ScaRaB-MT TOA FLUXES

Algorithms-Validation

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Outline:

L2 TOA Fluxes calculation : SEL , SANN1, SANN2 Algorithms

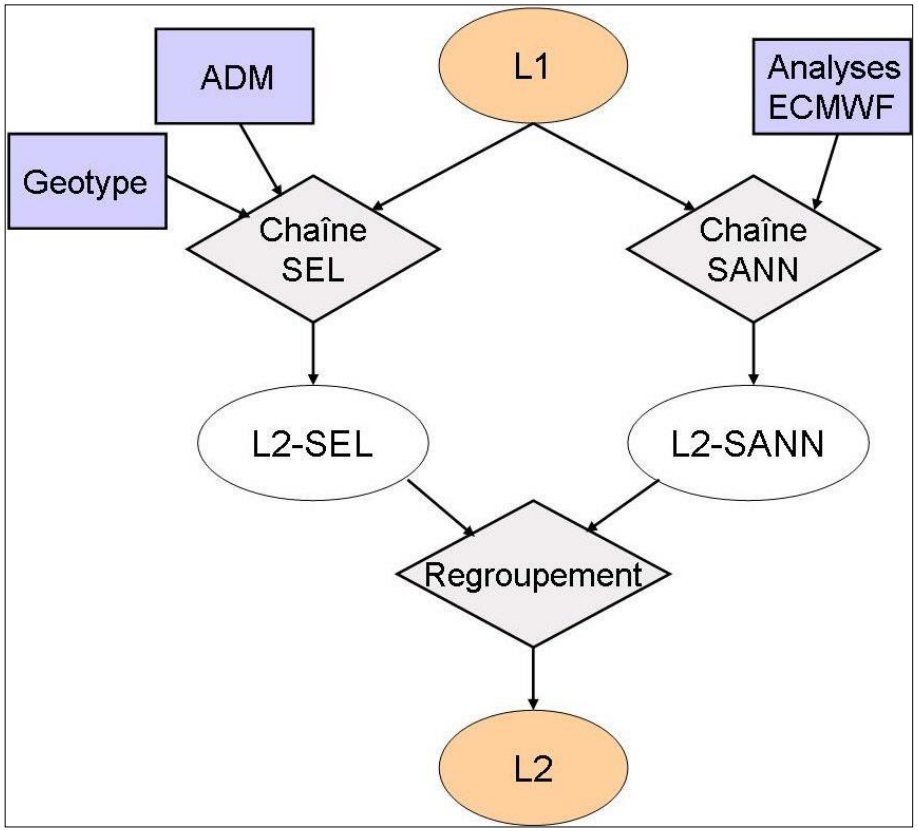
Level 2 SCARAB products

Comparison with CERES_SSF

Long term monitoring

Conclusion

Level 2 ScaRaB-3_MT products

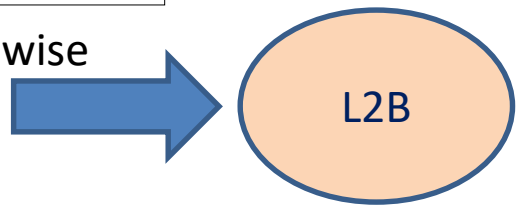


Input: Calibrated filtered L1 ScaRaB
4 channels(Vis, IR, SW, TW)

Ancillary:
ADM
Geotype : IGBP
ECMWF(TWC) analysis

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

Dumpwise or Orbite wise
HDF



1° x 1°
NetCDF

SEL – ScaRaB ERBE like

Equivalent to the CERES ES-8 products ,

Maximum Likekihood Estimation (MLE)

Angular Radiation Models (Suttles et al 1988)

Ancilary datas (IGBP)

Duvel J.P., Viollier M., Raberanto P., Kandel R., Haeffelin M., Pakhomov L.A., Golovko V.A., Mueller J., Stuhlmann R., and the International ScaRaB Scientific Working Group, 2001: The ScaRaB-Resurs Earth radiation budget dataset and first results. Bull. Amer. Meteor. Soc., 82, 1397-1408.

