CENTRE NATIONAL D'ÉTUDES SPATIALES

Sensors cross calibration over desert sites using SADE database

P. Henry, S. Lacherade, C. Tinel ,
B. Fougnie, P. Gamet, D. Blumstein
CNES-CST

Outline

- Desert sites in CNES
- SADE Database
- Calibration method
- Calibration results
- Sites characterization
- Opening SADE data base

Desert sites in CNES : a long story… (1)

- **Cosnefroy H., X. Briottet, M. Leroy (1993) Characterization of desert areas with Meteosat 4 data fo optical satellite sensors.** *Proc. of International Symposium on Optical Engineering and Photonics (SPIE), Orland*

First studies

- **Henry P., M. Dinguirard, M. Bodilis (1993) SPOT multitemporal calibration over stable desert areas.** *Proc. of Europto (SPIE), vol. 1938 (pp. 67– 76), Orlando*
- **Cosnefroy, H., M. Leroy, X. Briottet (1996) Selection and Characterization of Saharian and Arabi calibration of optical satellite sensors.** *Remote Sensing of Environment, 58, 101– 114*

Sites selection

- **Cosnefroy H., X. Briottet, M. Leroy, P. Lecomte, R. Santer (1997) A field experiment in Saharian calibration of optical satellite sensors.** *International Journal of Remote Sensing, 18(16), 3337– 3359*

Field campaign

- **Cabot F. (1997) A proposal for the development of a repository for inflight calibration of optical targets.** Proceeding of earth observing systems II. SPIE, vol. 3117

SADE is born

- **Cabot F., O. Hagolle, C. Ruffel, P. Henry (1999) Remote Sensing Data Repository for In-Flight Calibration of Optical Sensors over Terrestrial Targets,** *Proceedings of SPIE, 3750, Denver*
- **Hagolle O., P. Goloub, PY Deschamps, H. Cosnefroy, X. Briottet, T. Bailleul, JM Nicolas, F. Parol, B. Lafrance, M. Herman (1999) Results of POLDER in-flight calibration.** *IEEE Transactions on Geoscience and Remo*

Operational use

- **Cabot F., O. Hagolle, P. Henry (2000) Relative and multitemporal calibration of AVHRR, SeaWiFS, and VEGETATION using POLDER characterization of desert sites.** *Proc. of International Geoscience and Remote Sensing Symposium, Honolulu*
- **Cabot F., C. Miesch, O. Hagolle, P. Henry (2001) An assimilation approach to calibration of** *Proc. of International Geoscience and Remote Sensing Symposium, Sydney*

Method improvement

- **Miesch C., F. Cabot,, X. Briottet, P. Henry (2003) Assimilation method to derive spectral gr sites from satellite datasets,** *Remote Sensing of Environment, 87, 359– 370*

Sites characterization

Desert sites in CNES : a long story… (2)

Initial objectives

- In orbit vicarious calibration to assess :
  - On-board calibration validation
  - Multiangular calibration of large field of view optical sensors : detectors normalization in the f.o.v.
  - In time calibration monitoring
  - Intercalibration of optical sensors

Main characteristics of the requested sites

- Stable in time : no vegetation, no water…
- Easy to access : clear sky, good atmospheric conditions
- High reflectance to reduce the impact of atmospheric effects
- Large enough to reduce the environmental effects
- Homogeneous enough for reduced f.o.v. instrument
- Low directional effects

⇒ choice : desert sites

Desert sites in CNES : a long story… (3)

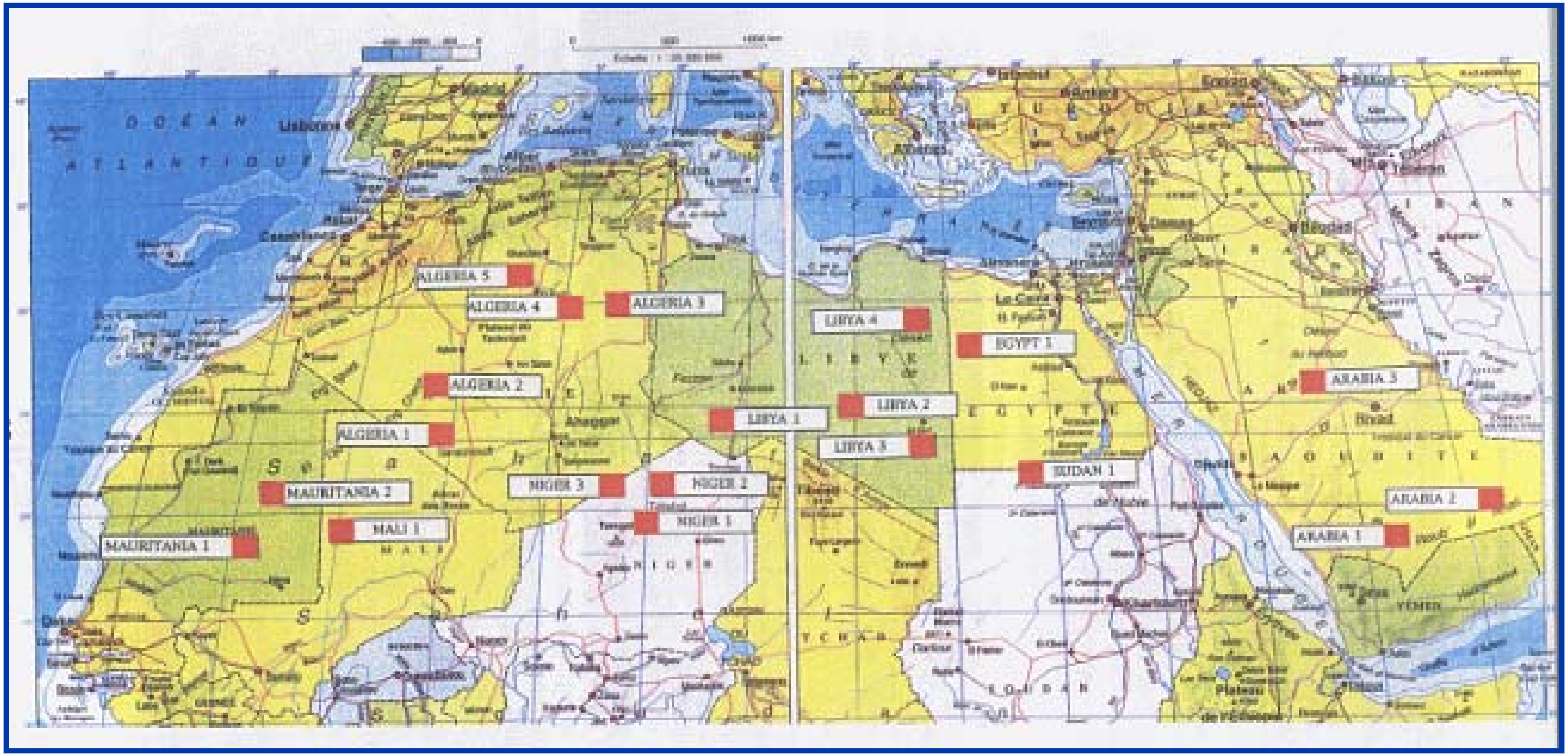
Sites selection

- Spatial uniformity
  - Better than 2% for 100x100 km^2 area
  - Statistics using Meteosat 4 acquisitions
- Stability over time (seasonal effect)
  - Stability better than 20% (after atmospheric effect filtering)
  - 1 year of Meteosat data (1 per day)
- Low directional effect
  - Directional effects less than 15%
  - 1 month of AVHRR data completed with Meteosat data

Sites characterization

- Ground truth measurements : field campaign in Algeria (1993)
- No other opportunity to perform ground or atmospheric characterization

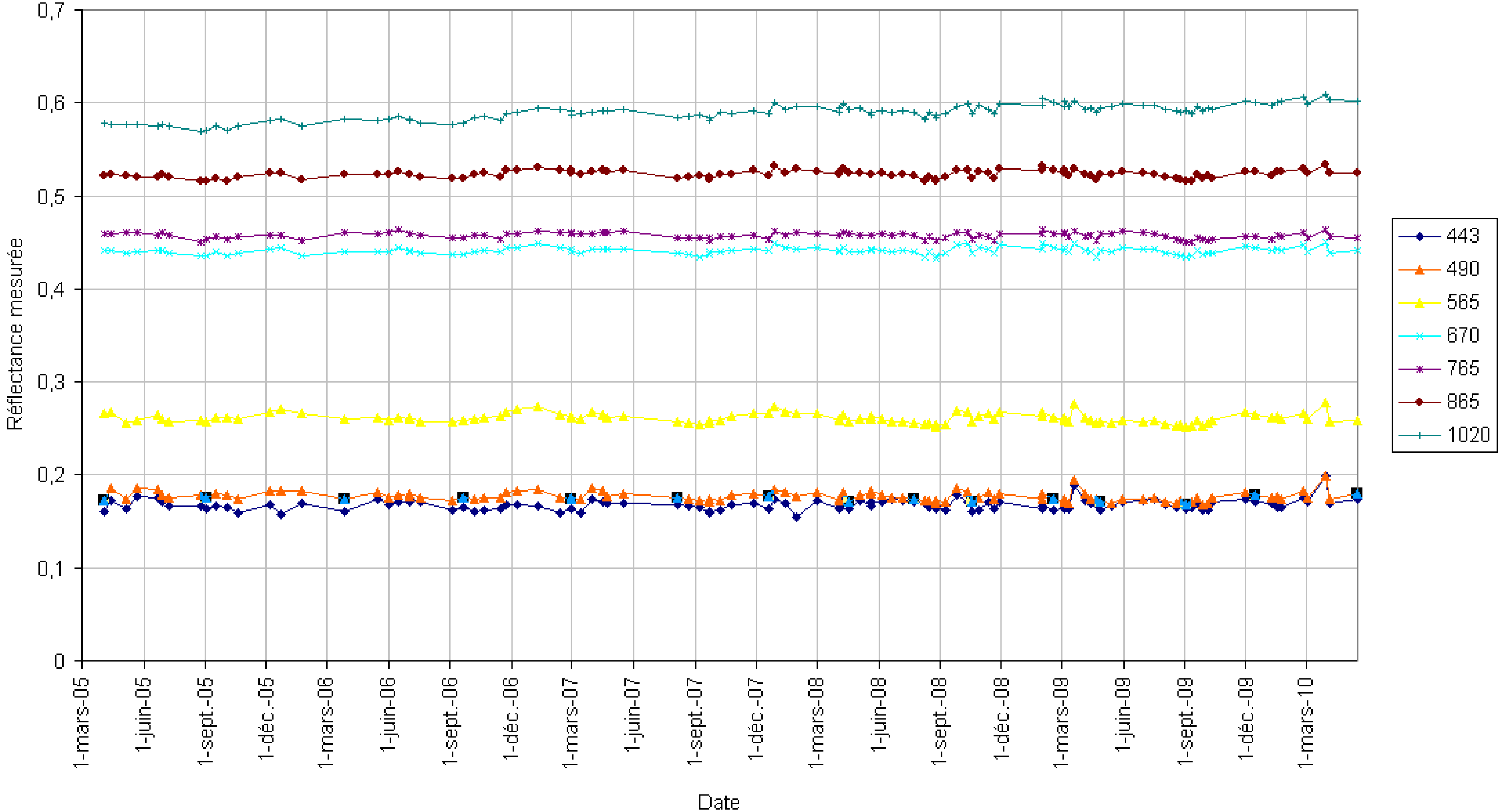
Desert sites in CNES : a long story… (4)



20 sites selected over North Africa and Arabia

Desert sites in CNES : a long story… (5)

Libya 3 site as seen by Parasol/POLDER with fixed viewing conditions ($\theta_v \approx 30$)



SADE – Calibration Data Repository (1)

■ Systematic collect of satellite acquisitions over the 20 sites

- *POLDER 1* (oct. 1996- june 1997) – *POLDER* 2 (2003)
- Since 1990 : SPOT high resolution
- Since 1998 : *VEGETATION 1 & 2*
- Since 2001 : *ENVISAT/MERIS*, AQUA/*MODIS*

  + *SeaWiFs*, *AVHRR*

  + *MISR*, *ATSR2*, *AATSR*…

  + *Formosat 2, Kompsat 2, Theos*

  + *Landsat7/ETM^{+}, Terra/MODIS*

  + Meteo data (NCEP + EPTOMS)

■ Storage in a data base

- ORACLE data base
- Easy data management (SQL requests)
- Link between satellite measurements and calibration results (traceability)

Note : SADE also includes measurements over ocean, sun glint, clouds and snowy sites (soon to come : moon)

SADE – Calibration Data Repository (2)

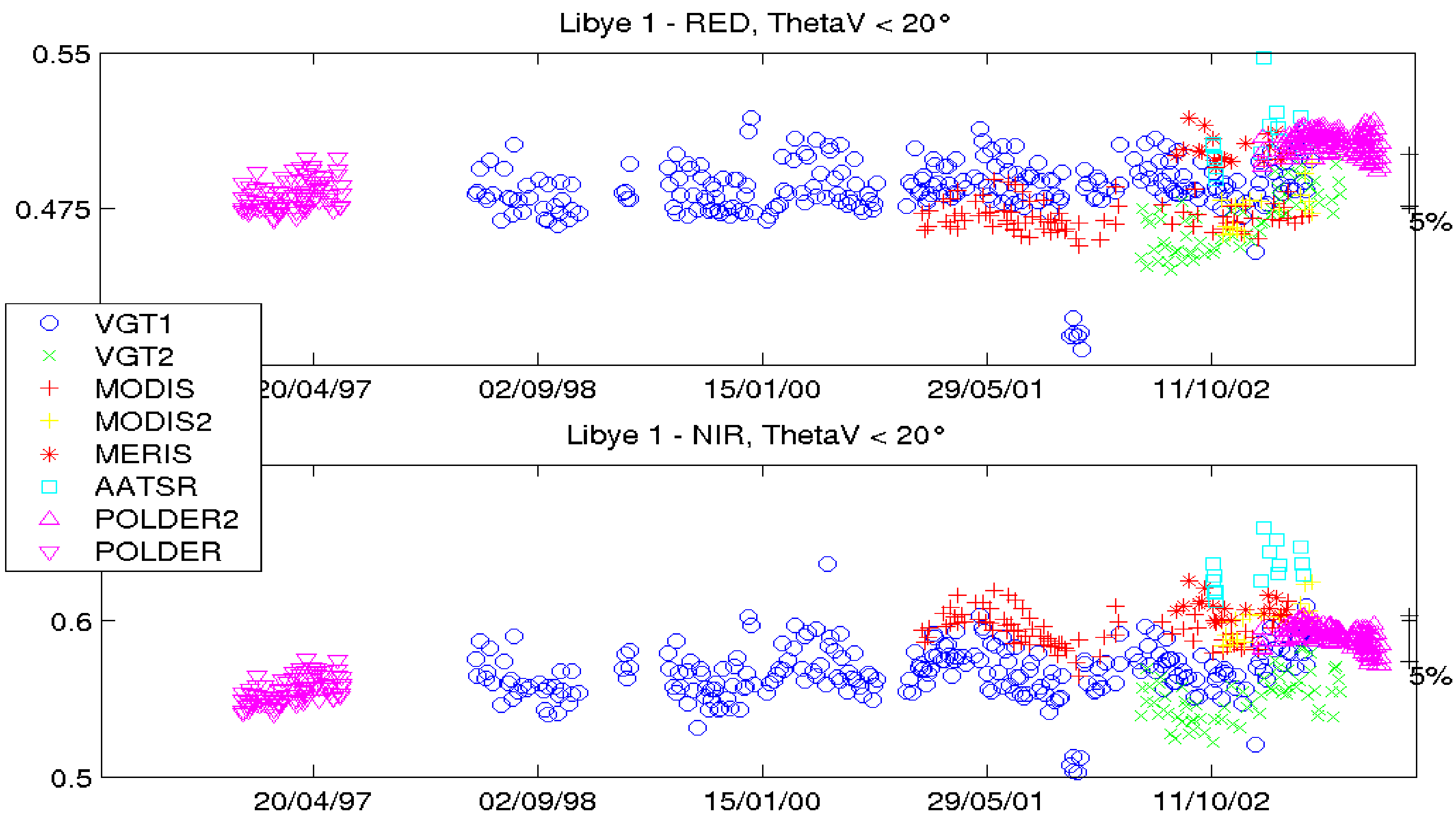
- **Stored data** **(more than 300.000 multispectral measurements over deserts)**
  - Mean ToA reflectance over the site **(and associated standard deviation)**
  - Viewing date
  - Geometric acquisition conditions : viewing angles, sun angles
  - Atmospheric conditions : pressure, water vapor, ozone, aerosol optical depth
  - Product reference

⇒ Only clear sky data are selected

- **Calibration results are also stored in the data base**
  - Elementary calibration results associated to each satellite acquisition
  - Enhanced calibration results computed after modeling, filtering, statistics, comparisons…

SADE = "Structure d'Accueil de Données d'Etalonnage"

