DSCOVR Science Team Meeting
Sept 27-29 2022

Shortwave reflected energy from the Earth Polychromatic Imaging Camera compared with NISTAR

Clark Weaver

Sept 27, 2021 2:40pm

Road Map

Use spectral information from AVIRS aircraft observations to fill in EPIC spectral gaps.

1 For each EPIC pixel choose a high resolution AVIRS spectrum based on earth surface type

2 Construct a composite high resolution spectrum that fits the 6 EPIC channels.
Mixture of spectra from solid cloud and spectra from earth surface

3 Spectrally integrate to produce SW energy from composite spectra for each EPIC pixel

Comparison

1 Pixel level comparison EPIC SW energy with CERES Single Scanner Foot print product
up to 30 minutes time difference

2 Compare area integrated EPIC SW energy with NISTAR Band B 4-hour time averages

High Spectral Resolution information from
SCIAMACHY versus AVIRIS

SCIAMACHY: 275nm – 2micron
parts of spectra sampled at different geographic locations

365nm – 2.5micron
Full complete Spectra at single geographic location

Merge UV part of SCIAMACHY with visible near-IR part of AVIRIS

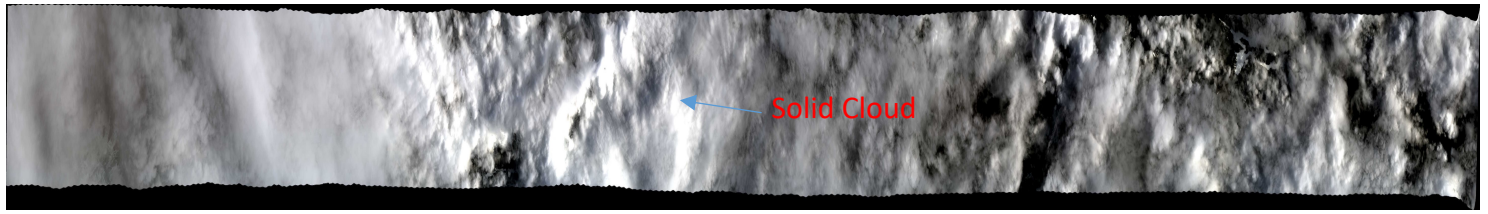
Cloud over Ocean

SCIAMACHY

between .275 to .365 microns

AVIRIS
Airborne Visible / Infrared Imaging Spectrometer

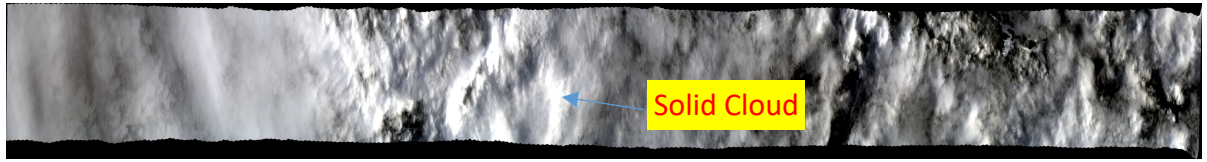
224 channels between .365 and 2.5 microns



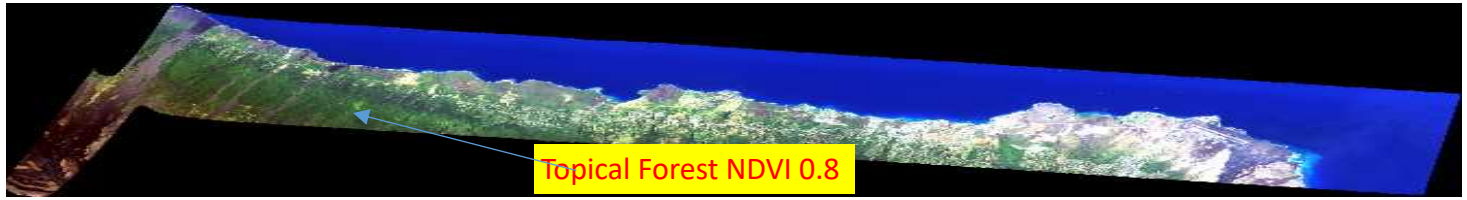
Composite Spectra = Open_Ocean_spectra * cld_fraction + Cloud_spectra * (1 - cld_fraction)

