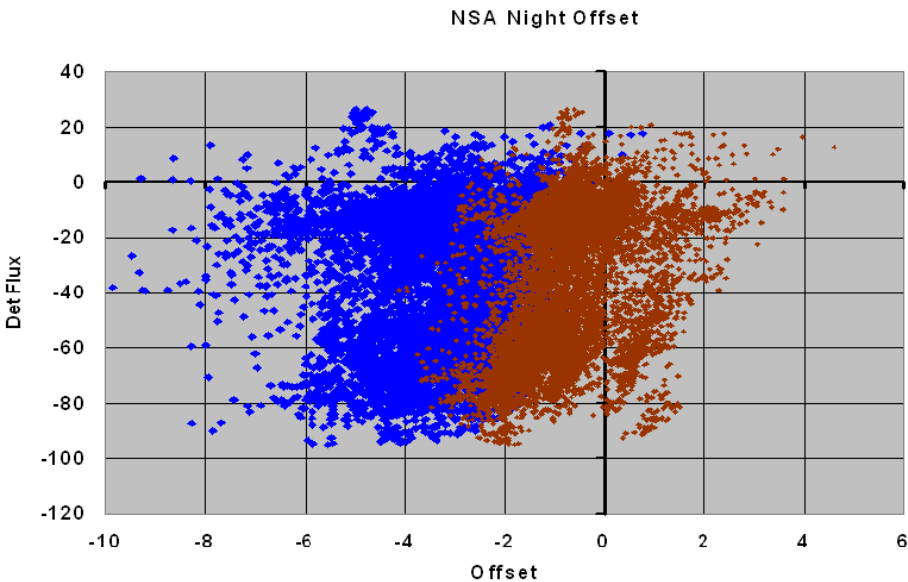
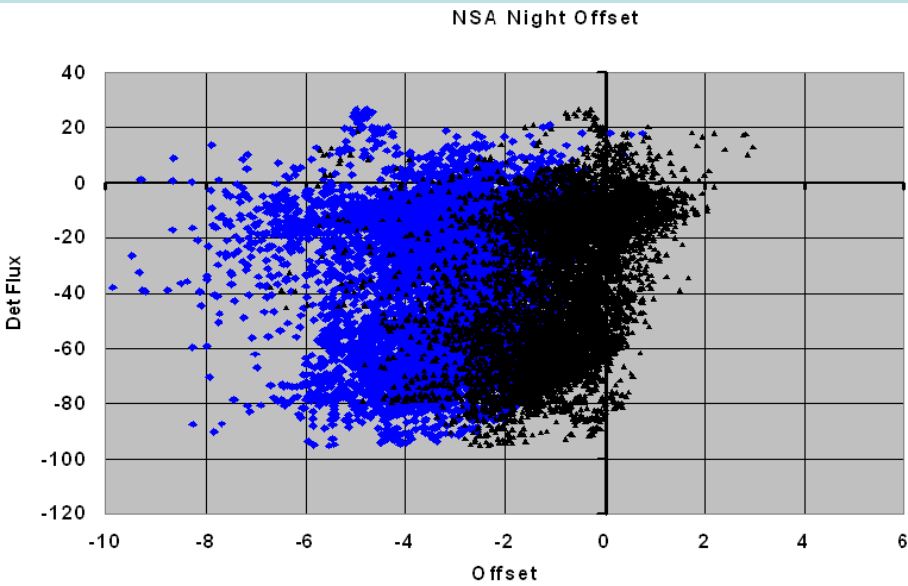
Remove fan screen and use larger area screening

Provide greater area for air to flow into ventilator



DC vs AC Fans

DC fans produce significantly smaller and “better behaved” night time offsets.



Operations

- **Listen, do you hear the fans running?**
- **Hold your palm over the dome (not touching dome): do you feel the air flow? Does it feel like strong flow?**
- **Is the cable slot sealed?**
- **Is the screen plugged up?**

Cold Climate Operations Issues

- **The following is from a summary report to the BSRN at the 2012 Workshop held in Potsdam, Germany, from the BSRN Cold Climate Issues Working Group**

Cold Climate Issues Working Group Update

Chuck Long for the CCIWG

Sunrise at Atqasuk, Alaska



It's a cold world out there!



NSA Radiometer IOP

Storm Peak Lab riming, CO, Oct 10, 2010

Cold Climate Issues

- **Instruments impacted by meteorological conditions: snow, frost rime, etc.**
- **Other issues include:**
 - **Thermopile sensitivity at cold temperatures**
 - **Hazardous conditions for personnel**
 - **Cracking of electrical cables due to cold temps**
 - **Possibly shifting bases for instrument stands**
 - **Etc.**

NSA IOP Tests Performed

- **Two different fan output flow volumes**
 - **Standard speed and high speed (18/44 CFM)**
- **AC vs. DC powered ventilator heaters**
- **Optimal heater placement inside ventilator (IR effects versus mitigation)**
- **Various heater designs**
- **Effects of insulation on sun shield**
 - **More heat to dome**

Radiometer Dome and Shield Accumulation

- PIR most susceptible to rime accumulation on sun shield
 - Or wind direction effect?
- Snow accumulation for all

