



GLOBE Aerosol Instrumentation: Evaluation and Recommendations

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Presentation to Science Advisory Committee
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GLOBE Aerosols Protocol



Current GLOBE aerosol instrument

- sun photometer
- uses LEDs at 505nm and 625nm
- outputs voltage readings
- equations to calculate AOD
- *instrument availability limited*



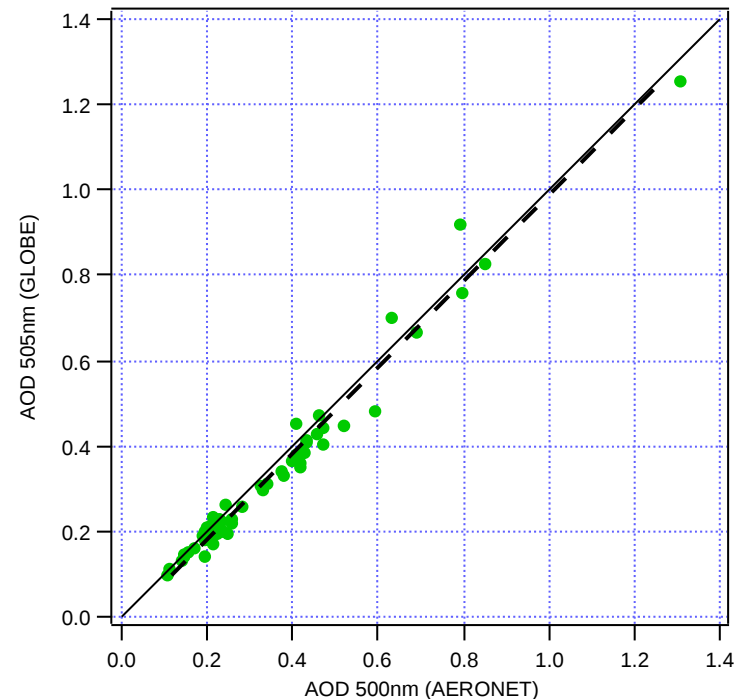
- simple kit to build instrument

AERONET Cimel Sun Photometer at Langley's CAPABLE site



GLOBE sun photometer data collected during summer 2012 and 2013 compares very well with the research-grade sun photometer in the AERONET network

Comparison at 505nm



Potential Alternate Instrument for GLOBE Aerosols Protocol



SHADE spectrophotometer aerosol instrument (Solar Handheld Aerosol Determination Experiment)

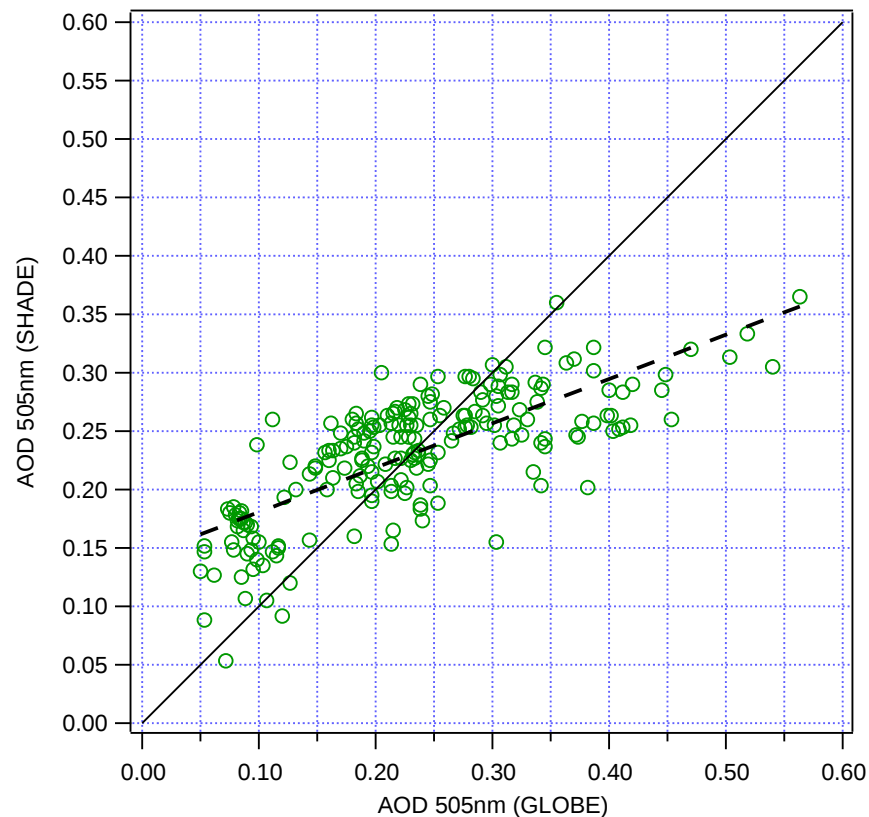
- sun photometer
- uses photodiodes at 505nm and 620nm
- measures voltage
- onboard processing with data logger
- level 2 AOD, pressure, air mass, solar elevation angle on instrument log
- can download data to computer - software generates level 2 data
- cost \$500