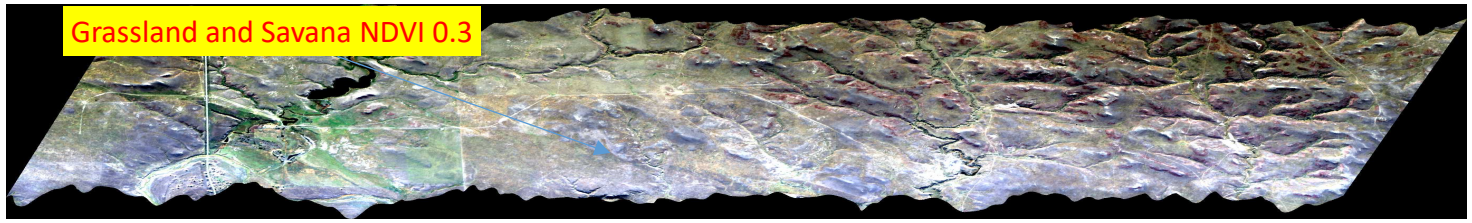
cld_fraction adjusted to fit shape of 6 EPIC radiances

Cloud over Land



Possible Land surfaces

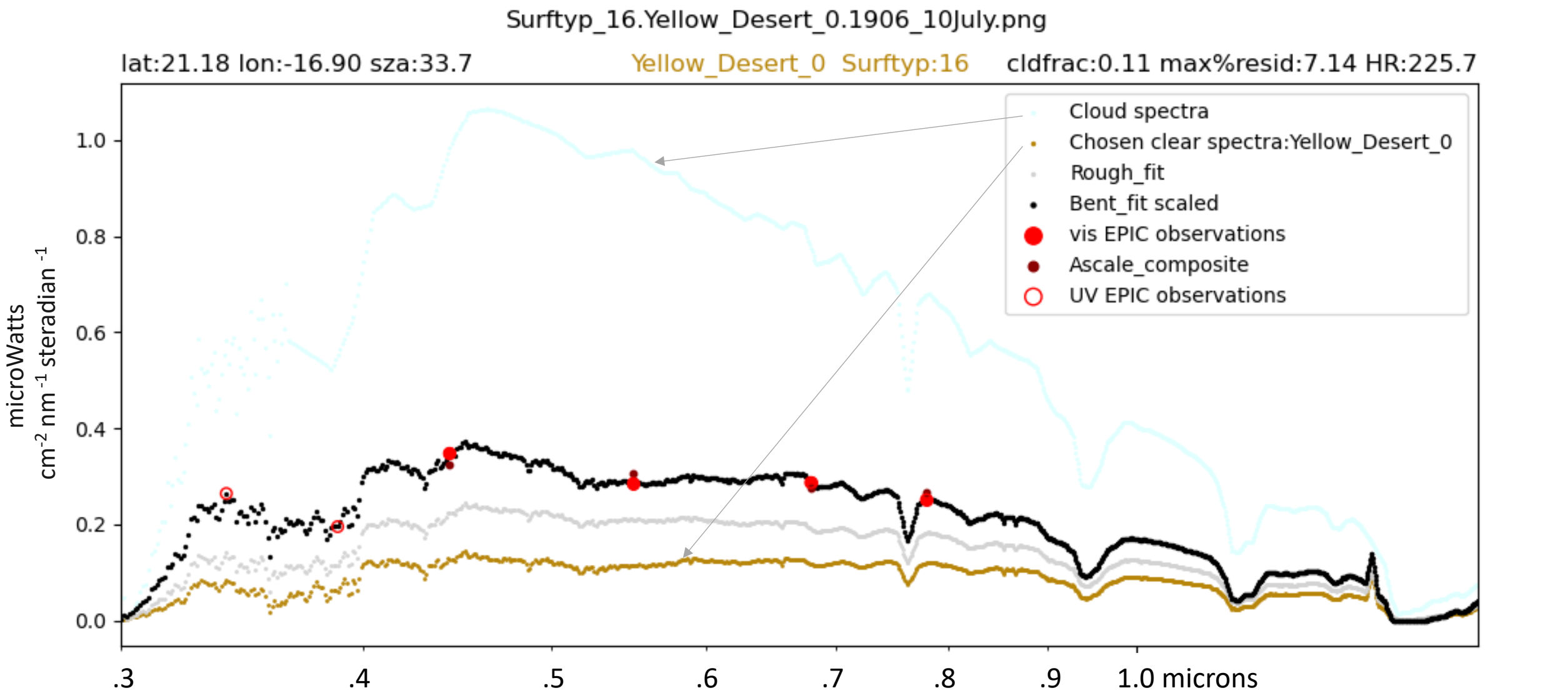


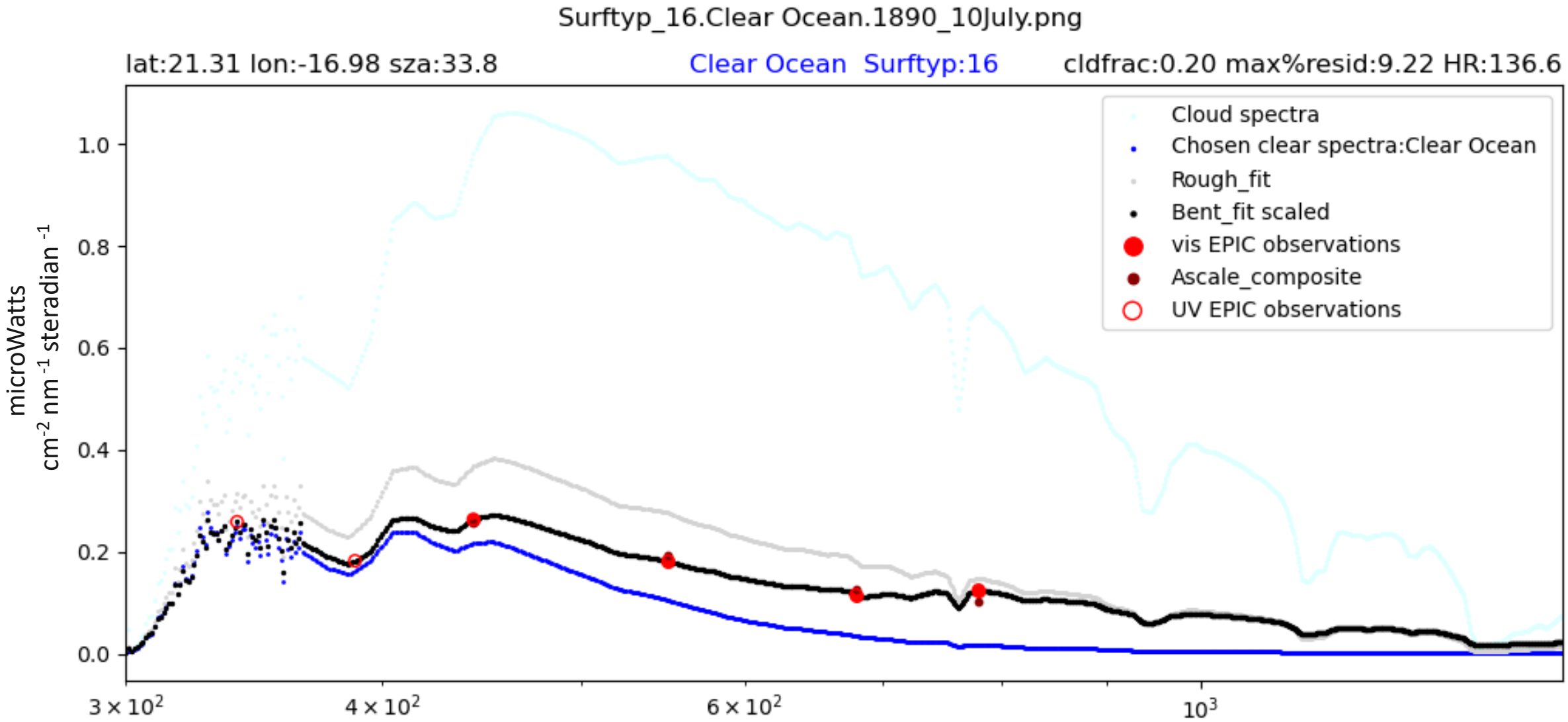


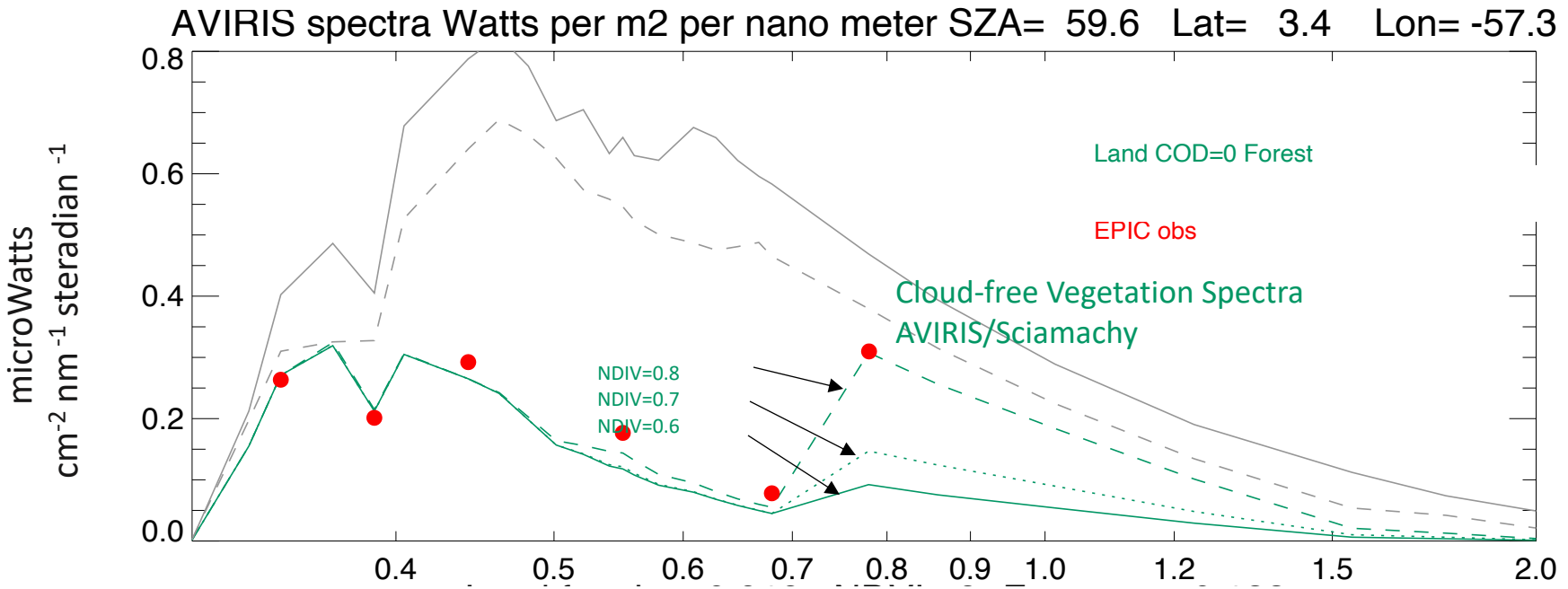
EPIC radiance Wm^{-2} str^{-1} nm^{-1}

