Broadband Surface Irradiances and Aerosol Optical Depth from Chebogue Pt., N.S., July-Aug 2004
Bonus topic: Thick Fog Identification

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100% raw data recovery

Measurements – 1-min. resol.

Broadband Downwelling Irradiance

- Direct Solar (2)
- Diffuse-sky solar (2)
- Total (Global) solar (2)
- Thermal IR

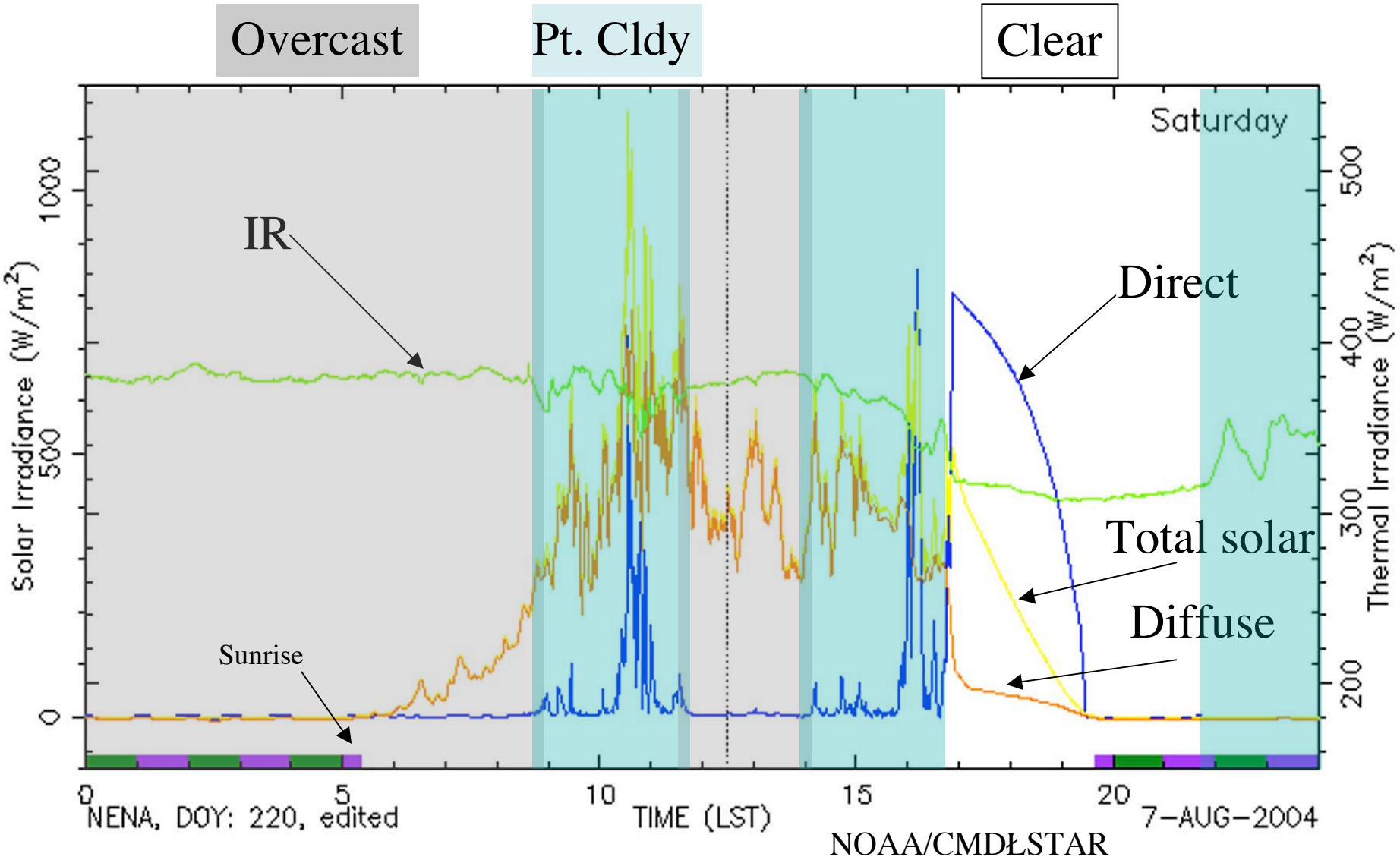
Narrowband Direct Solar

- 368, 412, 500, 610 nm
- 675, 778, 862 nm

Meteorology (4-m)

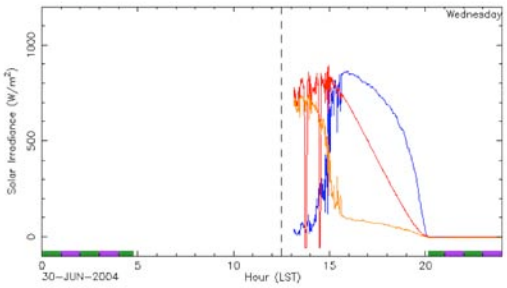
- Air Temp., RH, Ws & Dir, Pres.

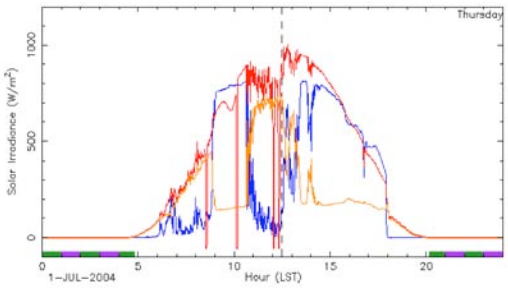
Broadband Solar and IR Downwelling Irradiance
Chebogue Pt.

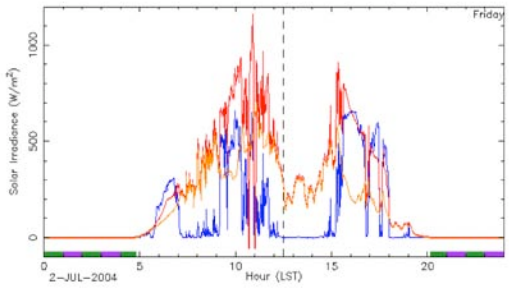


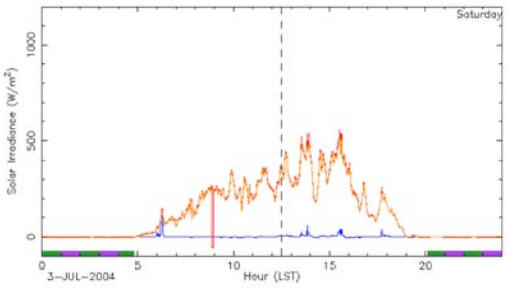
Solar Radiation, NENA, Chebogue Point, NS, JułAug ‘04

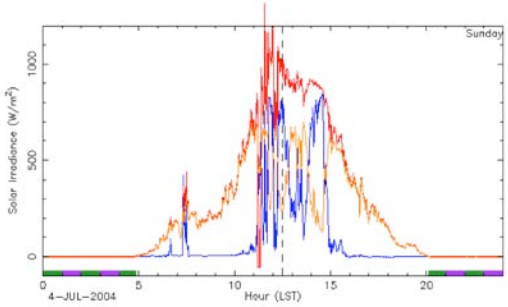
D_Global Direct Diffuse

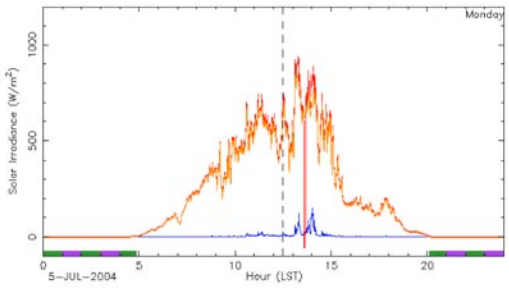


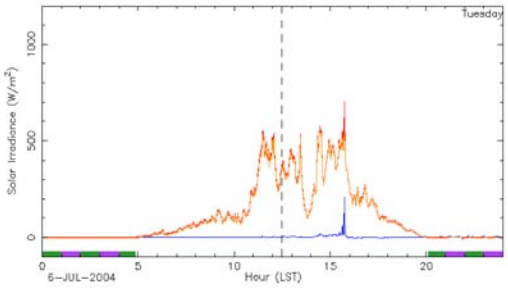


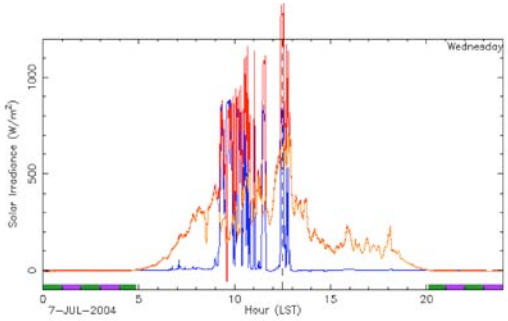


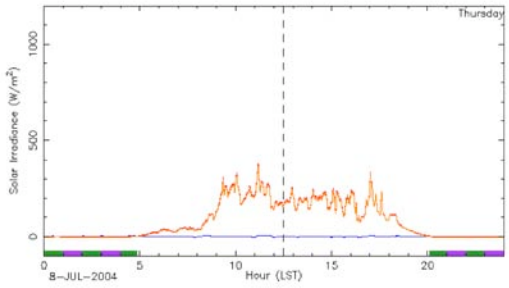






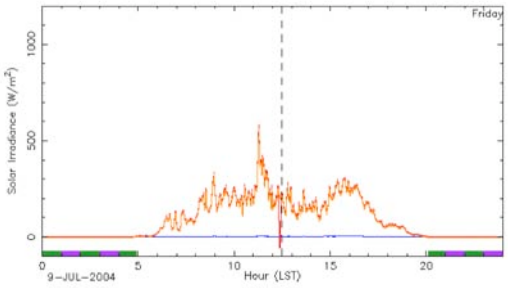


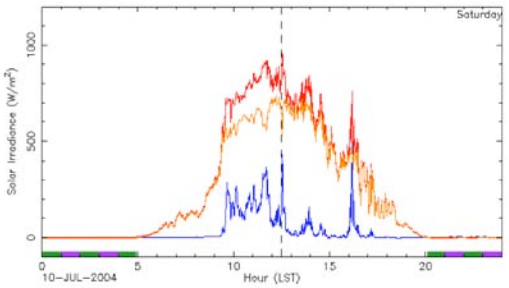


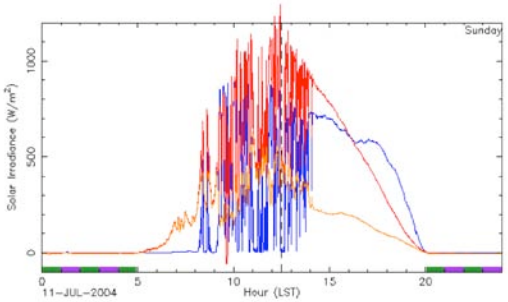


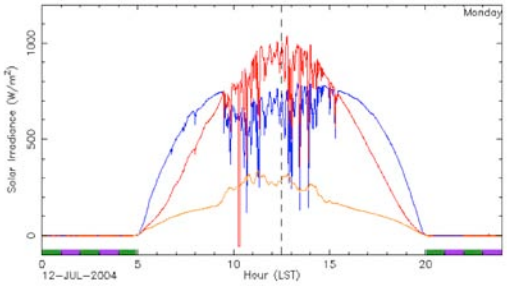
Solar Radiation, NENA, Chebogue Point, NS, JułAug ‘04