<http://shade.ubicode.com>

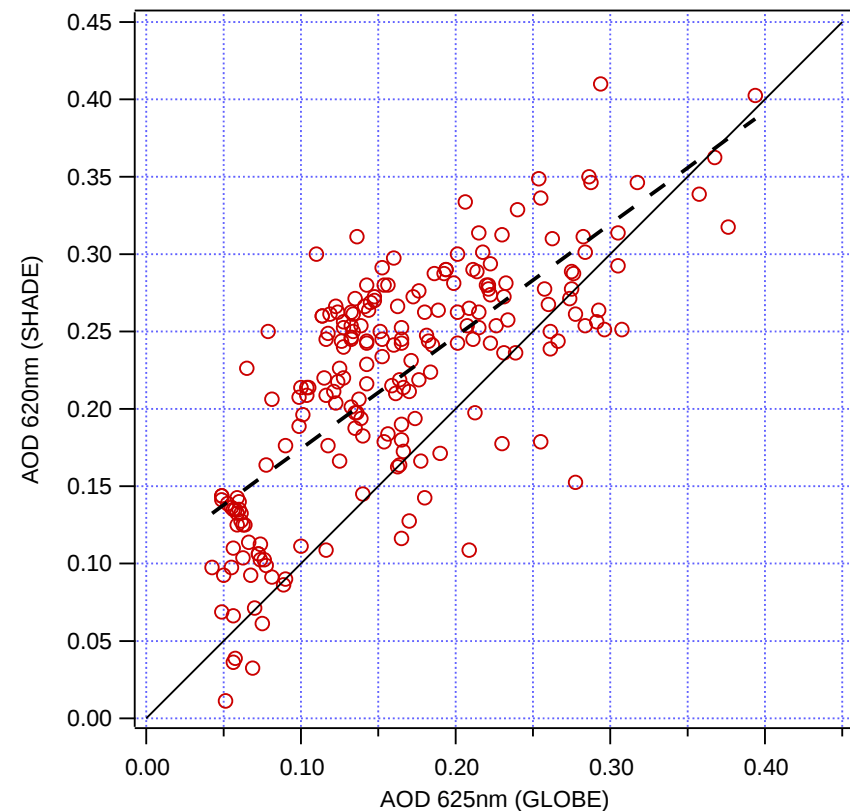
Intercomparison of GLOBE, SHADE and AERONET

During summer 2013, students collected >1200 side-by-side column measurements from GLOBE and SHADE aerosol instruments