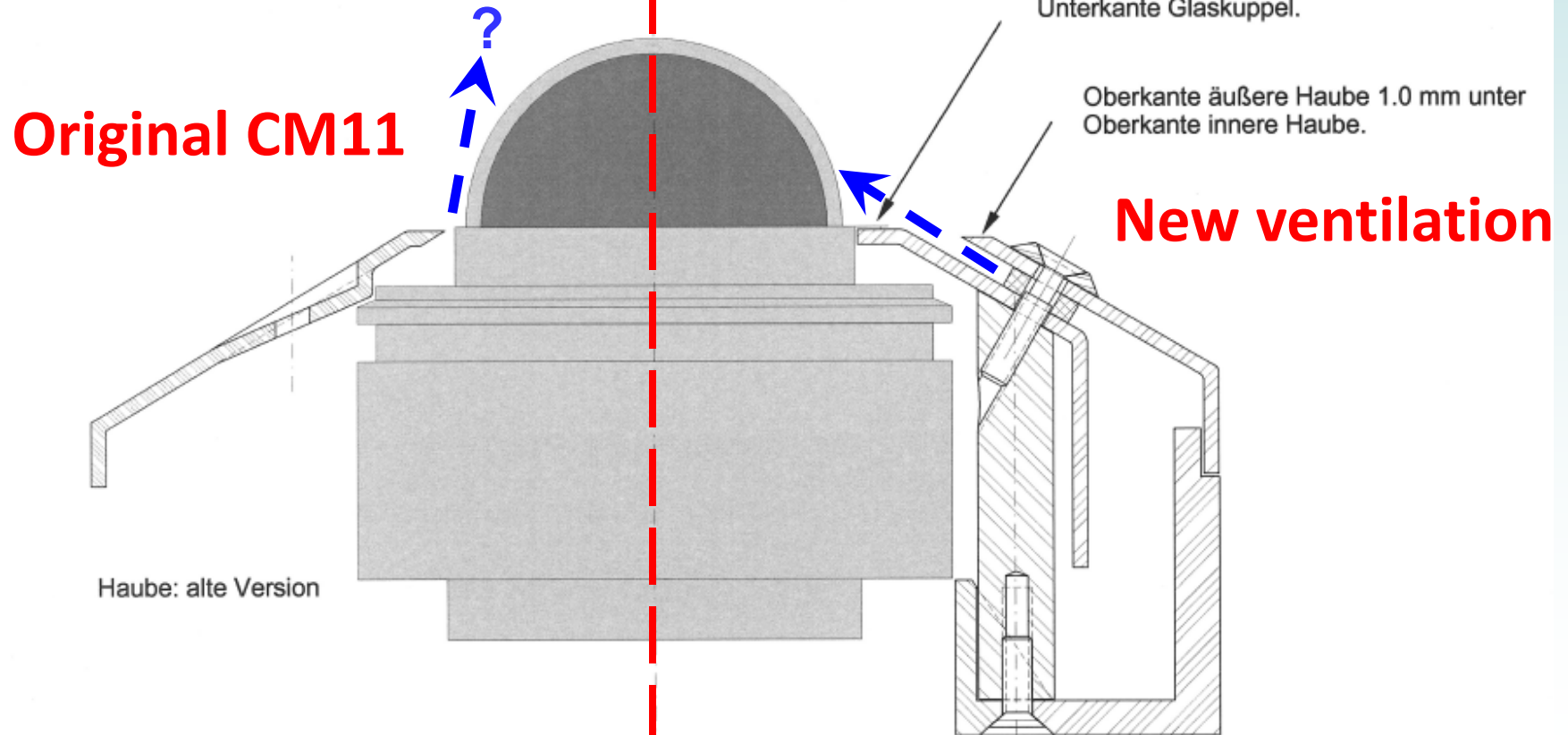


Conclusions

- **Eppley ventilator sun shield too flat on top for optimal cold climate use**
- **Higher speed fans are better**
- **Better design would have steeper sun shield and air flow more directed over dome**
- **Heating helps, but insufficient for all cases**
 - **Balance between heating and increased IR offset effects**

Gert: New ventilator design

15 Watt ventilator with a strong air stream not touching the body of the instrument but only the dome. Additional heating option just before the outlet not needed.



Ventilation blocking: Jungfraujoch, Sonnblick Mountain Observatory



Internal heating

Radiometers at Storm Peak Lab, CO, winter 2010



- **STORMVEX Campaign**
- **Significant riming and “100 year” snow**
- **SPN-1 virtually unaffected**
- **Recommend as ancillary radiometer?**

Matsui, N., Long, C. N., Augustine, J., Halliwell, D., Uttal, T., Longenecker, D., Niebergall, O., Wendell, J., and Albee, R., 2012: Evaluation of Arctic broadband surface radiation measurements, *Atmos. Meas. Tech.*, 5, 429-438, doi:10.5194/amt-5-429-2012.

SPN resistance to snow



**SIRTA site, near Paris France,
Jordi Badosa and Martial Haeffelin**

- **It snowed!**
- **SPN-1 not buried**
- **Recommend as ancillary radiometer?**
 - **Serve as QC tool for components**
 - **Serves as “best estimate” when primary contaminated**