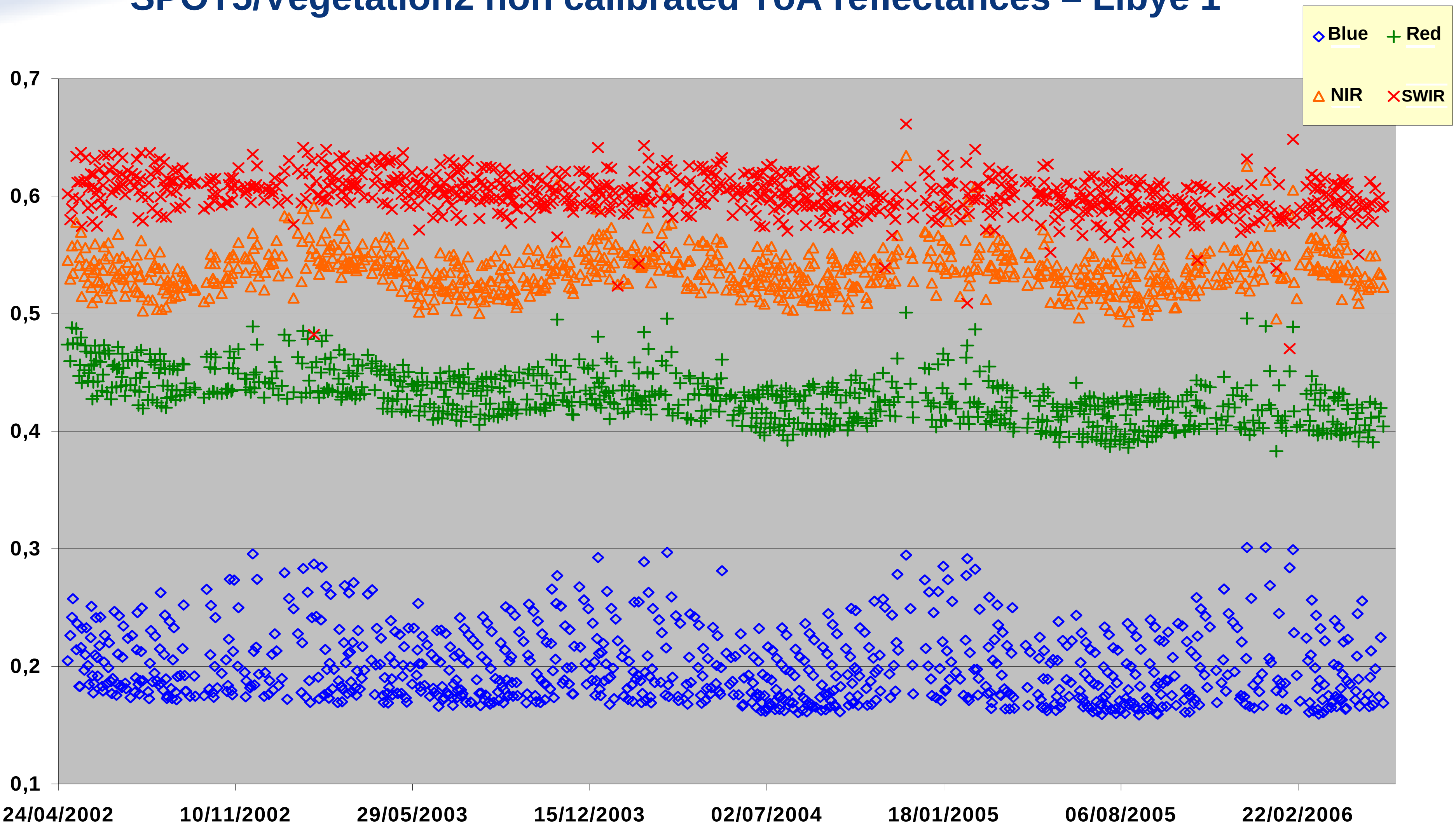
SADE – Calibration Data Repository (3)



Direct ToA reflectance comparison

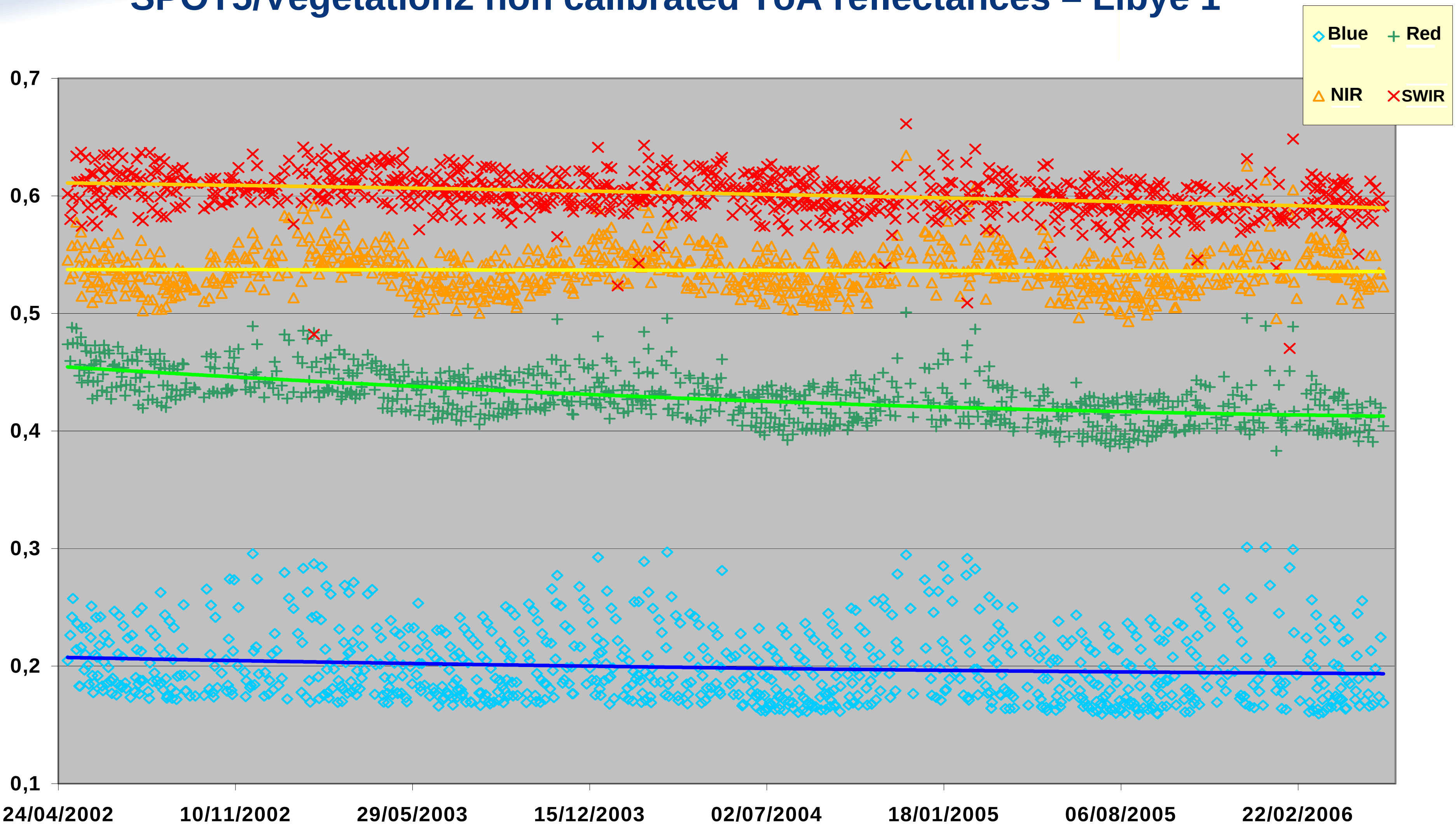
SADE – Calibration Data Repository (4)

SPOT5/Vegetation2 non calibrated ToA reflectances – Libye 1



SADE – Calibration Data Repository (4)

SPOT5/Vegetation2 non calibrated ToA reflectances – Libye 1

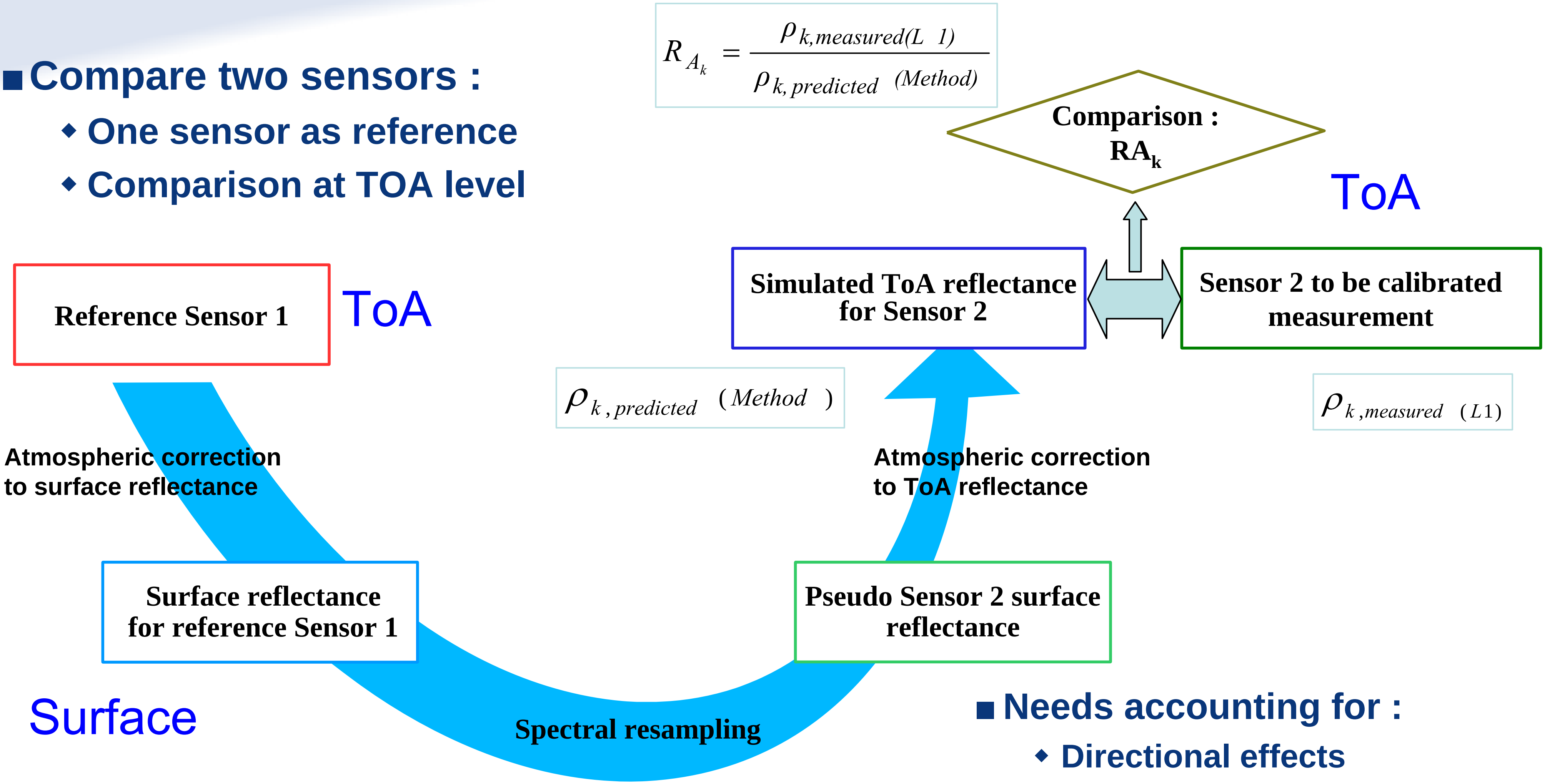


Calibration over desert sites : method (1)

- **General description of the method**
  - Comparison measured reflectance versus modelled reflectance (calibration reference)
  - Modelled reference obtained through reference sensor measurements (cross calibration)
  - Main hypothesis : the sites are supposed to be stable in time
  - Intersensor calibration and/or multitemporal calibration
- **Operating procedure**
  - One sensor taken as reference (POLDER preferred because of spectral and angular coverage)
  - Comparison for close geometric conditions (limitation of site BRDF effect), no date restriction
  - Atmospheric corrections
  - Elementary calibration site by site, date by date
  - Merge all results (over the 20 sites)
- **Accuracy**
  - Multitemporal calibration : 1 to 2%
  - Sensors cross calibration : 2 to 3%
- **Operationality**
  - Operational use for *VEGETATION*, Parasol, SPOT/HRV, MERIS and other sensors according to opportunities : Formosat-2, SeaWiFS, MODIS, AVHRR …

Calibration over desert sites : method (2)

- **Compare two sensors :**
  - One sensor as reference
  - Comparison at TOA level



- **Needs accounting for :**
  - Directional effects
  - Atmospheric conditions
  - Spectral discrepancies

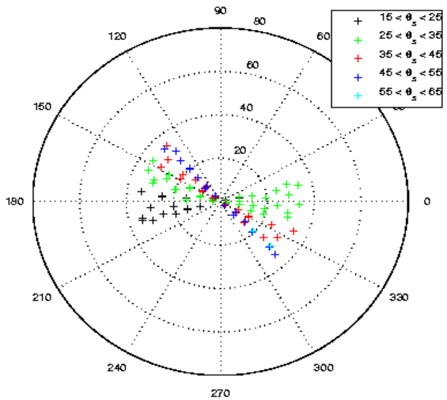
Calibration over desert sites : method (3)

Directional effects :

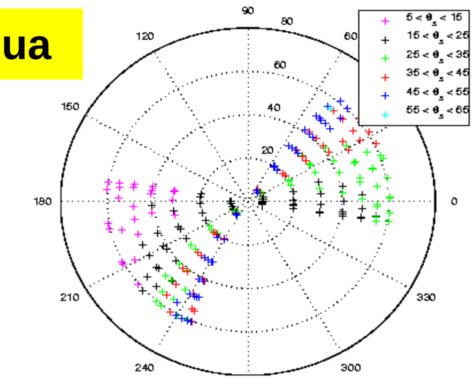
- Direct comparison of measurements in the same geometry (θ_s, θ_v, $\Delta\Phi$) :
  - $\theta_{s\,ref.} \pm 2°$; $\theta_{v\,ref.} \pm 2°$; $\Delta\Phi_{ref.} \pm 5°$
- Possibility to use of reciprocity principle to extend field of matching geometry

Available geometries for Libya 1

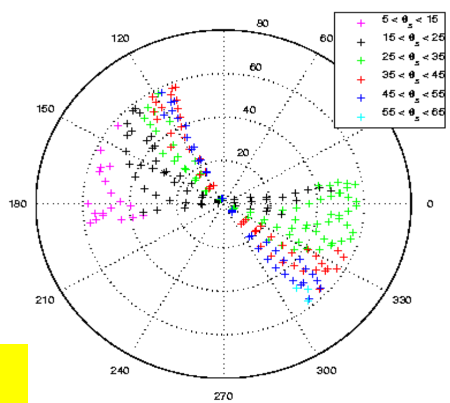
MERIS



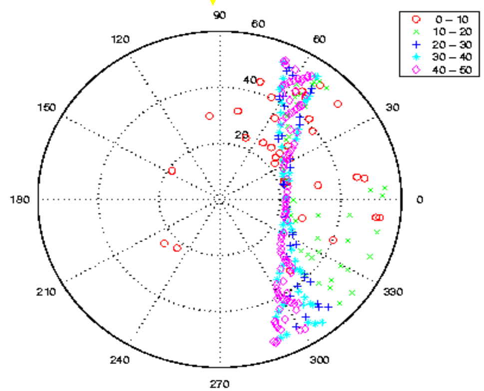
MODIS/Aqua



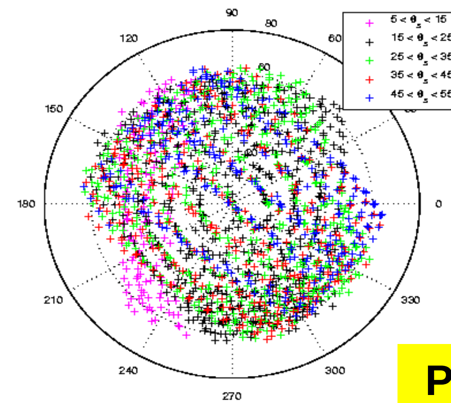
Végétation



SeaWiFS



Parasol



Calibration over desert sites : method (4)

Atmospheric effects :

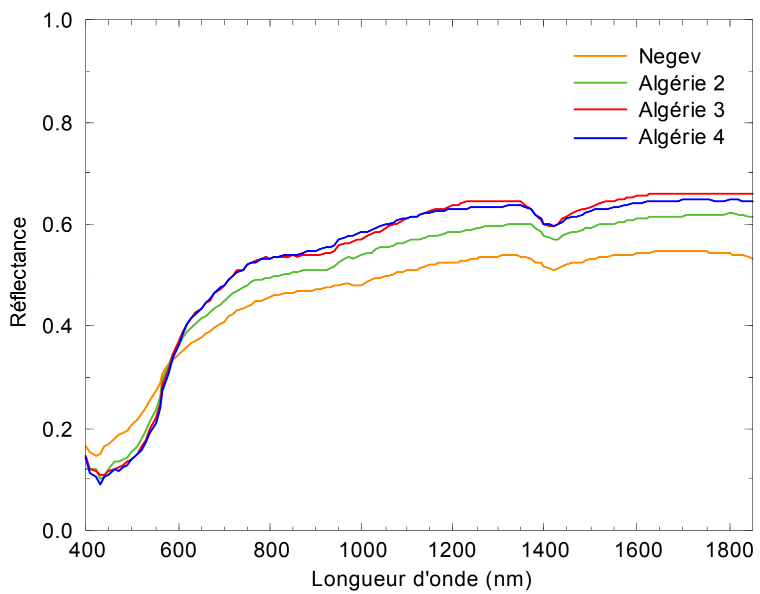
- Atmospheric correction performed using SMAC model and meteo data :
  - Rayleigh scattering correction using atmospheric pression (NCEP)
  - Water vapour (NCEP)
  - Ozone (TOMS)
  - Other contributors : CO_2, CO, NO_2, CH_4 (climatology or constant values)
- Problem : aerosol correction…
  - Aerosol optical thickness τ =0.2 (desert aerosol model)
  - Statistically solved through the use of a lot of data :

