Surface–Only Flux Algorithms Working Group Report

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Validation of Surface Flux Algorithms

Maintain, validate and improve CERES Surface-Only Flux Algorithms (SOFA).

SOFA algorithms use cloud properties derived from MODIS imager data.

CERES Ed-4A processing used MODIS Collection-5 data through Feb2017.

MODIS Collection-5 Terra products were found to be degrading and affecting CERES nighttime cloud retrievals.

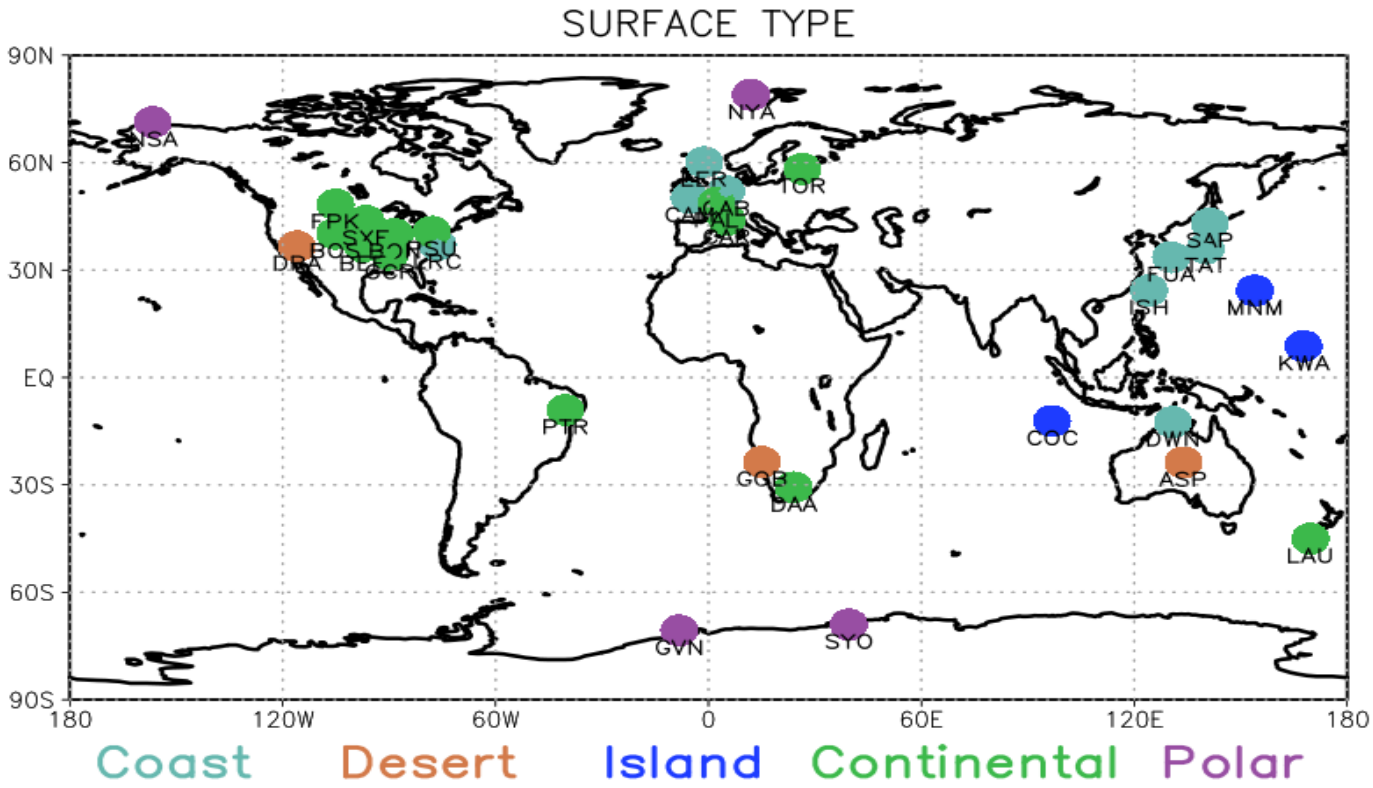
Remediation of Collection-5 resulted in Collection-6.1 which is used for CERES Ed-4A processing starting in Feb2016.

Differences between SOFA fluxes caused by collection change.

The one-year overlap period between Collections-5 and -6 based CERES products allowed for a comparison between them.

In addition to nighttime cloud retrievals, aerosol optical depths were also affected by the collection change. Effects of both of these can be seen in SOFA fluxes.

Surface Sites Available to Compare SOFA Ed4A from MODIS C5 to MODIS C6.1 March 2016-February 2017