Kandel R., M. Viollier, P. Raberanto, J.Ph. Duvel, L.A. Pakhomov, V.A. Golovko, A.P. Trishchenko, J. Mueller, E. Raschke, R. Stuhlmann, and the International ScaRaB Scientific Working Group, 1998: The ScaRaB Earth Radiation Budget Dataset, Bull. Americ. Meteor. Soc., 79, 765-783.

SANN – ScaRaB Artificial Neural Network

SANN1 : using as input the 4 channels on board (SW, TW, Vis, IR)

SANN2 : using the 2 broadband channels (SW, TW) and the TWC from ECMWF analysis

Viollier, M., C. Standfuss, O. Chomette and A. Quesney, 2009: Top-of-Atmosphere Radiance-to-Flux conversion in the SW domain for the ScaRaB-3 instrument on Megha-Tropiques. J. Atmos. Oceanic Technol., 26, 2161-2171.

Level 2 ScaRaB-3_MT products

Level -2 v2.0 are released at CDS-ICARE (AERIS)

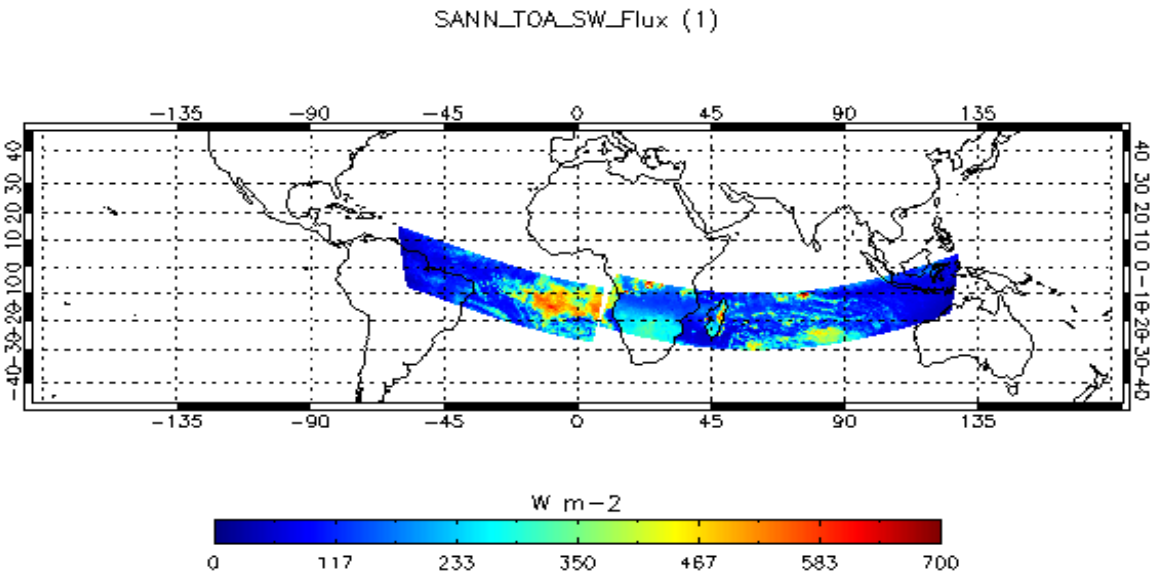
http://www.icare.univ-lille1.fr/mt

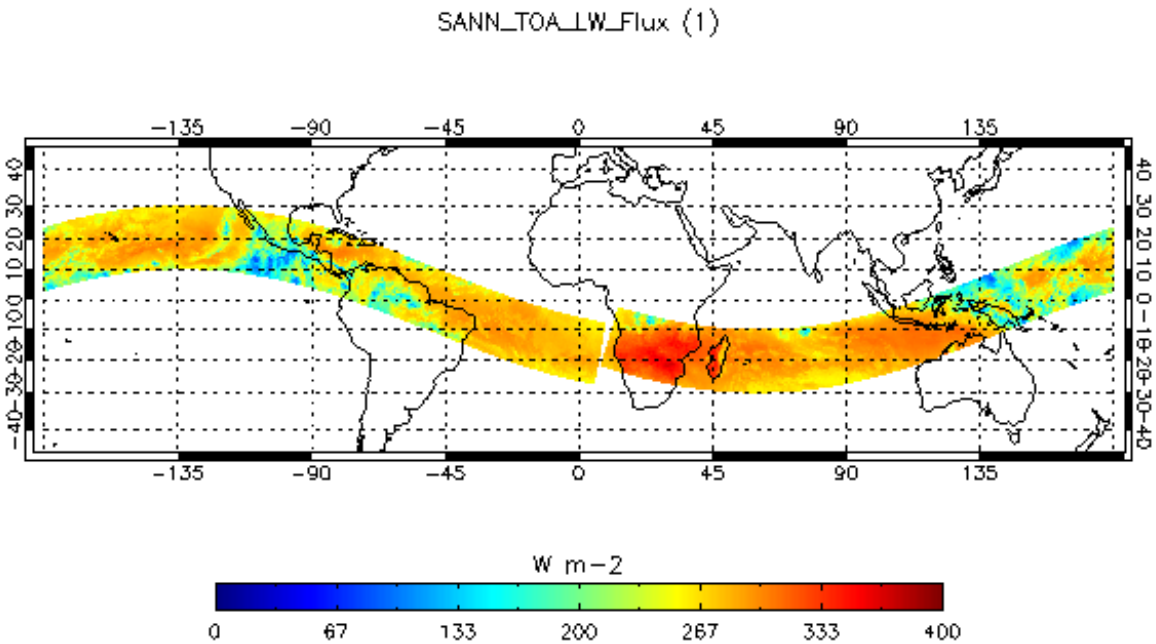
L2 for LW and SW TOA unfiltered radiance based on L1A2 (HDF4)

L2 for LW and SW TOA flux based on L1A2 (HDF4) (SEL, SANN1, SANN2)