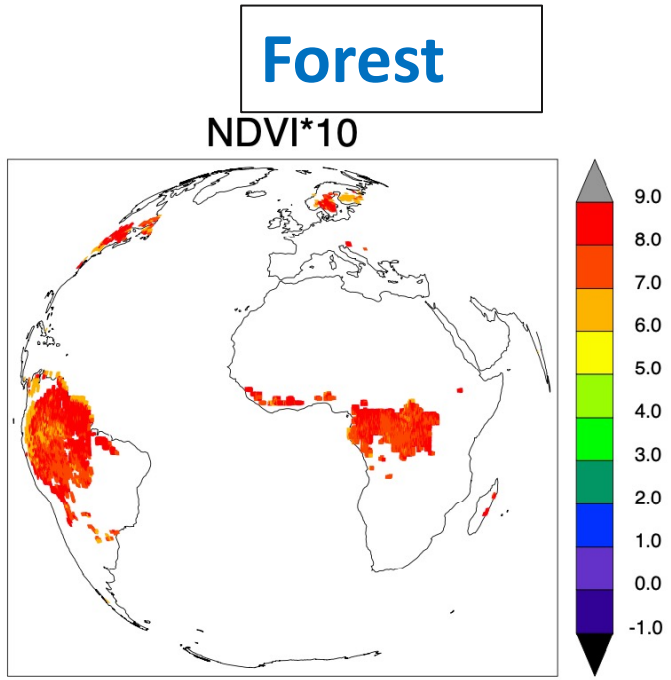
I_λ = EPIC counts * K_λ (calib factor) * S_λ (solar flux) / π λ = 340, 388, 443, 551, 680, 780 (nm)