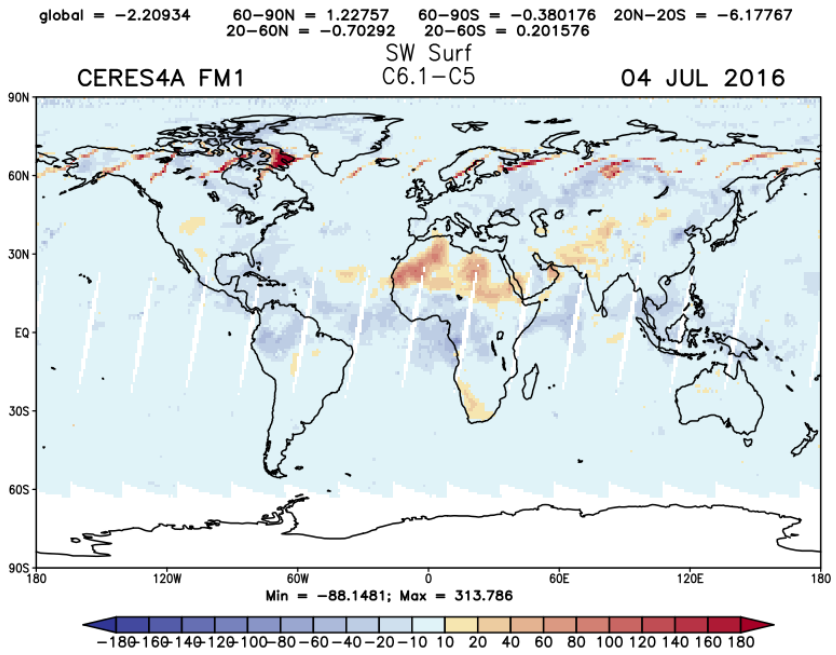


9 Coast
3 Desert
3 Island
13 Continental
4 Polar

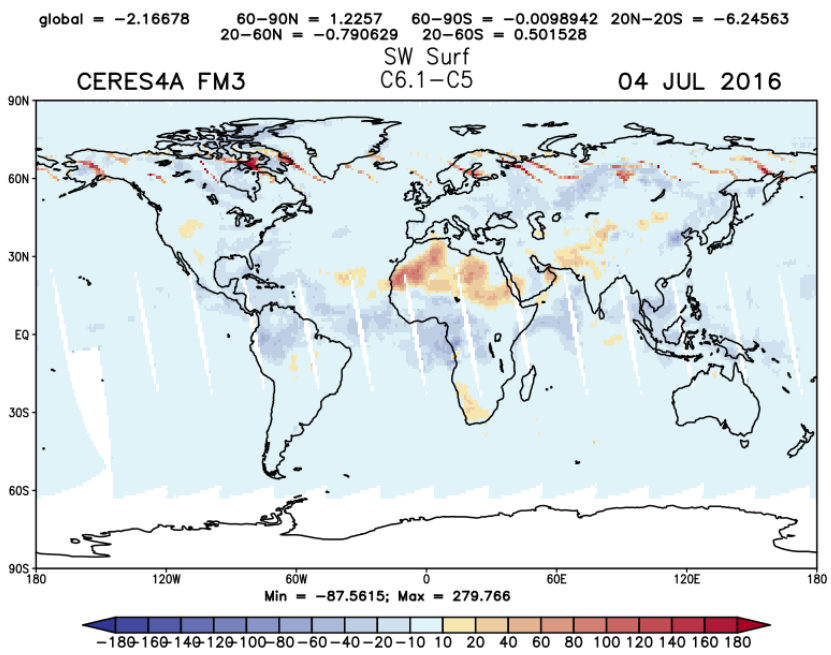
Flux comparisons were made with ground-based measurements at the 32 sites shown above.

Difference in SWB Surface Fluxes
Collection 6.1 – Collection 5
4 July 2016

Terra



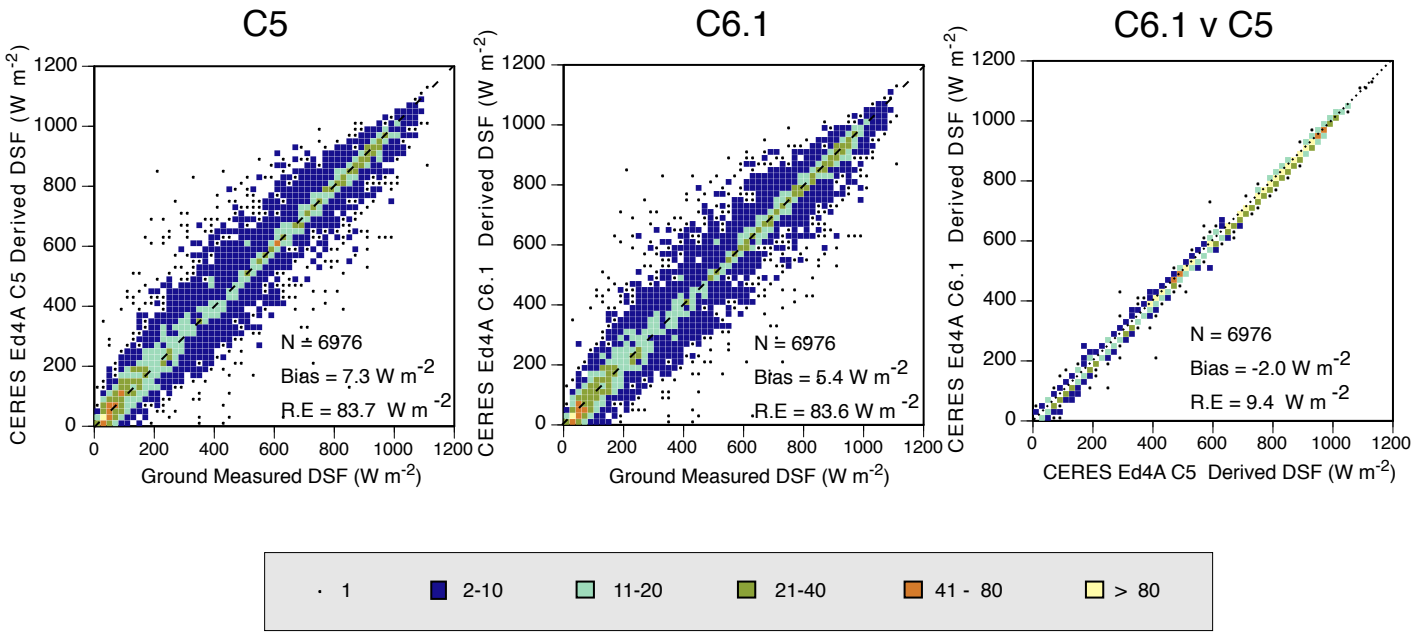
Aqua



The flux differences over Sahara region are caused by aerosol differences.