L2-B for LW and SW SANN1 but on a 1°x1° regular grid in netCDF

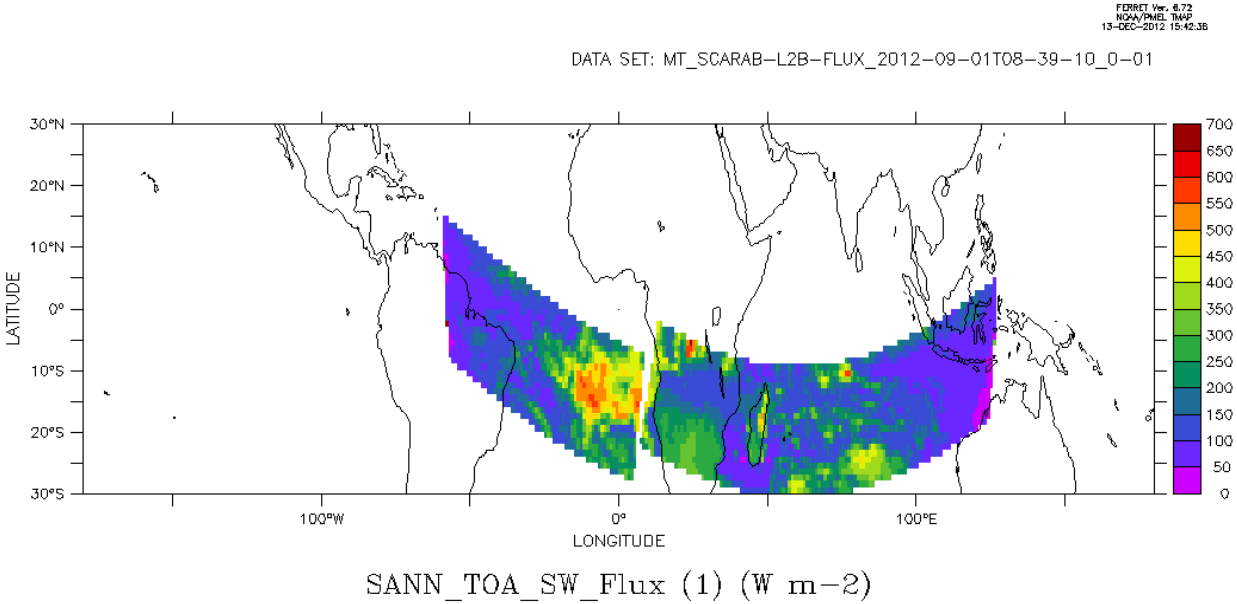
Level 2 ScaRaB-3_MT products

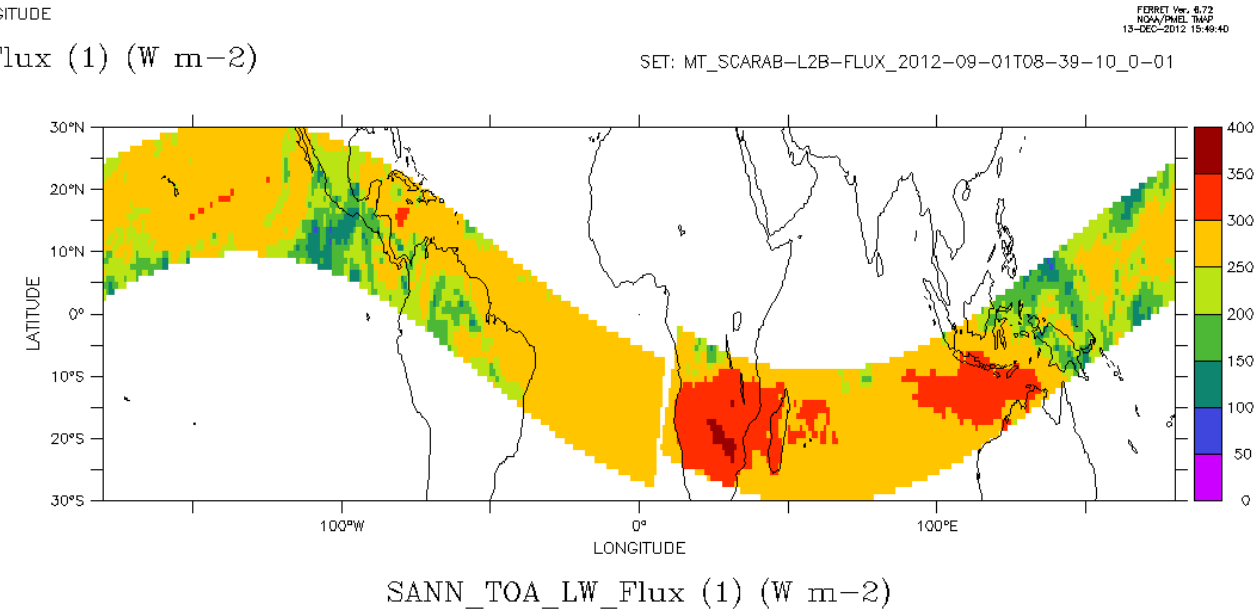




FLUX L2B 1°x1°

Mean of instantaneous values within the grid