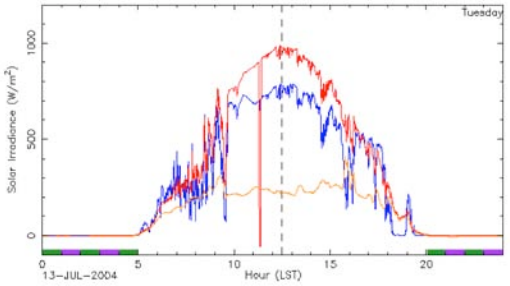
D_Global Direct Diffuse

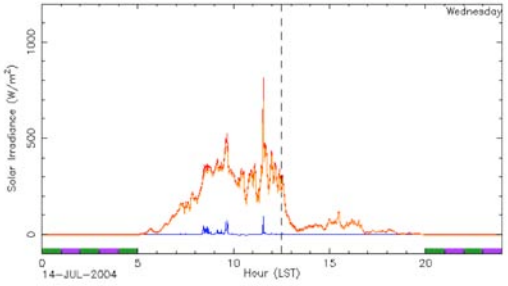


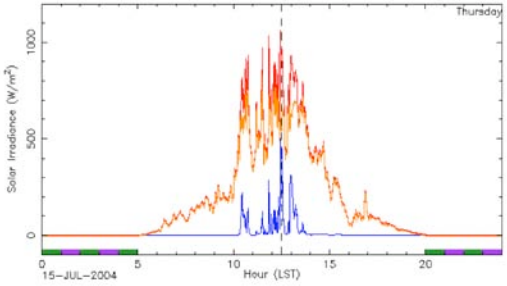


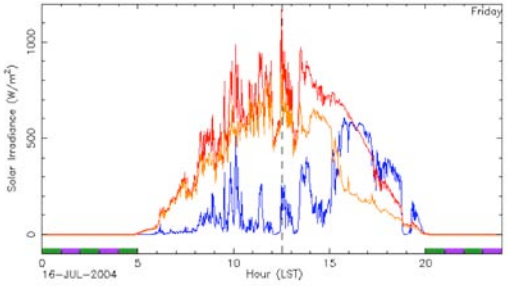


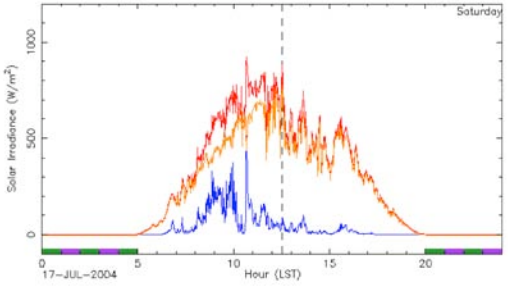






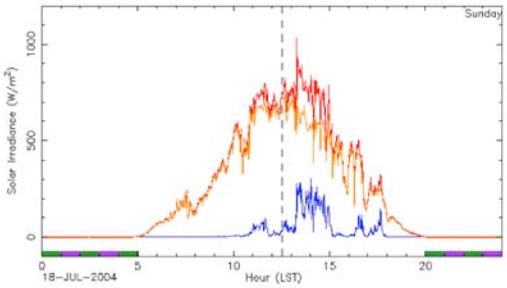


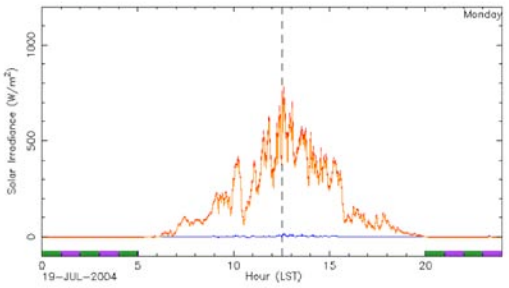


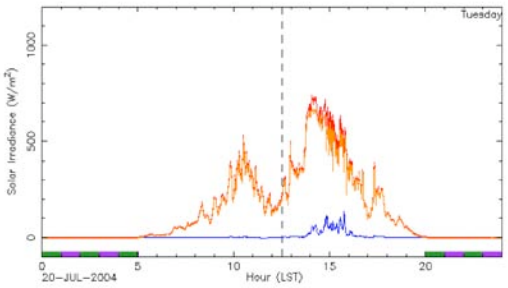


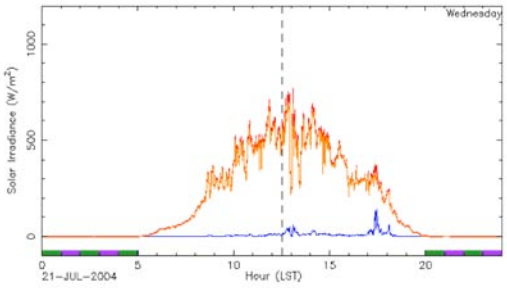
Solar Radiation, NENA, Chebogue Point, NS, JułAug ‘04

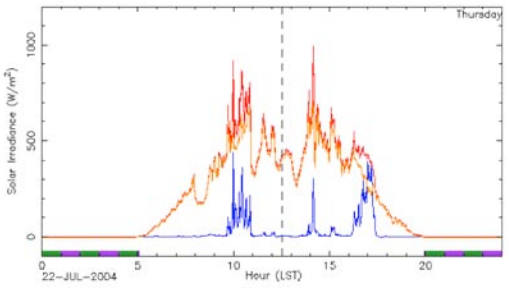
D_Global Direct Diffuse

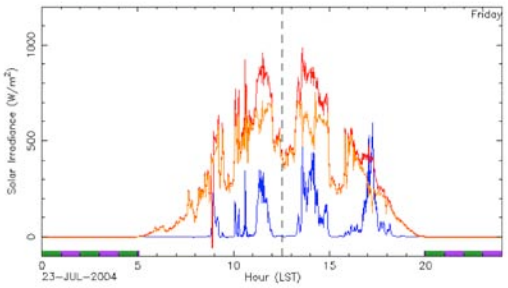


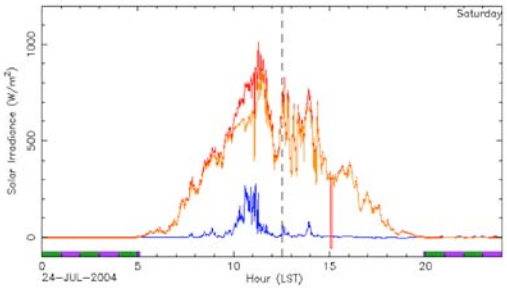


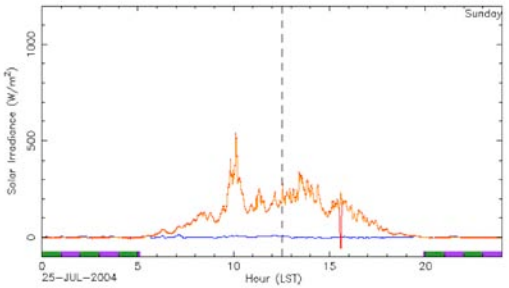


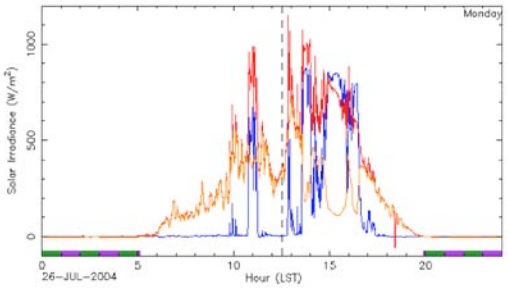






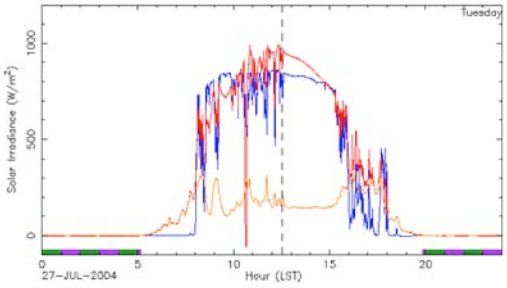


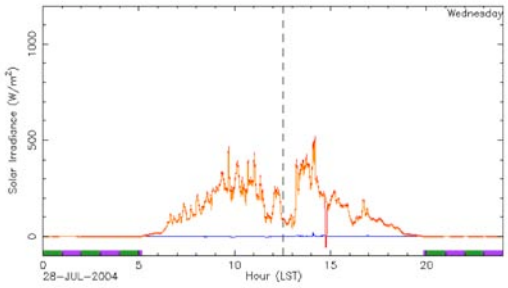


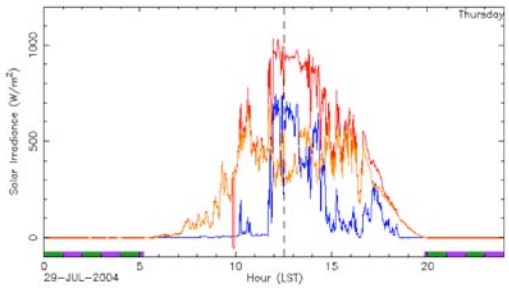


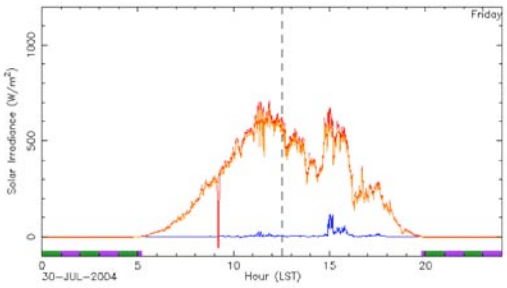
Solar Radiation, NENA, Chebogue Point, NS, JułAug ‘04