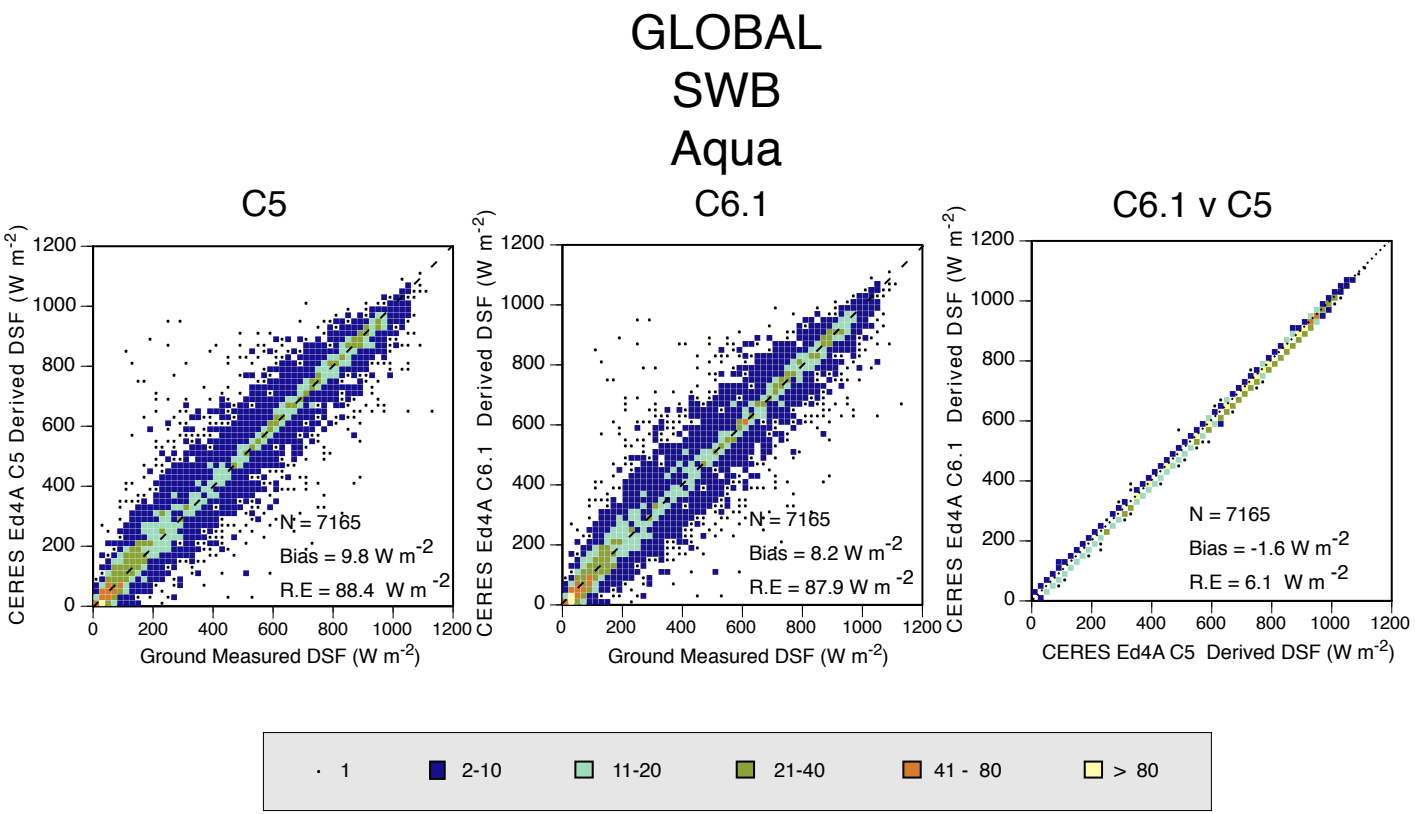
Validation of SWB

GLOBAL
SWB
Terra



Scatterplots show small improvement in surface SW fluxes for Terra and for Aqua (next slide).

Validation of SWB

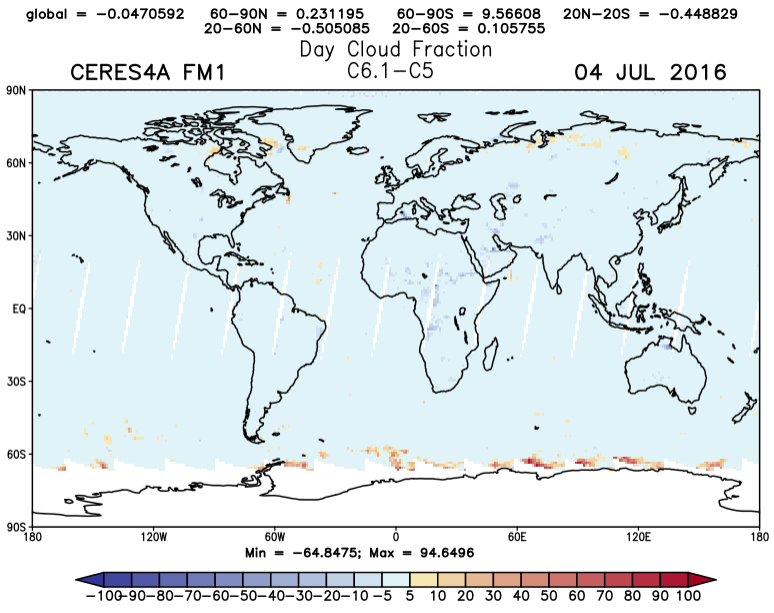


SW Surface Flux Results

- Use of Collection-6.1 aerosols results in small improvement in surface SW fluxes for both Terra and Aqua in comparisons with ground-based measurements.

Difference in Daytime Cloud Collection 6.1 – Collection 5 4 July 2016

Terra



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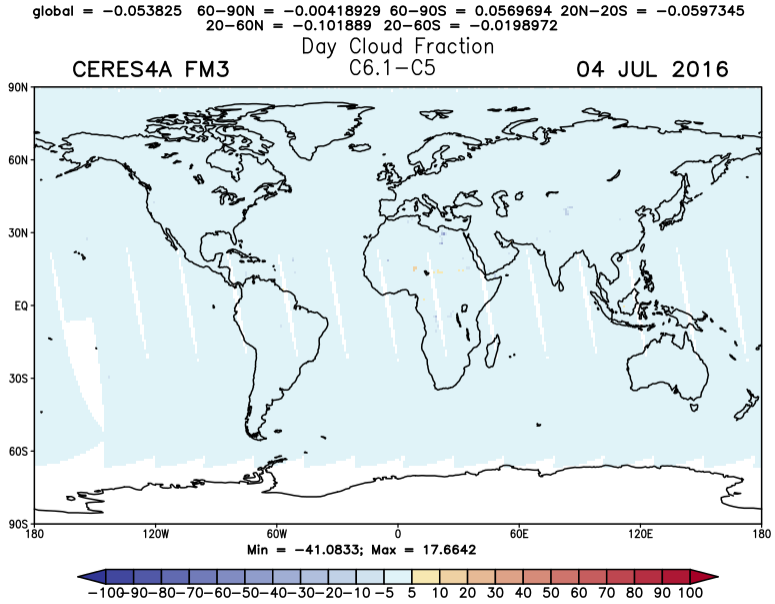
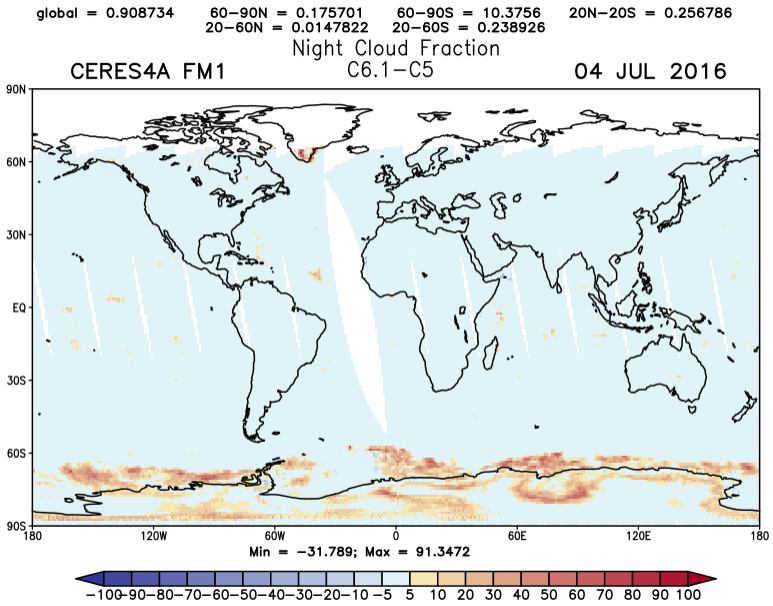