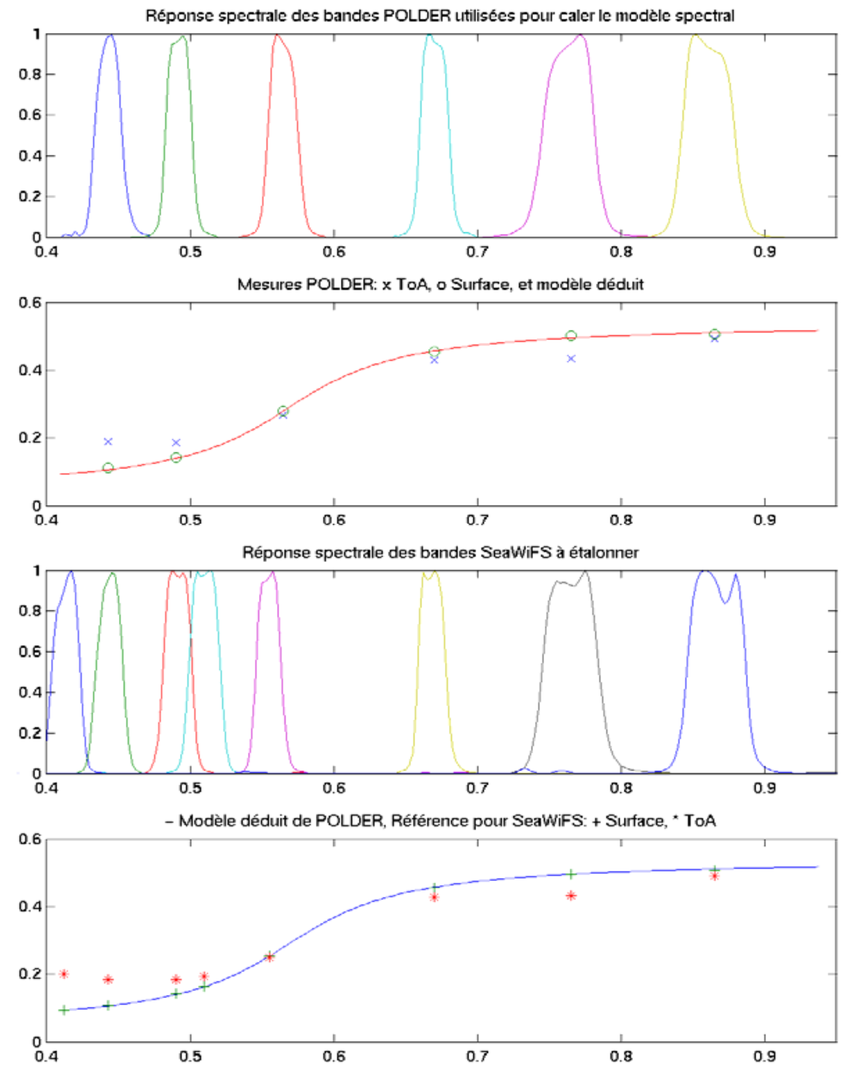
    no significant bias, but dispersion for short wavelengths
- Comparison performed at ToA level
  - Reference sensor ToA data are corrected to obtain ground reflectances
  - ToA Sensor 2 reflectances are simulated using these ground reflectances and meteo data at the date of Sensor 2 acquisition

Calibration over desert sites : method (5)

Spectral resampling :

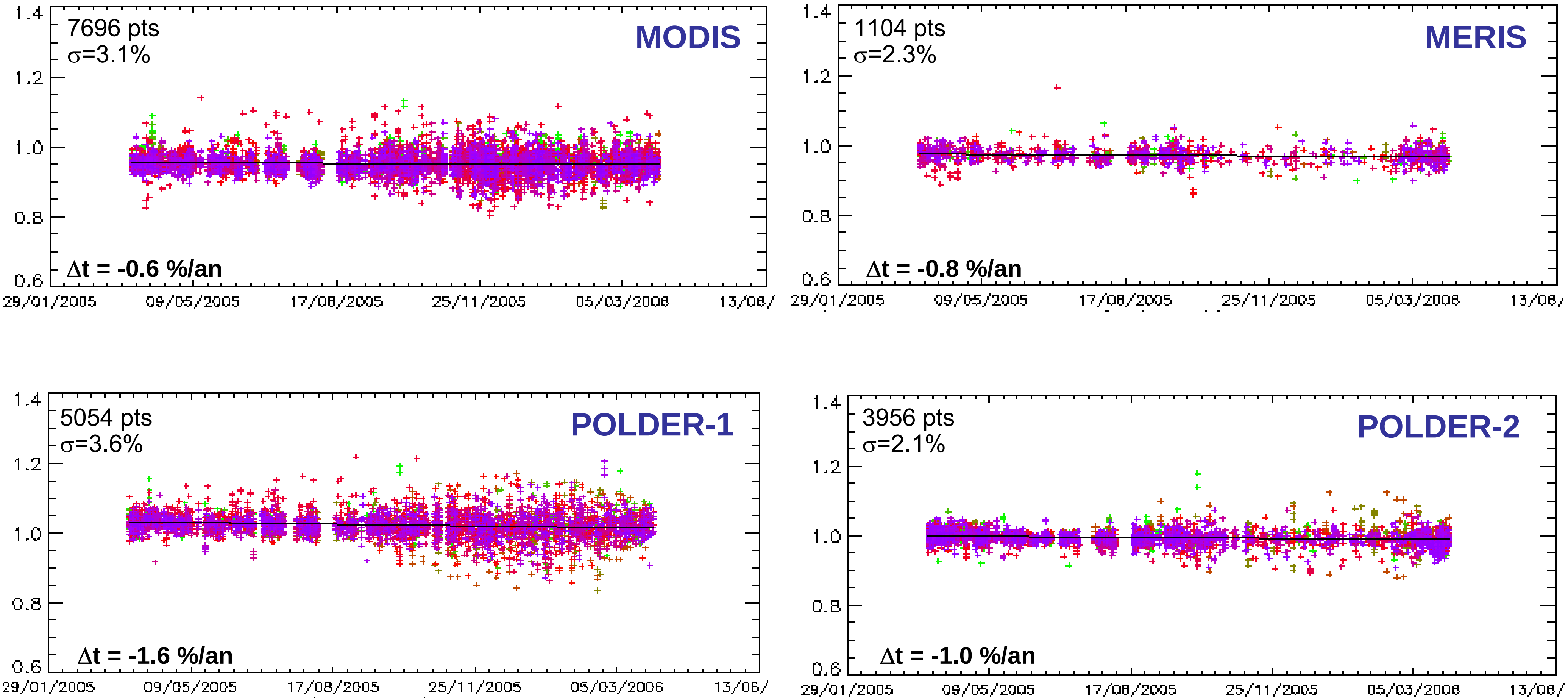
- After atmospheric correction
- Reference sensor measurements to fit an empirical spectral model (using spline functions)





Calibration over desert sites : results (1)

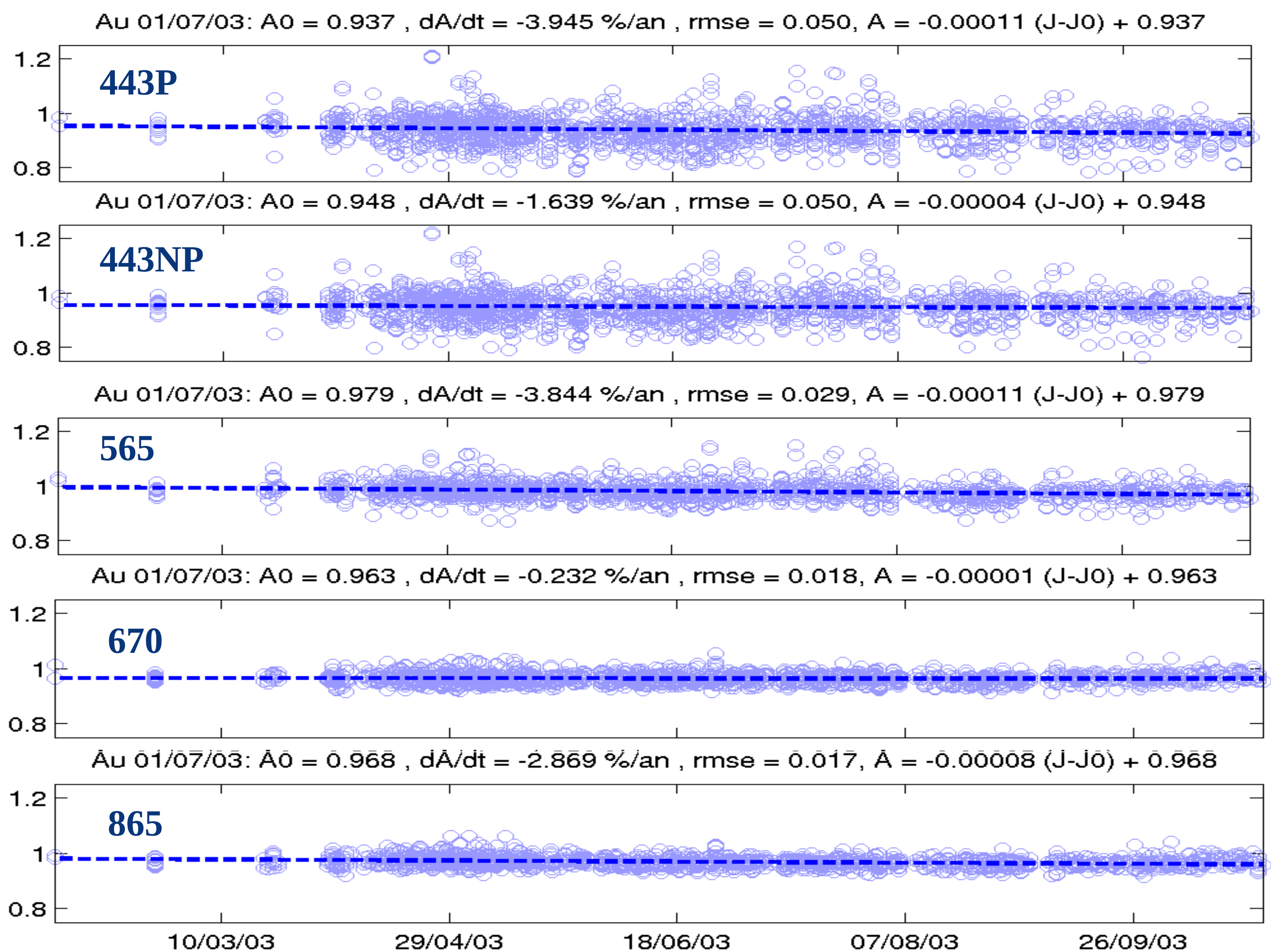
- **Parasol/Polder 670nm band cross calibration with different sensors**



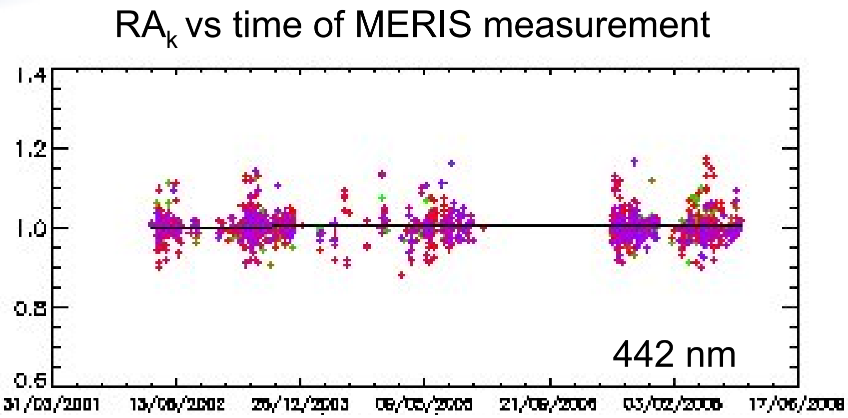
Calibration over desert sites : results (2)

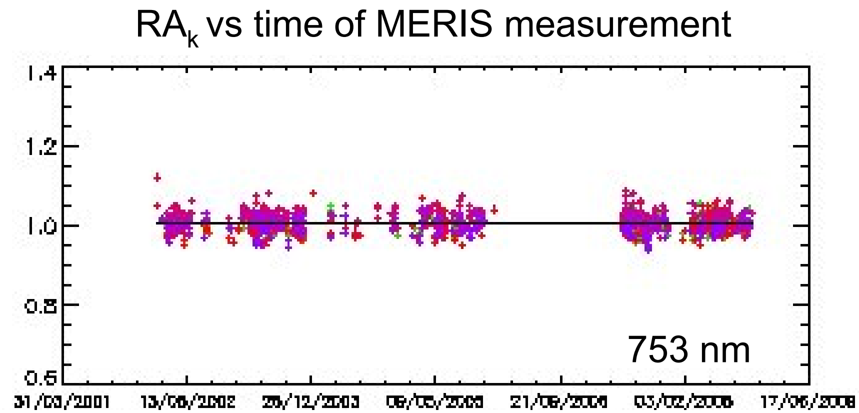
- **Polder 2 calibration versus MODIS**

Reducing noise when increasing the wavelength (atmospheric noise)

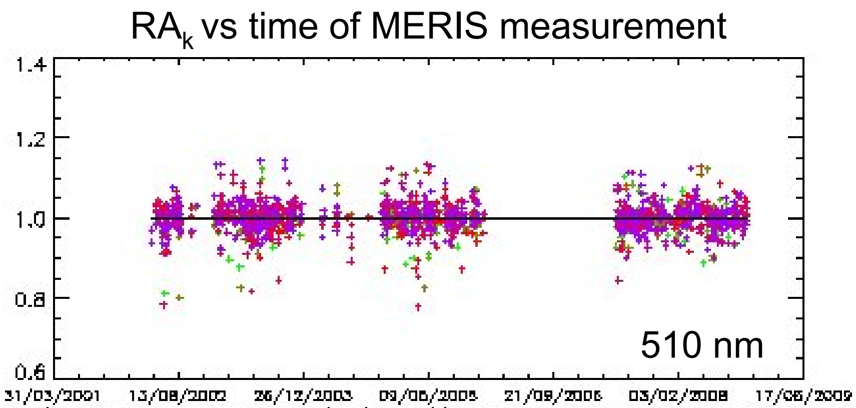


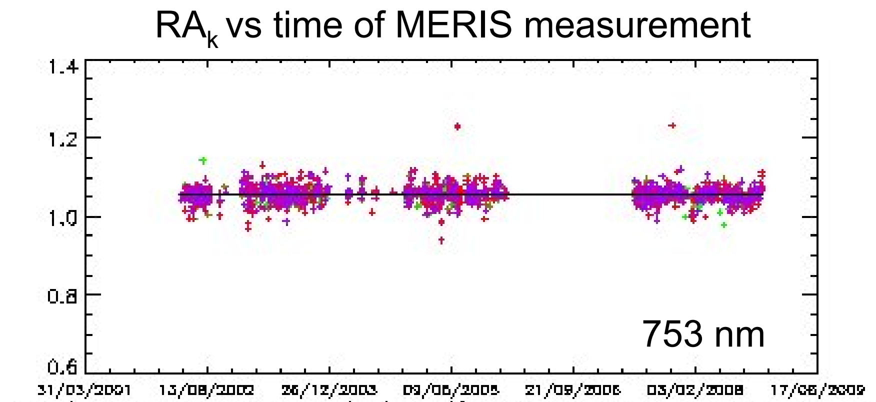
Calibration over desert sites : results (3)