VLIDORT (Vector LInearized Discrete Ordinate Radiative Transfer package) used to account for differences in viewing and illumination geometry

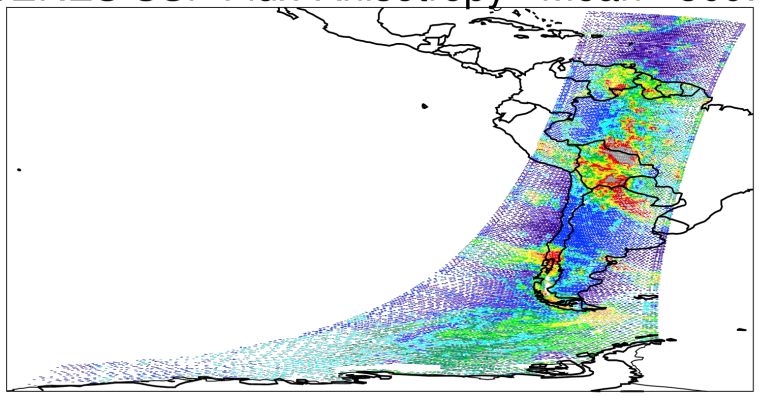

Surftyp_16.Yellow_Desert_0.1906_10July.png
lat:21.18 lon:-16.90 sza:33.7
Yellow_Desert_0 Surftyp:16
cldfrac:0.11 max%resid:7.14 HR:225.7
Cloud spectra
Chosen clear spectra:Yellow_Desert_0
Rough_fit
Bent_fit scaled
vis EPIC observations
Ascale_composite
UV EPIC observations
microWatts
cm-2 nm-1 steradian-1
1.0
0.8
0.6
0.4
0.2
0.0
.3
.4
.5
.6
.7
.8
.9
1.0 microns

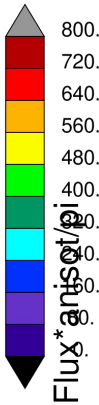

Surftyp_16.Clear Ocean.1890_10July.png
lat:21.31 lon:-16.98 sza:33.8
Clear Ocean Surftyp:16
cldfrac:0.20 max%resid:9.22 HR:136.6
Cloud spectra
Chosen clear spectra:Clear Ocean
Rough_fit
Bent_fit scaled
vis EPIC observations
Ascale_composite
UV EPIC observations
microWatts
cm-2 nm-1 steradian-1
1.0
0.8
0.6
0.4
0.2
0.0
3 × 10^2
4 × 10^2
6 × 10^2
10^3


AVIRIS spectra Watts per m2 per nano meter SZA= 59.6 Lat= 3.4 Lon= -57.3
microWatts
cm-2 nm-1 steradian -1
0.8
0.6
0.4
0.2
0.0
0.4
0.5
0.6
0.7
0.8
0.9
1.0
1.2
1.5
2.0
Land COD=0 Forest
EPIC obs
Cloud-free Vegetation Spectra
AVIRIS/Sciamachy
NDIV=0.8
NDIV=0.7
NDIV=0.6