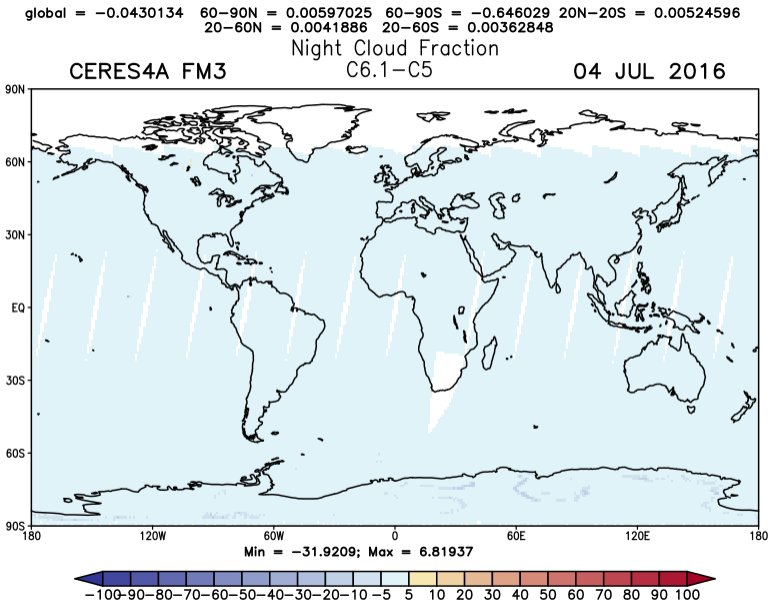
Daytime cloud retrievals show fairly insignificant differences.

Difference in Nighttime Cloud Collection 6.1 – Collection 5 4 July 2016

Terra



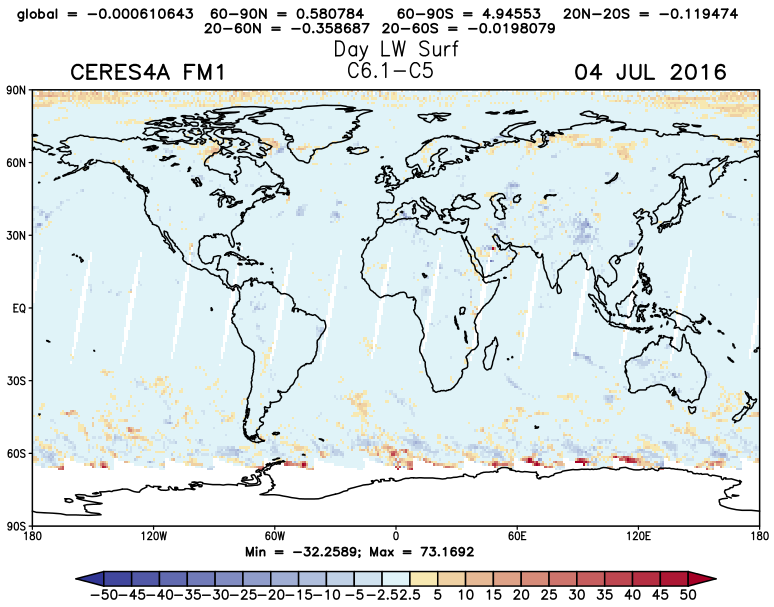
Aqua



Changes in nighttime clouds over southern polar regions for Terra are substantial.

Difference in Daytime Surface LWB
Collection 6.1 – Collection 5
4 July 2016

Terra



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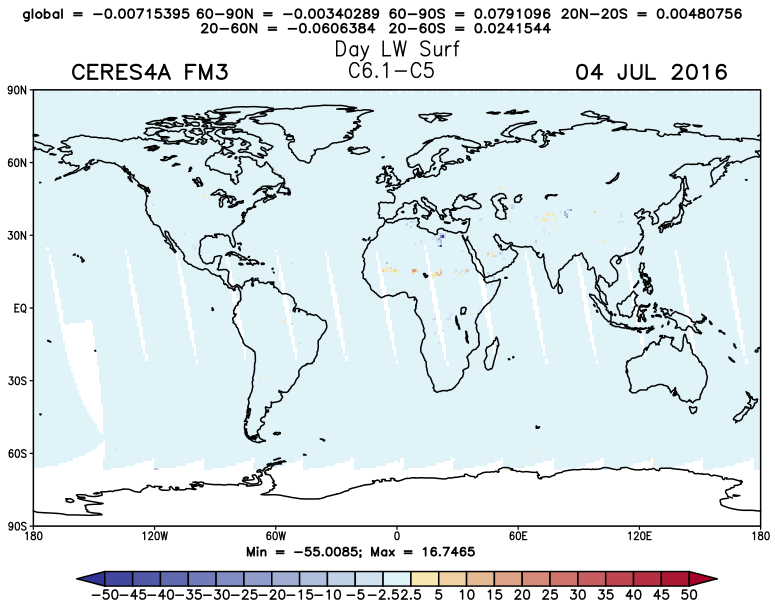
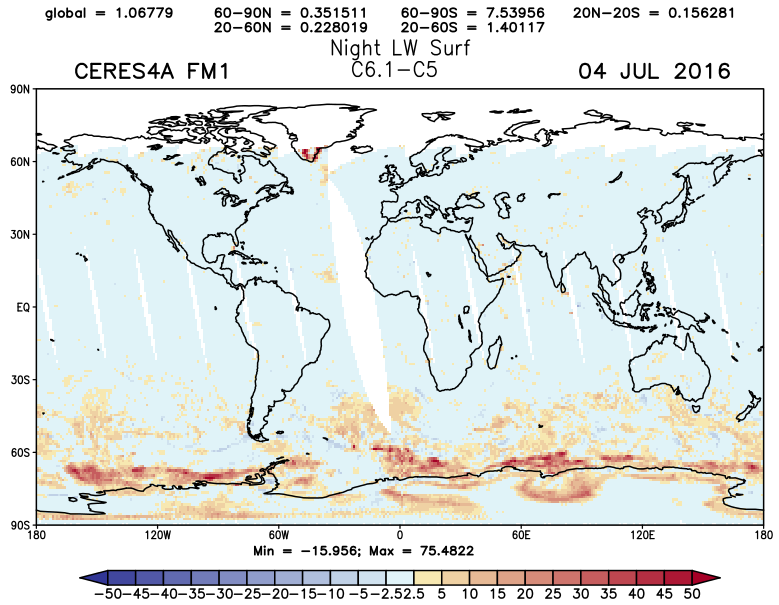


LW surface fluxes are affected by clouds. Daytime differences are very small.

Difference in Nighttime Surface LWB
Collection 6.1 – Collection 5
4 July 2016

Terra



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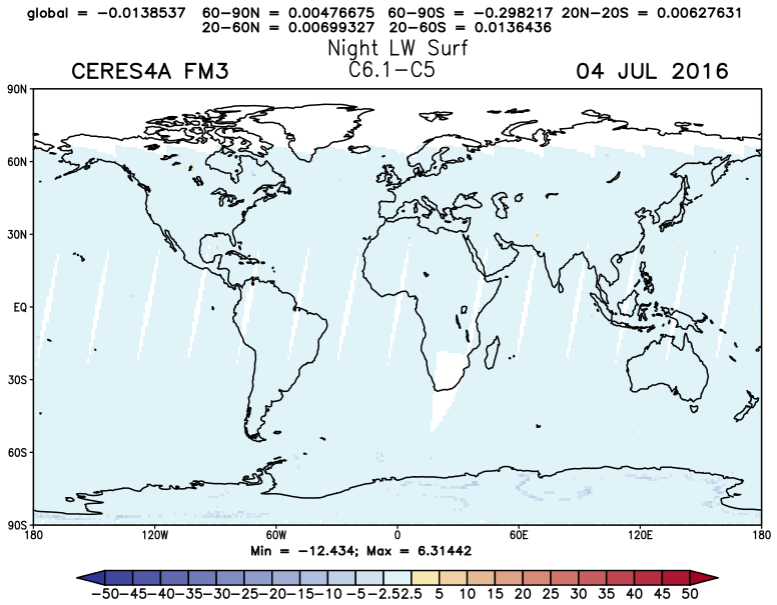
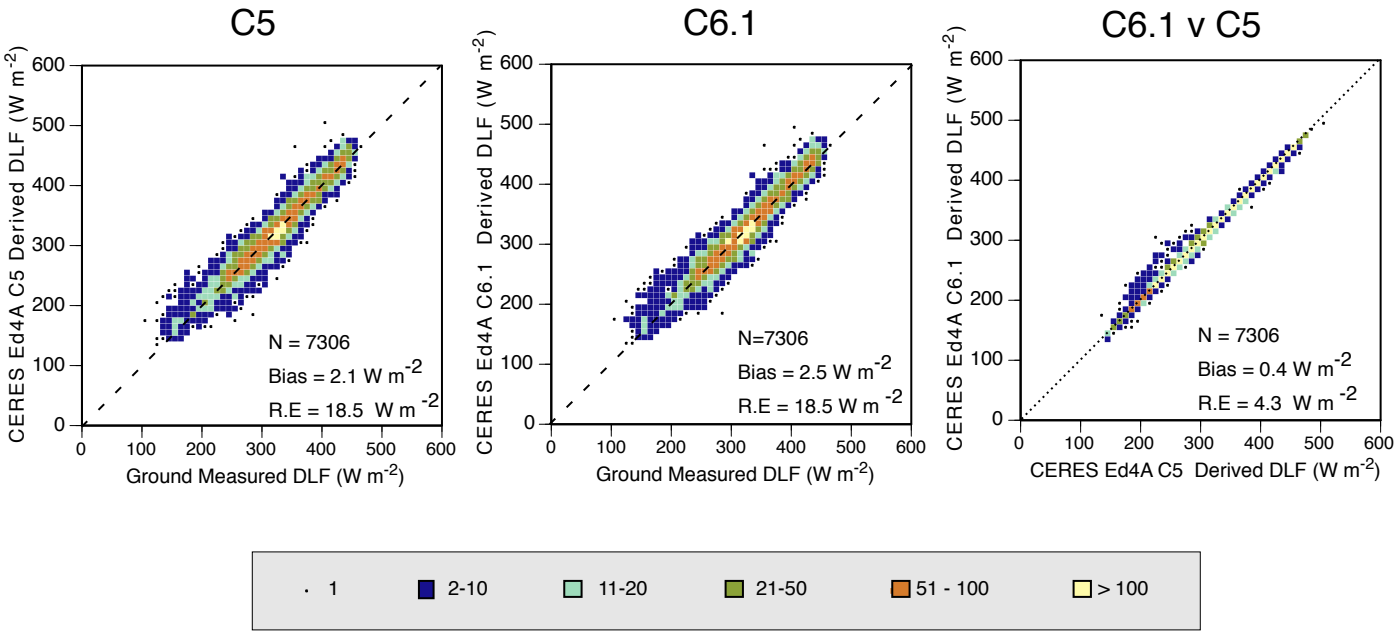


Nighttime differences in Terra are large caused by cloud differences.