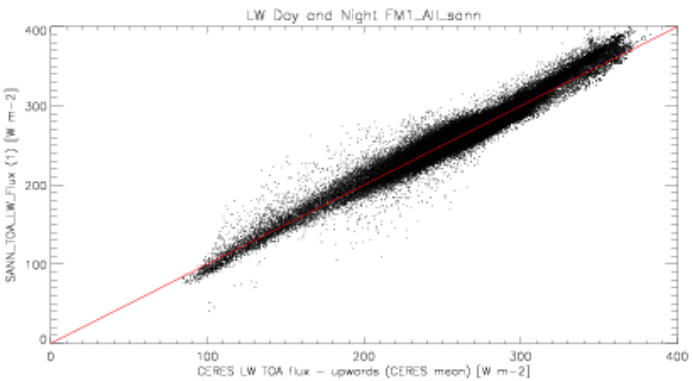
Flux comparison

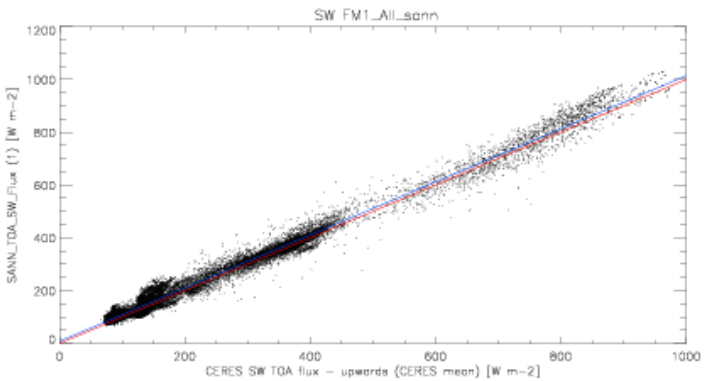
Comparison L2_ScaRaB – SSF_CERES

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

- Colocalisation (see also O. Chomette talk)
- Using $\Delta t = 5'$, cône : 10° PSF > 0.7