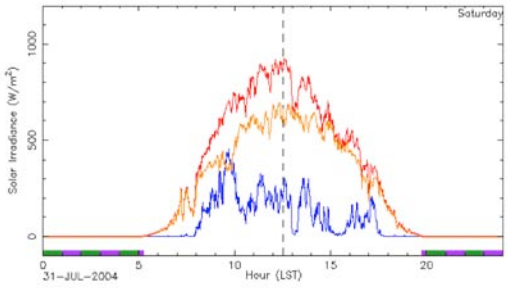
D_Global Direct Diffuse

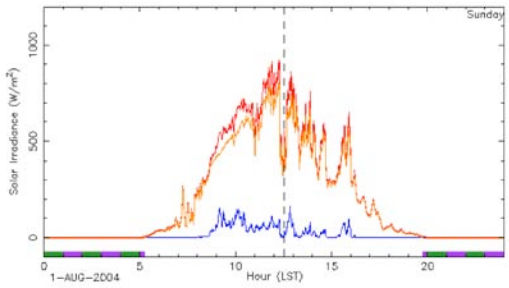


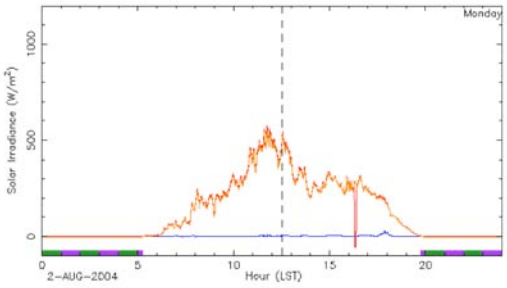


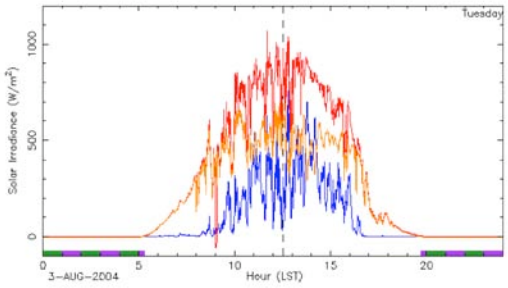


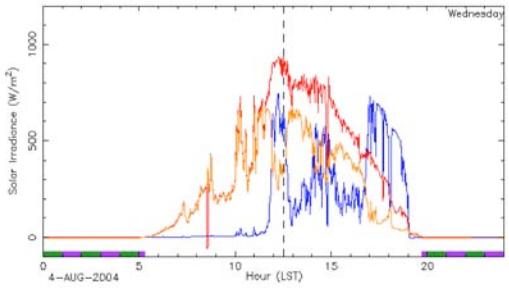












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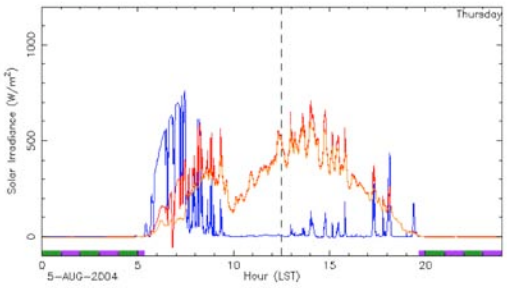

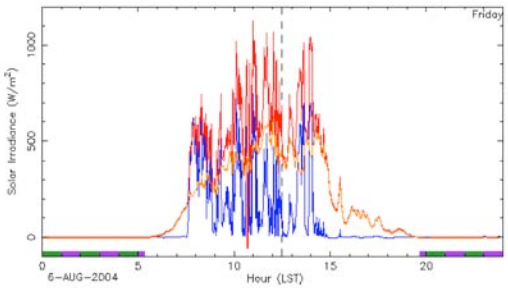

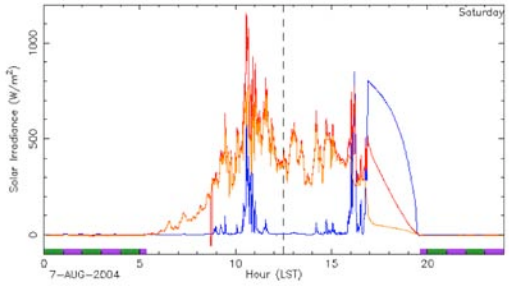

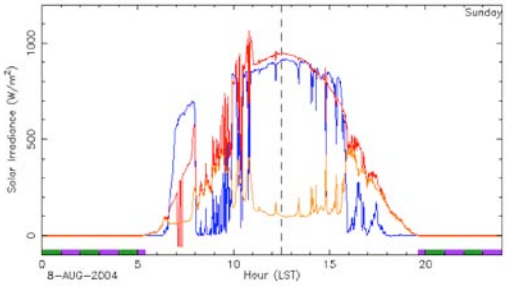

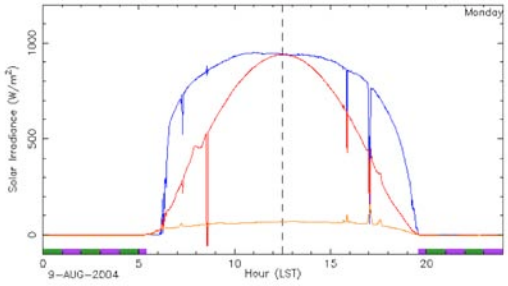

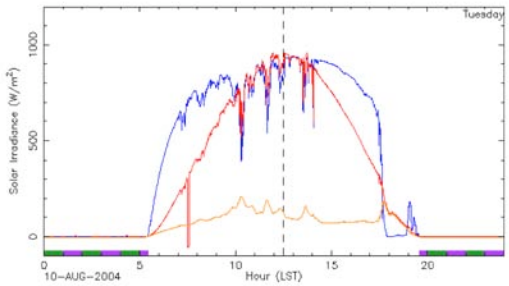

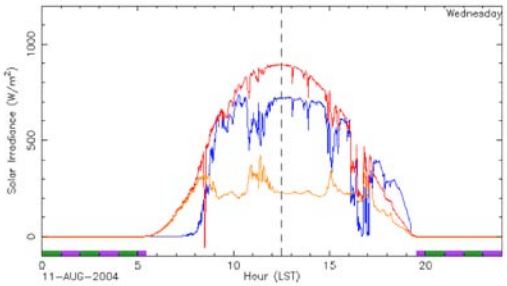

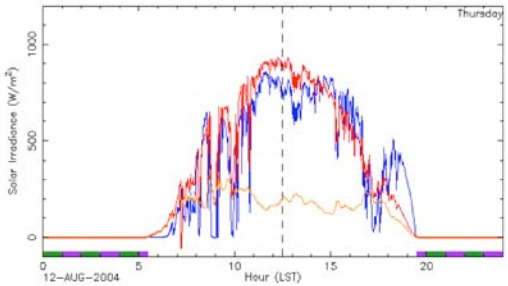

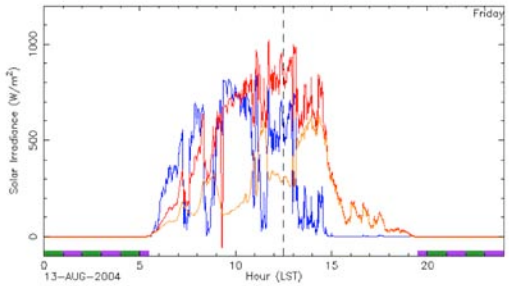

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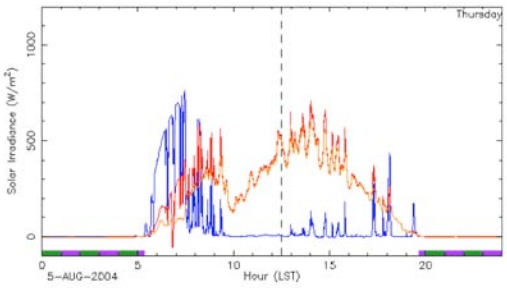
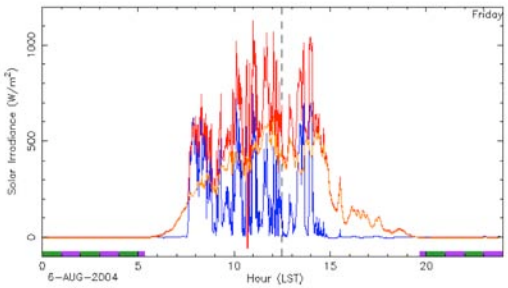
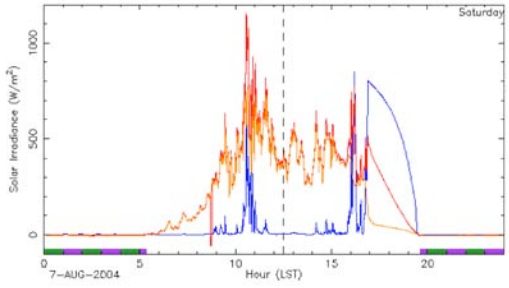
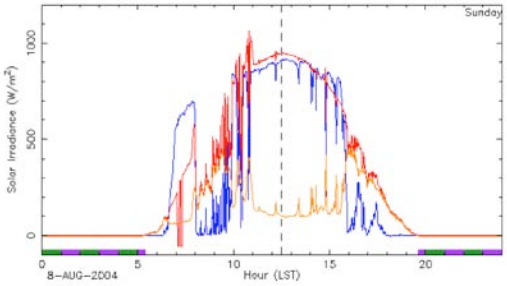
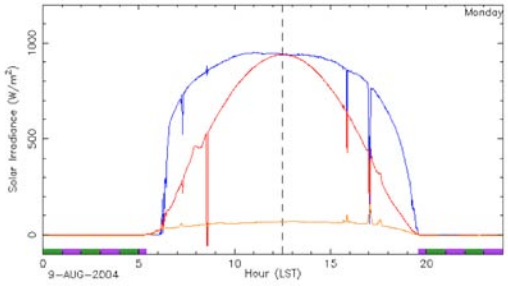
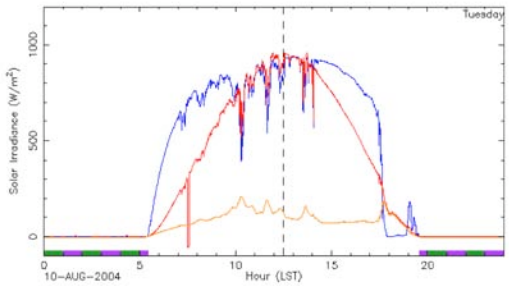