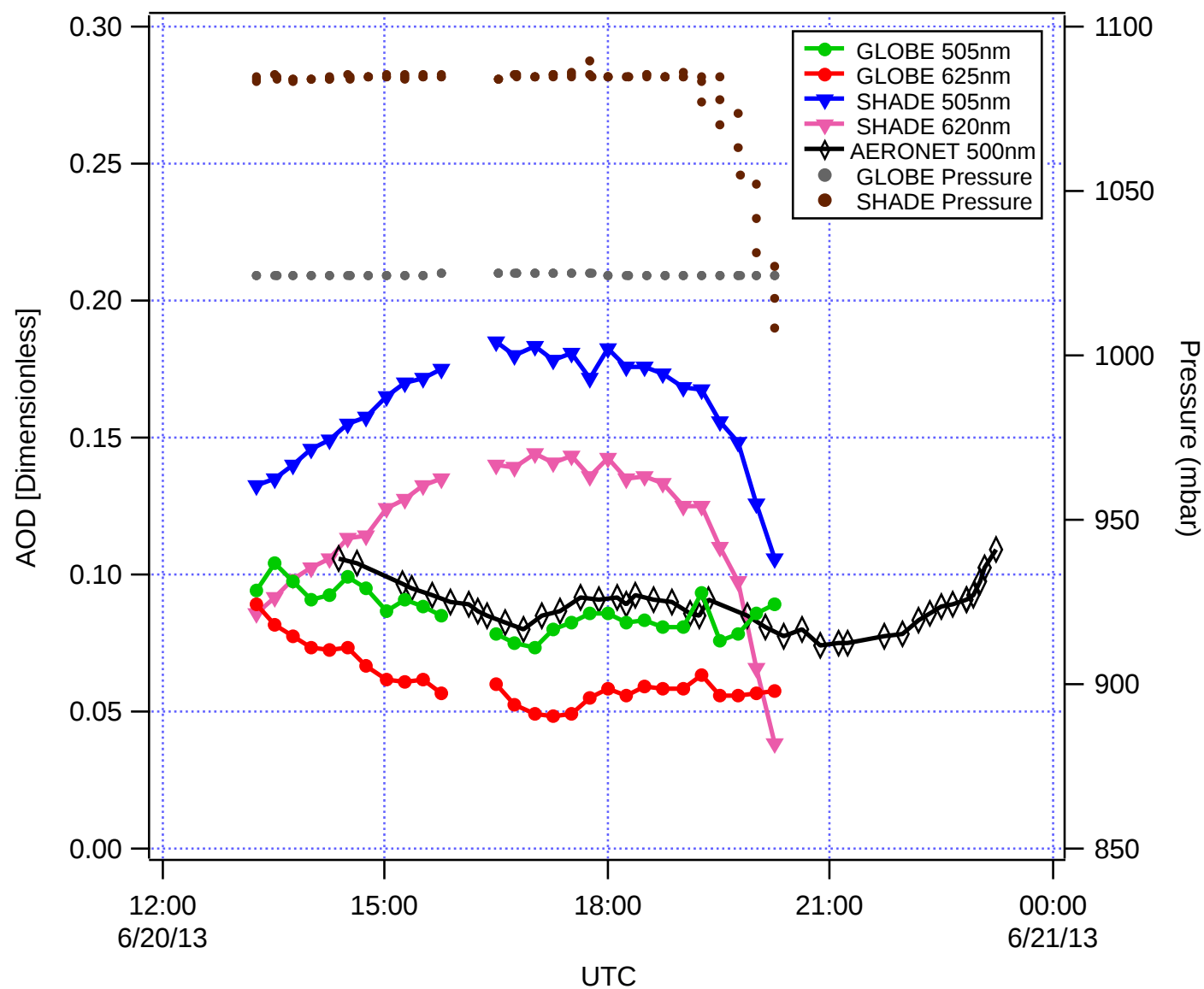
505 nm comparison