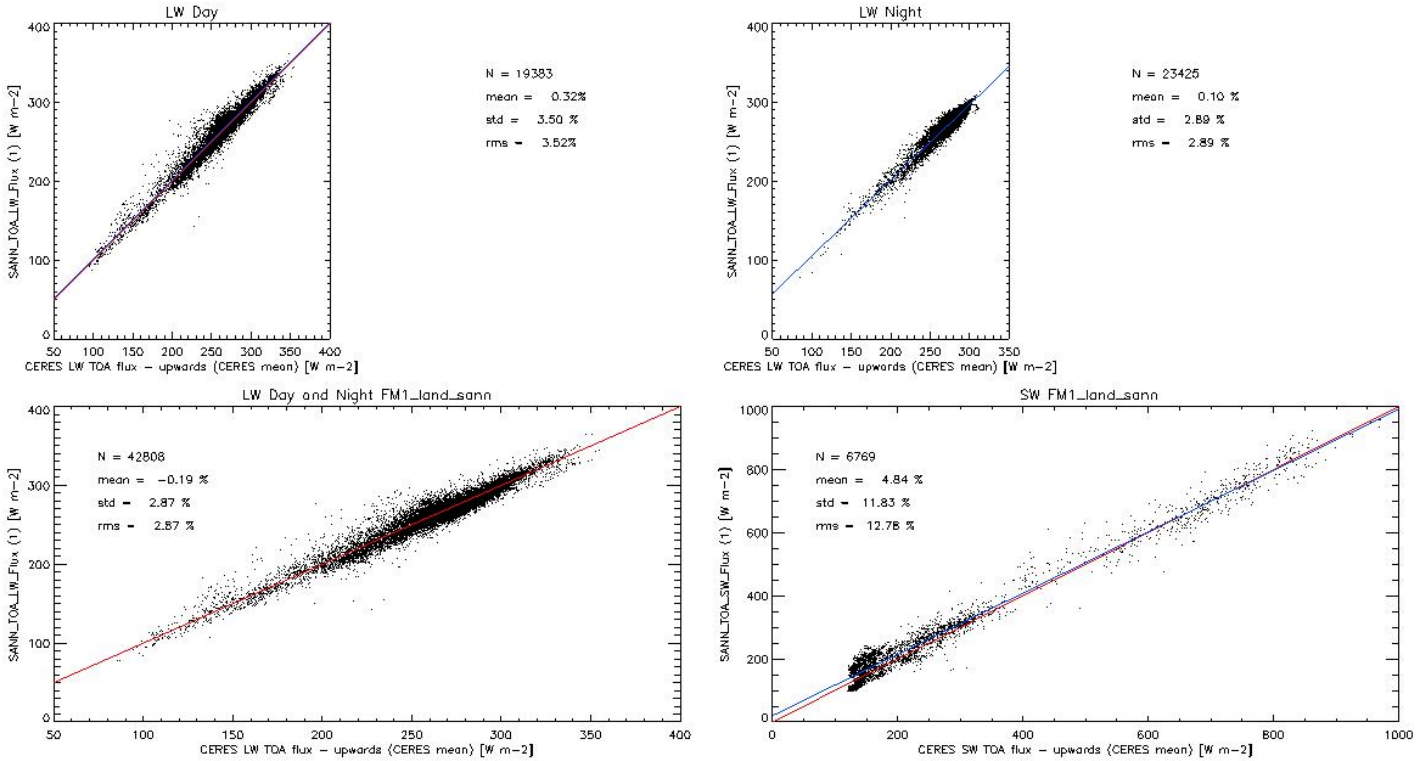
ScaRaB-FM1





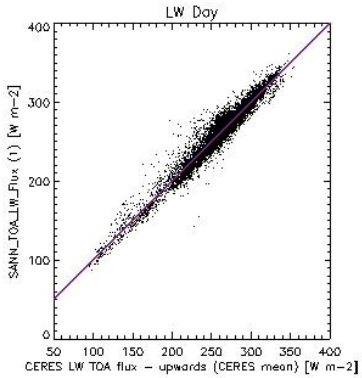
	FM1(juin2012)	FM2(juin2012)	FM1(dec2012)
LW	**0.31% ±2.75%**	**0.23%±2.81%**	**0.22%±2.72%**
SW	**3.86% ±9.80%**	**3.41%±10.20%**	**6.53%±13.89%**

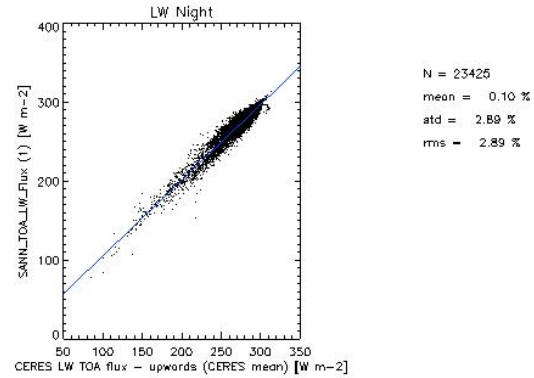
L2_ScaRaB – SSF_CERES OCEAN