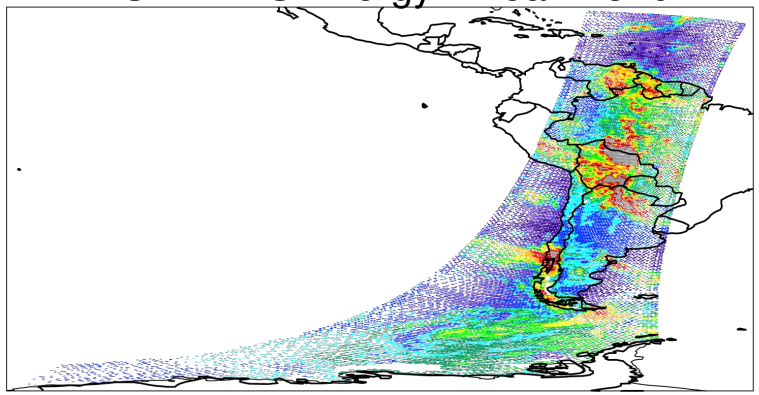

Forest
NDVI*10
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
-1.0

CERES SSF Flux*Anisotropy Mean= 309.9

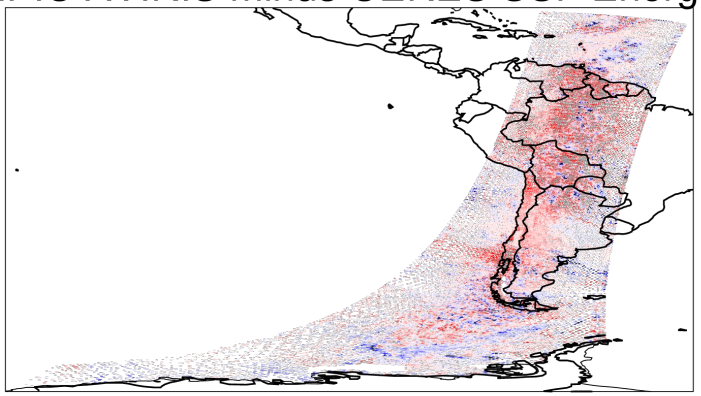


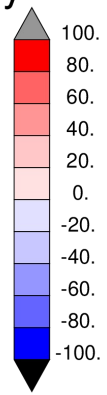


EPIC AVIRIS Energy Mean= 340.1

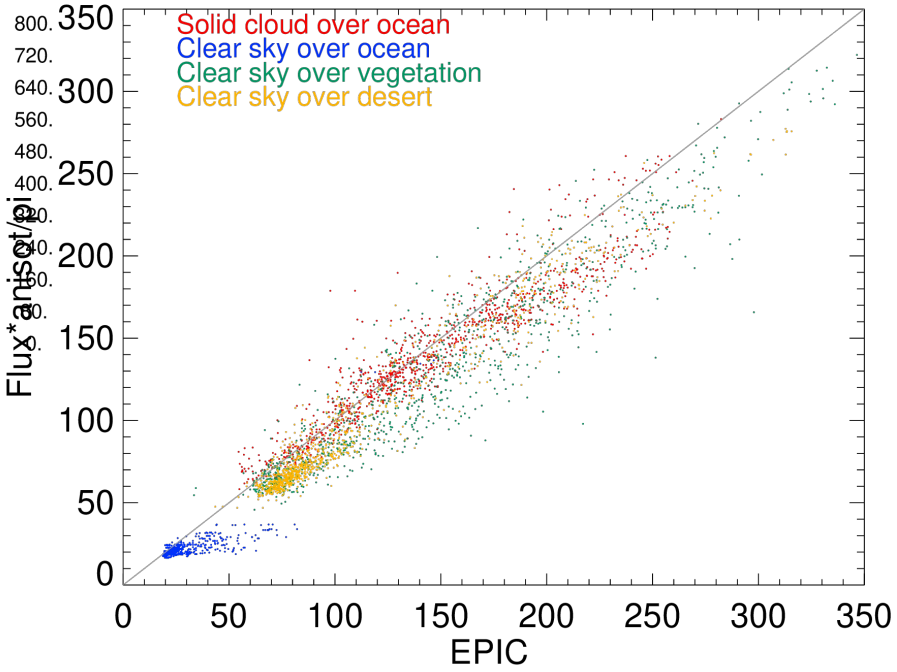


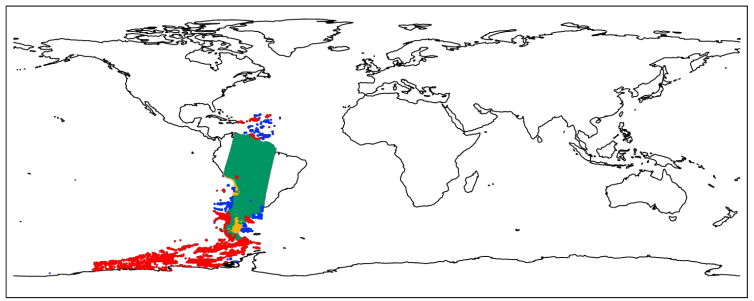
EPIC AVIRIS minus CERES SSF Energy



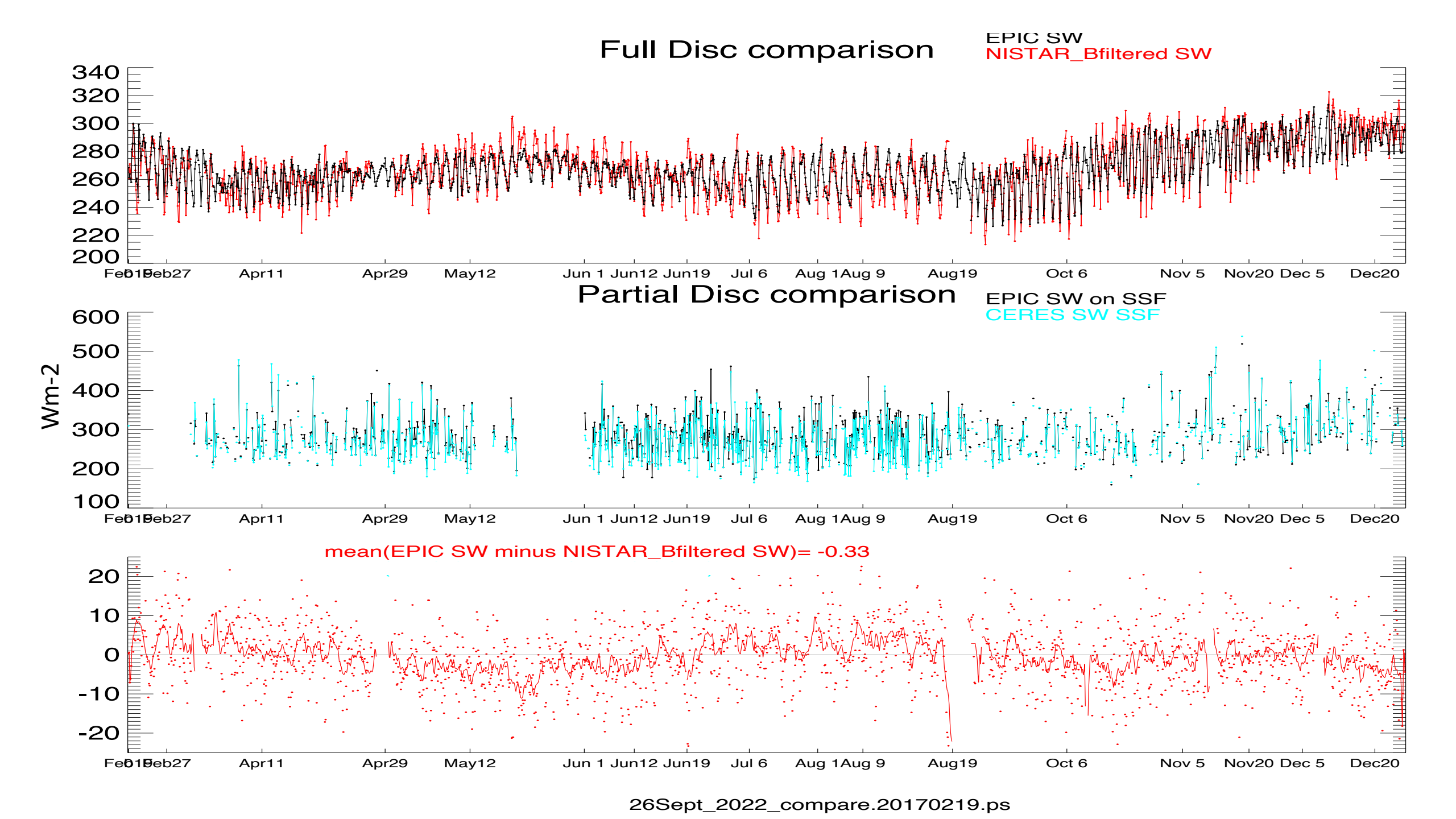


Correlation 0.96





/misc/cjw03/weaver/26Sept_2022_epic_SSF_flux_compare.2017.02.19.H15


Full Disc comparison
EPIC SW
NISTAR_Bfiltered SW
340
320
300
280
260
240
220
200
Feb15
Feb27
Apr11
Apr29
May12
Jun 1
Jun12
Jun19
Jul 6
Aug 1
Aug 9
Aug19
Oct 6
Nov 5
Nov20
Dec 5
Dec20
Partial Disc comparison
EPIC SW on SSF
CERES SW SSF
Wm-2
600
500
400
300
200
100
mean(EPIC SW minus NISTAR_Bfiltered SW)= -0.33
20
10
0
-10
-20
26Sept_2022_compare.20170219.ps