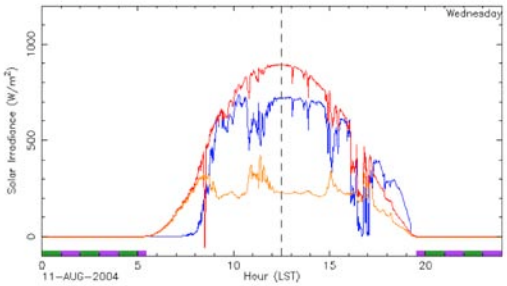


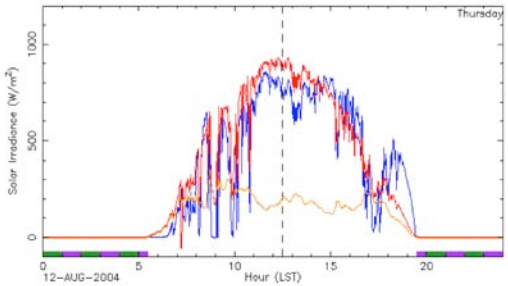


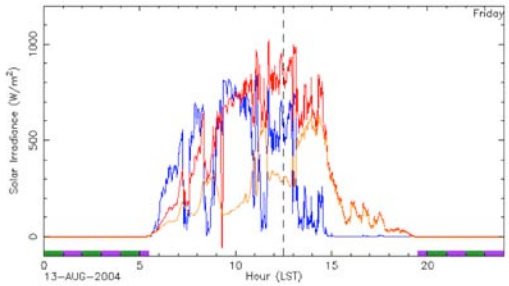








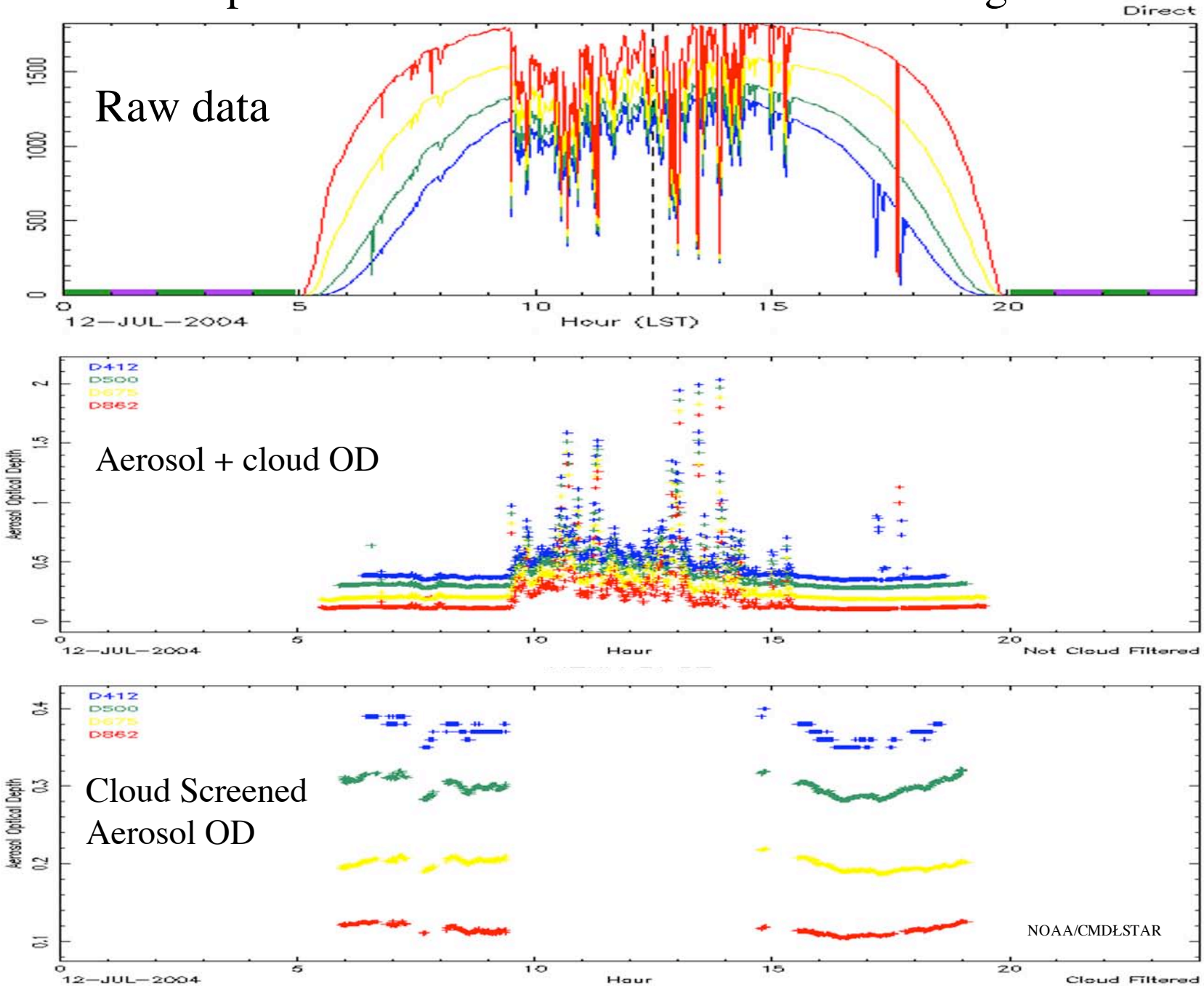




CMDL sunphotometers

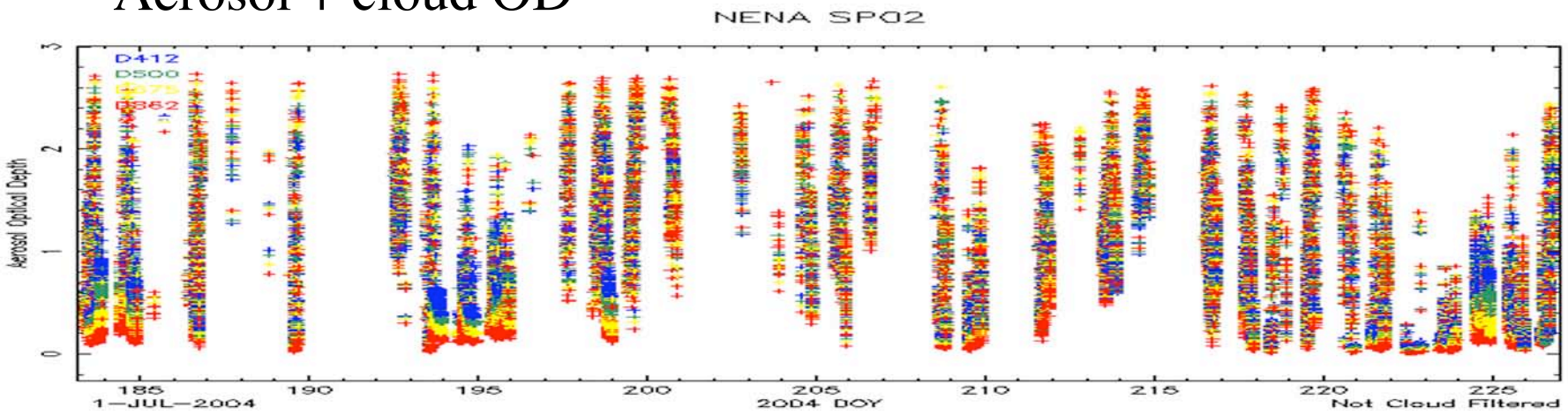
NENA SPO2

Chebogue Pt 2004

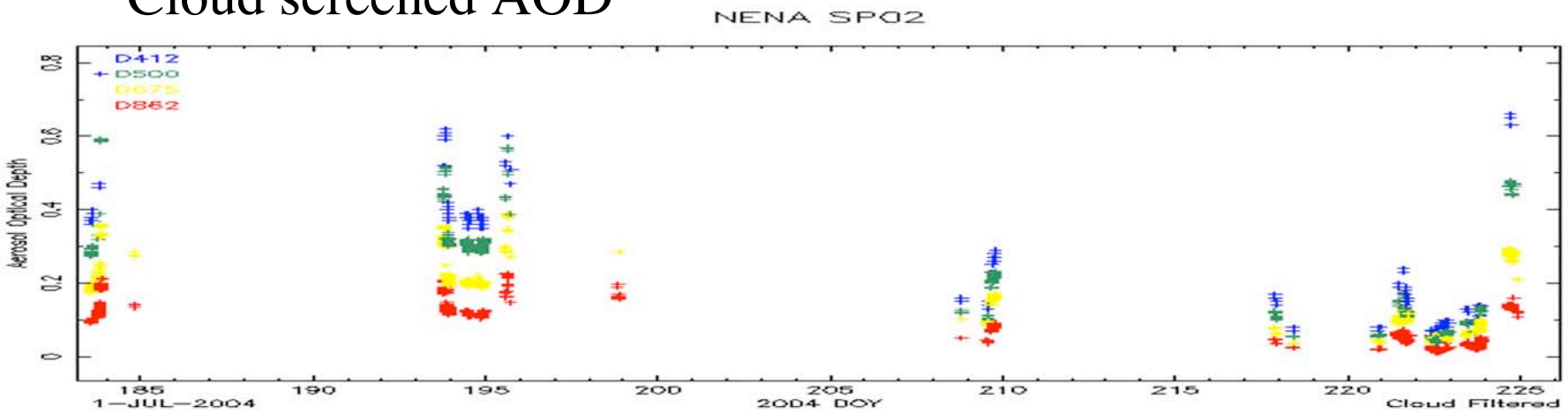