MERIS vs AQUA_MODIS used as reference



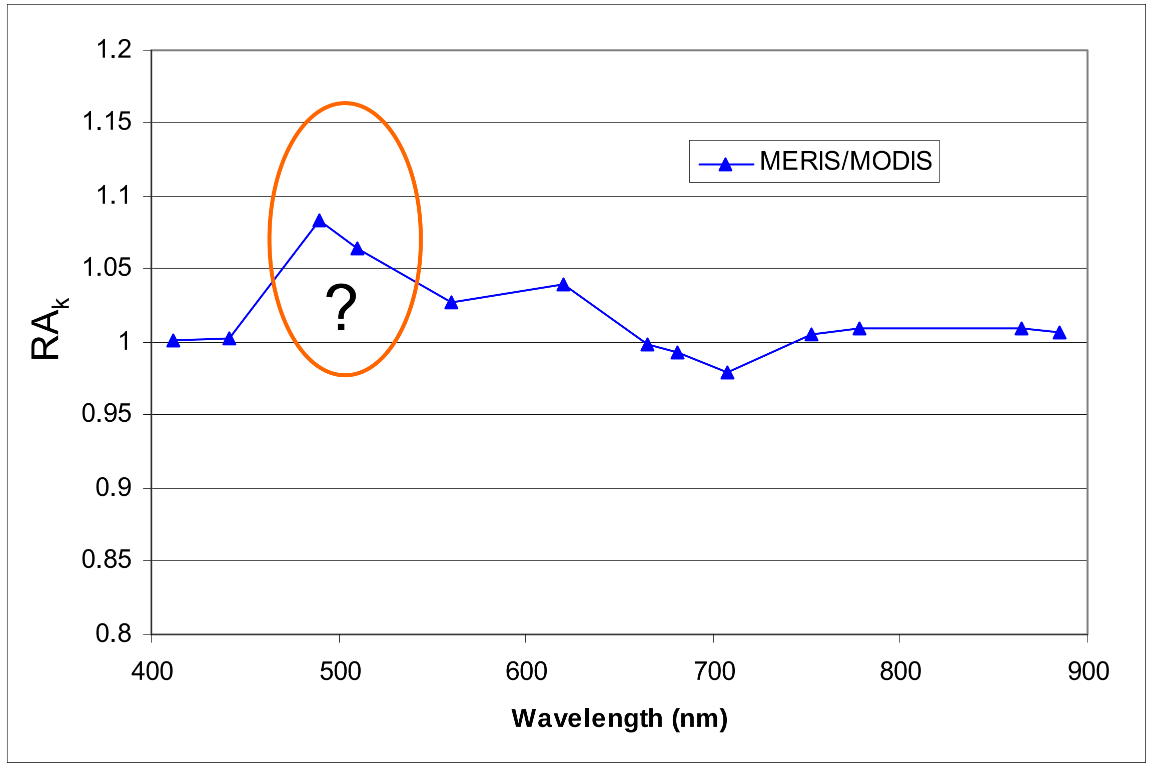


MERIS vs PARASOL_POLDER used as reference

Calibration over desert sites : results (4)

Intercalibration MERIS/MODIS (MODIS as reference)

Bande	RA_k avg	σ (%)
412 nm	1.001	3.5
442 nm	1.003	3.7
490 nm	1.084	4.1
510 nm	1.065	3.6
560 nm	1.027	2.7
620 nm	1.041	2.3
665 nm	0.999	1.8
681 nm	0.993	1.9
708 nm	0.979	2.3
753 nm	1.006	2.3
778 nm	1.009	2.3
865 nm	1.010	1.9
885 nm	1.007	1.9

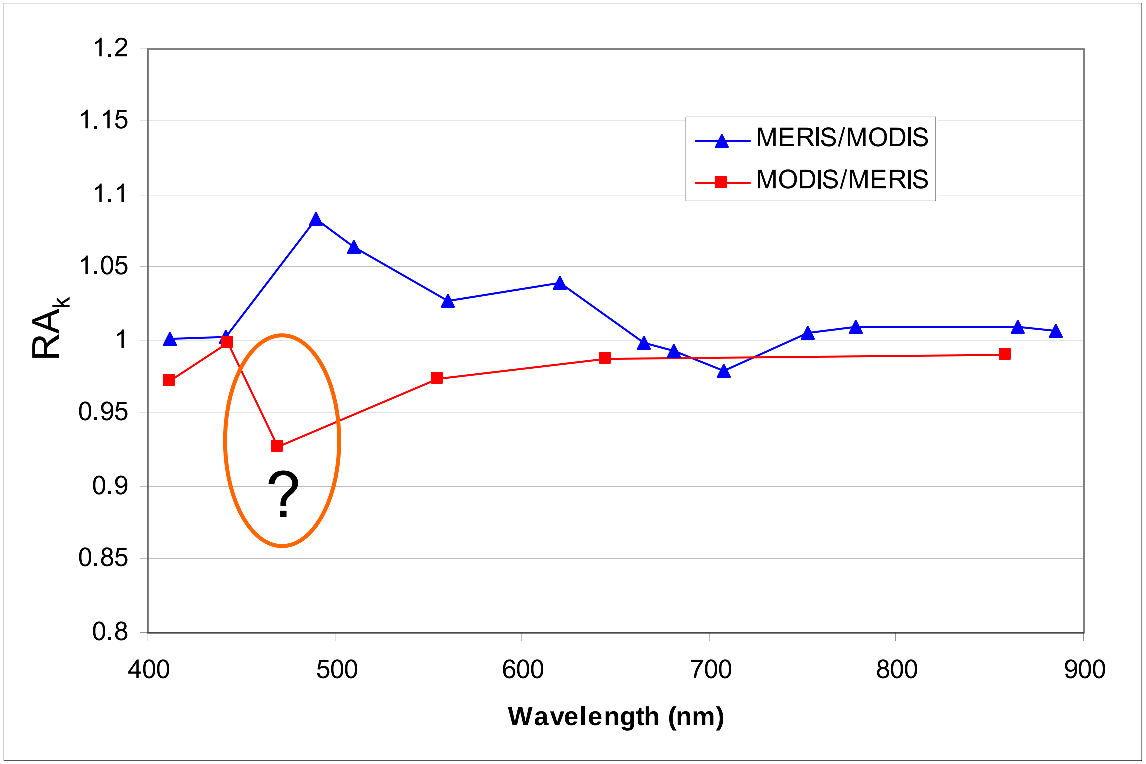


Good intercalibration for most of the spectral bands

Calibration over desert sites : results (5)

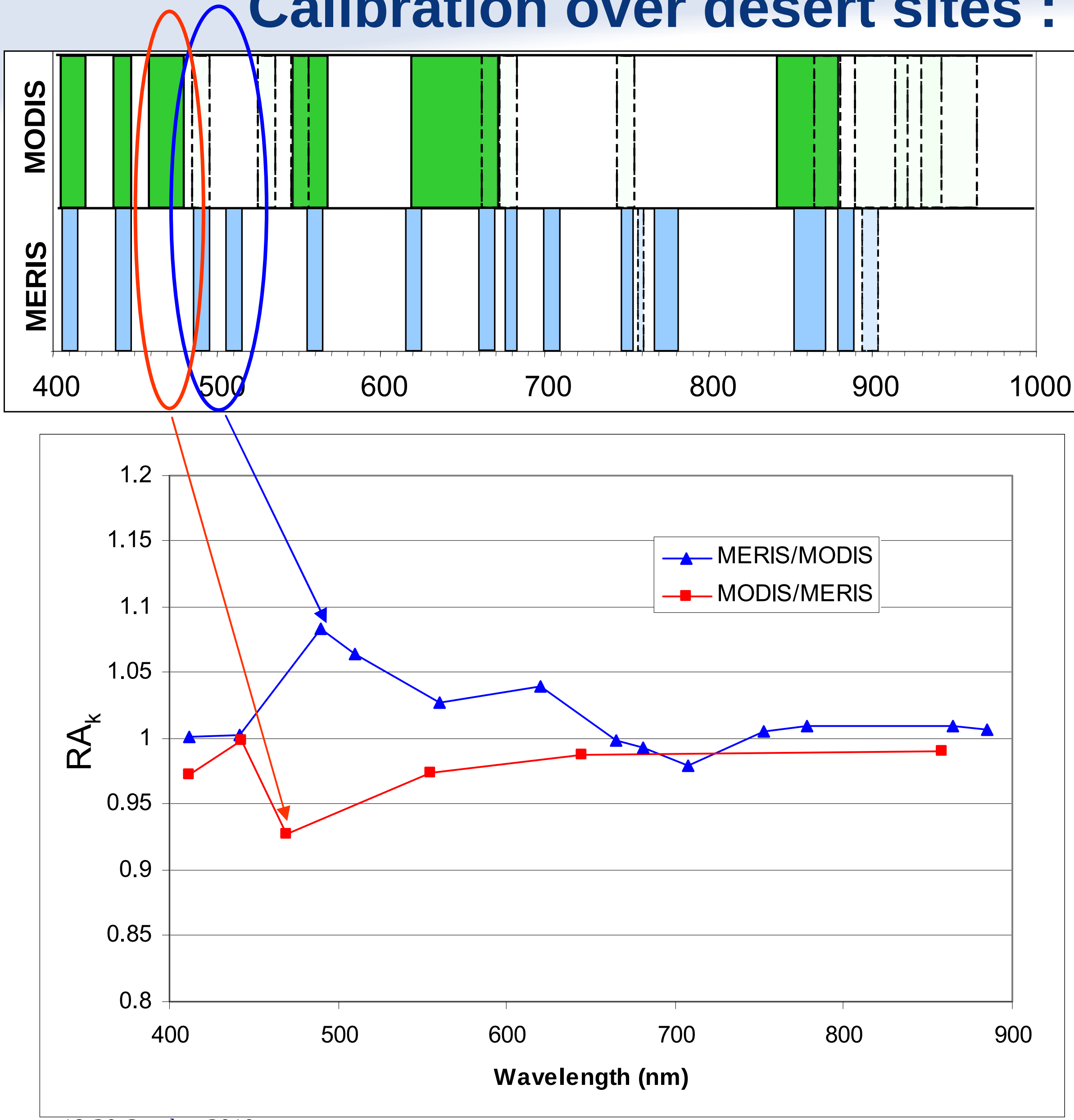
Intercalibration MODIS/MERIS (MERIS as reference)

Bande	RAk avg	σ (%)
412 nm	0.973	3.5
443 nm	0.999	3.7
469 nm	0.928	3.4
555 nm	0.974	2.6
645 nm	0.987	1.9
858 nm	0.991	1.8



Good consistancy MODIS/MERIS and MERIS/MODIS

Calibration over desert sites : results (6)

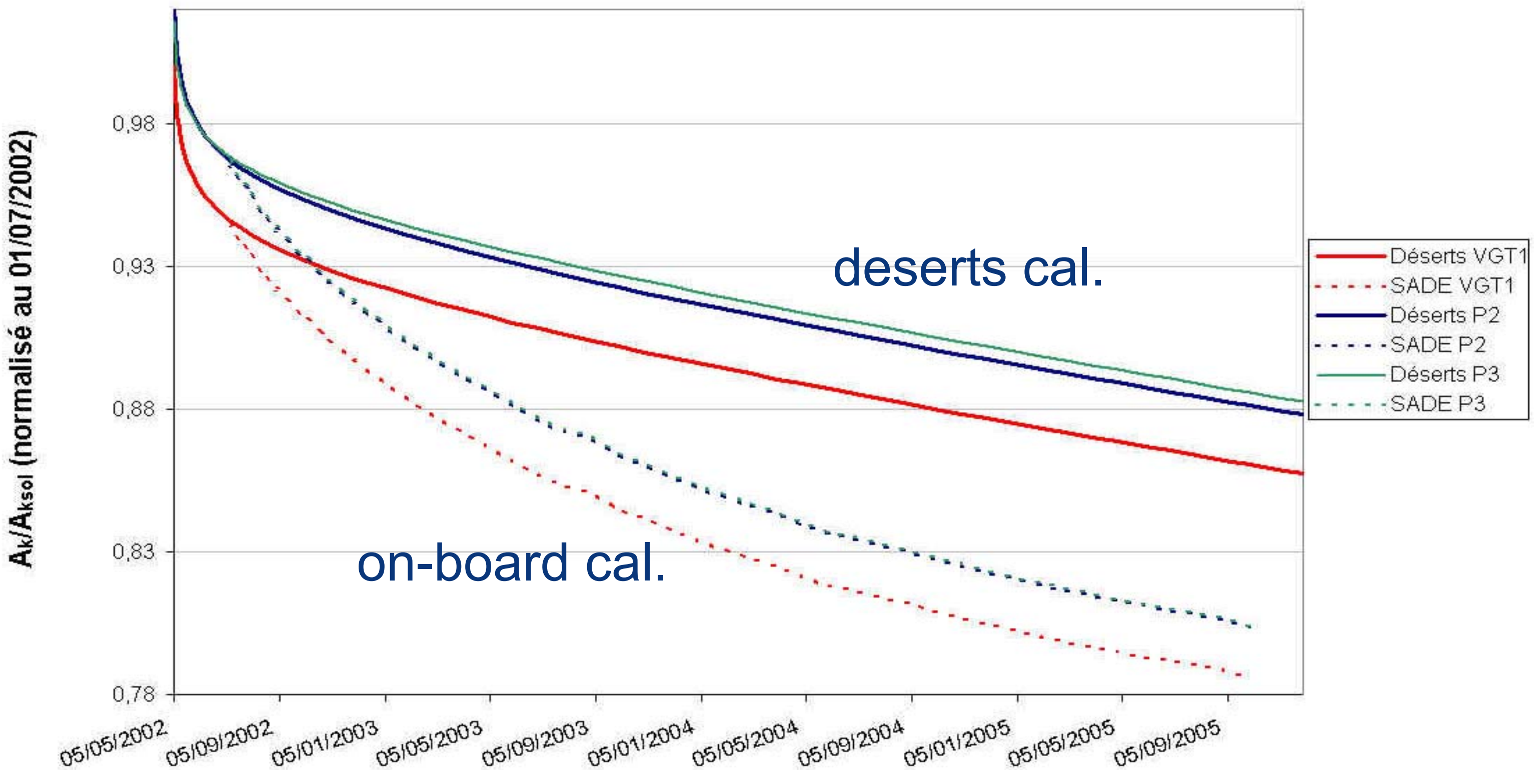


No MODIS band close to MERIS bands 490nm and 510nm

No MERIS band close to MODIS band 469 nm

Calibration over desert sites : results (7)

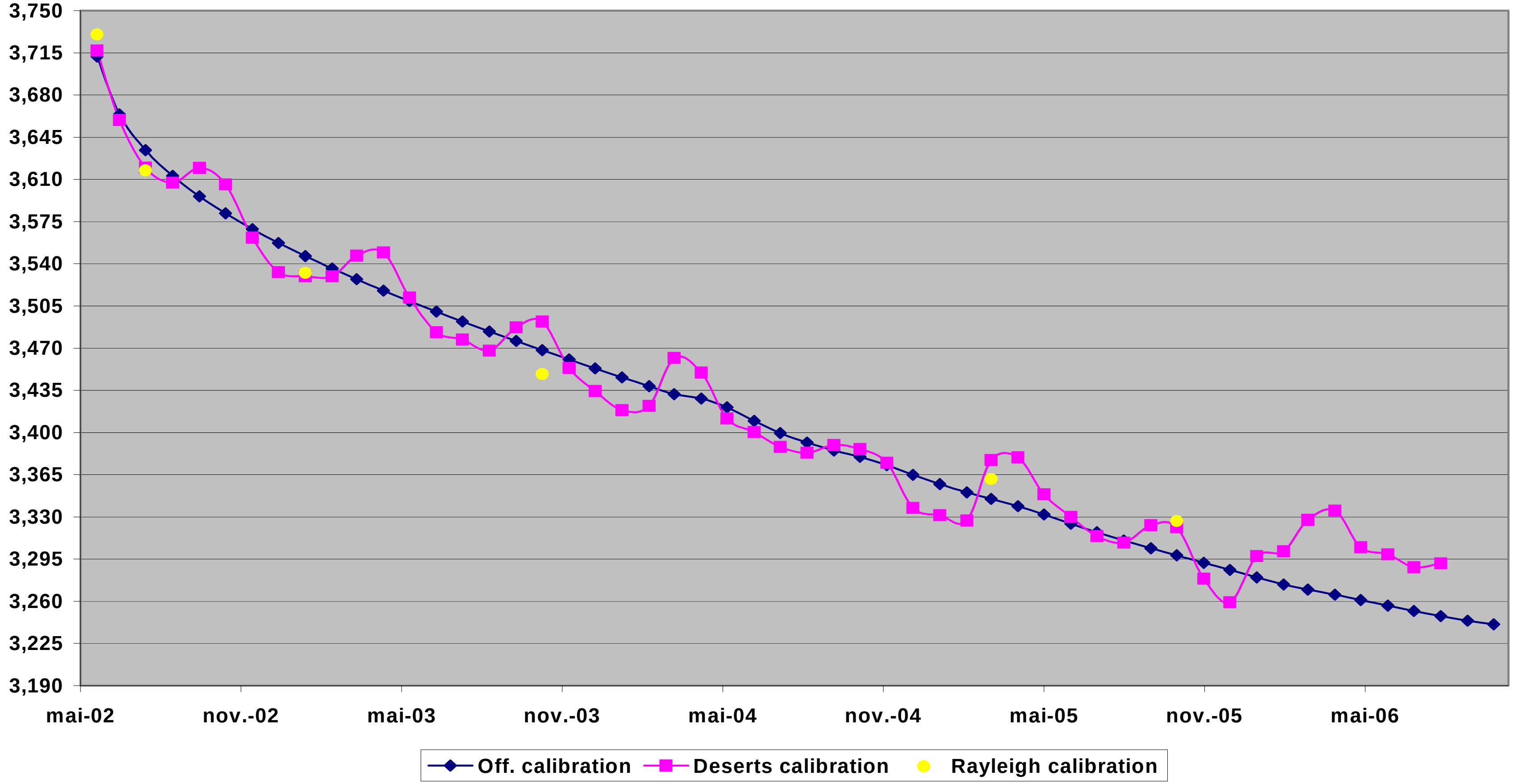
■ **Végétation 2 on-board calibration misfunctioning**



Végétation 2 **red band** **calibration over deserts using different references (*POLDER 2*, *Parasol*, *Végétation 1*) compared to calibration monitored with the on-board lamp**

Calibration over desert sites : results (8)