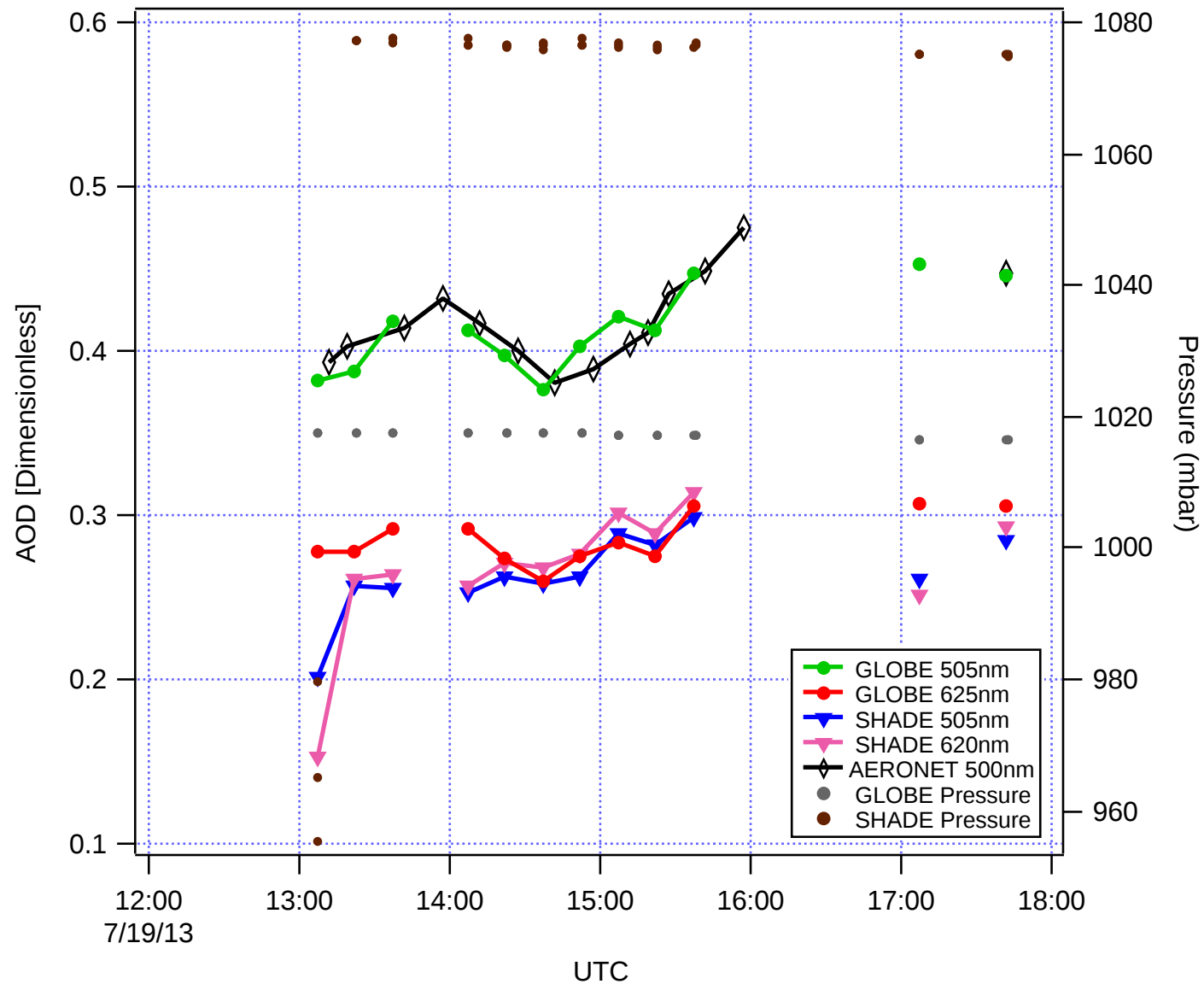
620 nm to 625 nm comparison