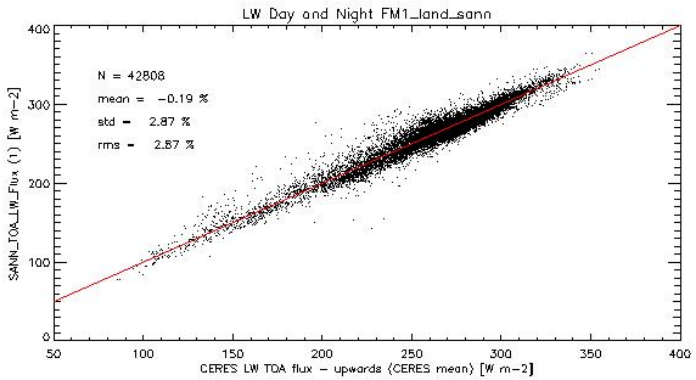


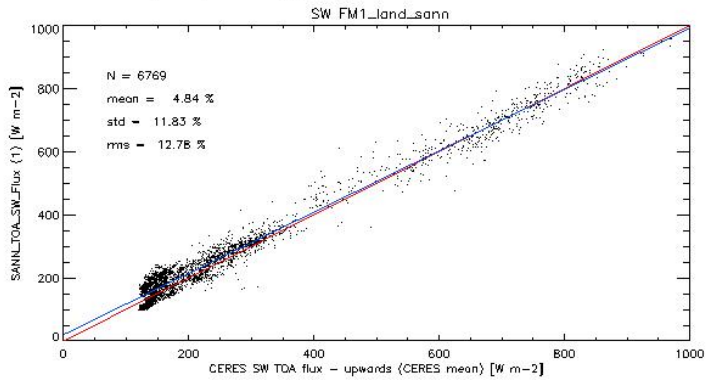
OCEAN	FM1 SANN1	FM1 SANN2	FM2 SANN1
LW Jour	0.50%±2.63%	-0.57%±2.10%	0.53%±2.85%
LW Night	0.55%±4.20%	-0.73%±4.30%	0.31%±4.30%
LW	0.21%±2.51%	-0.80%±2.20%	0.18%±2.57%
SW	5.90%±12.68%	8.90%±9.59%	4.75%±13.07%