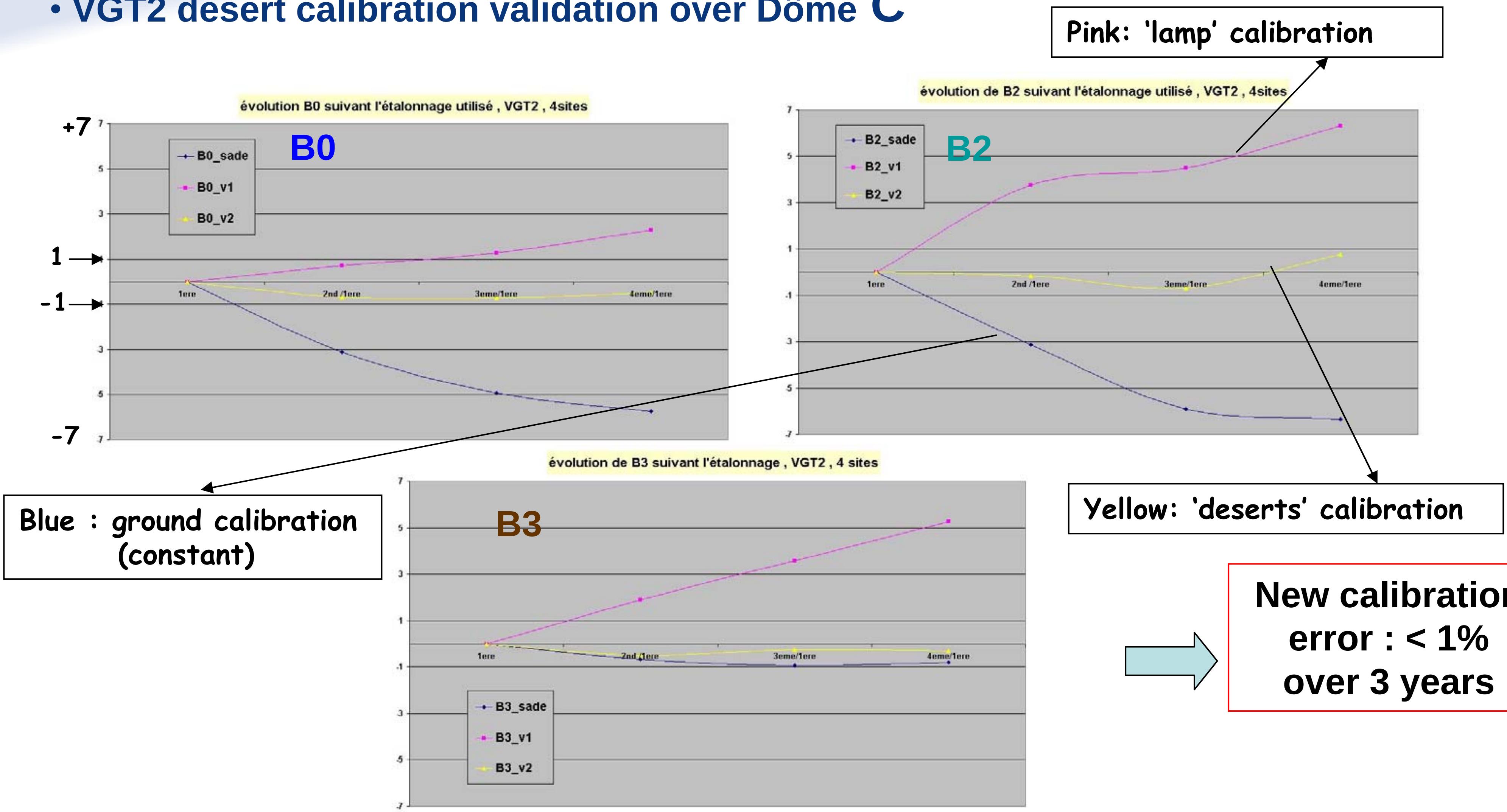
■ Végétation 2 calibration monitoring over deserts



Végétation 2 red band "official" calibration using desert calibration monthly results

Calibration over desert sites : results (9)

• **VGT2 desert calibration validation over Dôme C**



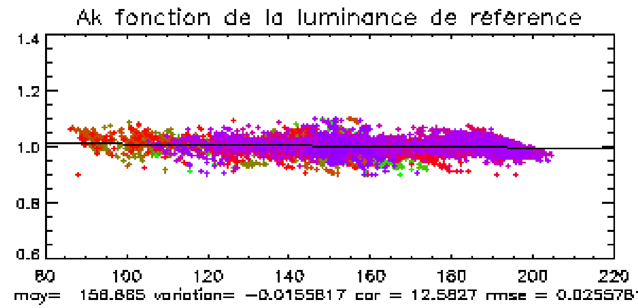
New calibration error : < 1% over 3 years

Calibration over desert sites : results (10)

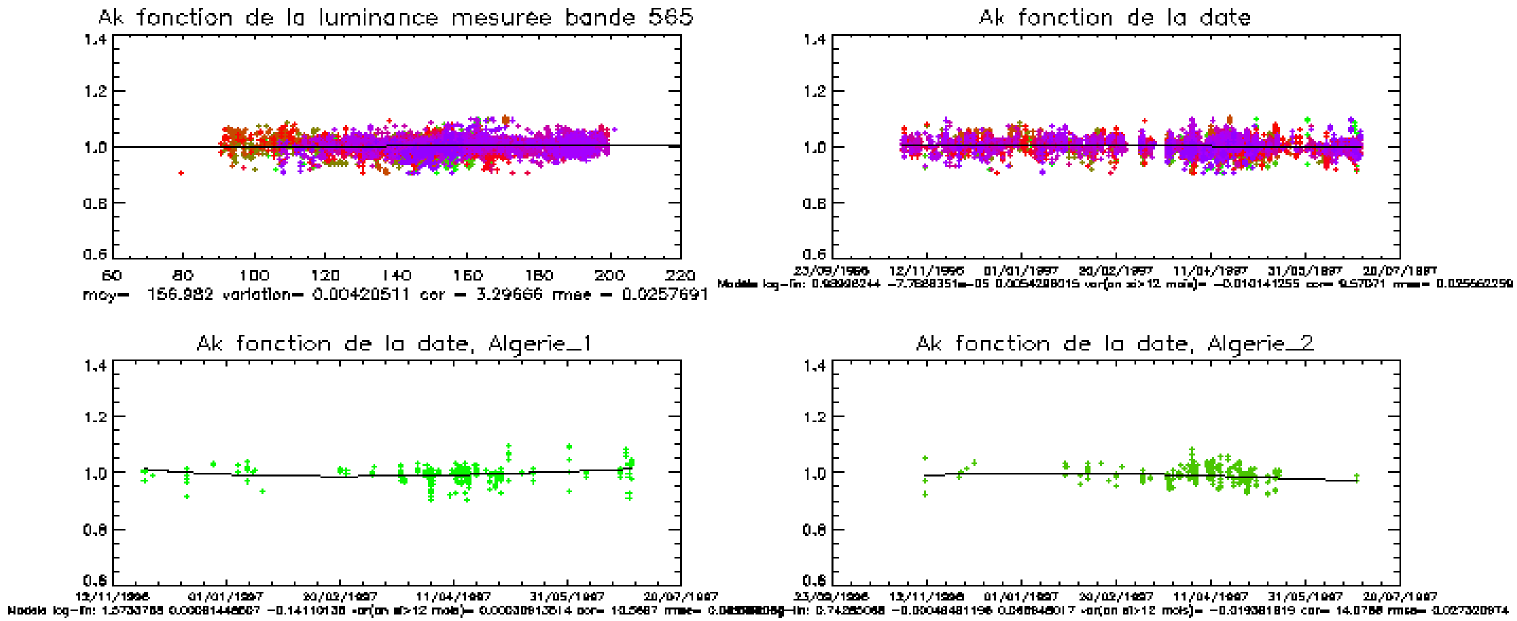
Calibration results plots against many different parameters

Etalonnage sur déserts de ADEOSPOLDER bande = 565

Date du traitement 20/06/2005–16:44:49
Période du 30/10/1996 au 29/6/1997
Ak /Aksol = 1.00253 Nbre de points = 7538
Ecart_type = 0.0257848
Fichier de conf: param_etal_InterEtalon_spline_1_1_appP0.txt
Capteur de référence: P2_E0
Seuillage Ak/Akmed: 0.100000



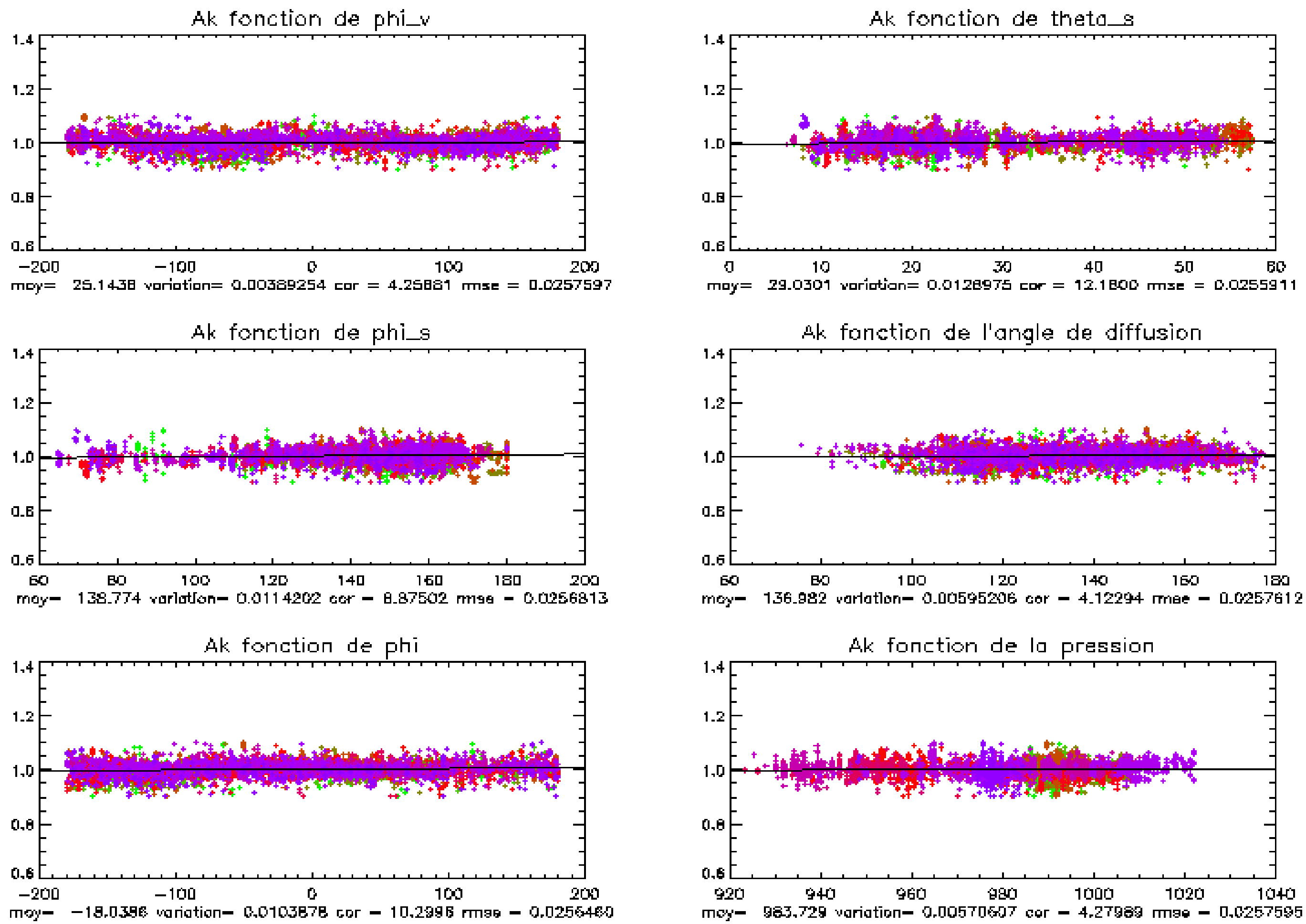
$$R_{A_k} = \frac{\rho_{k,measured(L\ 1)}}{\rho_{k,predicted\ (Method)}}$$



Calibration over desert sites : results (11)

■ Calibration results plots against many different parameters

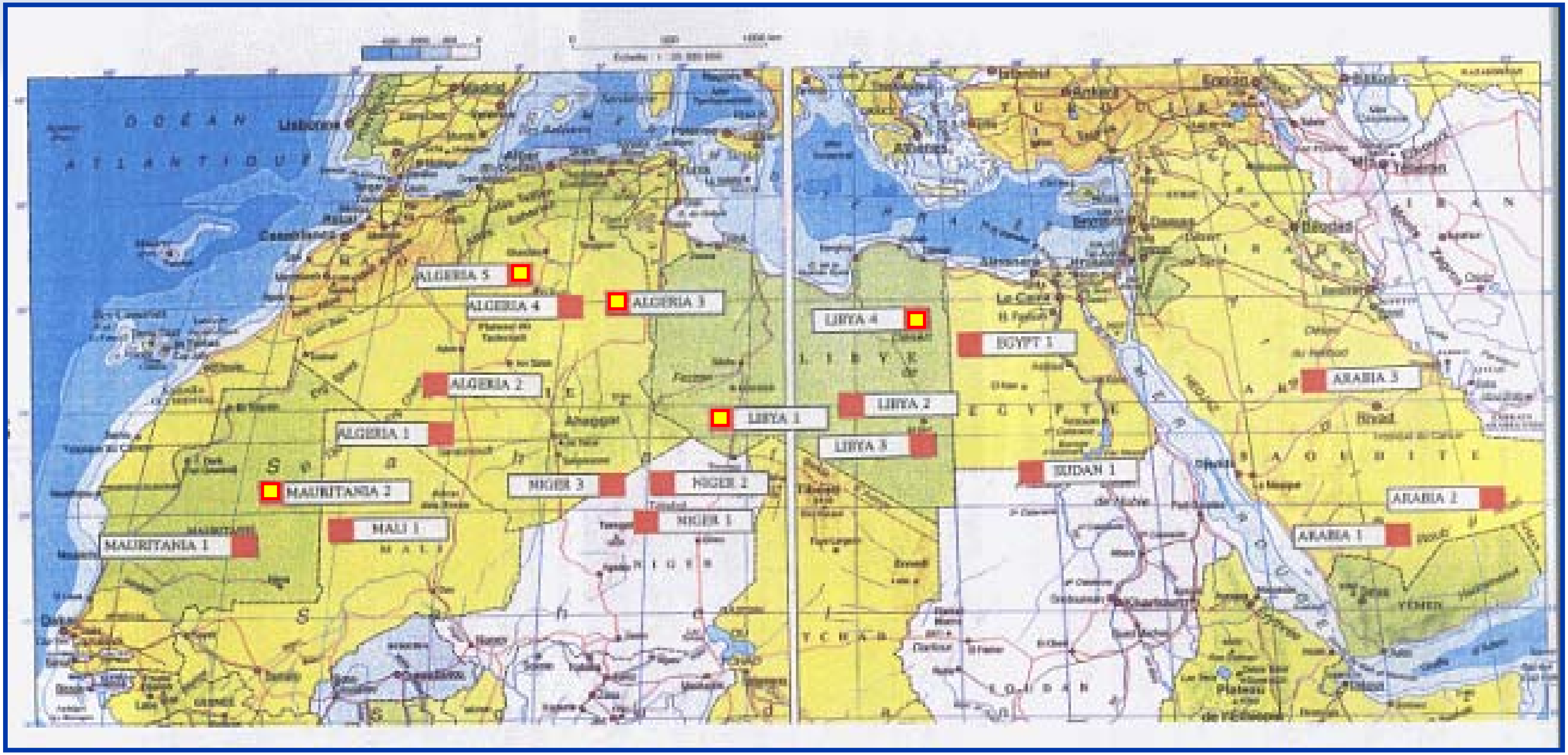
$$R_{A_k} = \frac{\rho_{k,measured(L\ 1)}}{\rho_{k,predicted}\ (Method)}$$



CEOS selected sites (1)

- Top 10 of desert sites submitted to CEOS based on their long term behaviour
- 5 sites selected by the CEOS/WGCV/IVOS group taking into account :
  - Landsat accessibility : complete site included in a scene
  - Historical archive of data on the site (SPOT, Formosat, Kompsat…)
- CEOS sites :
  - Algeria 3
  - Algeria 5
  - Libya 1
  - Libya 4
  - Mauritania 2

CEOS selected sites (2)

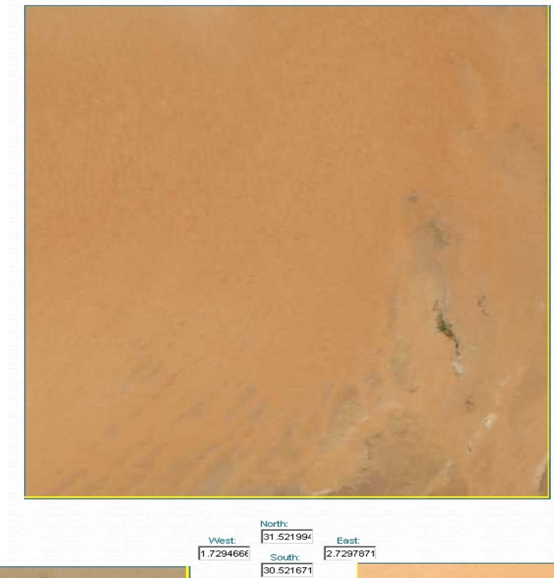


5 selected sites : Algeria 3 & 5, Libya 1 & 4, Mauritania 2

CEOS selected sites (3)