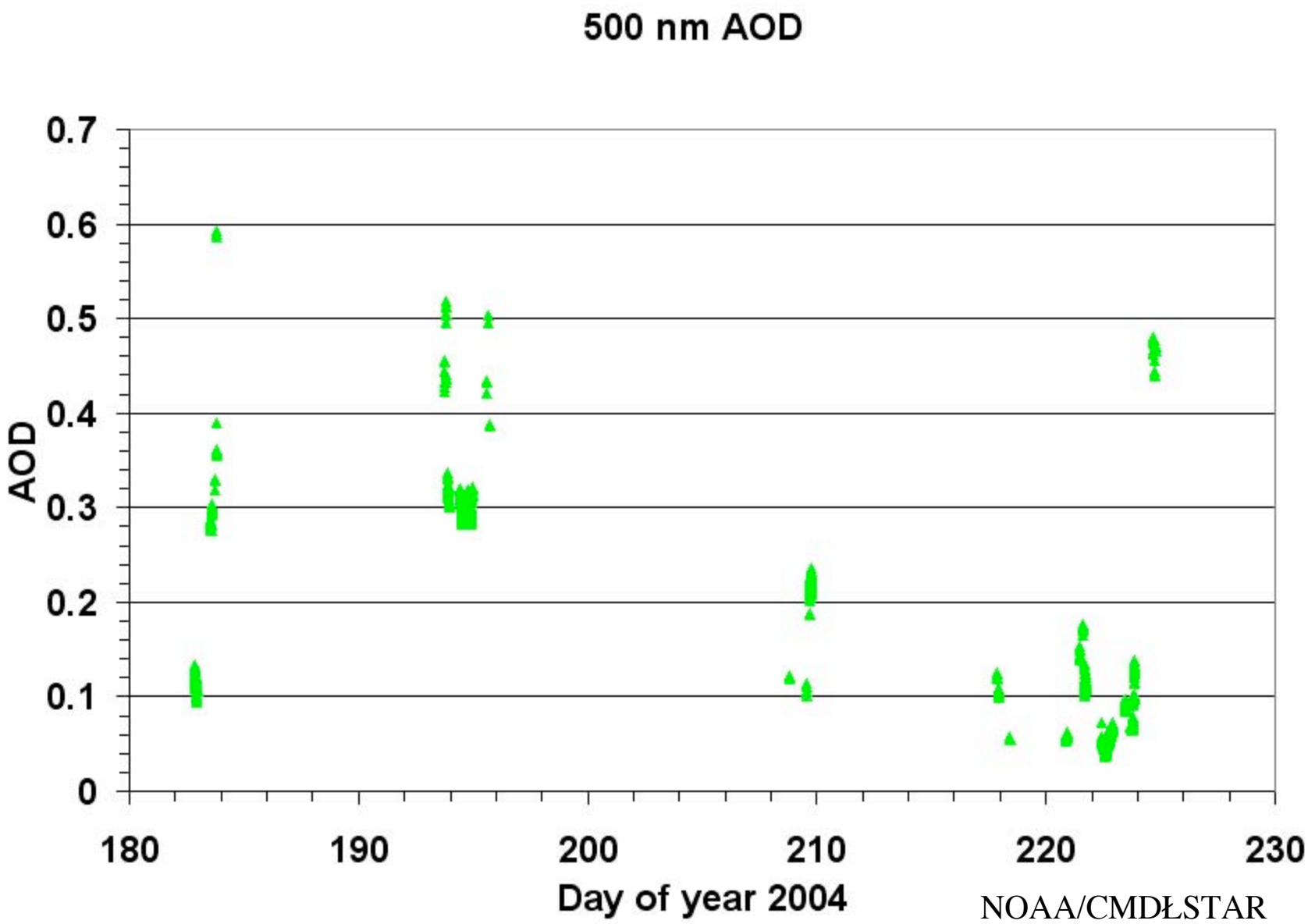
Aerosol Optical Depth, NENA, Chebogue Point, NS, JułAug ‘04

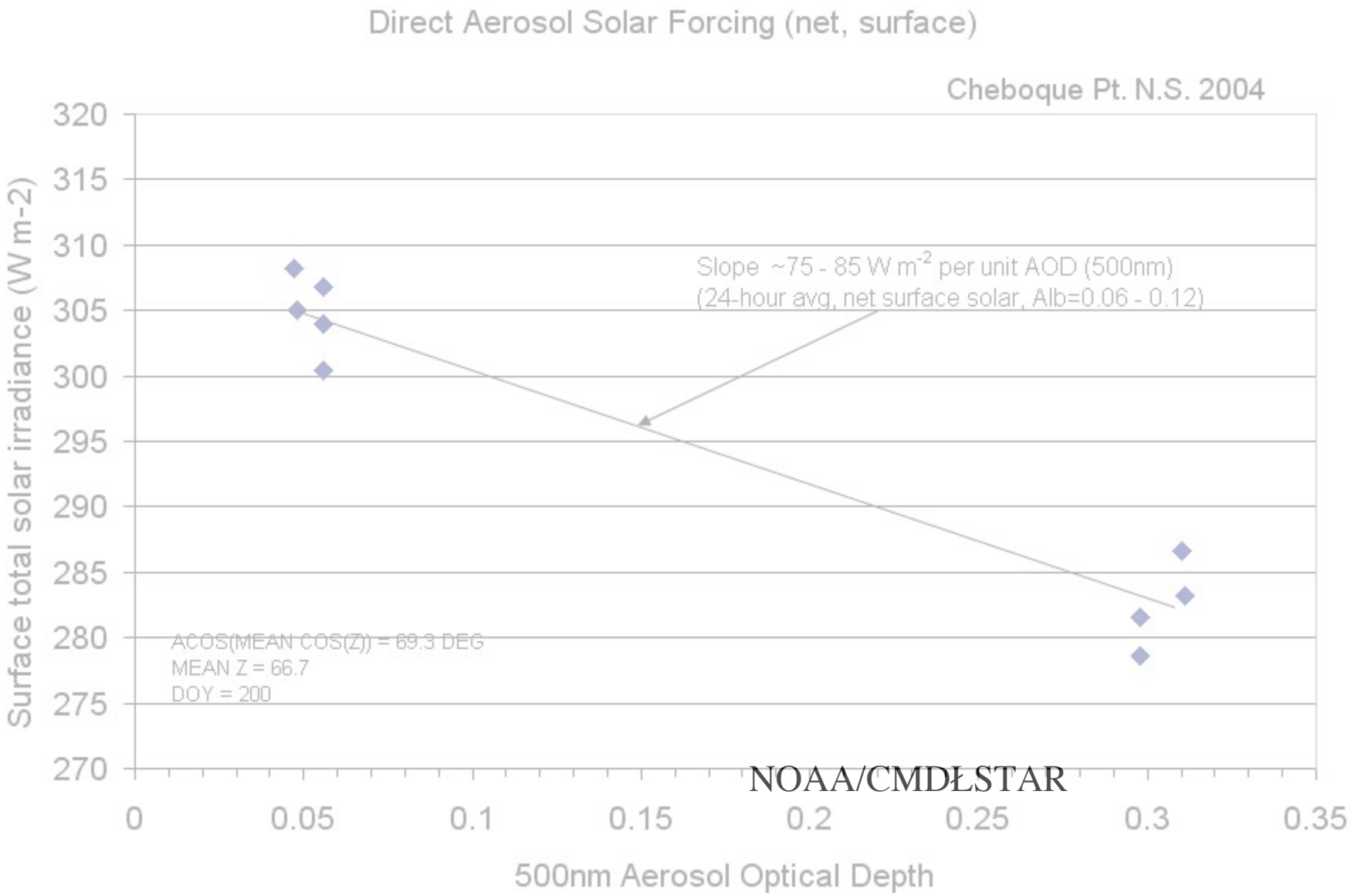
Aerosol + cloud OD



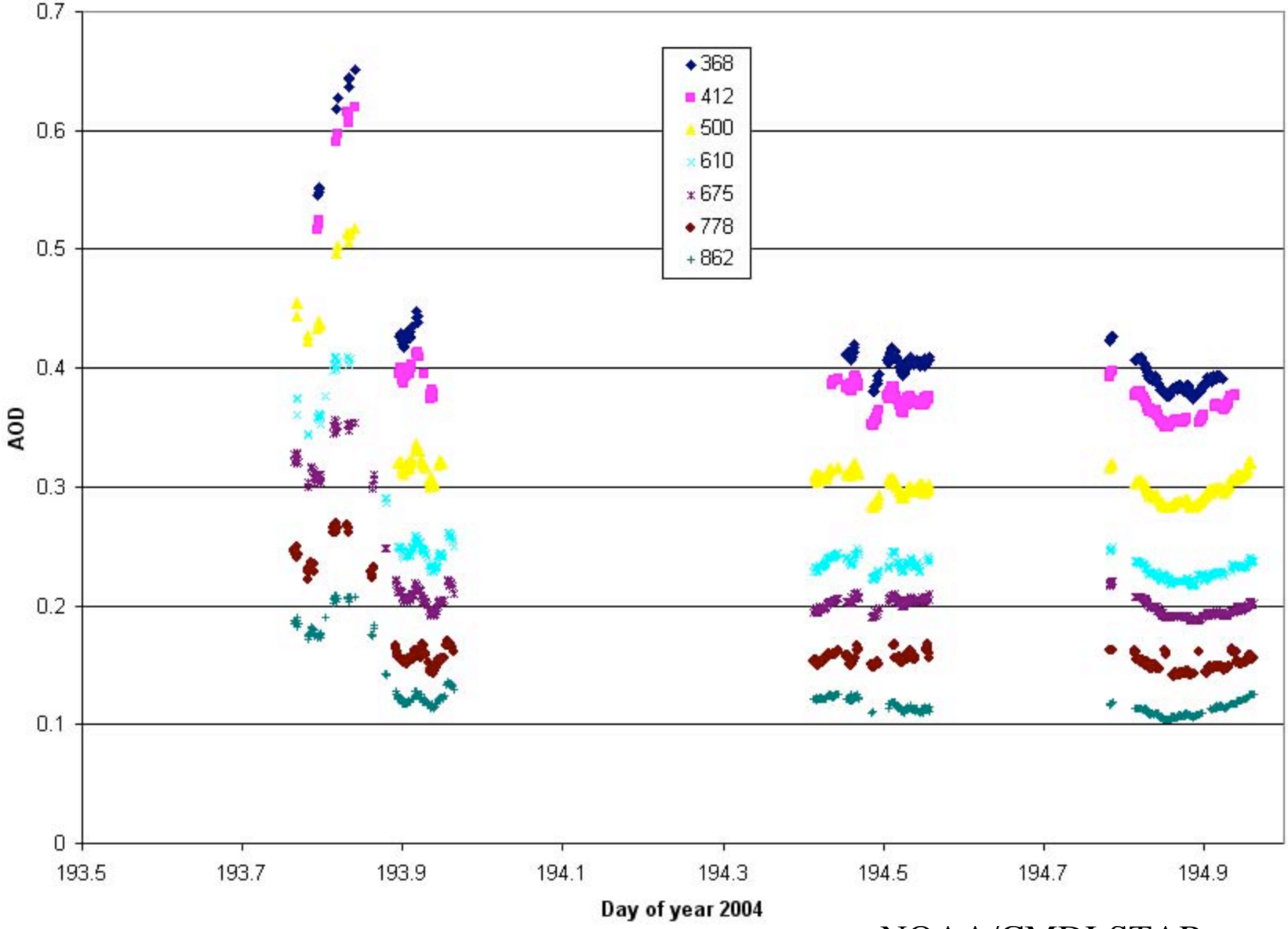
Cloud screened AOD




500 nm AOD
AOD
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
180
190
200
210
220
230
Day of year 2004
NOAA/CMDŁSTAR