L2_ScaRaB – SSF_CERES LAND



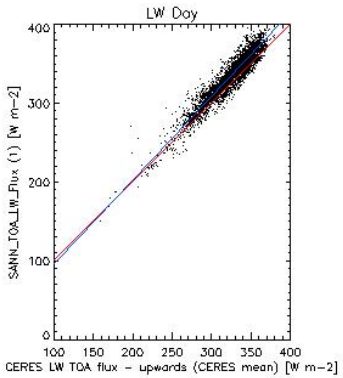


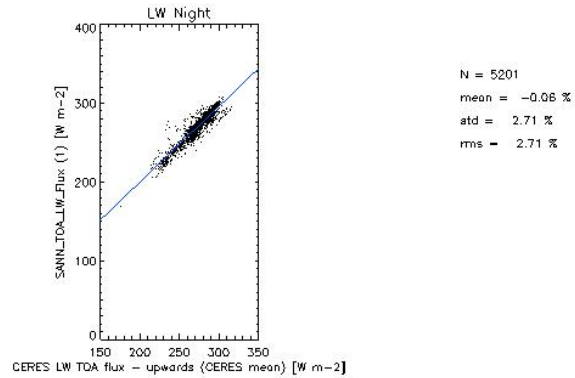


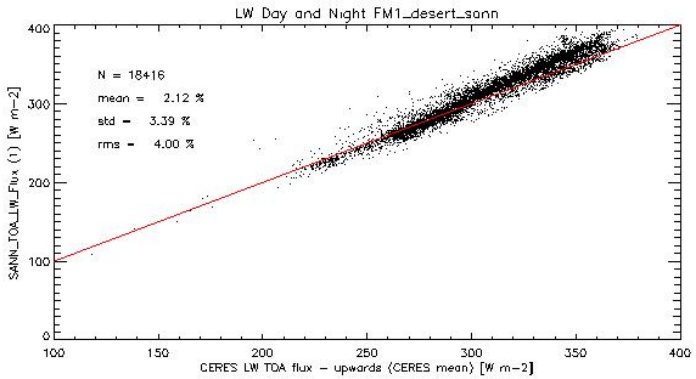


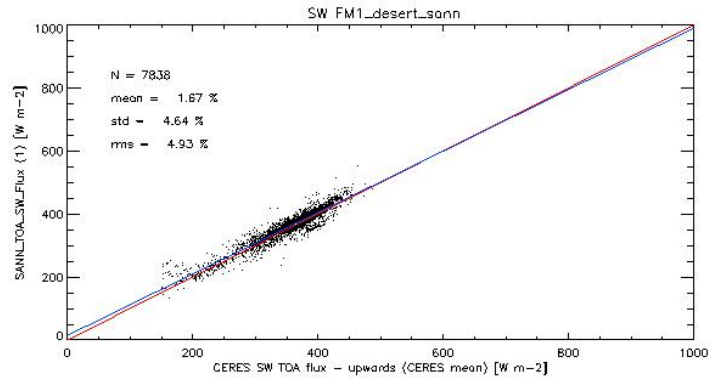
LAND	FM1 SANN1	FM1 SANN2	FM2 SANN1
LW Jour	0.31%±3.54%	-1.05%±3.45%	0.04%±4.07%
LW Night	0.10%±2.89%	-1.14%±2.91%	-0.12%±3.46%
LW	0.19%±2.87%	-1.45%±3.13%	-0.38%±2.96%
SW	4.84%±12.78%	3.82%±11.33%	2.88%±13.05%