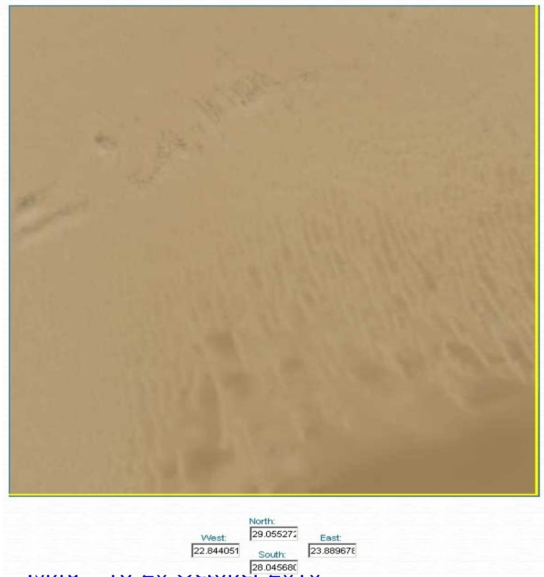
Algeria 3

Algeria 5



Libya 1

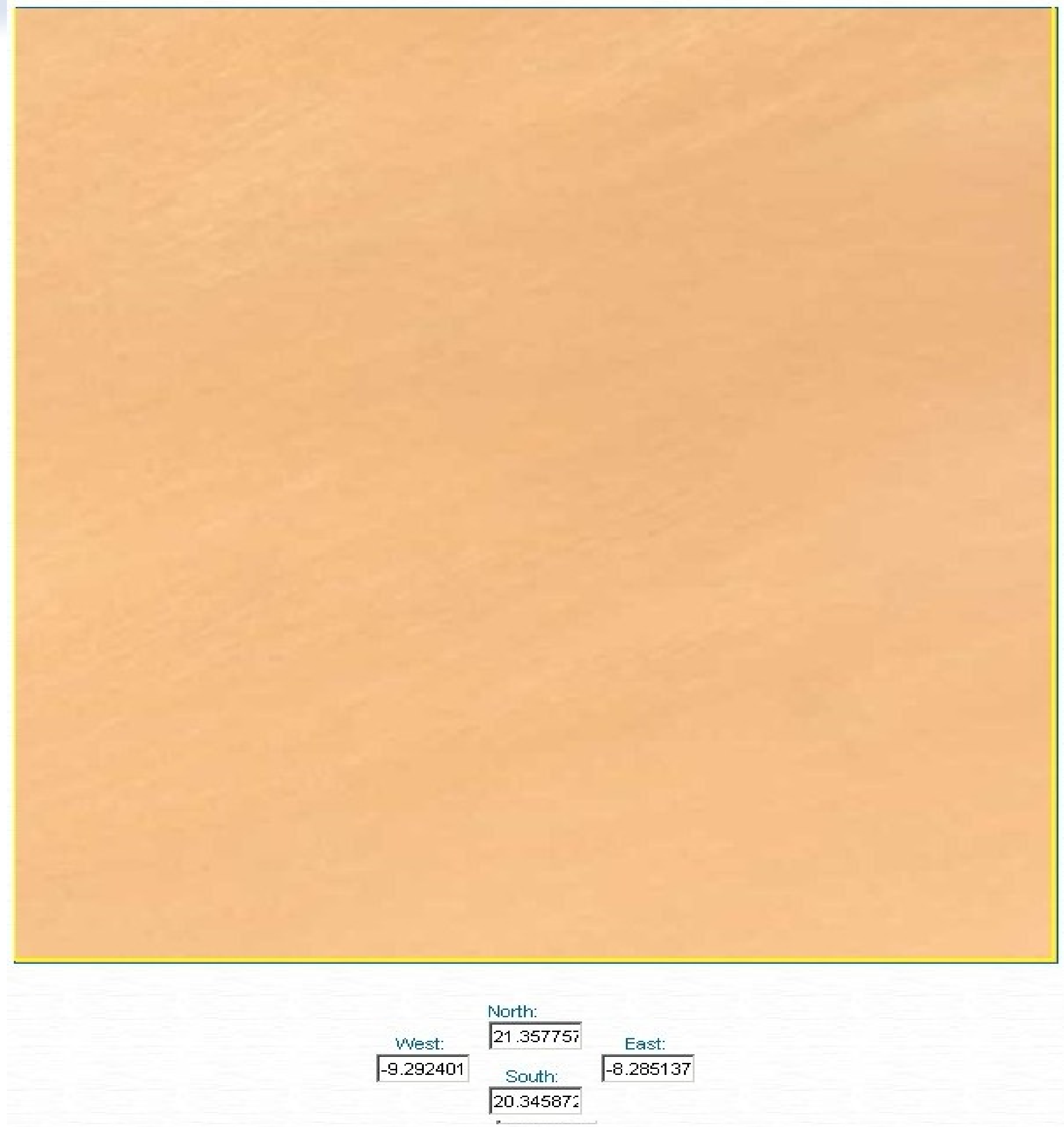
Libya 4



Mauritania 2

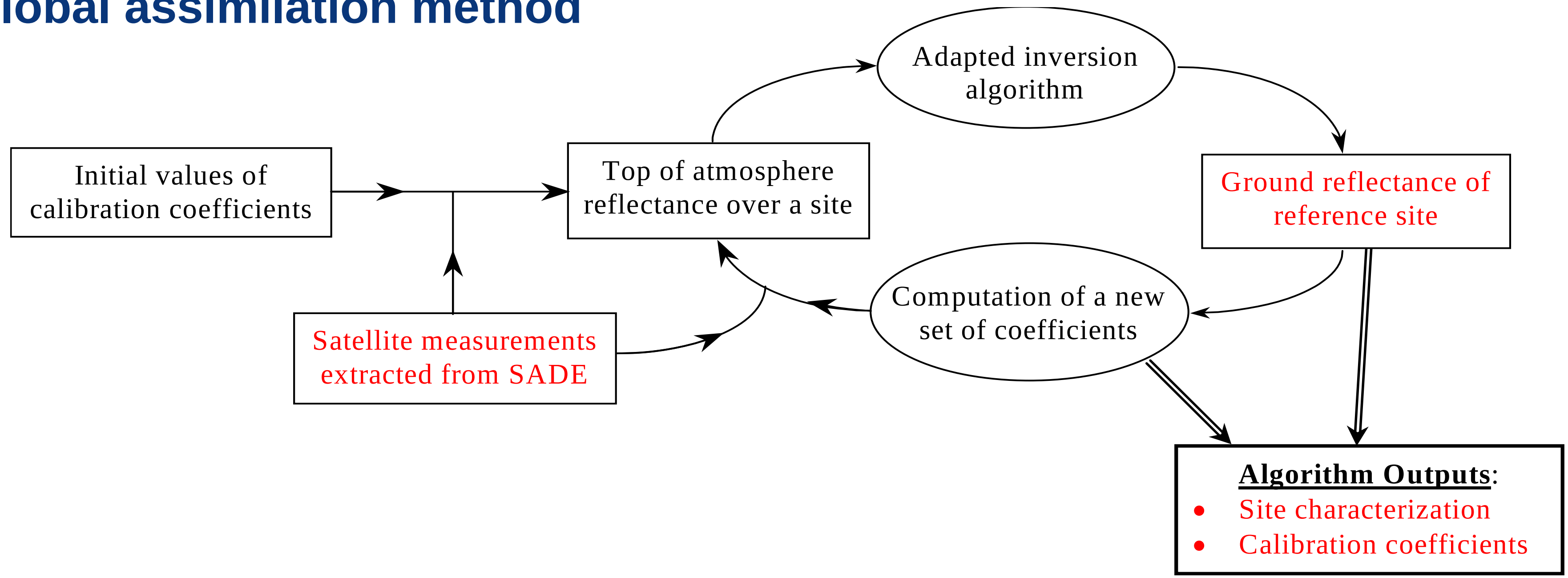
CEOS selected sites (4)

Mauritania 2



Recent studies : sites characterization (1)

- **Objective : Use of SADE data to characterize the desert sites behavior**
  - First step : spectral characterization
  - Second step : directional characterization
  - Finally : spectral and directional model
- **How : Global assimilation method**



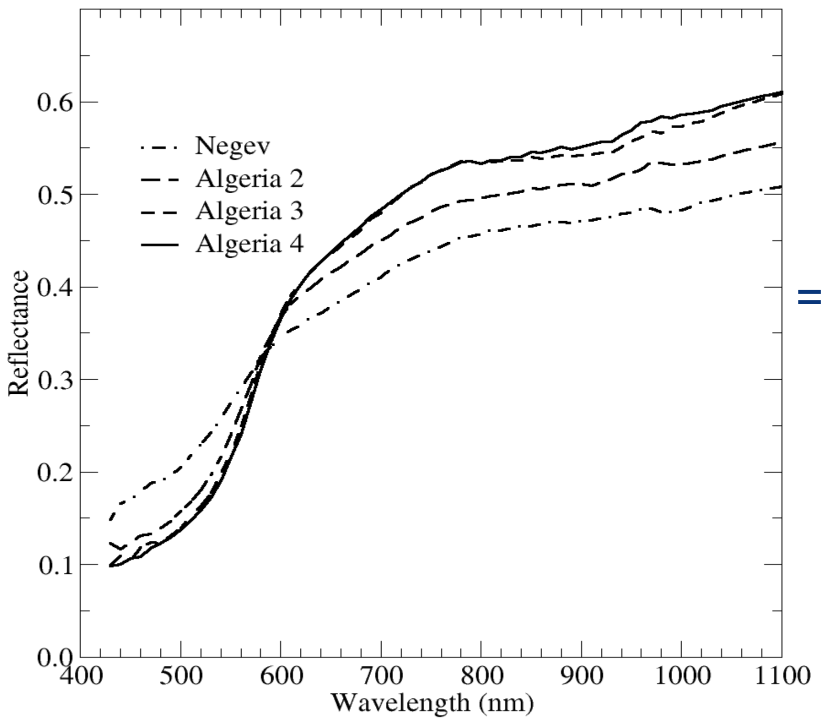
Recent studies : sites characterization (2)

- **<u>Problem</u> :**
  - **Characterization of the desert reflectance using a large number of satellite data coming from different instruments (and spectral bands)**

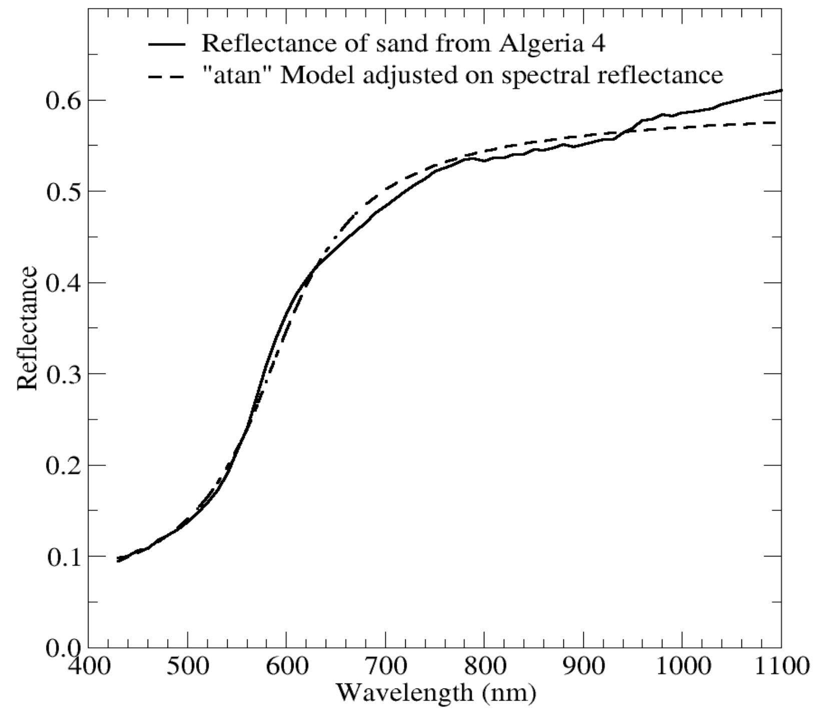
- **<u>Method</u> :**
  - **<u>Initial assumptions</u> :**
    - **Atmospheric parameters are known (SADE)**
    - **Sensors are inter-calibrated**
  - **Determination/choice of a spectral or directional model**
  - **Development of an adjustment algorithm able to deal with data of various origins (reflectance integrated in the spectral bands)**

Recent studies : spectral characterization (1)

■ **Determination of an ad-hoc spectral model of sandy desert from desert samples characterized with ONERA devices**



=> use of a simple model (4 parameters)

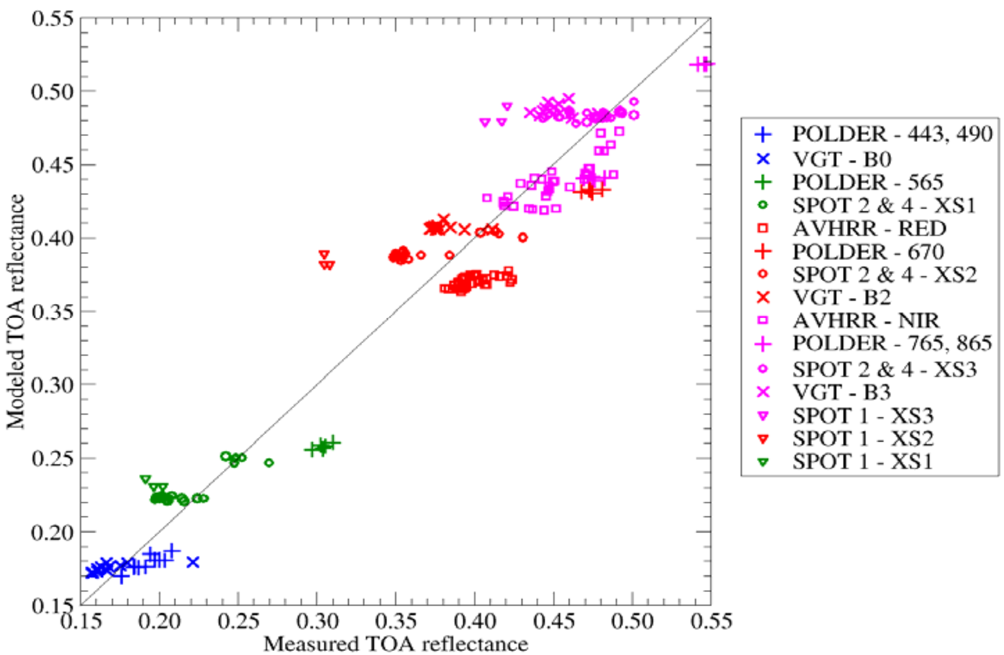


Typical spectral behaviour of desert sand

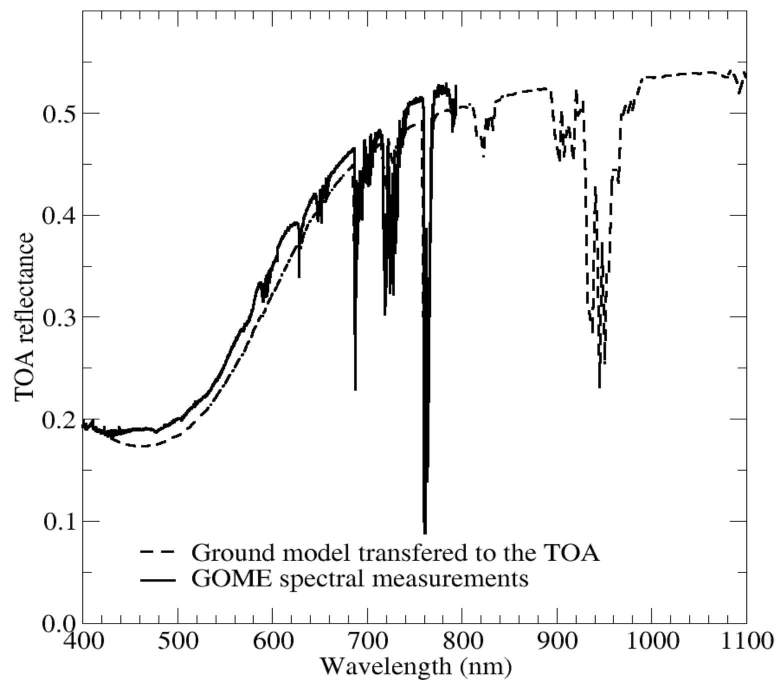
Recent studies : spectral characterization (2)

- Fit of the model with a satellite data set over Libya 1:
  => use of *POLDER*, *VGT*, *SPOT* and *AVHRR* data

Adjustment:
the simulated TOA data using the adjusted ground model are compared to original data