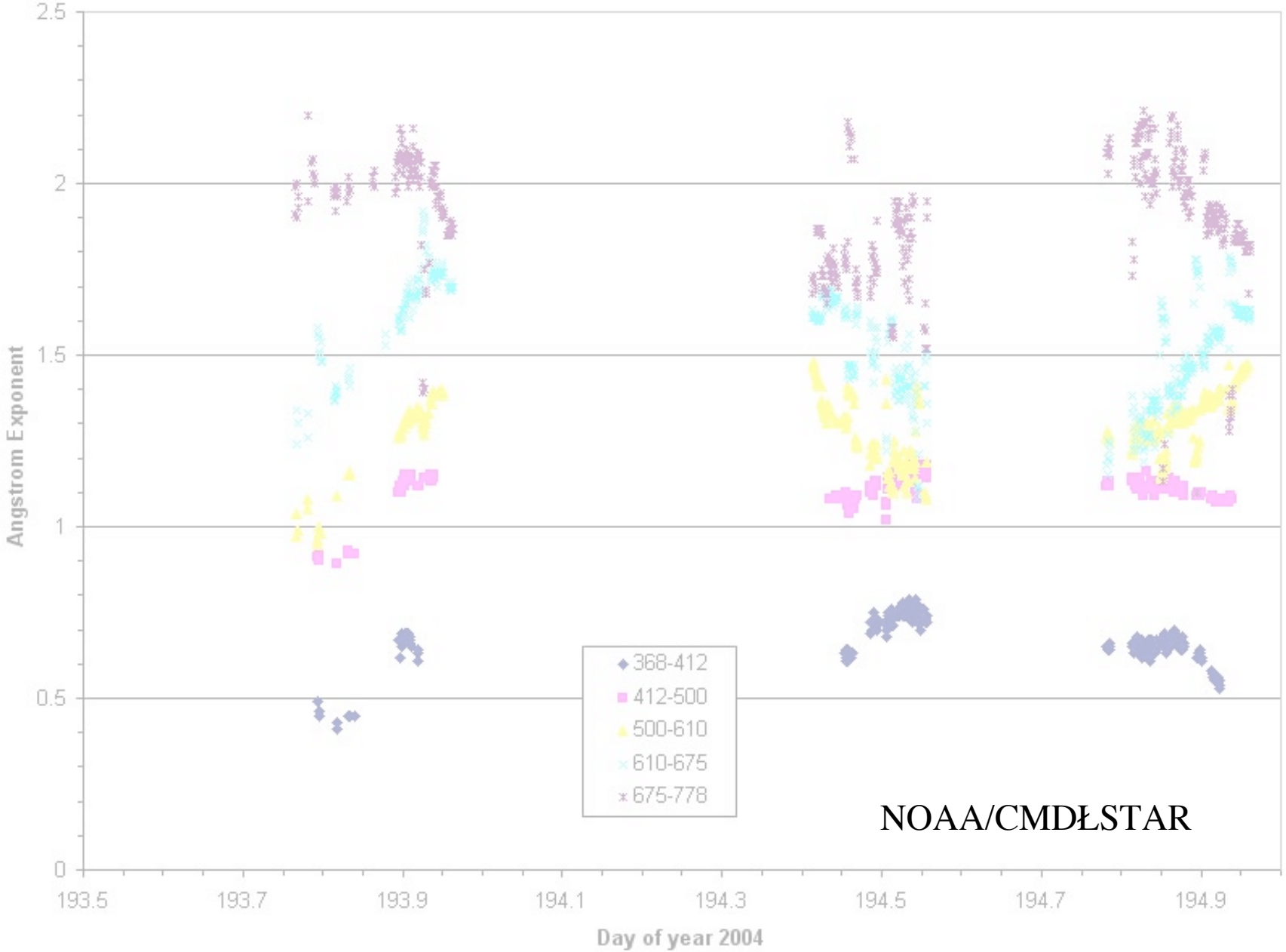

Direct Aerosol Solar Forcing (net, surface)
Cheboque Pt. N.S. 2004
Surface total solar irradiance (W m-2)
320
315
310
305
300
295
290
285
280
275
270
Slope ~75 - 85 W m-2 per unit AOD (500nm)
(24-hour avg, net surface solar, Alb=0.06 - 0.12)
ACOS(MEAN COS(Z)) = 69.3 DEG
MEAN Z = 66.7
DOY = 200
NOAA/CMDLSTAR
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
500nm Aerosol Optical Depth