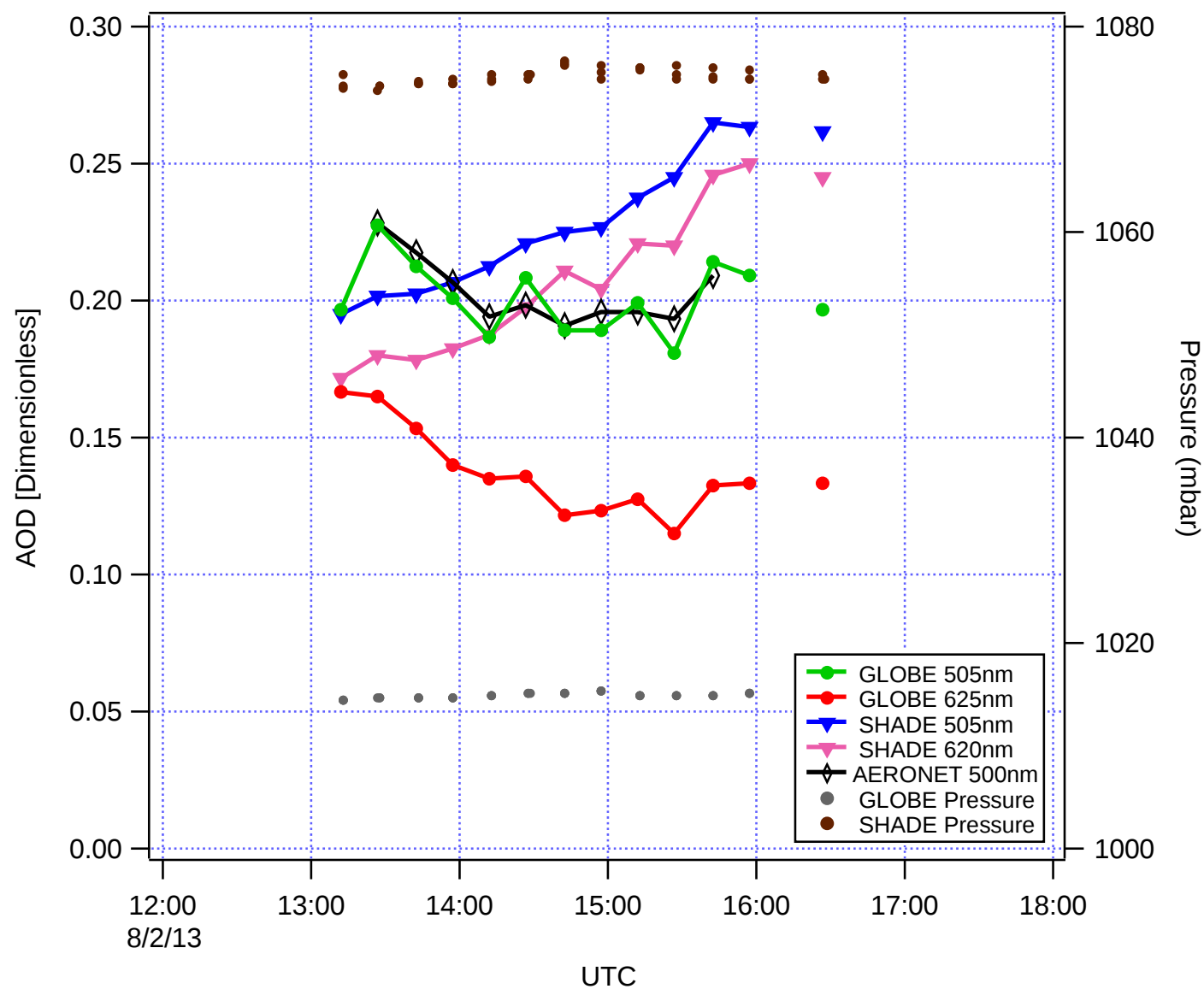
Intercomparison of GLOBE, SHADE and AERONET



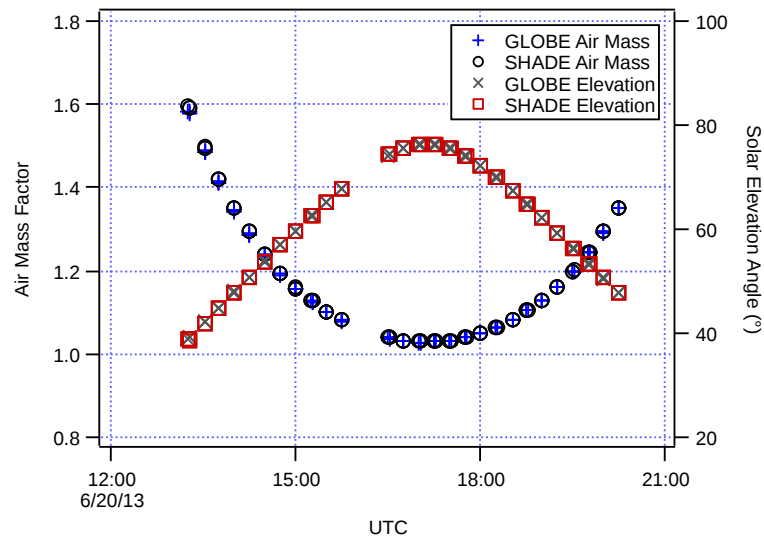
Intercomparison of GLOBE, SHADE and AERONET



Intercomparison of GLOBE, SHADE and AERONET



Investigating differences between GLOBE and SHADE

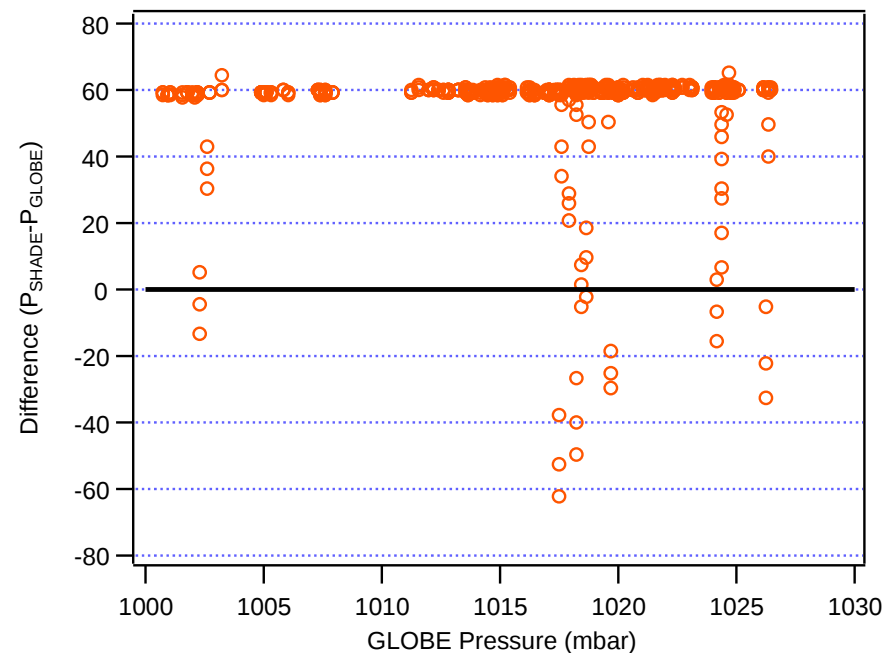


GLOBE and SHADE air mass and solar elevation can be directly compared – very little difference

GLOBE parameters are calculated from equations in spreadsheet or on website behind the scene
SHADE parameters are calculated onboard and read from log

Atmospheric Pressure at CAPABLE site
Min = 1000.7 mbar Max = 1026.5 mbar

SHADE onboard pressure
Min = 955.5mbar Max = 1089.7 mbar
becomes erratic when the batteries
begin losing charge



Concerns and Issues with SHADE instrument

Possible issues resulting in inconsistent data readings



- SHADE aperture irregular shaped
- Not an opening – light must go through plastic
potential transmission issues at different wavelengths
- Potential stray light issues inside instrument case
- Issues with pressure readings

Issues with ease of use of SHADE instrument

- Instrument randomly reboots during measurement or reading of log
- can't read backlit digital screen in sunlight while making measurement
- Software for downloading data and generating level2 data requires 32bit computer – not readily available now in US

Recommendations – test another SHADE instrument,
work with vendor to correct findings
discuss algorithm with GSFC scientist,
not ready for primetime