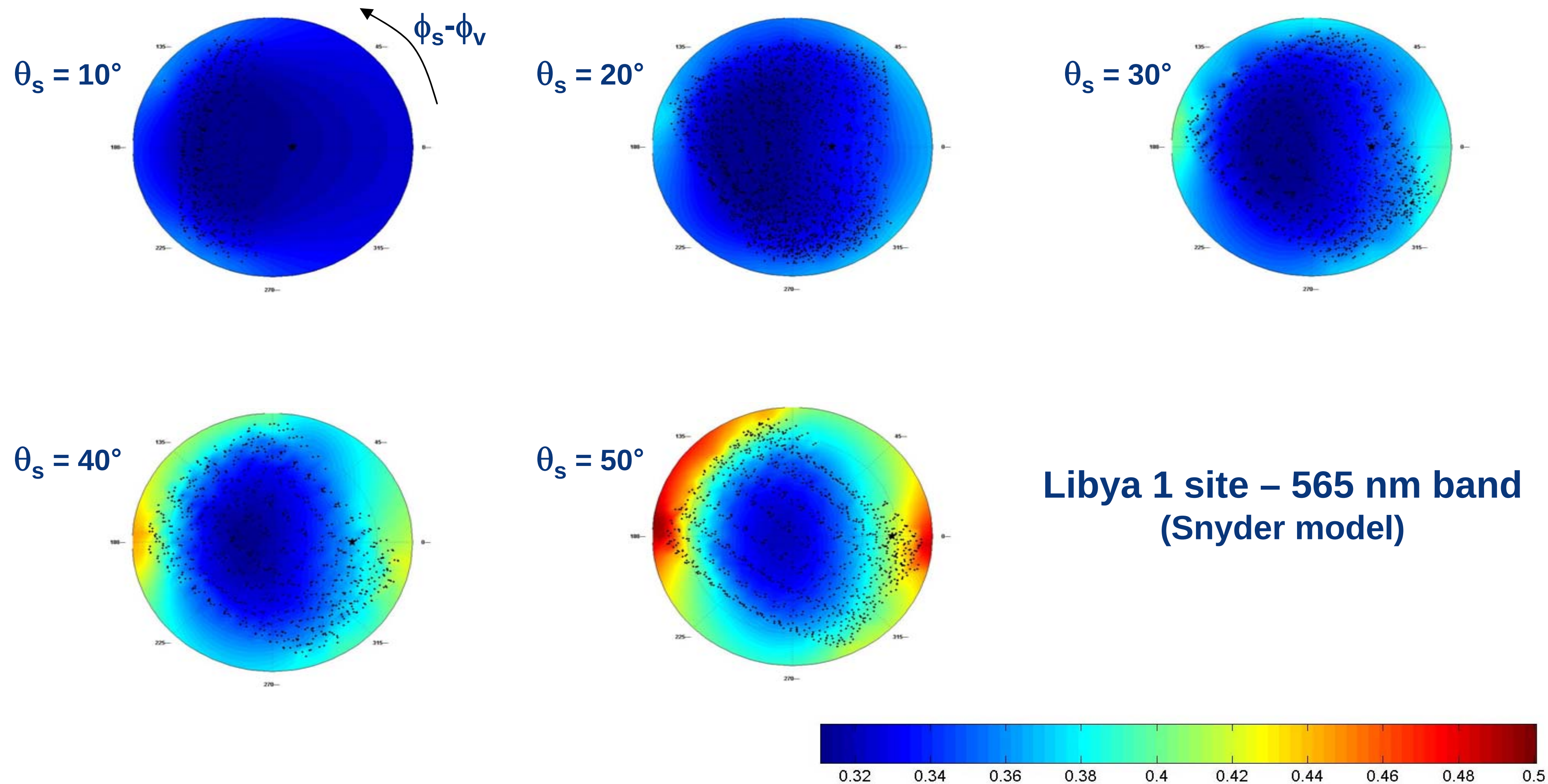
Comparison with GOME:
the adjusted model is transferred at TOA and is compared to a GOME acquisition



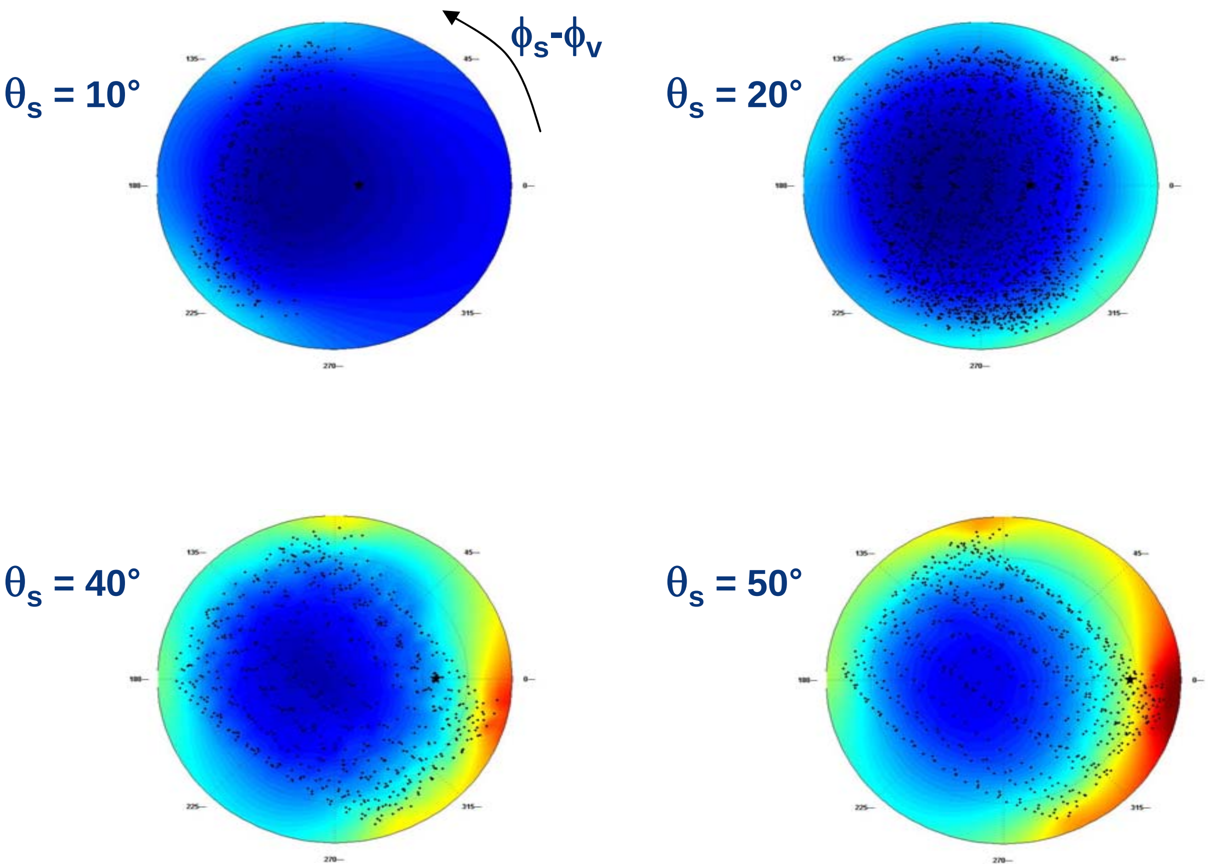
Recent studies : BRDF characterization (1)

- **Establishing a method for directional ground reflectance characterization**
  - **Improvement of atmospheric correction**
  - **Study of several BRDF models**
  - **Definition of an iterative filtering method (to get rid of data affected by atmospheric problem)**
- **Focusing on the 5 CEOS selected sites**
  - **Computation of directional characterization for 5 spectral bands : $\rho(\theta_s,\theta_v,\Delta\phi)$**
- **Main conclusions**
  - **Very good results except in the ‘blue’ range**
  - **Proof of existing models limitation**
  - **Definition of a range of geometrical conditions acceptable for accurate cross calibration process**

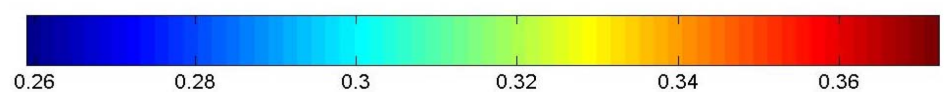
Recent studies : BRDF characterization (2)



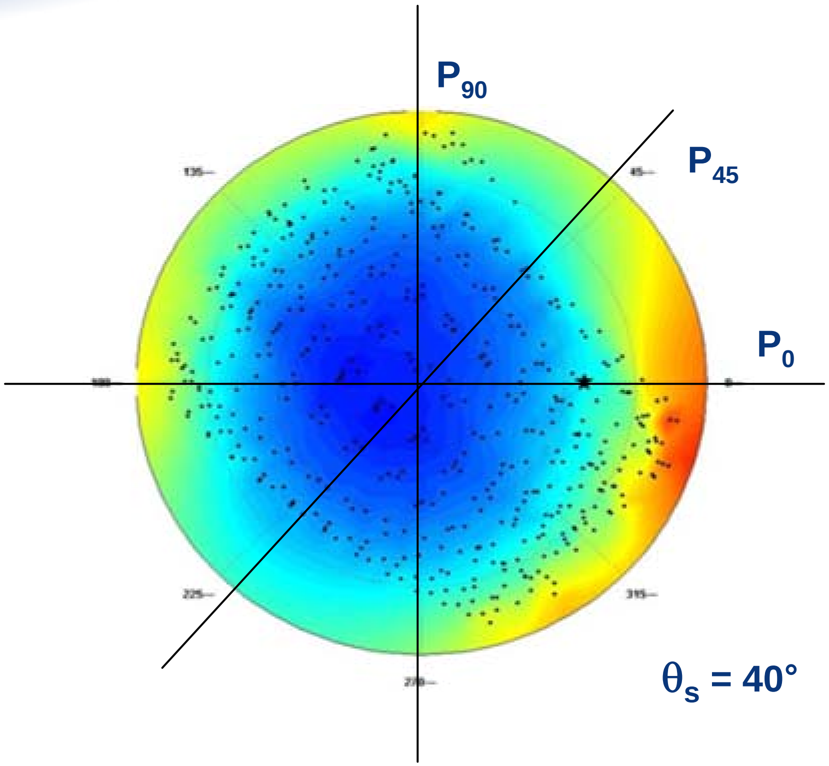
Recent studies : BRDF characterization (3)



Mauritania 2 site – 565 nm band
(Snyder model)



Recent studies : BRDF characterization (4)



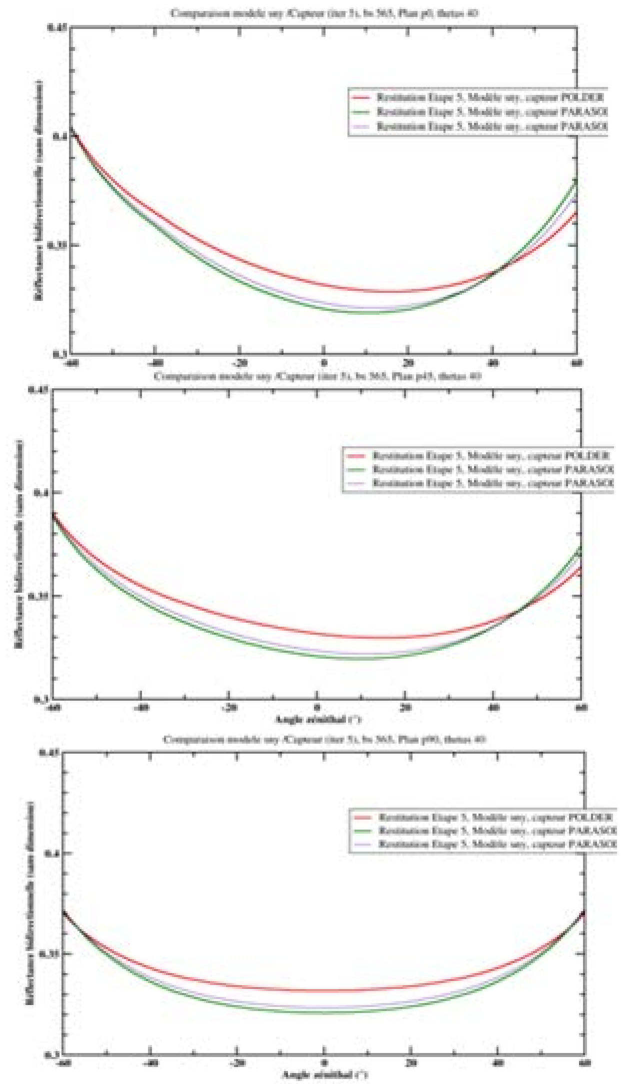
Libya 1 site – 565 nm band

(Snyder model)

P_0

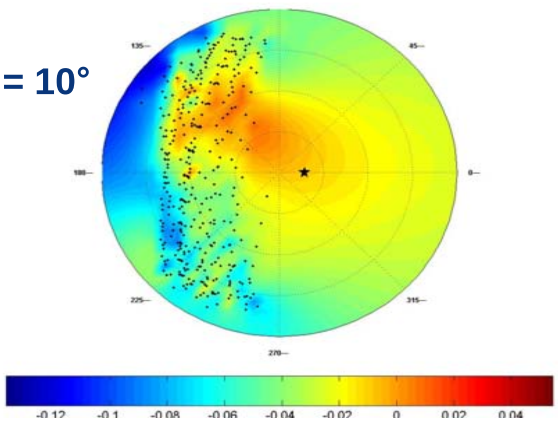
P_{45}

P_{90}

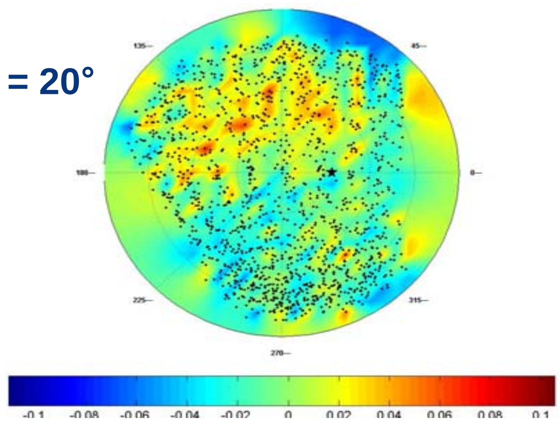


Recent studies : BRDF characterization (5)

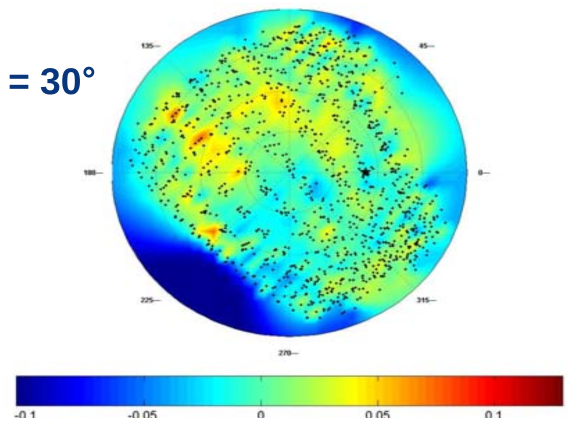
θ_s = 10°



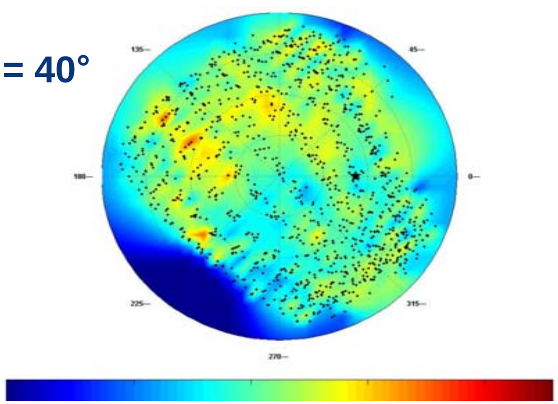
θ_s = 20°



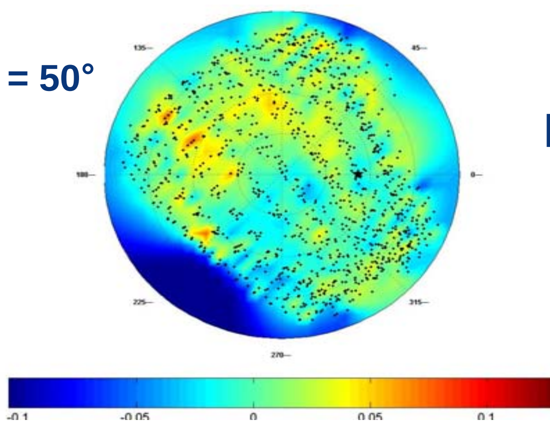
θ_s = 30°



θ_s = 40°



θ_s = 50°

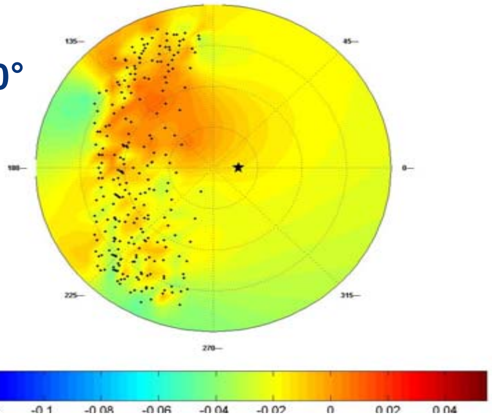


Libya 1 site – 565 nm band

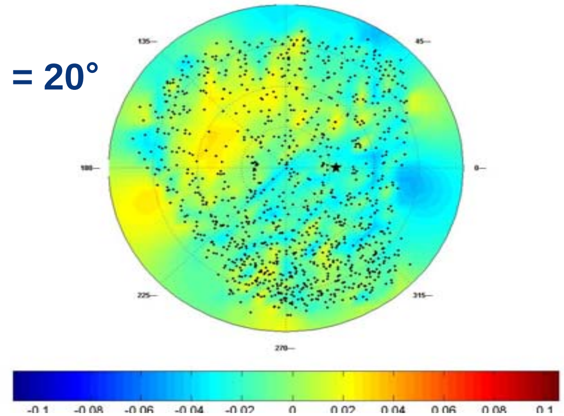
model - measure discrepancies before filtering

