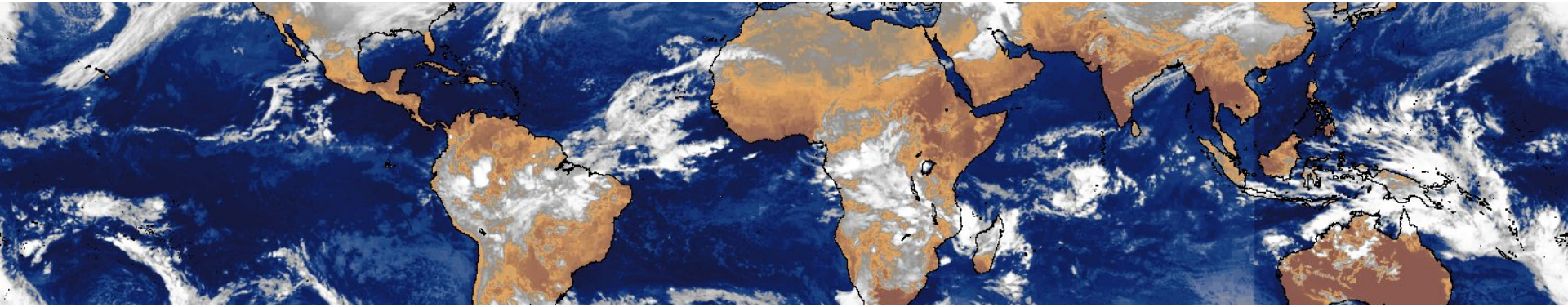
ScaRaB-MT TOA FLUXES
Validation



Le 28Janvier 2014 à 0300Z Courtesy SATMOS

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Outline:

Earth Radiative Budget missions objectives

Level 2 SCARAB products

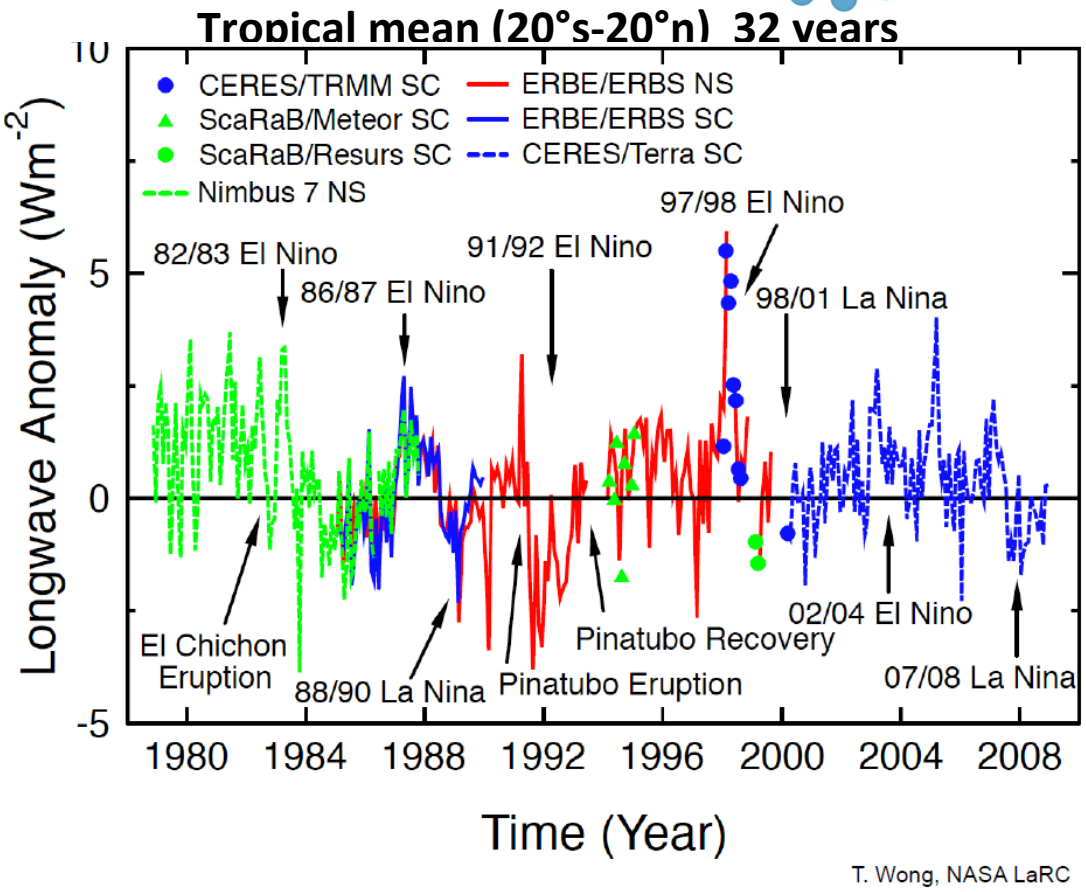
Comparison with CERES_SSF

Conclusions and Further studies

Radiative Budget :