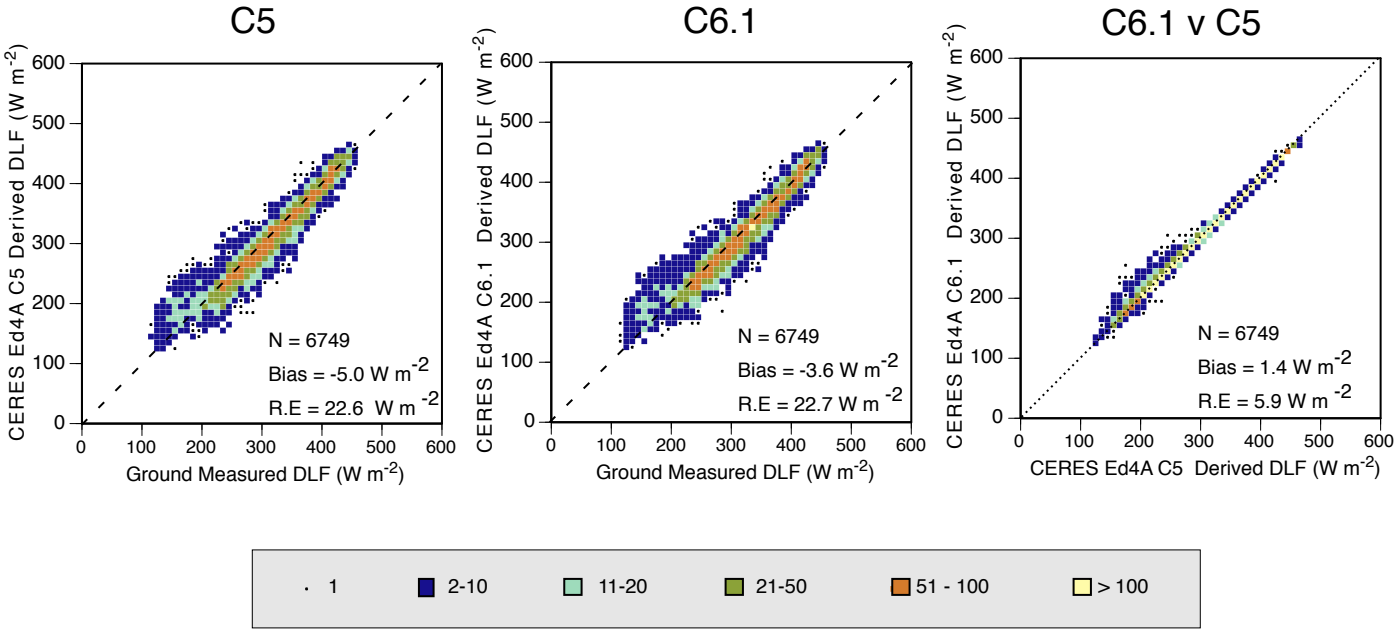
Validation of LWB

GLOBAL
LWB
Daytime
Terra

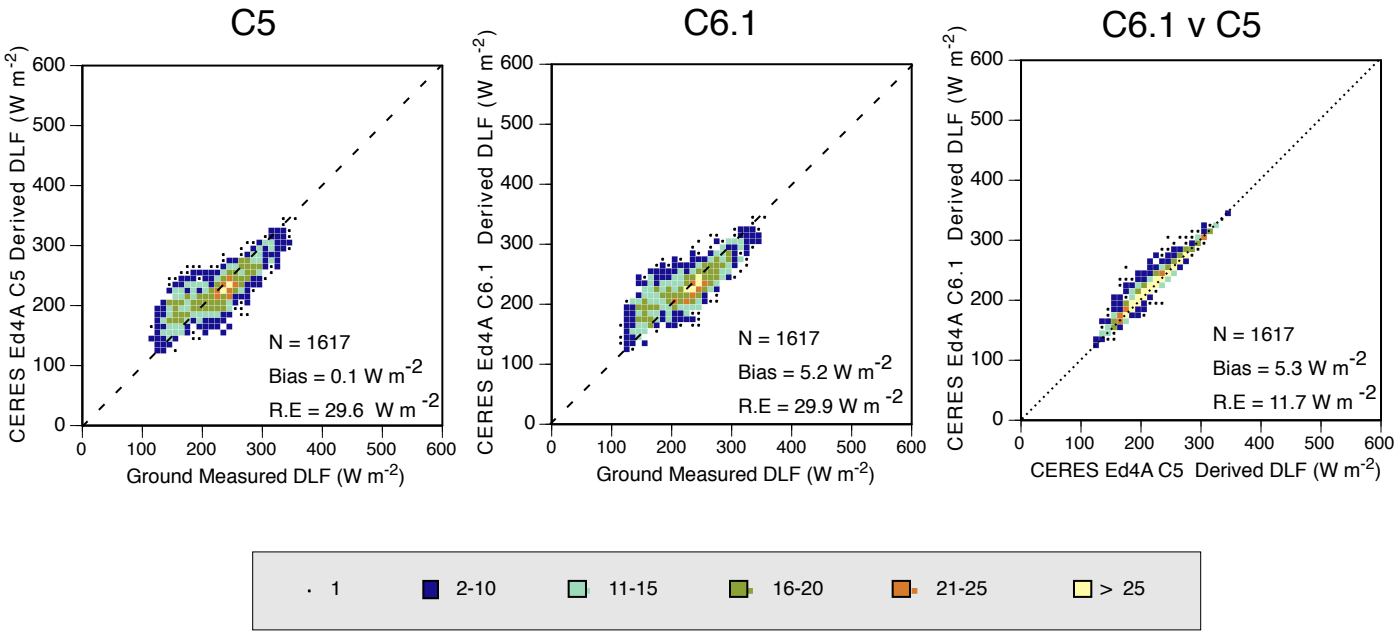


Validation of LWB

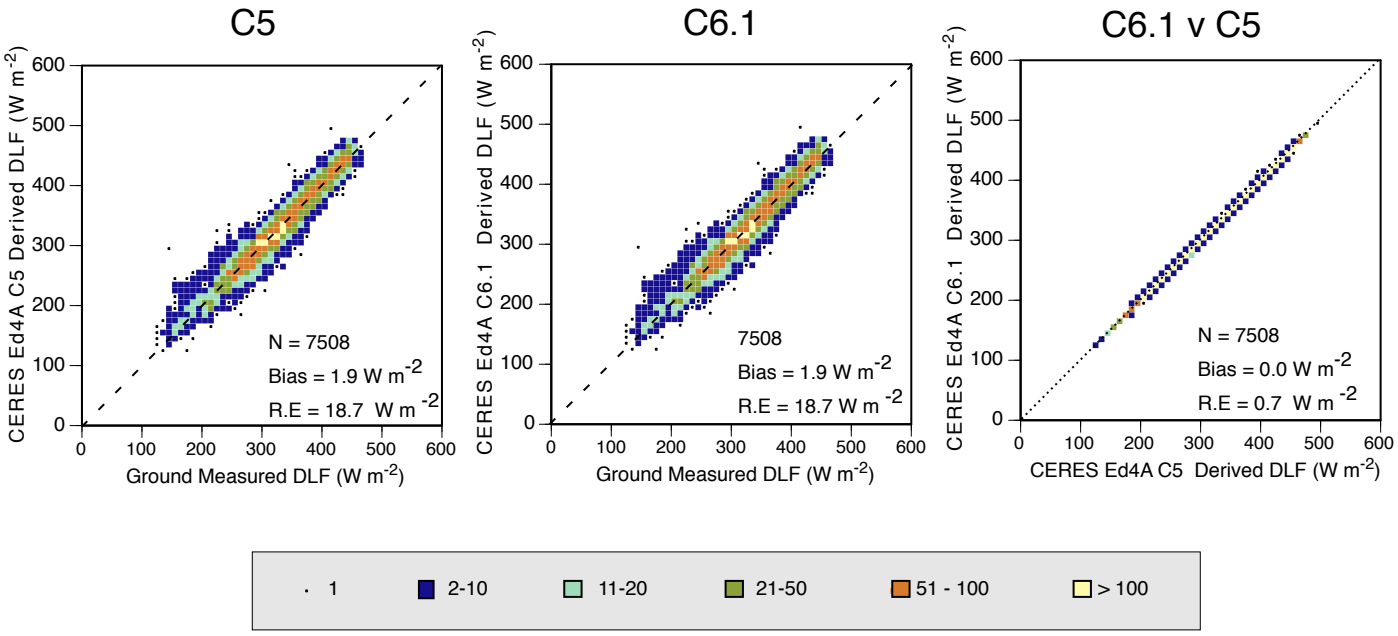
GLOBAL
LWB
Nighttime
Terra



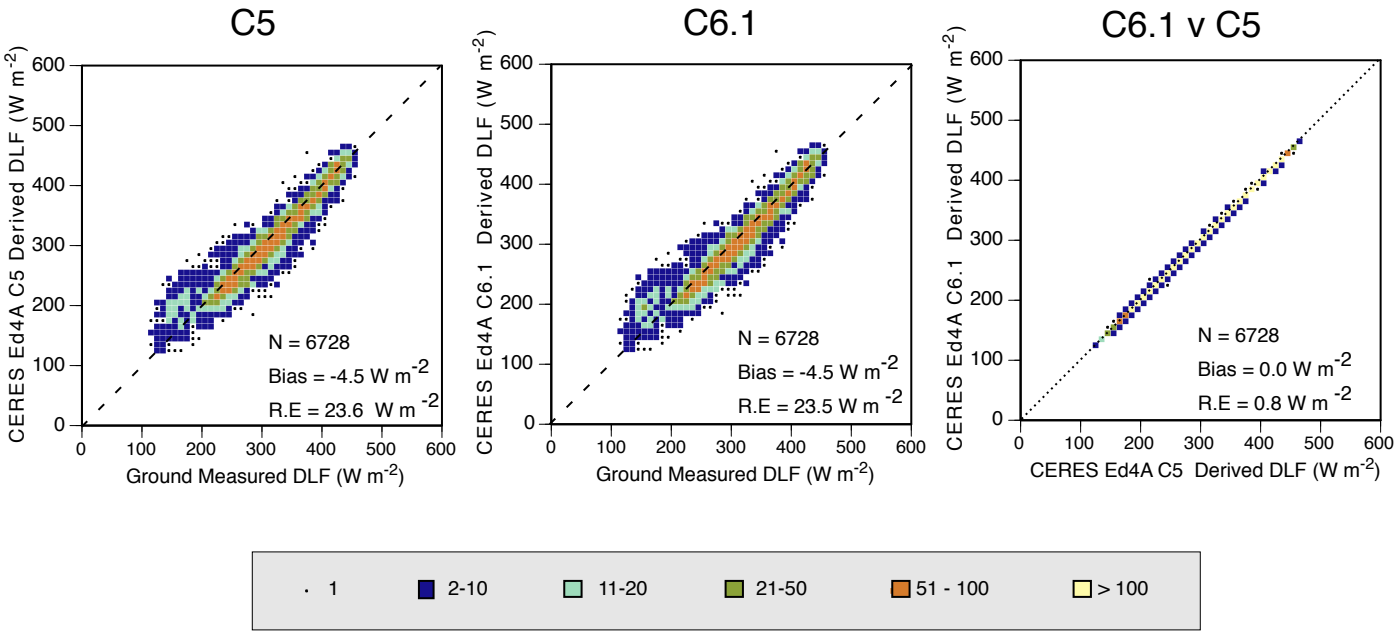
POLAR
LWB
Nightime
Terra



GLOBAL
LWB
Daytime
Aqua



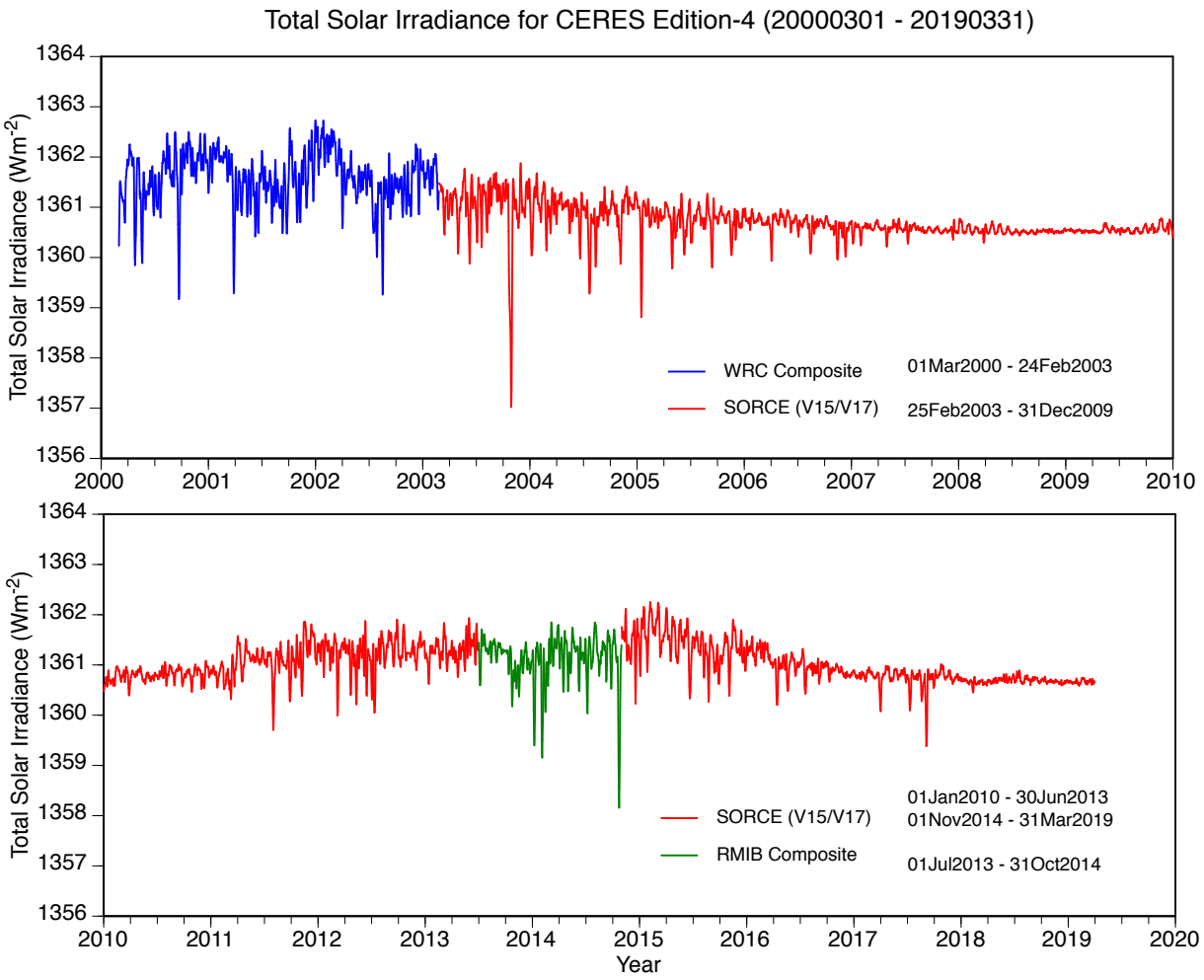
GLOBAL
LWB
Nightime
Aqua



Conclusions for SOFA Ed4A algorithms

Validation studies have demonstrated that with the collection-6.1 updates of clouds and aerosols, the LW and SW surface only flux algorithms continue to show good agreement with the ground–based measurements.

Status of TSI composite data from WRC, SORCE(V15) and RMIB for the Timeframe of CERES Terra, Aqua & NPP

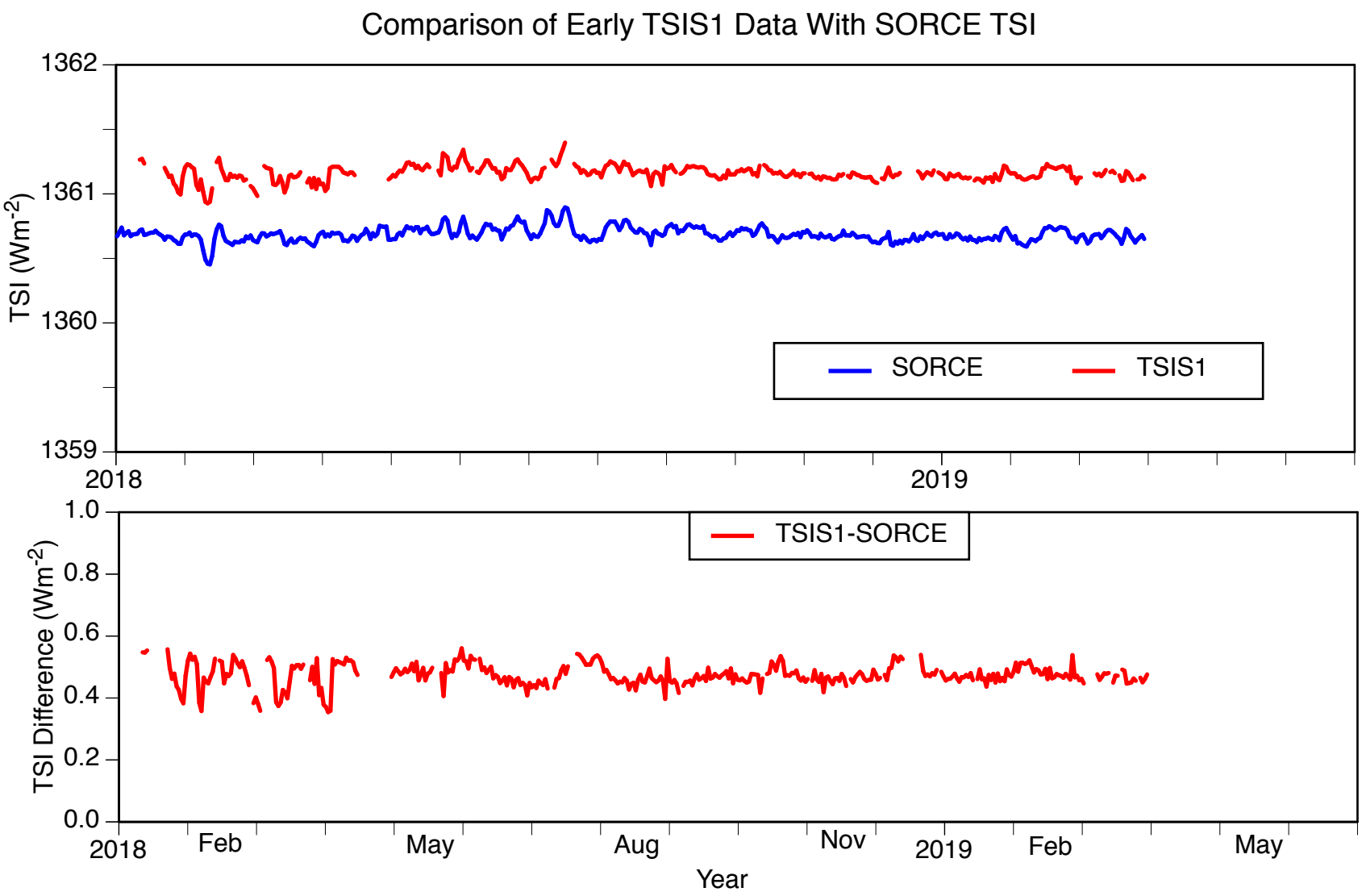


For CERES Ed 4A, all TSI data are offset to match SORCE TSI Version 15

Status of the SORCE Instrument

According to the January-March 2019 TSIS/SORCE Newsletter, a decommissioning review was undertaken on March 1st 2019 to determine the future disposition of the SORCE (Solar Radiation & Climate Experiment) satellite. At that meeting a plan was initiated to lower the the SORCE mission status to phase F by July 2019 with a possibility of continuing to archive SORCE data until the end of 2019, after which SORCE would cease operation.

In the meantime, The TSIS-1 (Total Spectral and Irradiance Sensor) has begun taking data, which will allow for continuity in the TSI data record. A comparison of available TSIS-1 data with SORCE data are shown on the next slide.



Gaps in SORCE data are rare but early TSIS1 data has many gaps.