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%

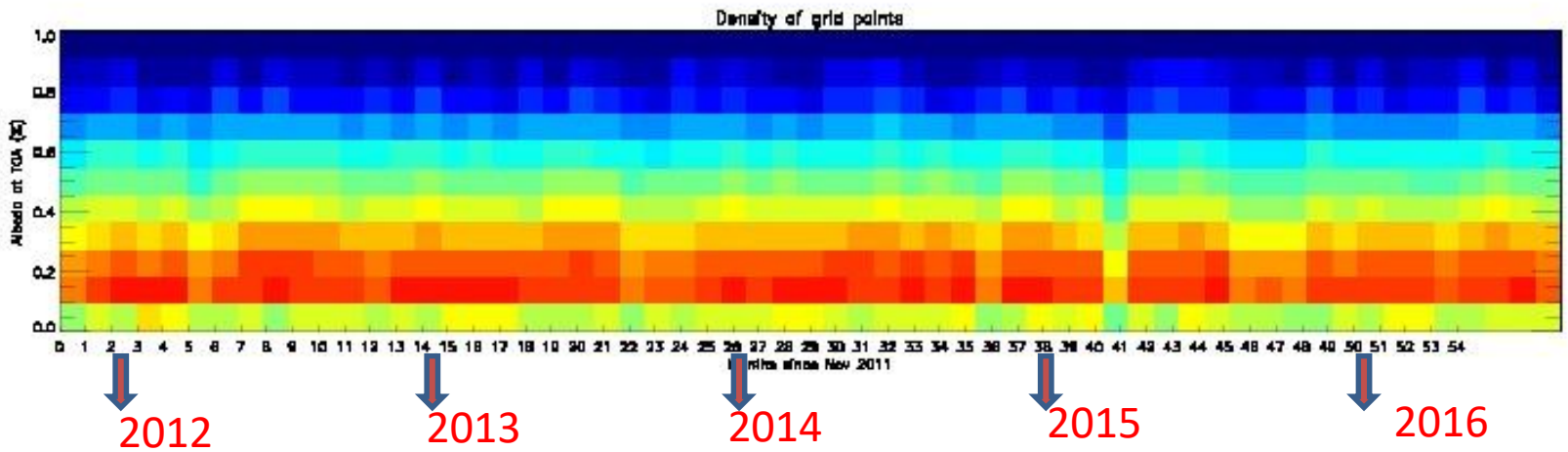
Long term monitoring :

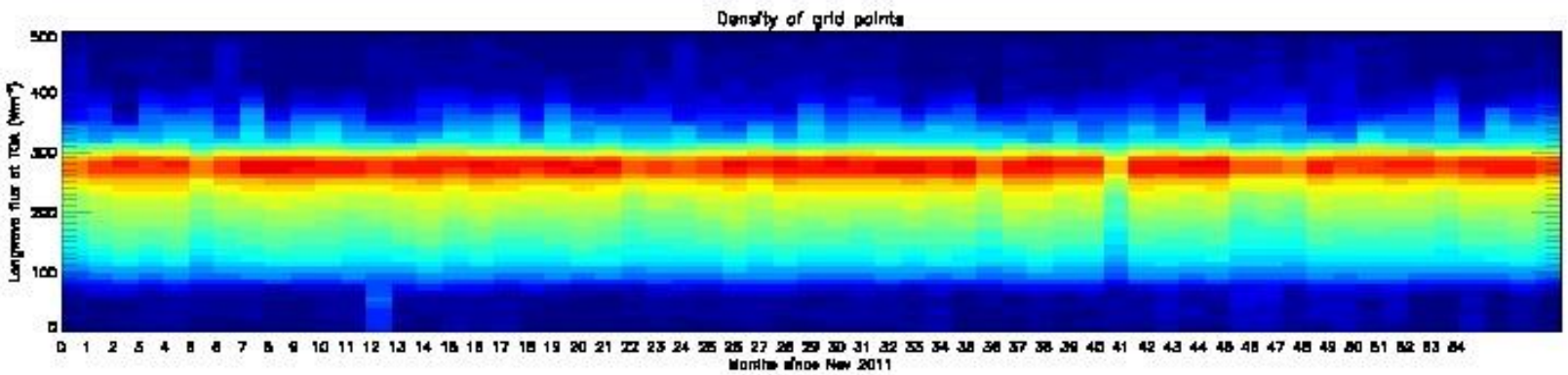
5 years of data

DCC (not shown here)

Albedo – LW

→ also O. Chomette talk


Density of grid points
Albedo at TOA (%)
Months since Nov 2011
2012
2013
2014
2015
2016


Density of grid points
Longwave flux at TOA (Wm⁻²)
Months since Nov 2011

Conclusion

SCARAB provide an independant confirmation of the CERES measurements.

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

Do we need other data?

Grid 2x2 , Grid 0.5x0.5°
Level 1 (Radiances) gridded ??

Thank You