ERB Missions

Before 1980, Nimbus-7 etc…
1980's ERBE
1990's ERBE/WFOV,
SCARAB-1 et 2, CERES-TRMM
2000's CERES-Terra
CERES-Aqua
2010's SCARAB-3_MT, CERES-SNPP



➔ **Continuous and Long temporal serie in the same scale**

Radiative Budget :

ERB Missions

Within SCARAB-3_MT, we are involved in this dual effort:

Offering an independent estimation of SW and LW fluxes

Based on a different technology with regard to CERES technology, allowing to validate the absolute value and the stability of the "record" of the radiative budget.

Can SCARAB provide an independant confirmation of the CERES measurements and vice versa ?

Requirements for such a comparison to be useful: theoritical error budgets in the SW

Loeb et al., show CERES SW radiance error budget is compatible with climate monitoring

SCARAB SW error budget @ 1 sigma

Items	Value	Type	
Short wave calibration (sphere)	3% @2σ	Biais	1.5%
Error on spectral response		Biais	0.4%
Thermal gain correction	0.08%/° dT= 0.04° @1σ	Random	0.03%
Thermal leak correction	20% of the thermal leak@1σ	Random	0.04%
Location	0.06°@1σ	Random	0.4%
Budget at 1 sigma			1.6%

Rosack et al., CNES, 2012

CERES FM 2 error budget @ 2 sigma

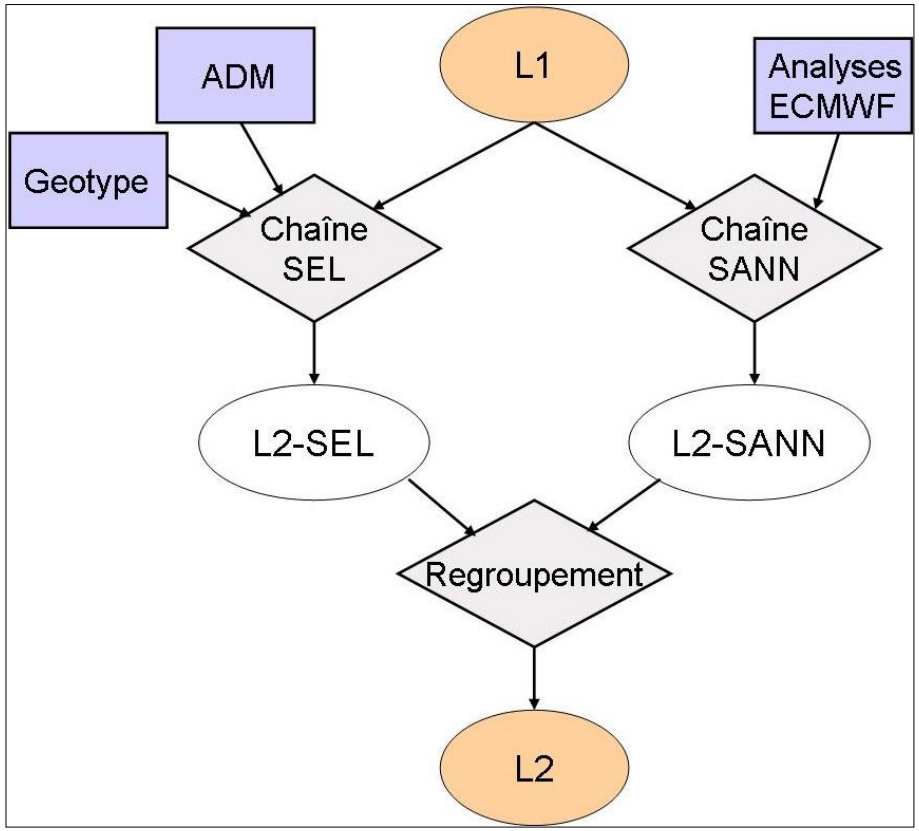
	Bias errors of unknown sign (W m^{-2})				
Source	Incoming solar	Outgoing SW	Outgoing LW	Net incoming	Comment
Total solar irradiance	±0.2	0	0	±0.2	Absolute calibration (95% confidence)
Filtered radiance	0	±2.0	±2.4 (N) ±5.0 (D)	±4.2	Absolute calibration (95% confidence)
Unfiltered radiance	0	±0.5	±0.25 (N) ±0.45 (D)	±1.0	- Instrument spectral response function - Unfiltering algorithm

Loeb et al., 2009 J Climate

SW SCARAB budget @ 1 sigma ~ 1.6%

SW CERES budget @ 1 sigma ~ 1%

Level 2 ScaRaB-3_MT products

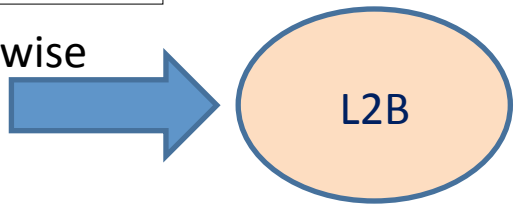


Input: Calibrated L1 ScaRaB
4 channels(Vis, IR, SW, TW)

Ancillary:
ADM
Geotype : IGBP
ECMWF(PWC) analysis

Output:
Flux L2 :SW, LW, Albedo
SEL : ERBE-Like
SANN1: using 4 channels
SANN2: using 2 channels + PWC

Dumpwise or Orbite wise
HDF



1° x 1°
NetCDF

Level 2 ScaRaB-3_MT products

Level -2 are released http://www.icare.univ-lille1.fr/mt

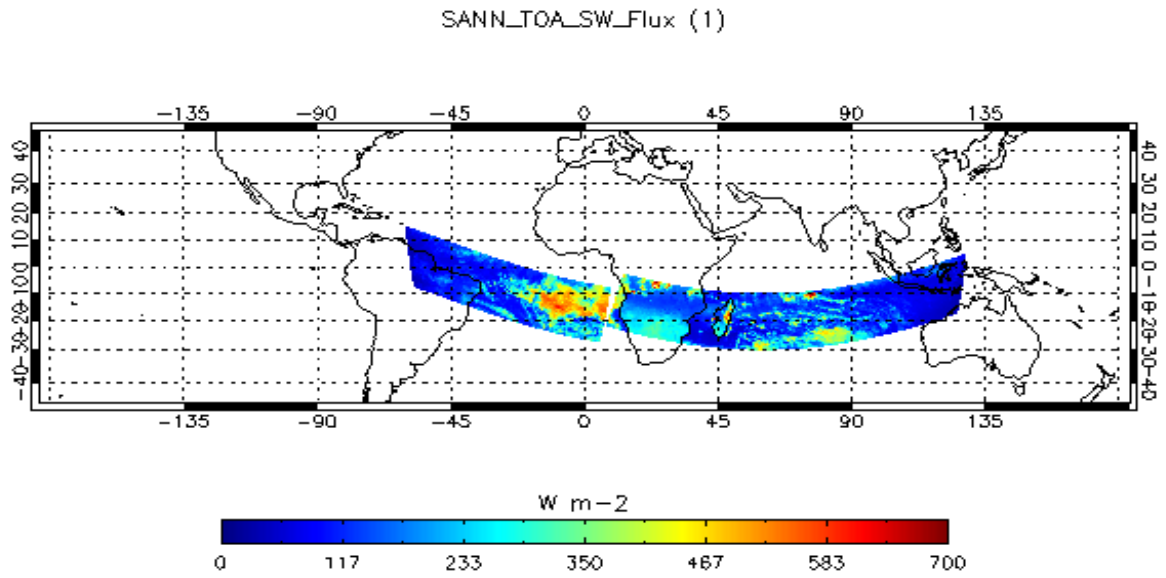
L2 for LW and SW TOA **unfiltered radiance** based on L1A2 (HDF4)

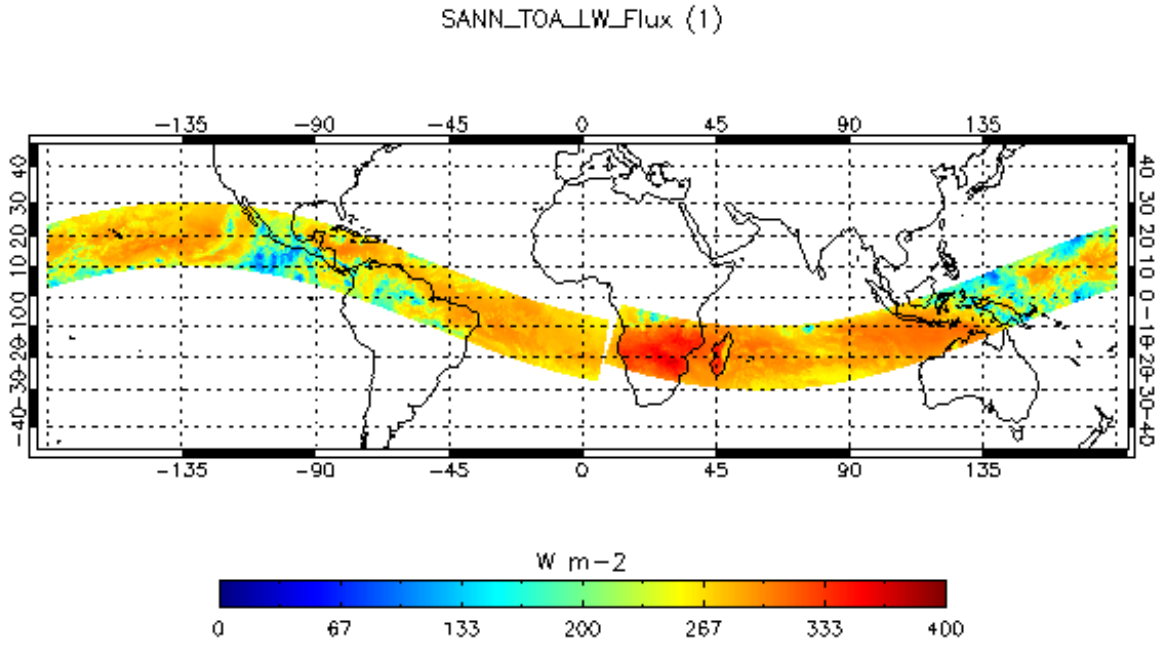
L2 for LW and SW TOA **flux** based on L1A2 (HDF4)

L2-B are the same but on a 1°x1° regular grid in netCDF

L1 Version 1.06 are regenerated by CNES-ISRO and sent to ICARE

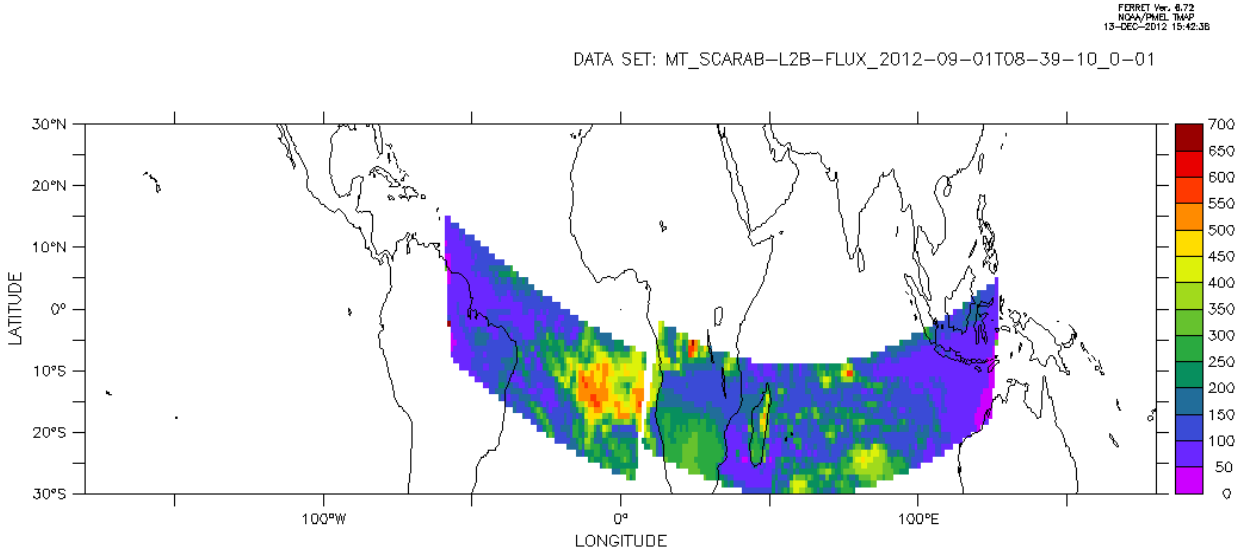
Level 2 ScaRaB-3_MT products



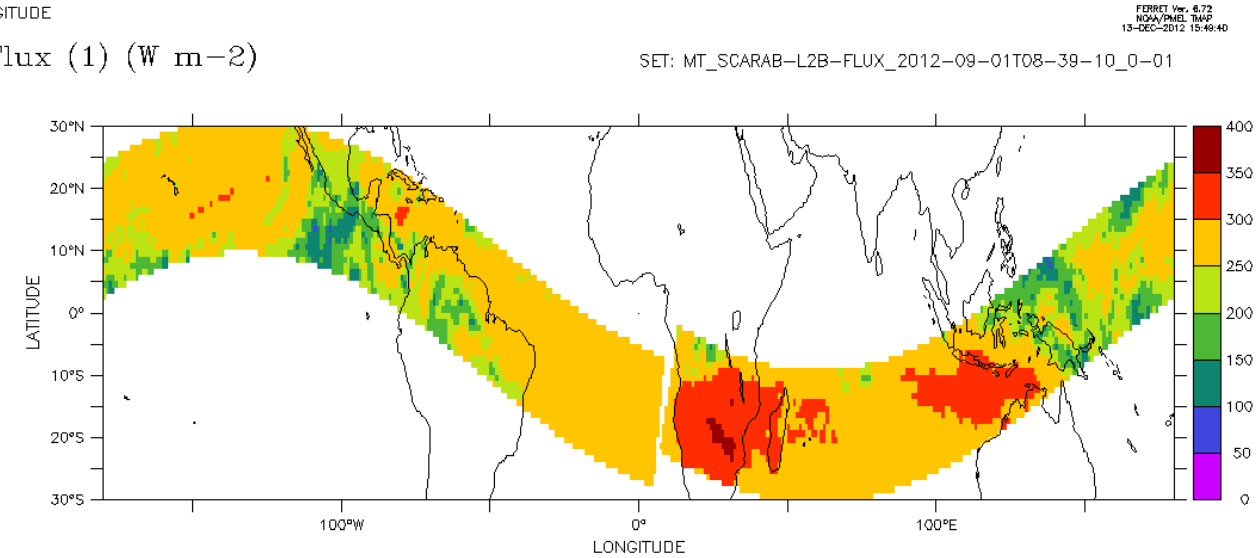


FLUX L2B 1°x1°

Mean of instantaneous values within the grid



SANN_TOA_SW_Flux (1) (W m-2)



SANN_TOA_LW_Flux (1) (W m-2)

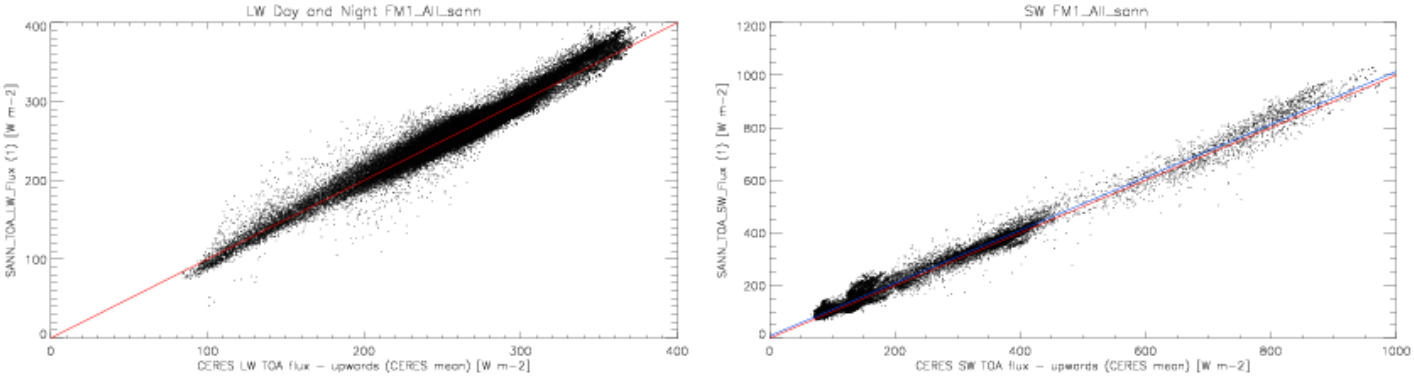
Flux comparison

Comparison L2_ScaRaB – SSF_CERES

•Instantaneous data: June 2012, December 2012
(ScaRaB, CERES FM1 et FM2)

•Colocalisation used by O. Chomette for radiances comparison
•Using $\Delta t = 5'$, cône : 10° PSF > 0.7

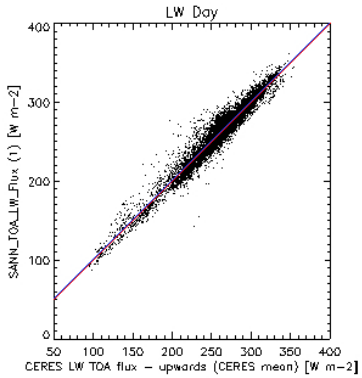
ScaRaB-FM1

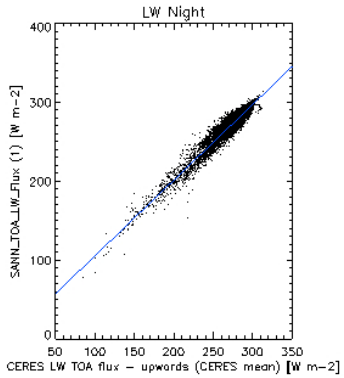


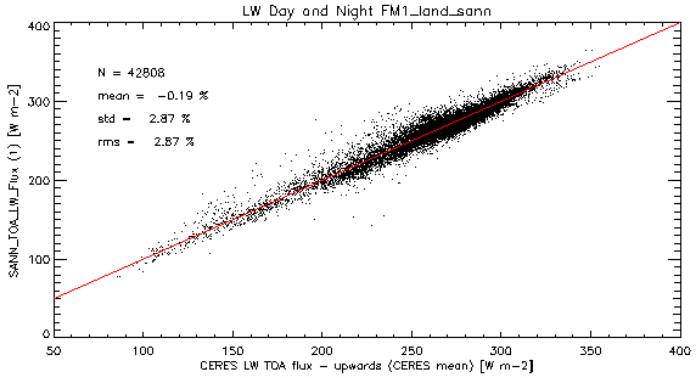
	FM1(juin2012)	FM2(juin2012)	FM1(dec2012)
LW	0.31% ±2.75%	0.23%±2.81%	0.22%±2.72%
SW	3.86% ±9.80%	3.41%±10.20%	6.53%±13.89%

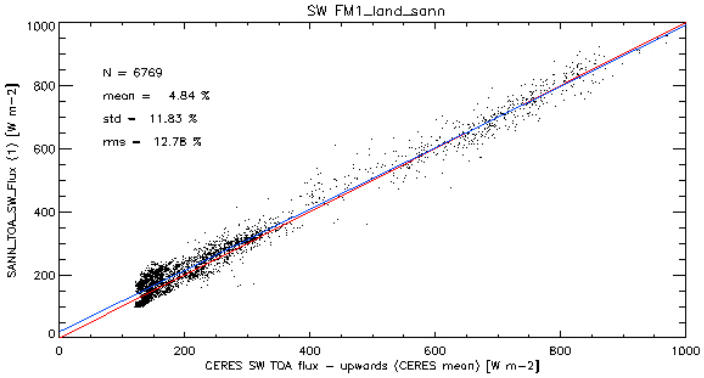
L2_ScaRaB – SSF_CERES

OCEAN





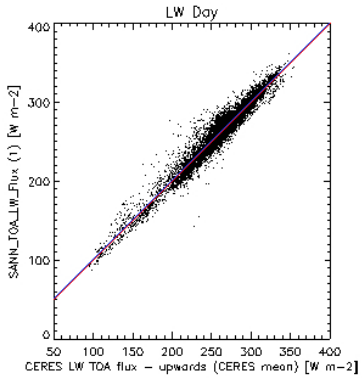


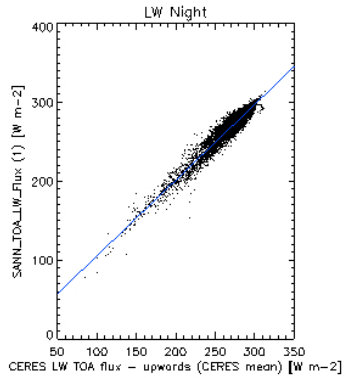


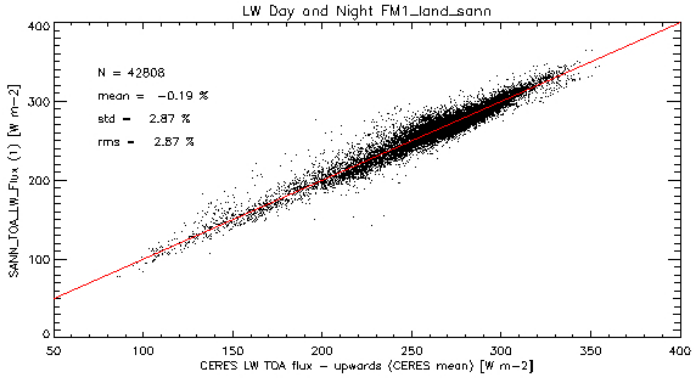
OCEAN	FM1 SANN1	FM1 SANN2	FM2 SANN1
LW Jour	0.50%±2.63%	-0.57%±2.10%	0.53%±2.85%
LW Night	0.55%±4.20%	-0.73%±4.30%	0.31%±4.30%
LW	0.21%±2.51%	-0.80%±2.20%	0.18%±2.57%
SW	5.90%±12.68%	8.90%±9.59%	4.75%±13.07%

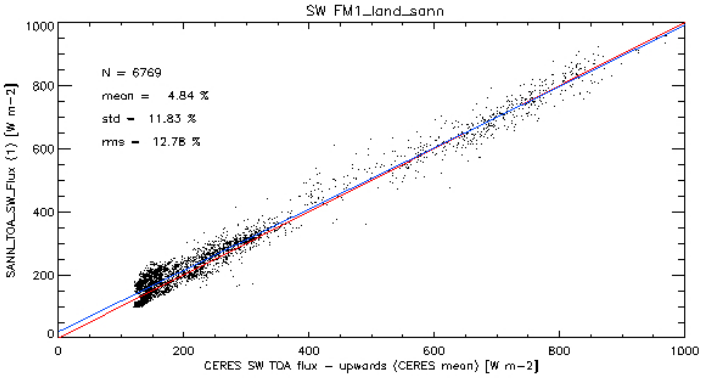
L2_ScaRaB – SSF_CERES

LAND





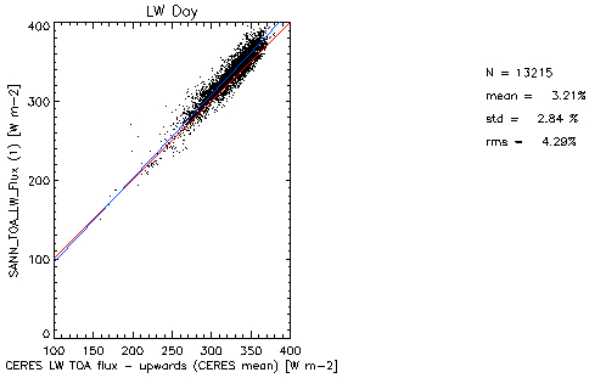


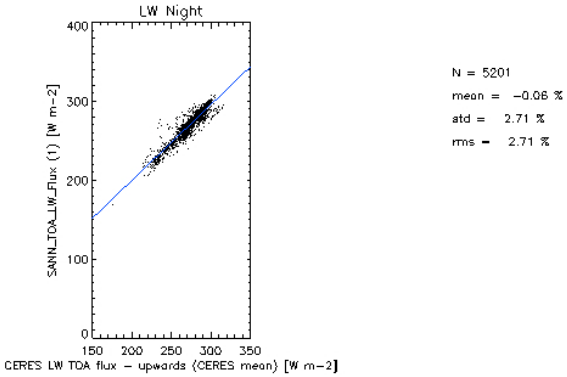


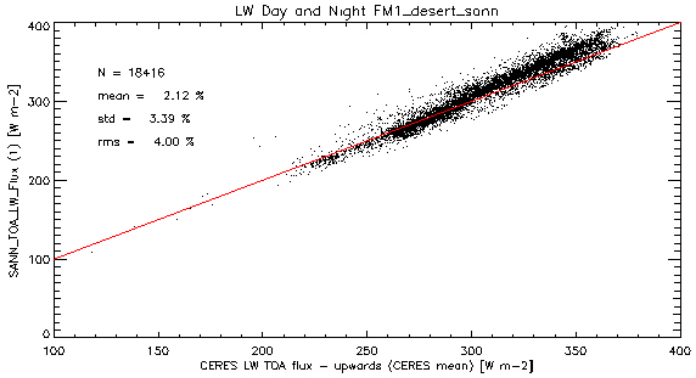
LAND	FM1 SANN1	FM1 SANN2	FM2 SANN1
LW Jour	0.31%±3.54%	-1.05%±3.45%	0.04%±4.07%
LW Night	0.10%±2.89%	-1.14%±2.91%	-0.12%±3.46%
LW	0.19%±2.87%	-1.45%±3.13%	-0.38%±2.96%
SW	4.84%±12.78%	3.82%±11.33%	2.88%±13.05%

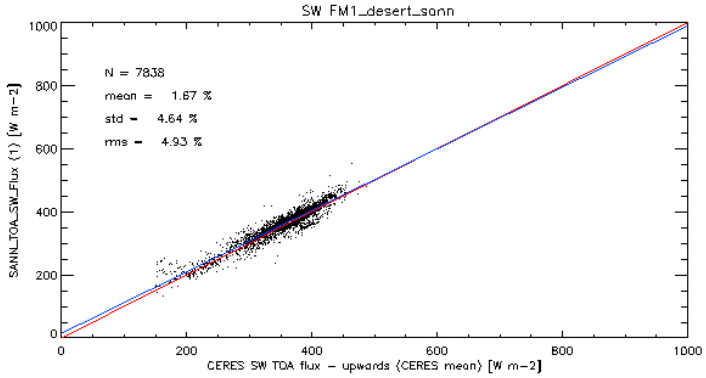
L2_ScaRaB – SSF_CERES

DESERT









DESERT	FM1 SANN1	FM1 SANN2	FM2 SANN1
LW Jour	3.21% ±4.29%	1.96%±4.36%	3.39% ±4.50%
LW Night	-0.06%±2.71%	-1.45%±3.05%	-0.07%±4.10%
LW	2.12%±4%	0.95%±4.21%	1.97%±4.09%
SW	1.67% ±4.93%	2.37%±4.95%	0.32% ±5.44%

Comparison
L2_ScaRaB – SSF_CERES

	FM1(juin2012)	FM2(juin2012)
LW	0.31% ±2.75%	0.23%±2.81%
SW	3.86% ±9.80%	3.41%±10.20%

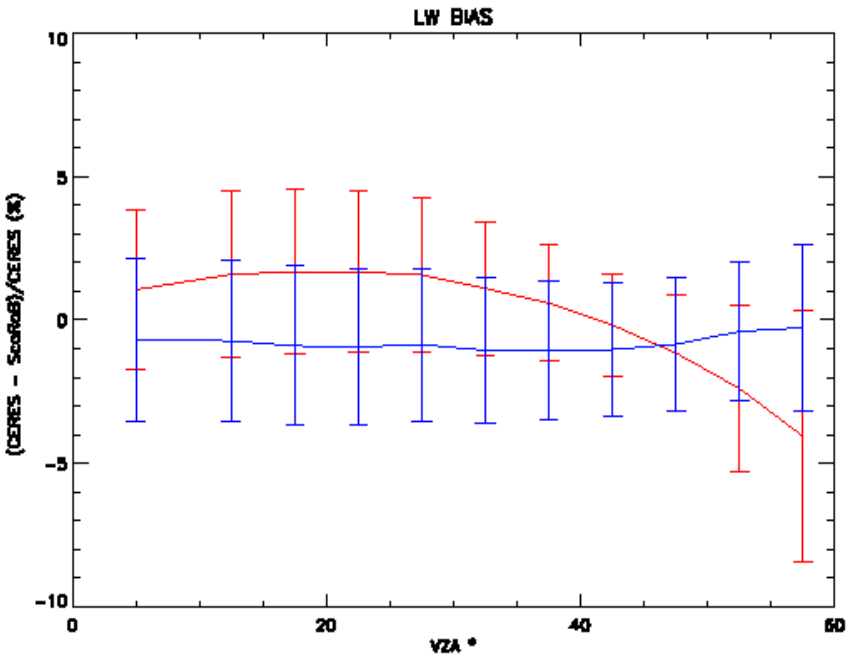
Conclusion – Further studies

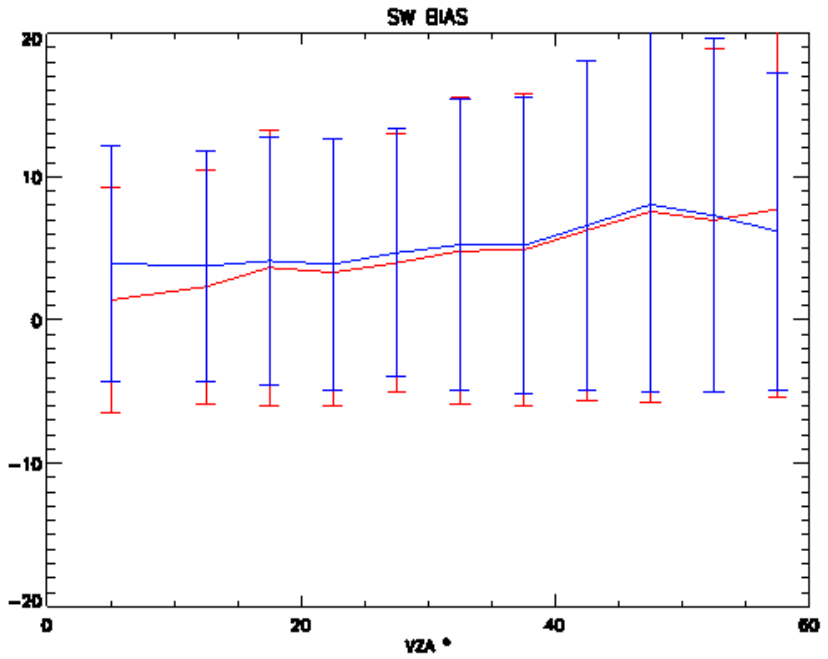
Viewing zenith angle dependency

Cloud over Ocean

Impact of the PWC parameter over continental surfaces

Viewing Zenith angle dependency





_____ SANN1 _____ SANN2

Thank You