Spectral AOD Chebogue Pt. 2004

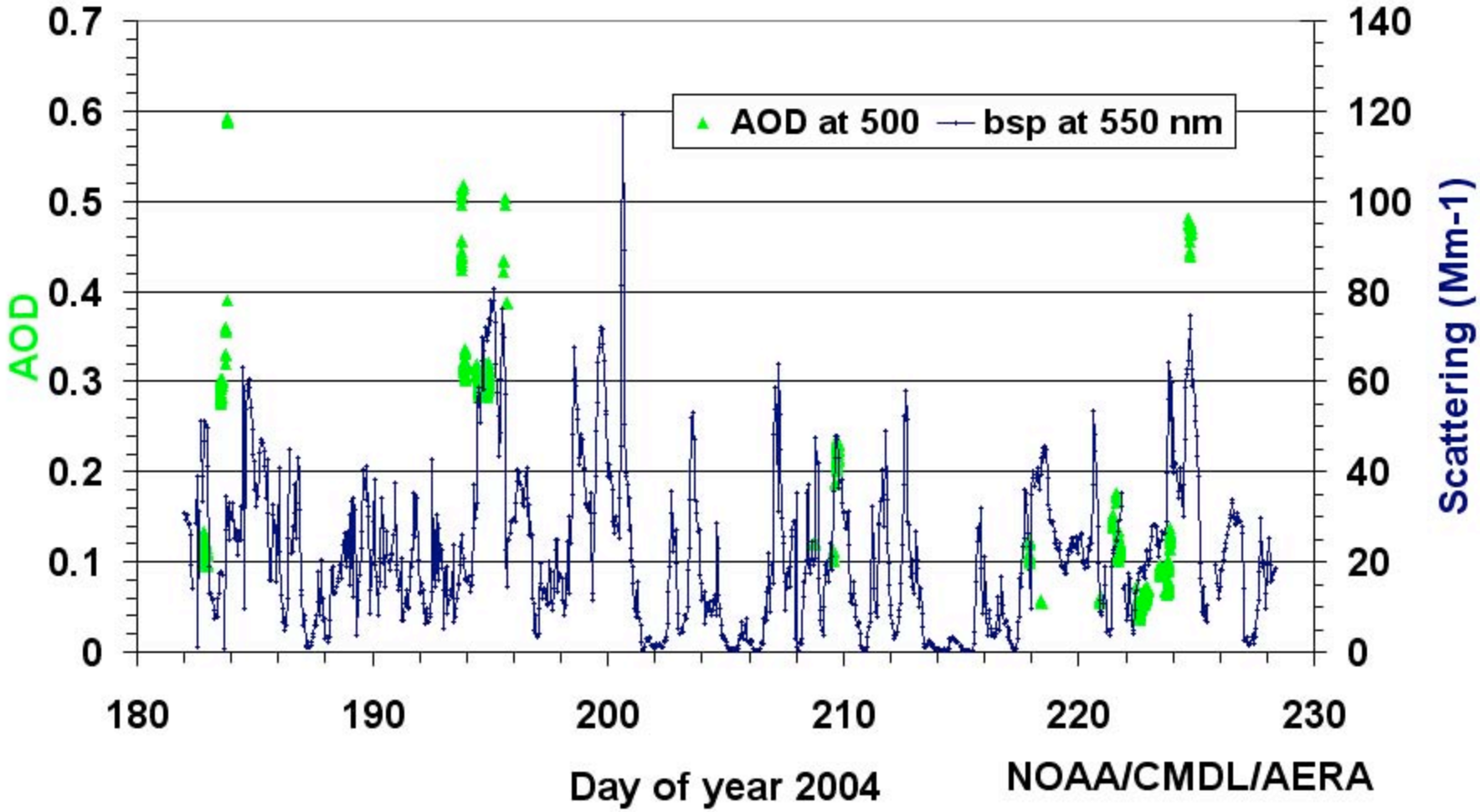


NOAA/CMDŁSTAR

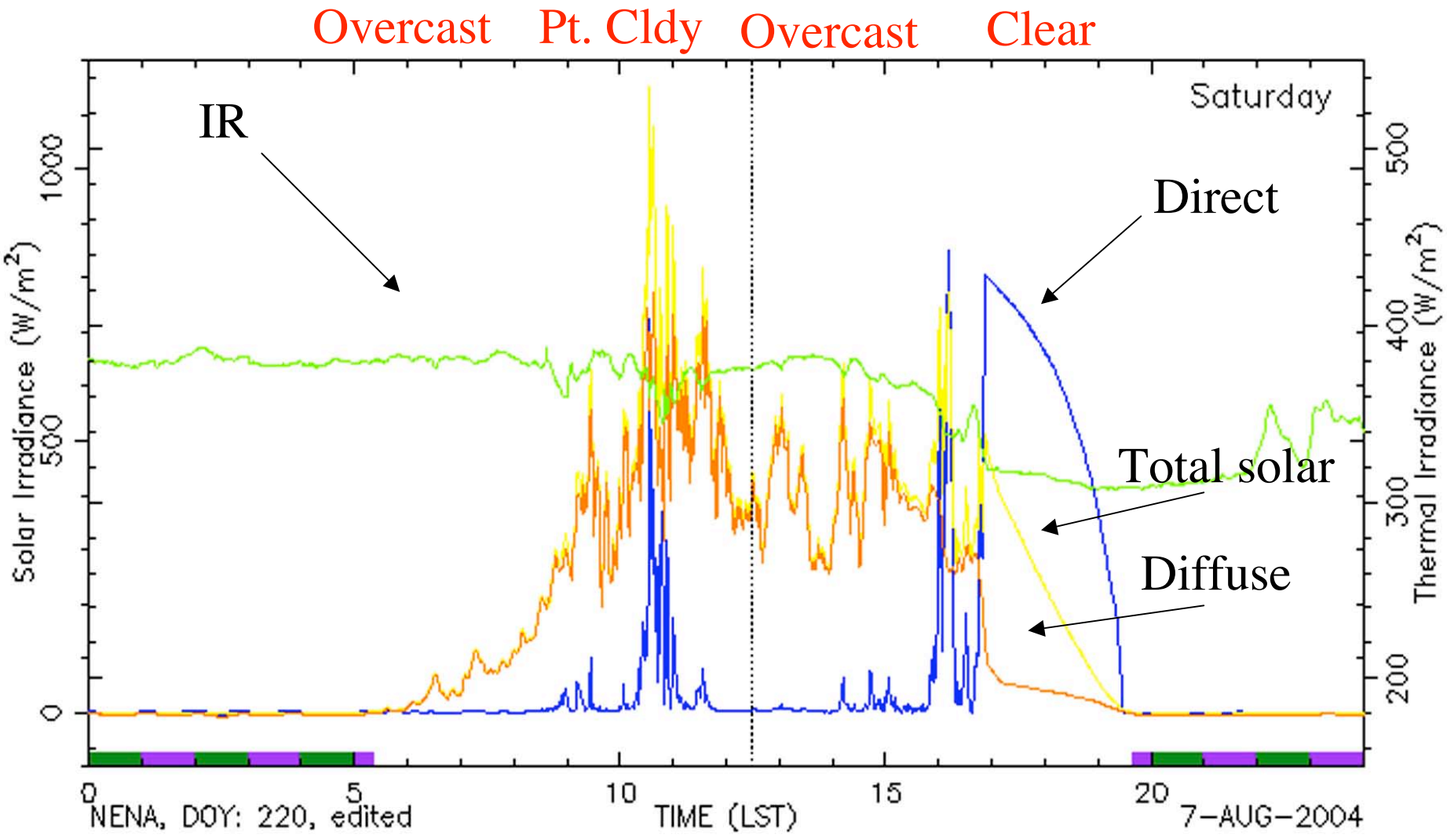
Preliminary Angstrom Exponents



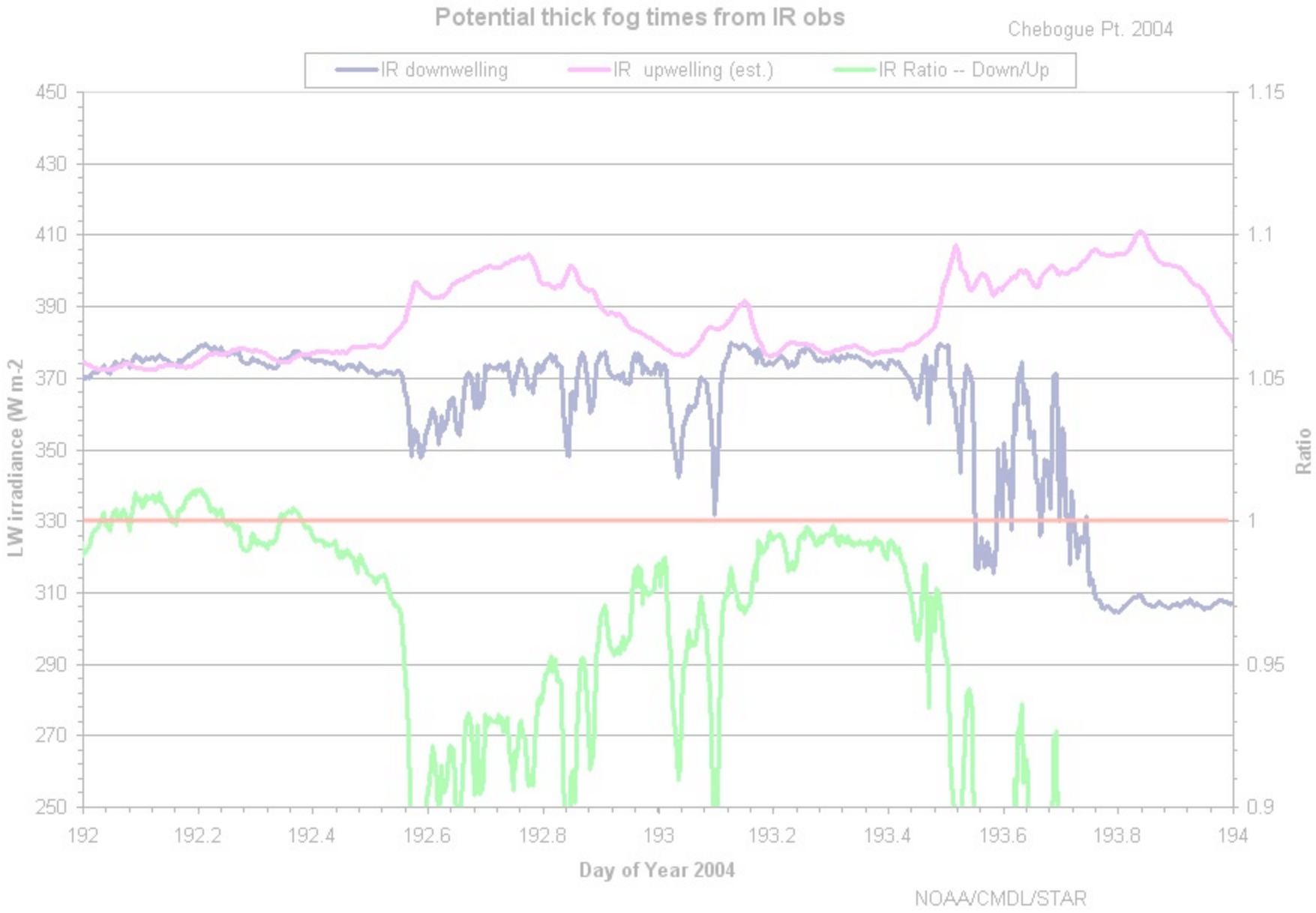
500 nm AOD and Neph 550 Scat



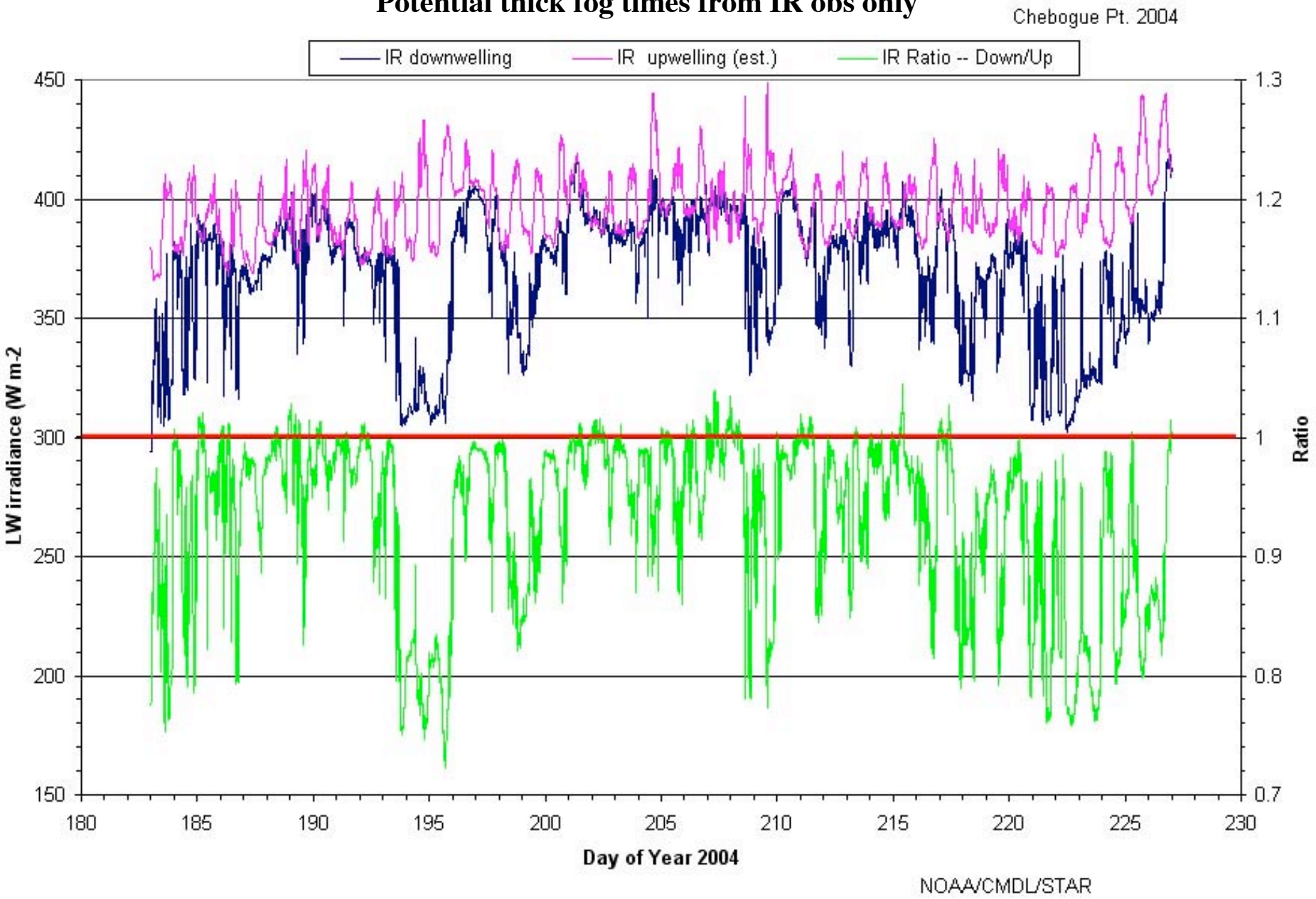
Chebogue Pt. Broadband Solar and IR Downwelling Irradiance



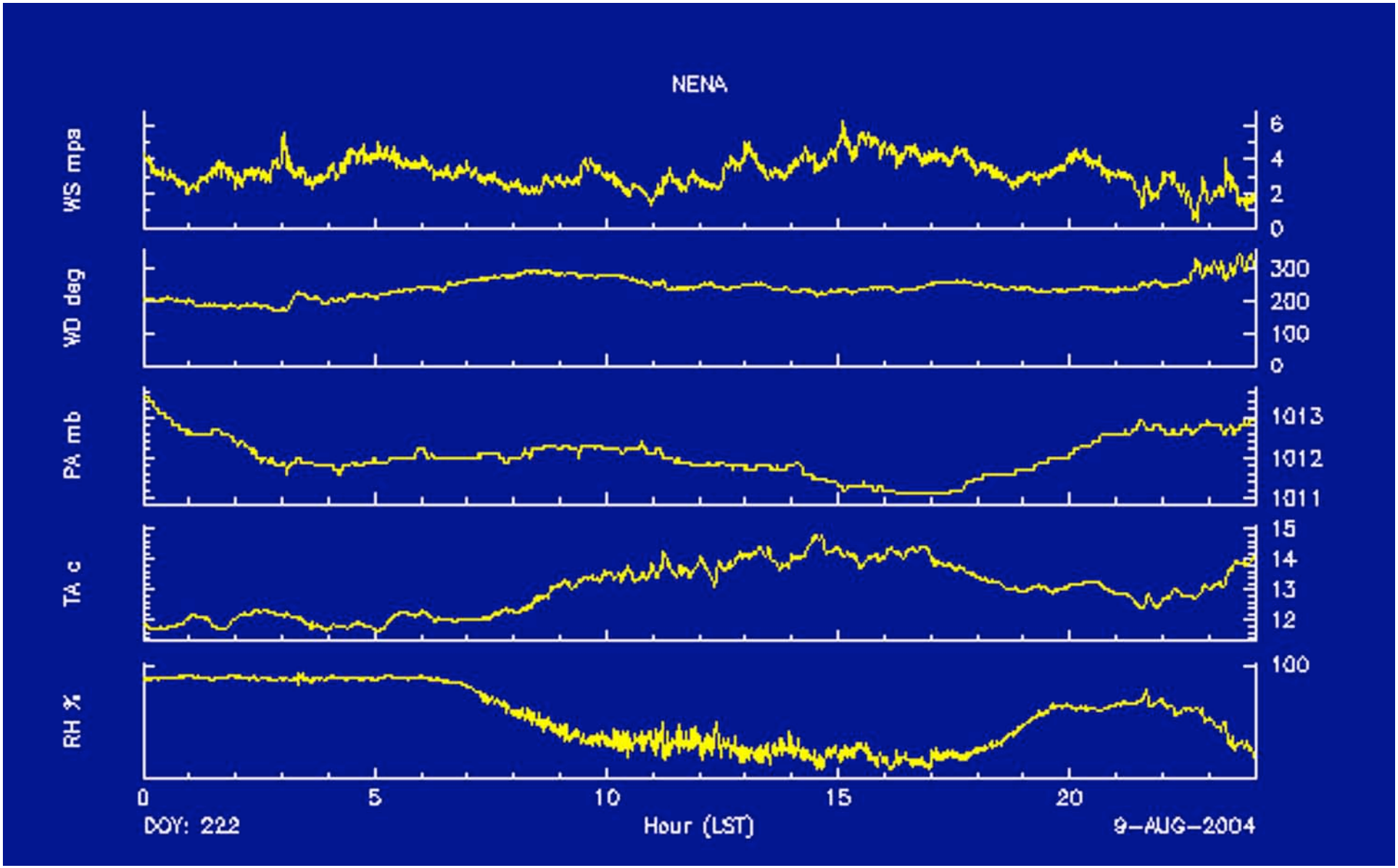
NOAA/CMDŁSTAR


Potential thick fog times from IR obs
Chebogue Pt. 2004
IR downwelling
IR upwelling (est.)
IR Ratio -- Down/Up
LW irradiance (W m-2
Ratio
450
430
410
390
370
350
330
310
290
270
250
1.15
1.1
1.05
1
0.95
0.9
192
192.2
192.4
192.6
192.8
193
193.2
193.4
193.6
193.8
194
Day of Year 2004
NOAA/CMDL/STAR

Potential thick fog times from IR obs only

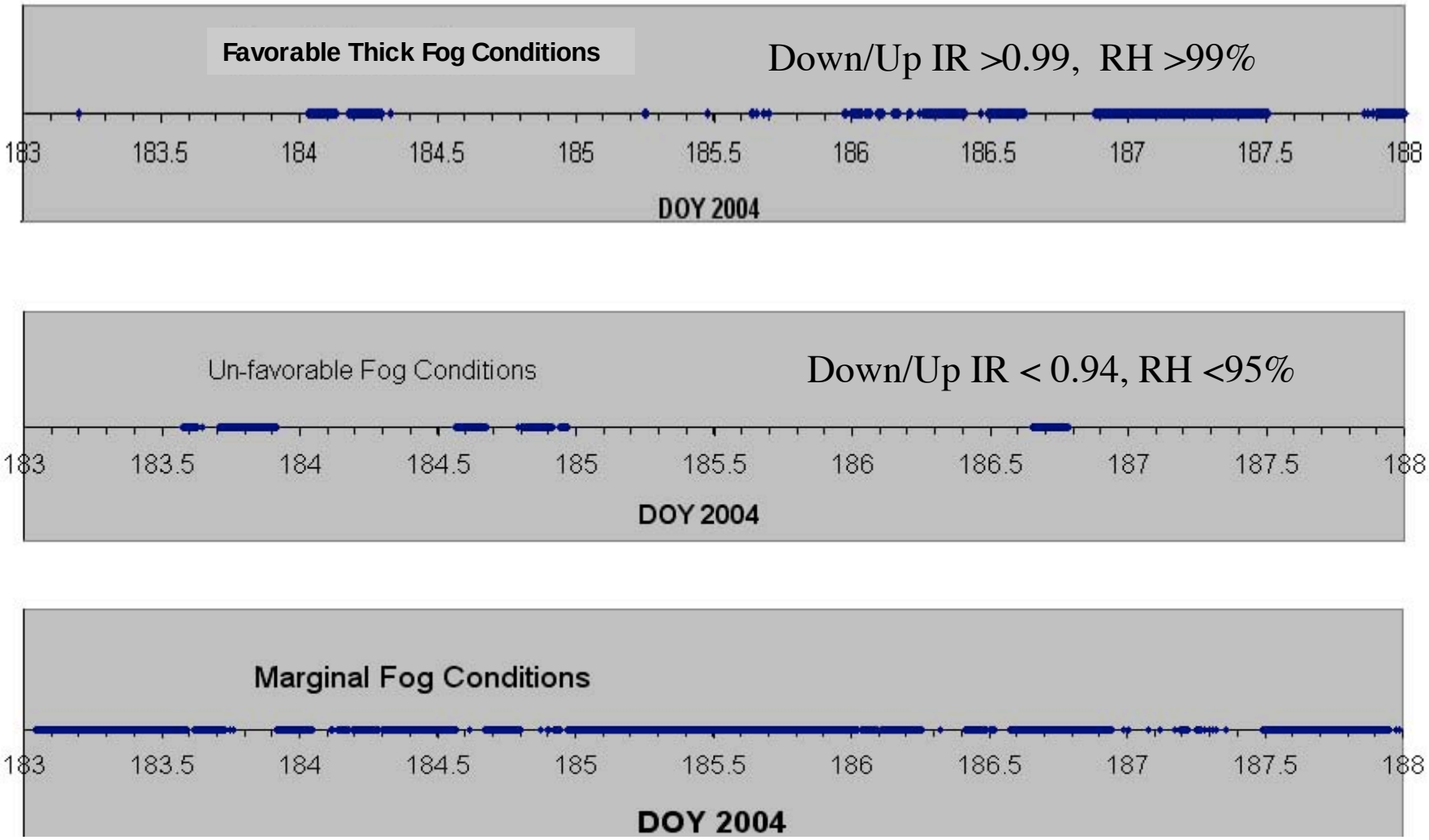


1-min. Met. Data (4-m) Chebogue Pt. 9-Aug 2004



NOAA/CMDŁSTAR

Fog potential determined from IR and RH obs.

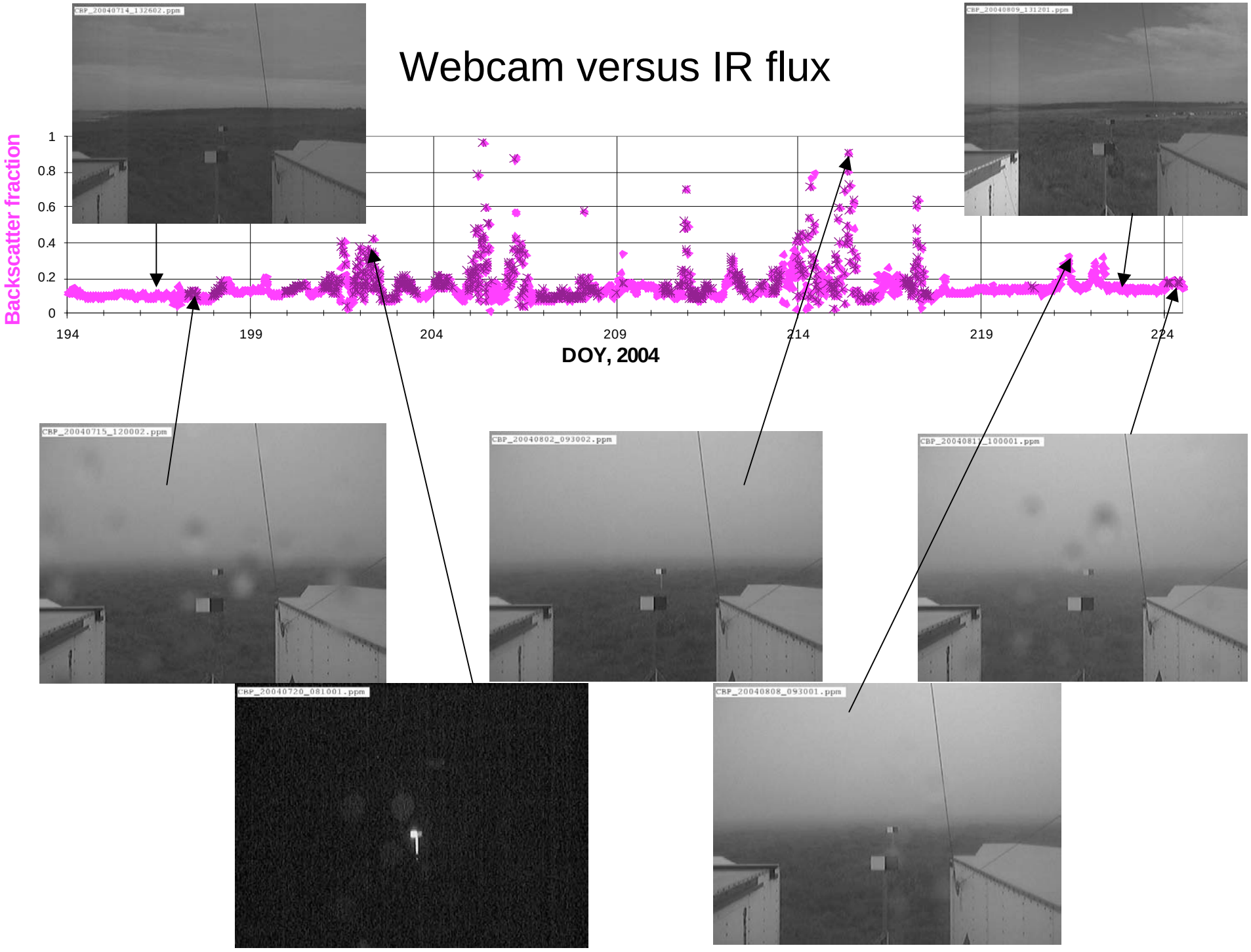


Chebogue Pt. 2004

Times = GMT (UT)

NOAA/CMDŁSTAR

Webcam versus IR flux



Summary

- Acquired 100% of possible downwelling solar and IR fluxes as well as 4-m met data.

- 38 hours of cloud screened, daytime spectral AOD obtained

- 500 nm AOD ranged from about 0.05 to 0.5

- Direct aerosol net solar radiative forcing at the surface found to be about 80 Wm^{-2} / unit AOD (essentially - DOY 194 vs. DOY 223)

- Radiation measurements contribute to detection of vertically thick fog conditions

- Its foggy a lot at Chebogue Pt. in July

Improving Calibration Standards