Recent studies : BRDF characterization (6)

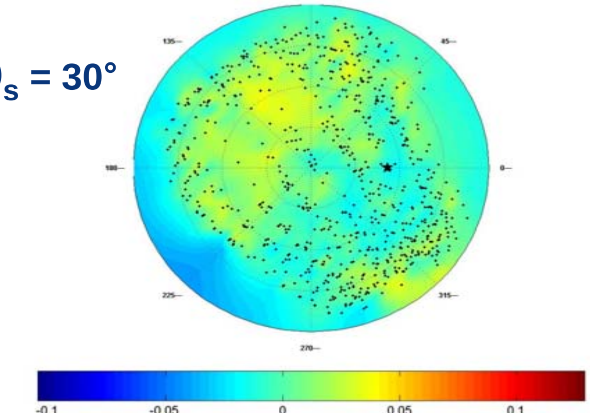
θ_s = 10°



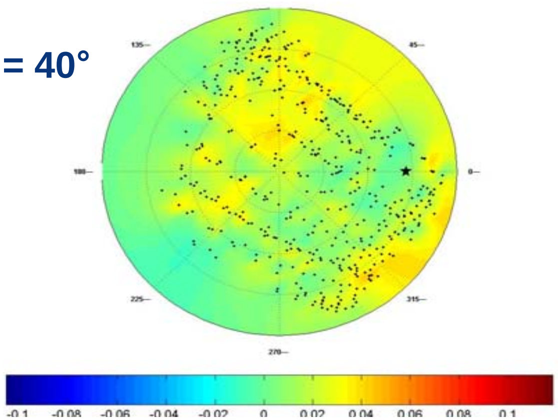
θ_s = 20°



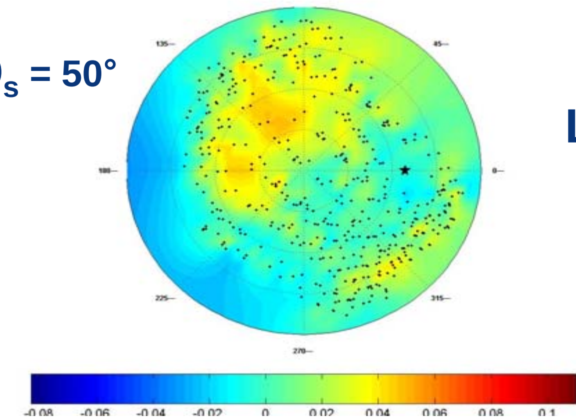
θ_s = 30°



θ_s = 40°



θ_s = 50°

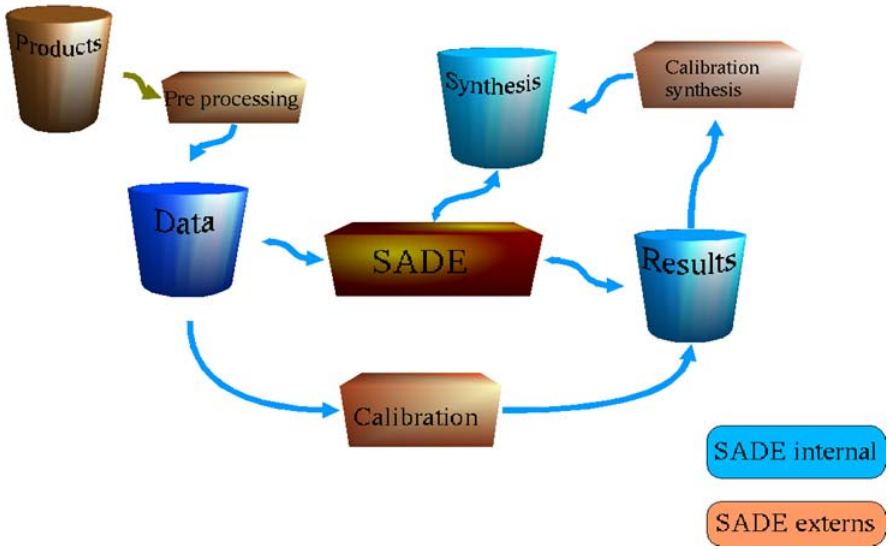


Libya 1 site – 565 nm band

model - measure discrepancies
after filtering

Opening the SADE database (1)

- **Database content : 3 levels**
  - **Measurements (Visible and NIR)**
    - Sensors : Polder1, Polder2, Parasol, SPOTs, SeaWiFS, VEGETATION 1&2, AVHRR, MERIS, MODIS, ...
    - Targets : Deserts, Ocean, Sun Glint, Clouds (DCC) and Snowy sites
    - Associated Meteo Data
  - **Elementary Calibration Results**
  - **Vicarious Calibration Results**



- **Only desert measurements are used for intercalibration**
  - **CNES proposes to provide access to desert data to GSICS and CEOS/IVOS members via WEB interface**
  - **Simple data format (ASCII)**

Opening the SADE database (2)

- Export measurements available on Desert sites (possibly Dôme-C)
- Existing SADE export format

	Field Name	Unit
common to all bands	Area size	—
	Latitude	deg
	Longitude	deg
	Solar azimuth angle	deg
	Solar Zenith angle	deg
	Water Vapour content	g.cm-2
	Ozone content	cm.atm
	Surface Pressure	mbar
	Surface Wind Speed	m.s-1
	Aerosols	
	NO2	
	CHP1	
	CHP2	
	Date/time of the measurement	
	Product Reference	

+ Bands Characteristics

	Field Name	Unit
Band 1	Band Id	
	Measurement Id	
	Measurement value = average	
	Measurement std.dev.	
	Viewing azimuth angle	deg
	Viewing Zenith angle	deg
Band 2	Band Id	
	Measurement Id	
	Measurement value = average	
	Measurement std.dev.	
	Viewing azimuth angle	deg
	Viewing Zenith angle	deg
...	Band Id	
	Measurement Id	
	Measurement value = average	
	Measurement std.dev.	
	Viewing azimuth angle	deg
	Viewing Zenith angle	deg

Opening the SADE database (3)

- **SADE data systematically exported on a server**
  - **Hierarchical organization of the files : Sensor / Year / Site**
  - **Updated every 6 months**
  - **1 file = 6 months of measurements over 1 site for all bands of 1 sensor**
- **Hosted web site : smsc.fr (Site des Missions Scientifiques du CNES)**
  - **Limited access to "registered" GSICS and CEOS agencies**
  - **CNES contact for first registration : Denis Blumstein**
- **Access to SADE data base will be soon opened to a few β-testers**

SADE DATA

RADIOMETRIC CALIBRATION

cnes
CENTRE NATIONAL D'ÉTUDES SPATIALES

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WELCOME | GROUND CALIBRATION | IN FLIGHT CALIBRATION | GLOSSARY | PUBLICATIONS | OTHER SITES

SADE DATA

SADE DESERTS DATA

Don't forget to change regularly your password !

Data are here provided in a tree structure as Satellite/Sensor/desert site/viewing period.

Satellites: ADEOS - ADEOS-2 - AQUA - ENVISAT - FORMOSAT-2 - KOMPSAT-2 - NOAA-9 - NOAA-11 - NOAA-14 - NOAA-16 - NOAA-17 - PARASOL - SPOT-1 - SPOT-2 - SPOT-4 - SPOT-5 - TERRA - THEOS

Data are also provided in a tree structure as desert site/all satellites, all sensors, all viewing period.

Sites: Algerie_1 - Algerie_2 - Algerie_3 - Algerie_4 - Algerie_5 - Arabie_1 - Arabie_2 - Arabie_3 - Egypte_1 - Libye_1 - Libye_2 - Libye_3 - Libye_4 - Mali_1 - Mauritanie_1 - Mauritanie_2 - Niger_1 - Niger_2 - Niger_3 - Soudan_1

The Format of the data issued from the SADE DataBase is:

ASCII File containing a set of lines, each line containing:

- Site area size (number of pixels)
- Latitude (deg, [-90°;+90°], convention North positive)
- Longitude (deg, [-180°;+180°], convention East Positive)
- Solar azimuth angle (deg) [0°;360°] counted from North (North = 0°, East=90°)
- Solar zenith angle (deg) [0°;90°]
- Water vapour content ($g.cm^{-2}$) [0.01 , 10]
- Ozone content (cm.atm) [0.08 , 0.6]
- Surface pressure (mbar) [650 , 1100]
- Surface wind speed ($m.s^{-1}$) (999.9 for deserts)
- Aerosols Optical Depth (at 550 nm) (set to 0.2 for deserts) [0.1 , 10]
- NO2 (-999 for deserts)
- Field 1 (-999 for deserts)
- Field 2 (-999 for deserts)
- Comment (maximum 32 chars)
- Viewing date (dd/mm/yy-hh:mm:ss)
- Product reference (maximum 64 chars)

And a serie of records separated by a space, corresponding to measurements and described as follows:

- Spectral band serial number
- Measurement identifier (number)
- Reflectance mean value (over the area)
- Reflectance mean value standard deviation

SADE DATA ACCESS

- Deserts Data
- Format

SPOT-4 Satellite

For SPOT-4 satellite, two sensors are available: HRVIR 1 and VEGETATION

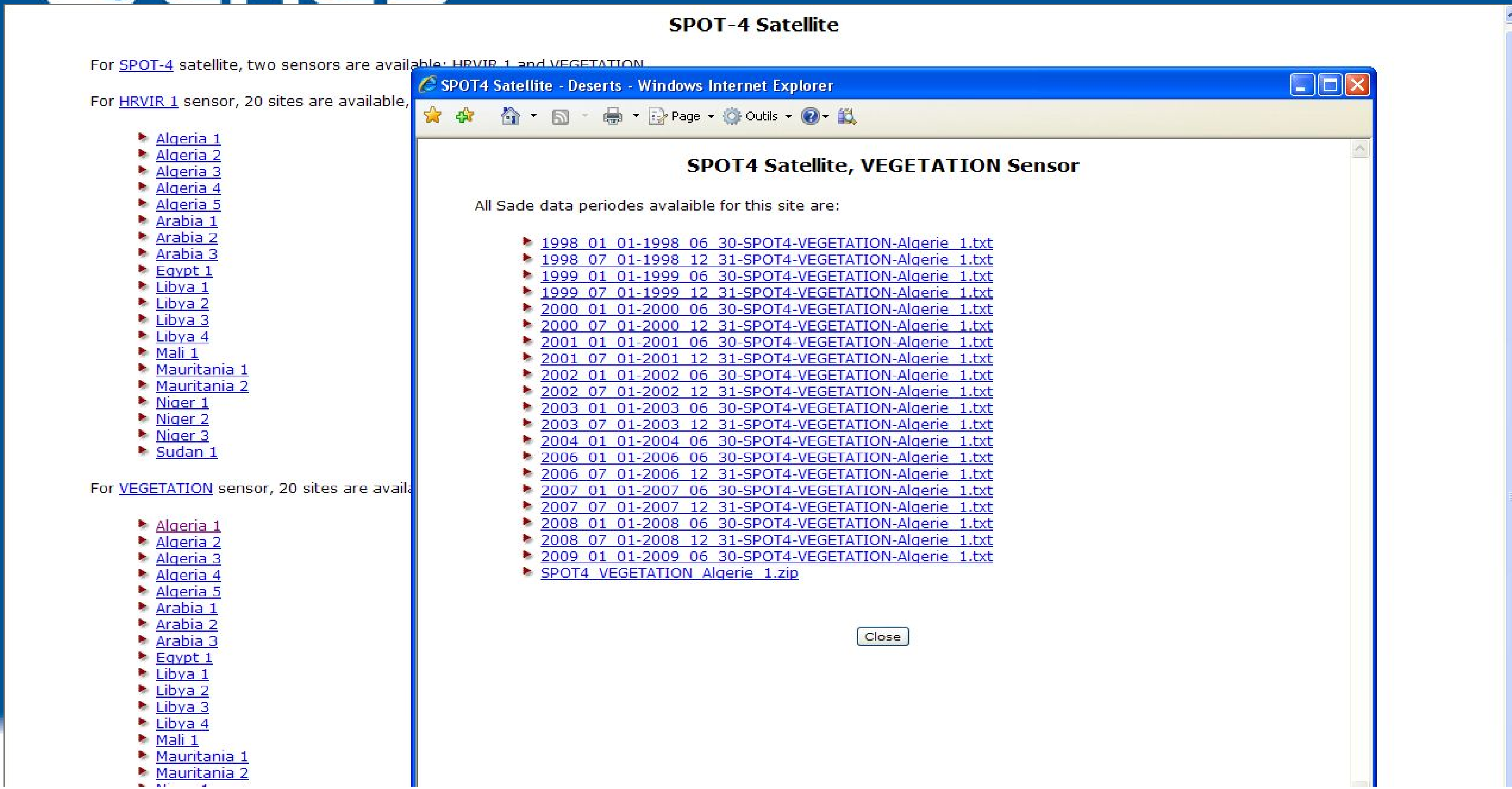
For HRVIR 1 sensor, 20 sites are available, for each site, one or several date are available:

- Algeria 1
- Algeria 2
- Algeria 3
- Algeria 4
- Algeria 5
- Arabia 1
- Arabia 2
- Arabia 3
- Egypt 1
- Libya 1
- Libya 2
- Libya 3
- Libya 4
- Mali 1
- Mauritania 1
- Mauritania 2
- Niger 1
- Niger 2
- Niger 3
- Sudan 1

For VEGETATION sensor, 20 sites are available, for each site, one or several date are available:

- Algeria 1
- Algeria 2
- Algeria 3
- Algeria 4
- Algeria 5
- Arabia 1
- Arabia 2
- Arabia 3
- Egypt 1
- Libya 1
- Libya 2
- Libya 3
- Libya 4
- Mali 1
- Mauritania 1
- Mauritania 2
- Niger 1
- Niger 2
- Niger 3
- Sudan 1

Download the Sade Desert data for each site for HRVIR 1 sensor on board SPOT-4 satellite, by clicking on the name of the site.


SPOT-4 Satellite
For SPOT-4 satellite, two sensors are available: HRVIR 1 and VEGETATION
For HRVIR 1 sensor, 20 sites are available,
Algeria 1
Algeria 2
Algeria 3
Algeria 4
Algeria 5
Arabia 1
Arabia 2
Arabia 3
Egypt 1
Libya 1
Libya 2
Libya 3
Libya 4
Mali 1
Mauritania 1
Mauritania 2
Niger 1
Niger 2
Niger 3
Sudan 1
For VEGETATION sensor, 20 sites are avail
Algeria 1
Algeria 2
Algeria 3
Algeria 4
Algeria 5
Arabia 1
Arabia 2
Arabia 3
Egypt 1
Libya 1
Libya 2
Libya 3
Libya 4
Mali 1
Mauritania 1
Mauritania 2
SPOT4 Satellite - Deserts - Windows Internet Explorer
Page
Outils
SPOT4 Satellite, VEGETATION Sensor
All Sade data periodes avalaible for this site are:
1998_01_01-1998_06_30-SPOT4-VEGETATION-Algerie_1.txt
1998_07_01-1998_12_31-SPOT4-VEGETATION-Algerie_1.txt
1999_01_01-1999_06_30-SPOT4-VEGETATION-Algerie_1.txt
1999_07_01-1999_12_31-SPOT4-VEGETATION-Algerie_1.txt
2000_01_01-2000_06_30-SPOT4-VEGETATION-Algerie_1.txt
2000_07_01-2000_12_31-SPOT4-VEGETATION-Algerie_1.txt
2001_01_01-2001_06_30-SPOT4-VEGETATION-Algerie_1.txt
2001_07_01-2001_12_31-SPOT4-VEGETATION-Algerie_1.txt
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2008_07_01-2008_12_31-SPOT4-VEGETATION-Algerie_1.txt
2009_01_01-2009_06_30-SPOT4-VEGETATION-Algerie_1.txt
SPOT4_VEGETATION_Algerie_1.zip
Close

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100	26.090000	-1.380000	166.500000	50.000000	0.903200	0.293000	983.400000	999.900000	0.200000	-999.900020	-999.900020	-999.900020	Desertique	03/01/2009-11:
100	26.090000	-1.380000	160.500000	51.500000	0.864800	0.306000	979.800000	999.900000	0.200000	-999.900020	-999.900020	-999.900020	Desertique	04/01/2009-11:
100	26.090000	-1.380000	154.500000	53.000000	0.856400	0.302000	979.200000	999.900000	0.200000	-999.900020	-999.900020	-999.900020	Desertique	05/01/2009-10:
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100	26.090000	-1.380000	150.000000	53.000000	0.697100	0.295000	977.800000	999.900000	0.200000	-999.900020	-999.900020	-999.900020	Desertique	16/01/2009-10:
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100	26.090000	-1.380000	144.000000	54.000000	0.519300	0.302000	989.700000	999.900000	0.200000	-999.900020	-999.900020	-999.900020	Desertique	22/01/2009-10:
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100	26.090000	-1.380000	130.500000	40.000000	1.590000	0.324000	977.600000	999.900000	0.200000	-999.900020	-999.900020	-999.900020	Desertique	15/03/2009-10: