Status of SYN L2 Products

PROBA-V QWG
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Disclaimer

The work performed in the frame of this contract is carried out with funding by the European Union. The views expressed herein can in no way be taken to reflect the official opinion of either the European Union or the European Space Agency.

Current status of SYN L2 and VGT-like products

1. **Status and modifications since last QWG**
2. **Several validation activities on-going**
   - Evaluation of AOD with AERONET matchups
   - Evaluation of SDR with SYN/MODIS intercomparison
   - Analysis of potential improvements
3. **Several planned evolutions on VGT-like branch**
4. **Status of the SYN AOD product**

Current status of SYN/VGT-like products

Last QWG (Octobre 2019), delivery of SYN L2 IPF 2.56 /1.28 including :

- Correction of minor issues
- **Correction of pressure indexation, surface pressure and Ozone transmittance**
- **Corrected Plate carrée grid definition**
- Adaptation to updated SLSTR L1 format

  - Operational since January 2020

SYN L2 IPF 2.66/1.38 = few SPRs corrections (rectangular patterns in T550, negative AOD, ..)

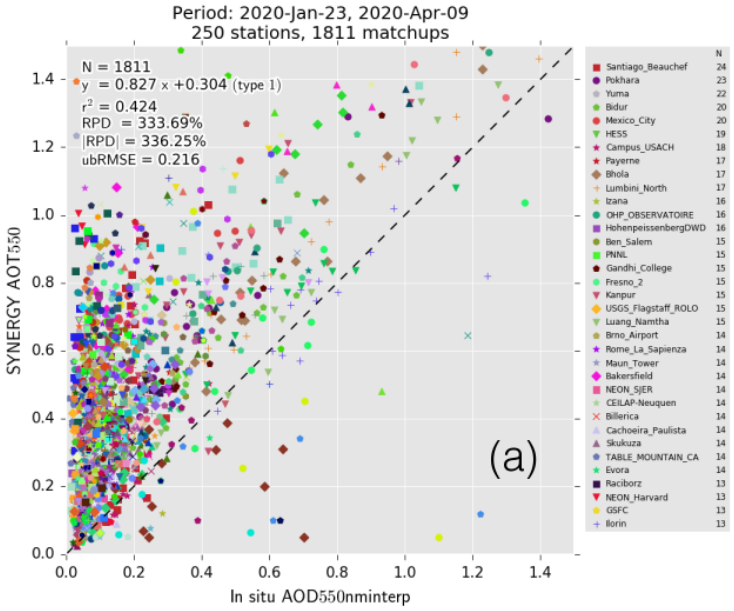
  - Operational this day

Several validation activities on SYN L2 products

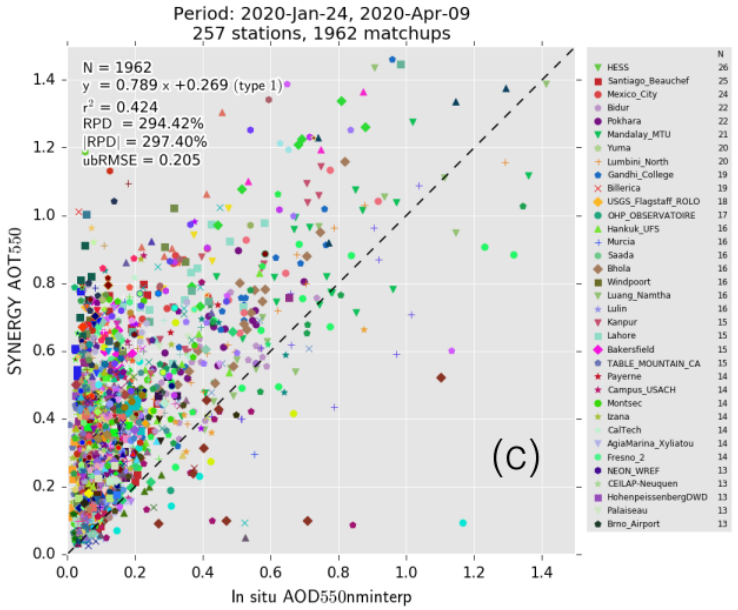
Evaluation of AOD :

- Quantitative evaluation
- AERONET matchups
- AOD_{SYN} >> $AOD_{AERONET}$
- S3A: 250 stations, 1811 matchups
- S3B: 257 stations, 1962 matchups

SYN Classic S3A



SYN Classic S3B



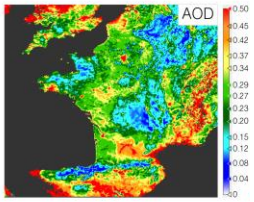
- Low correlation
- High dispersion
- AOD too high vs. AERONET

Several validation activities on SYN L2 products

Evaluation of surface direction reflectance :

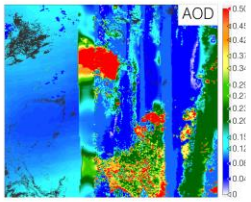
- Over estimation of the AOD
- 9 TDS: low to high NDVI (France, African Desert, USA Arizona, Brazil, Australian Desert, East Europe, Amazonia, South East USA, Congo)

TDS1 France



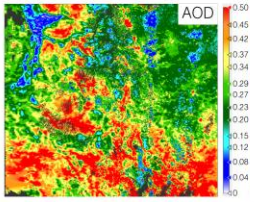
High NDVI

TDS2 African Desert



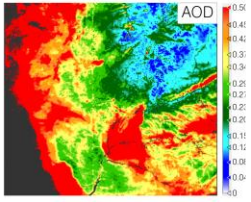
Low NDVI

TDS3 USA Arizona



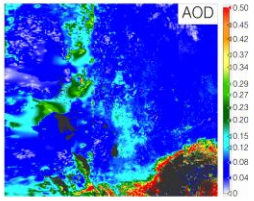
Moderate NDVI

TDS4 Brazil



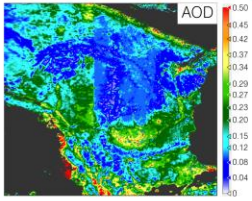
Moderate NDVI

TDS5 Autralian Desert



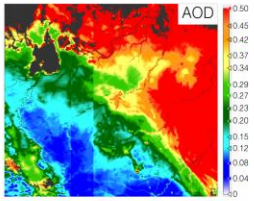
Low NDVI

TDS6 East Europe



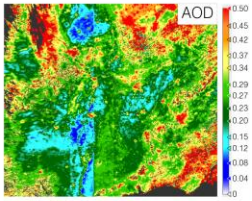
Moderate NDVI

TDS7 Amazonia



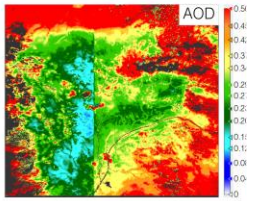
High NDVI

TDS8 South East USA



High NDVI

TDS9 Congo

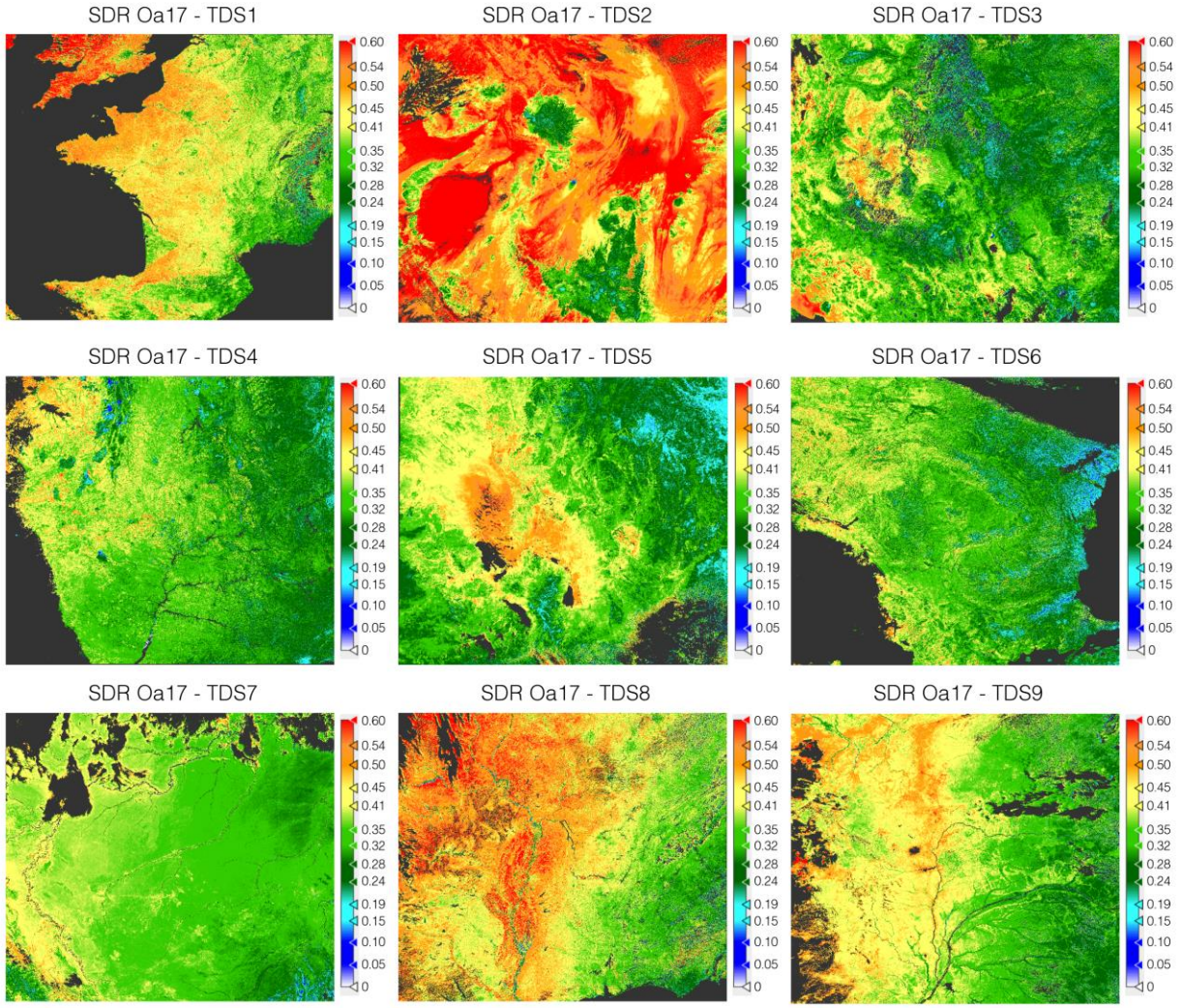


High NDVI

Several validation activities on SYN L2 products

Evaluation of surface direction reflectance :

- Clean products
- Single/dual view demarcation not visible as for AOD



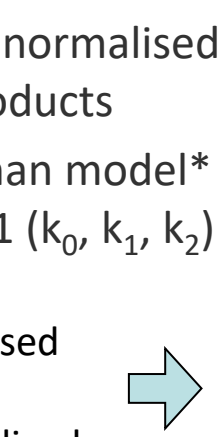
France, African Desert, USA Arizona, Brazil, Australian Desert, East Europe, Amazonia, South East USA, Congo)

Several validation activities on SYN L2 products

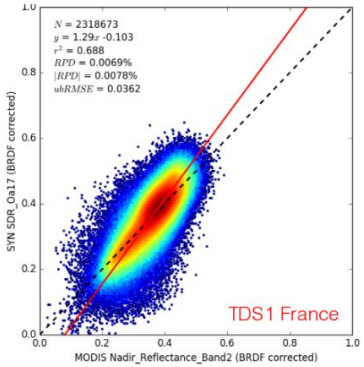
Evaluation of SDR:

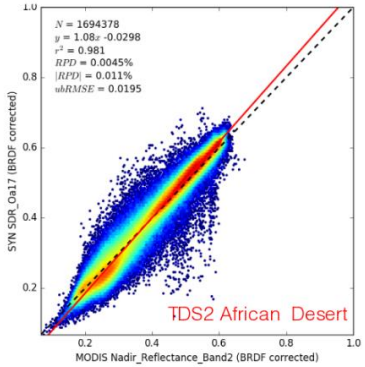
- SYN/MODIS SDR inter-comparison (Oa17/b2)
- Normalisation of the BDRF
- NBAR MODIS normalised MCD42A4 products
- Ross-Li-Maignan model* and MCD42A1 (k_0, k_1, k_2)

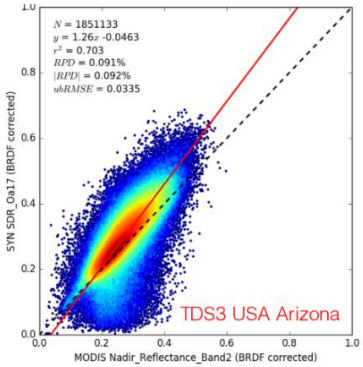
SYN normalised
vs.
MODIS normalised

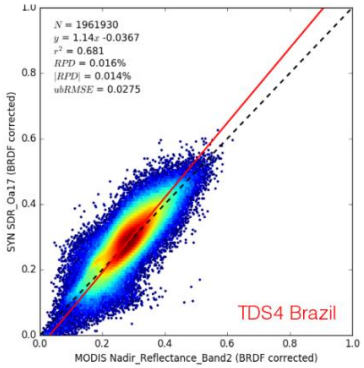


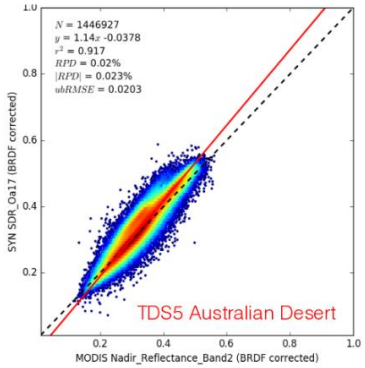
* Towards a Generalized Approach for Correction of the BRDF Effect in MODIS Directional Reflectances, E. Vermote, C.O. Justice, and F.-M. Bréon, IEEE Transactions on Geoscience and Remote Sensing, VOL. 47, NO. 3, March 2009

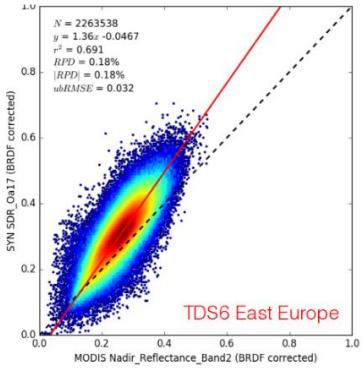


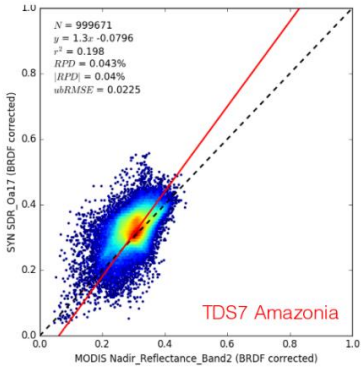


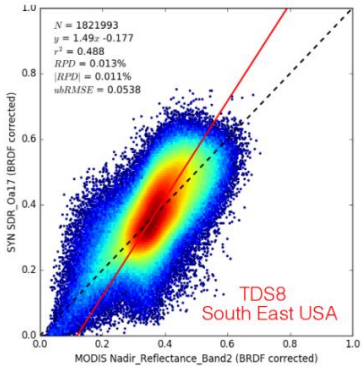












Several validation activities on SYN L2 products

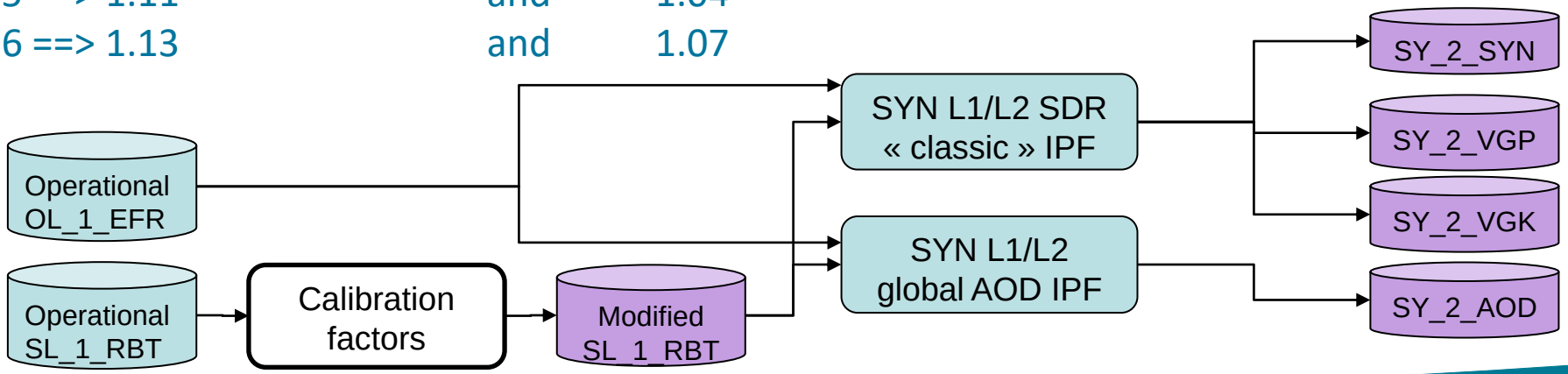
- Analysis of potential improvements:
  - ✓ Optimisation of SLSTR spectral/angular and NDVI weights
  - ✓ Increasing the number of aerosol models
  - ✓ Taken into account SLSTR calibration factors

Several validation activities on SYN L2 products

- Analysis of potential improvements:
  - ✓ Optimisation of SLSTR spectral/angular and NDVI weights
  - ✓ Increasing the number of aerosol models
  - ✓ **Taken into account SLSTR calibration factors**

@S3MPC.RAL.TN.005 : Définition of Correction factors to L1b products for nadir and oblique view using 4 distinct analysis (RAL Space; Rayference; University of Arizona)

S1 ==> 0.97 (nadir)	and	0.94 (oblique)
S2 ==> 0.98	and	0.95
S3 ==> 0.98	and	0.95
S5 ==> 1.11	and	1.04
S6 ==> 1.13	and	1.07



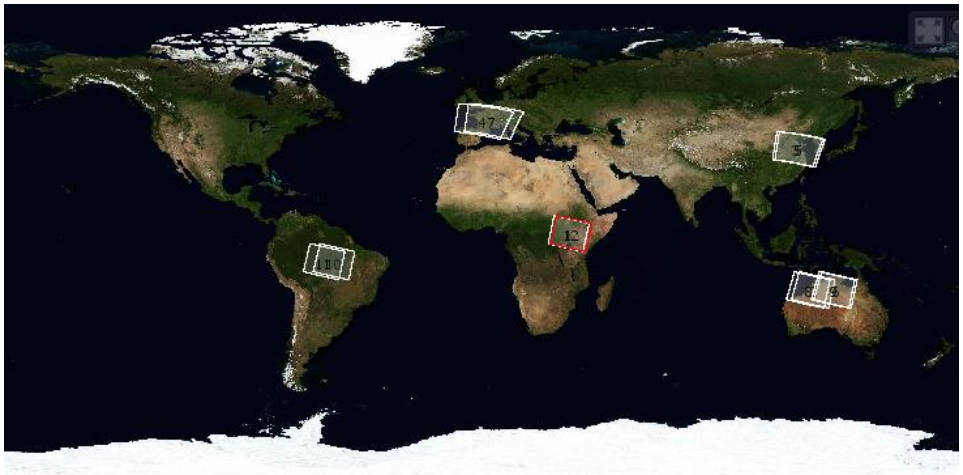
Used datasets

Analysis made on 10 granules representing 5 scenes :

On SY_2_SYN:

Analysis on retrieved AOD @ 550 nm

Analysis on Surface direction reflectance



On SY_2_VGP; SY_2_VGK:

Analysis on VGT-like TOA reflectances

Analysis on VGT-like surface reflectances

France :too cloudy
~~21/04/2019~~
~~07/05/2019~~

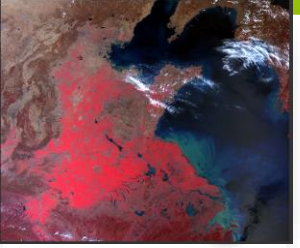
Brazil:
19/06/2019
30/06/2019

Ouganda/Kenya :
20/03/2019
06/08/2019

China
01/04/2019
02/05/2019

Australia (2 scenes)
31/03/2019
19/05/2019

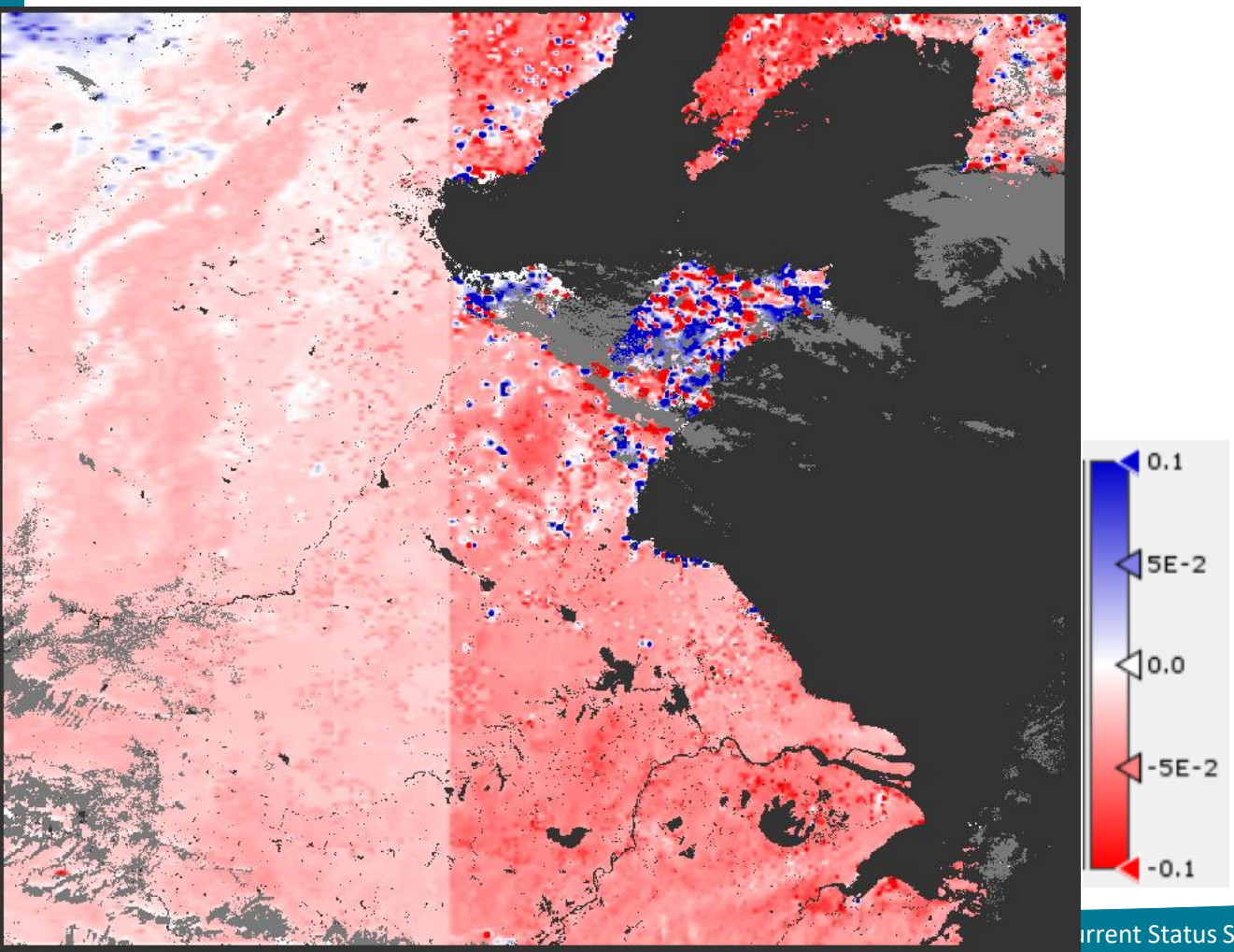
06/05/2019
29/05/2019



Differences on AOD@550nm

AOD_{mod} = retrieved AOD@550 nm <u>after application</u> of SLSTR calibration factors
AOD_{ope} = retrieved AOD@550nm <u>without</u> taken into account SLSTR calibration factors

Over China –
S3A_SY_2_SYN____20190401T021717_20190401T022017_[..]



$AOD_{mod} - AOD_{ope}$

SLSTR calibration factors imply **a reduction of the retrieved AOD@550 nm**, especially on **the dual view** side of the image,

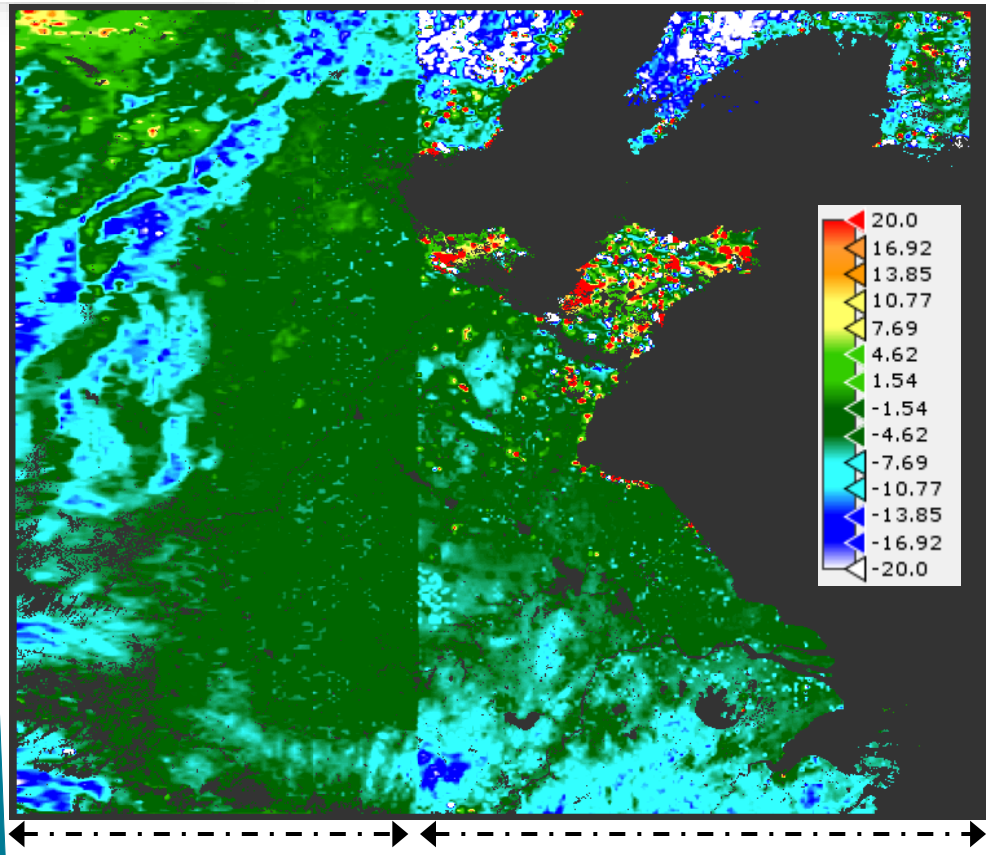
The only exception is pixels close to cloud coverage for which extremes values (either reduction or increase) can be found

Analysis of the percentage of the AOD differences

This percentage is computed from :

$$(AOD_{mod}*100 / AOD_{ope}) - 100$$

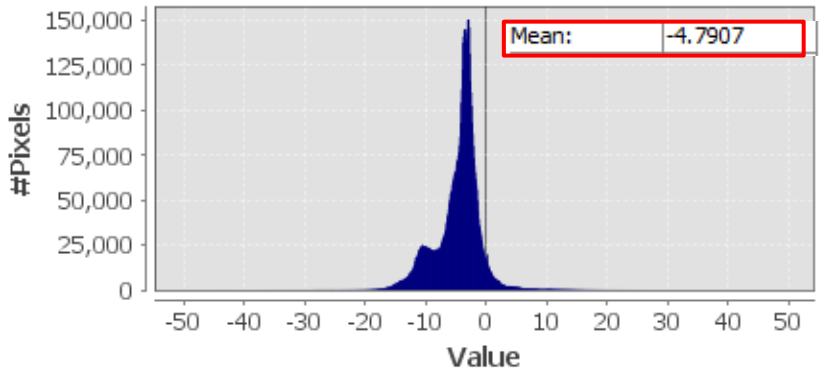
So a pixel associated with **-10** is corresponding to **a reduction of 10%** of the AOD when SLSTR calibration factors are applied



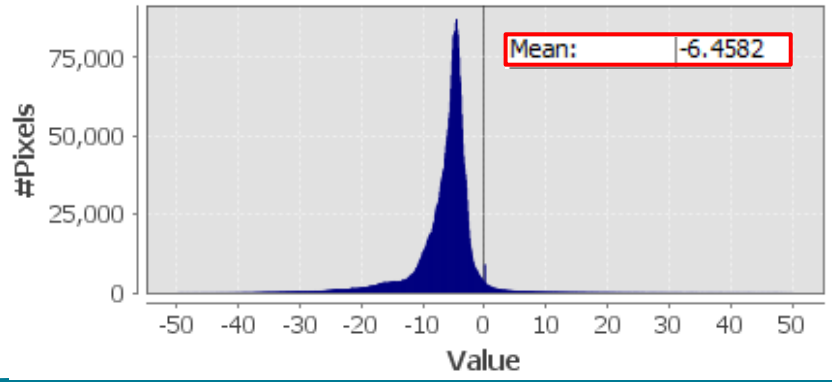
Nadir-only side

dual-view side

sucess and nadir only avec outliers



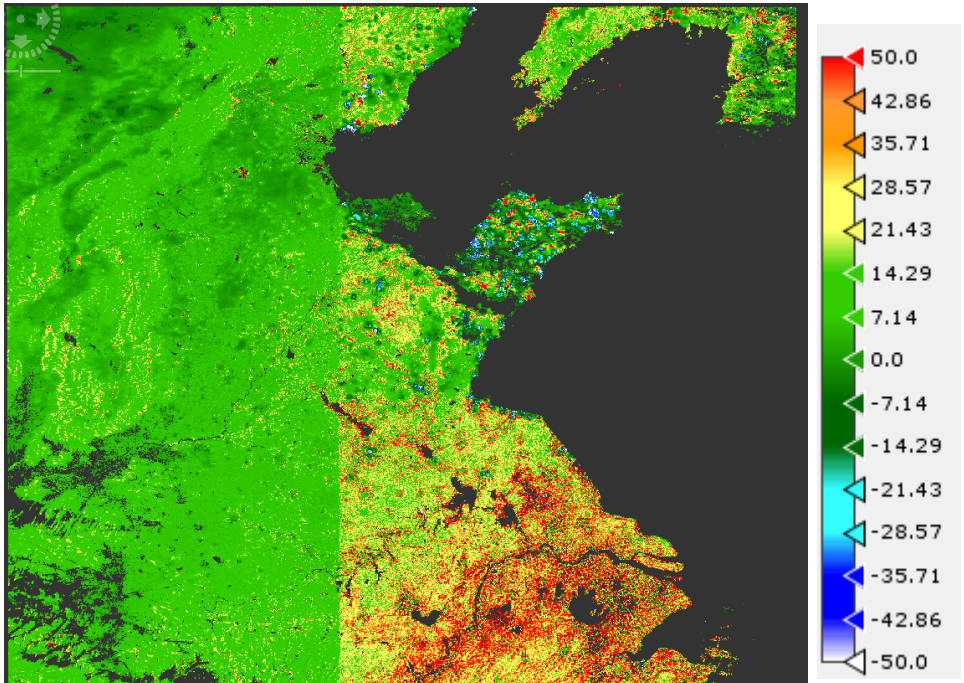
sucess dual view avec outliers



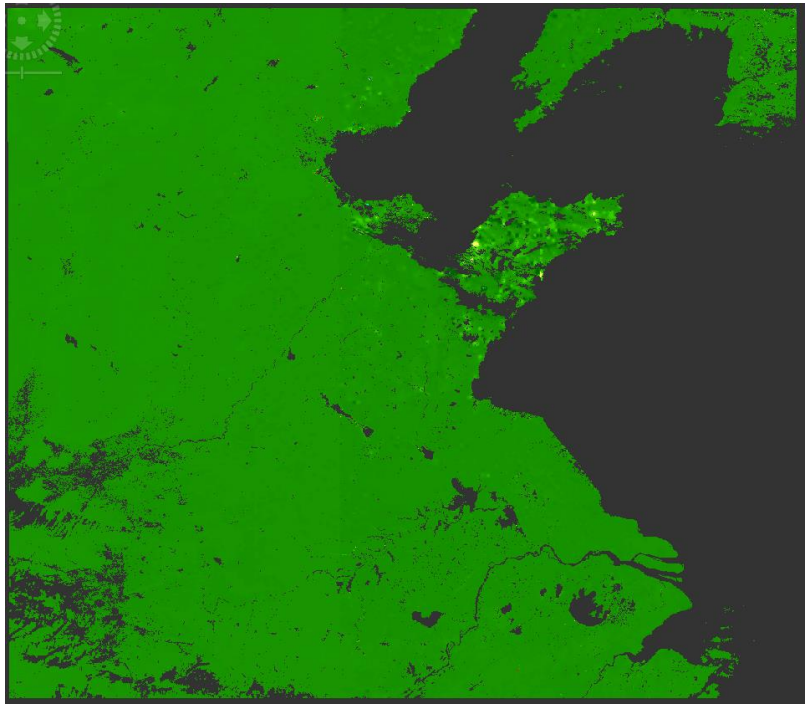
Percentage of the SDR differences

$(SDR_{mod}*100 / SDR_{ope}) - 100$

Surface directional reflectance Oa3 440 nm



Surface directional reflectance Oa17 875 nm



‹ sucess and nadir only

#Pixels total:	6806365
Minimum:	-83.3333
Maximum:	14700.0000
Mean:	8.0784
Sigma:	20.8361
Median:	9.0148

: sucess dual view

#Pixels total:	3830126
Minimum:	-100.0000
Maximum:	58800.0000
Mean:	44.6328
Sigma:	214.3400
Median:	17.8000

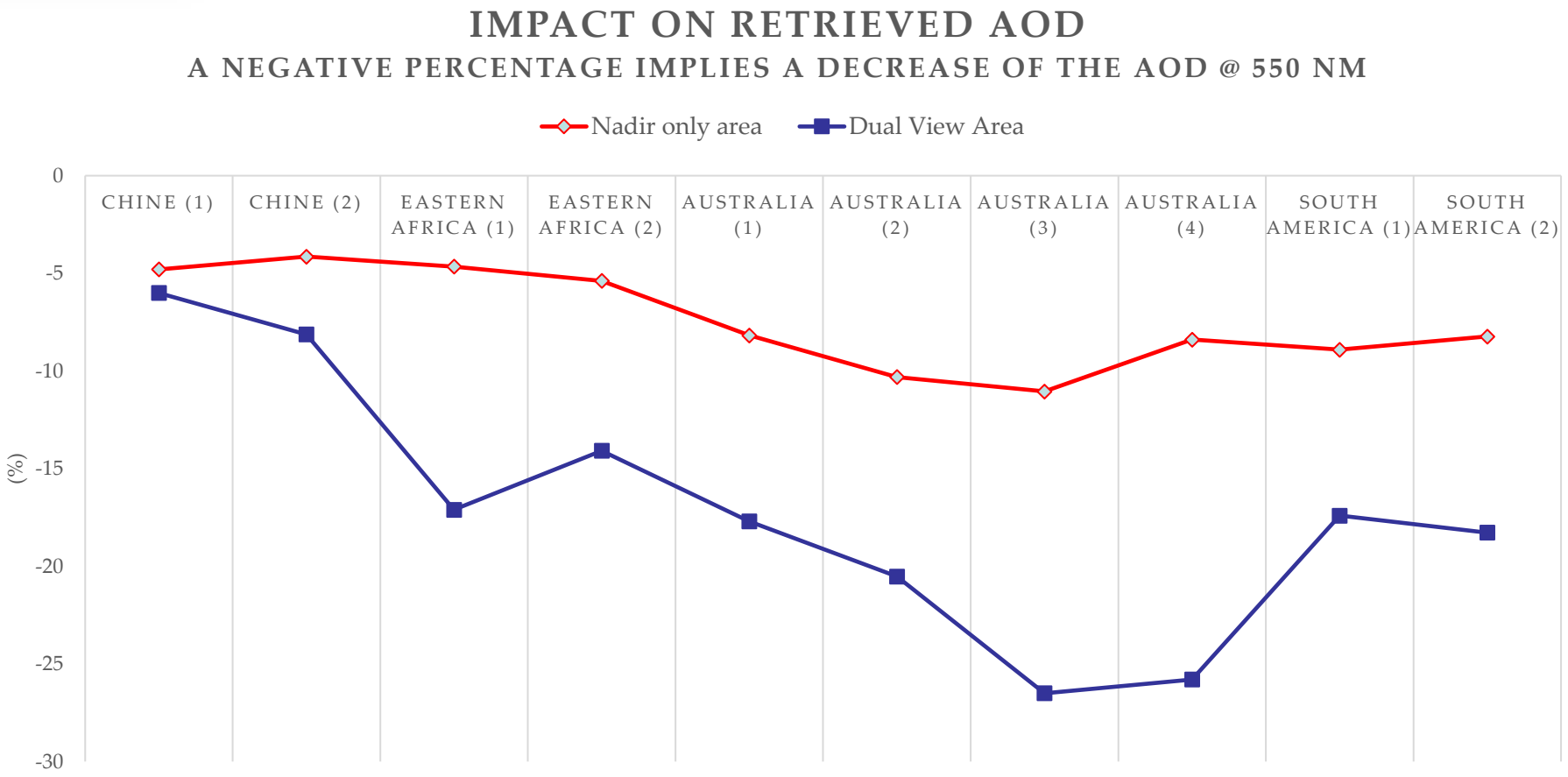
‹ sucess and nadir only

#Pixels total:	6815401
Minimum:	-5.1300
Maximum:	550.0000
Mean:	-0.3483
Sigma:	0.5847
Median:	-0.3827

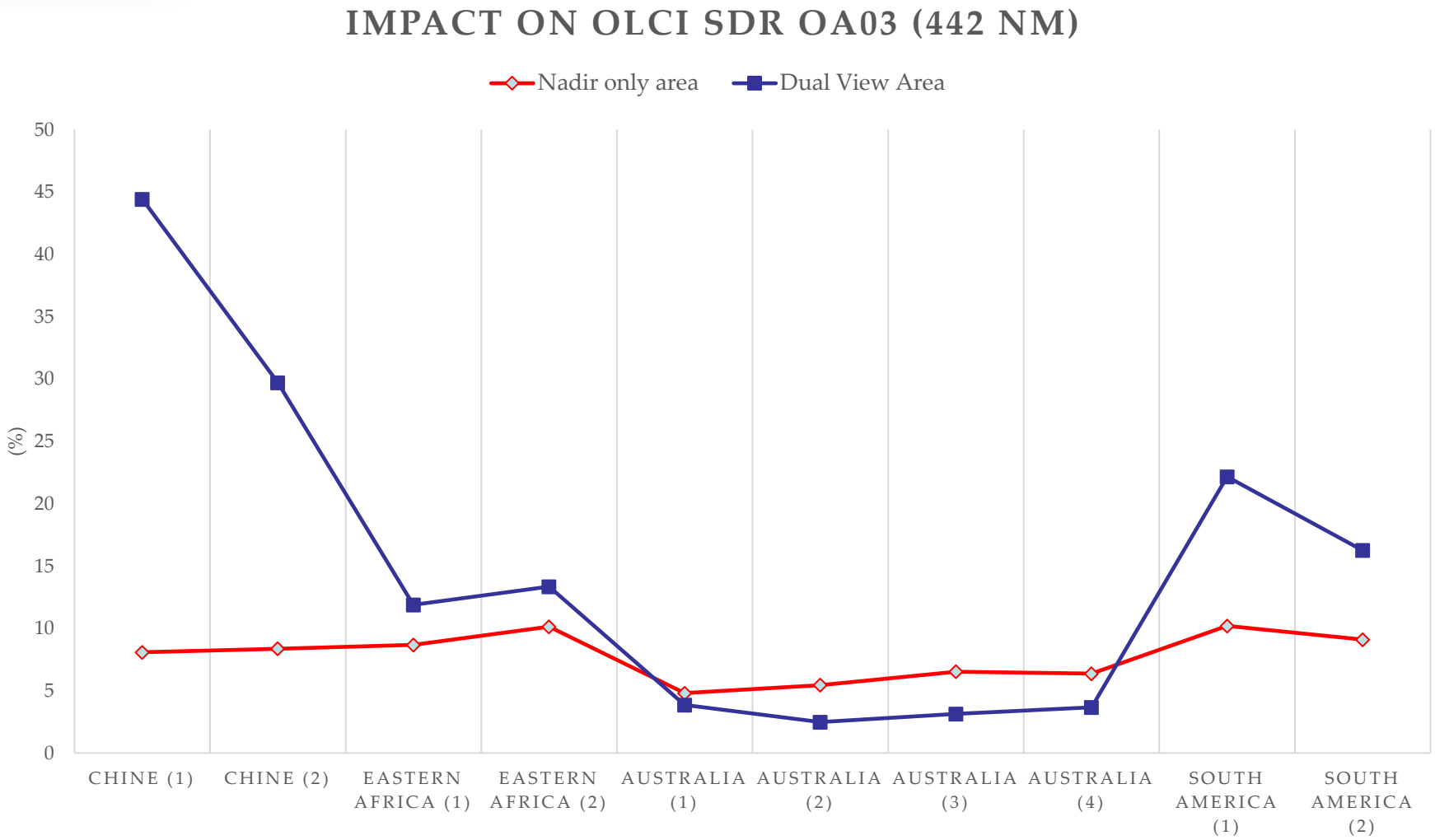
: sucess dual view

#Pixels total:	4007553
Minimum:	-96.0000
Maximum:	24800.0000
Mean:	-0.6576
Sigma:	12.7279
Median:	-8.8387

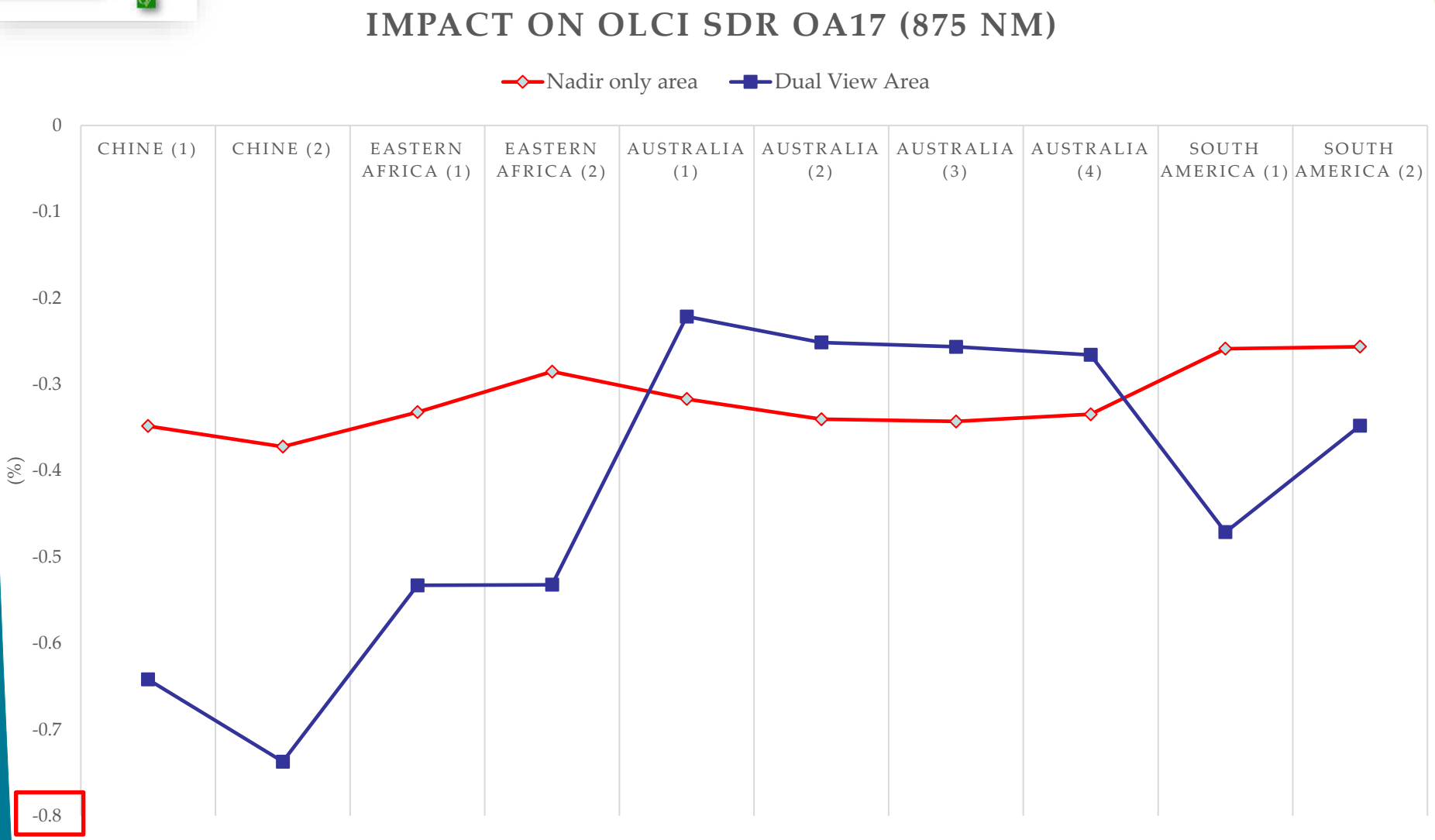
Impact on retrieved AOD, SDR OLCI Oa03 and OLCI Oa17



Impact on retrieved AOD, SDR OLCI Oa03 and OLCI Oa17



Impact on retrieved AOD, SDR OLCI Oa03 and OLCI Oa17



Differences observed on VGT-like products

Same analysis has been made also on SY_2_VGP products (TOA reflectances) and SY_2_VGK products (Surface reflectance)

VGT channel	Central Wavelength (nm)	Bandwidth (nm)	Combined OLCI/SLSTR channels
B0	450	20	OLCI Oa2 and Oa3
B2	645	35	OLCI Oa06, Oa07, Oa08, Oa09 and Oa10
B3	835	55	OLCI Oa16, Oa17, Oa18, Oa21
MIR	**1665**	**85**	**SLSTR S5 and S6**

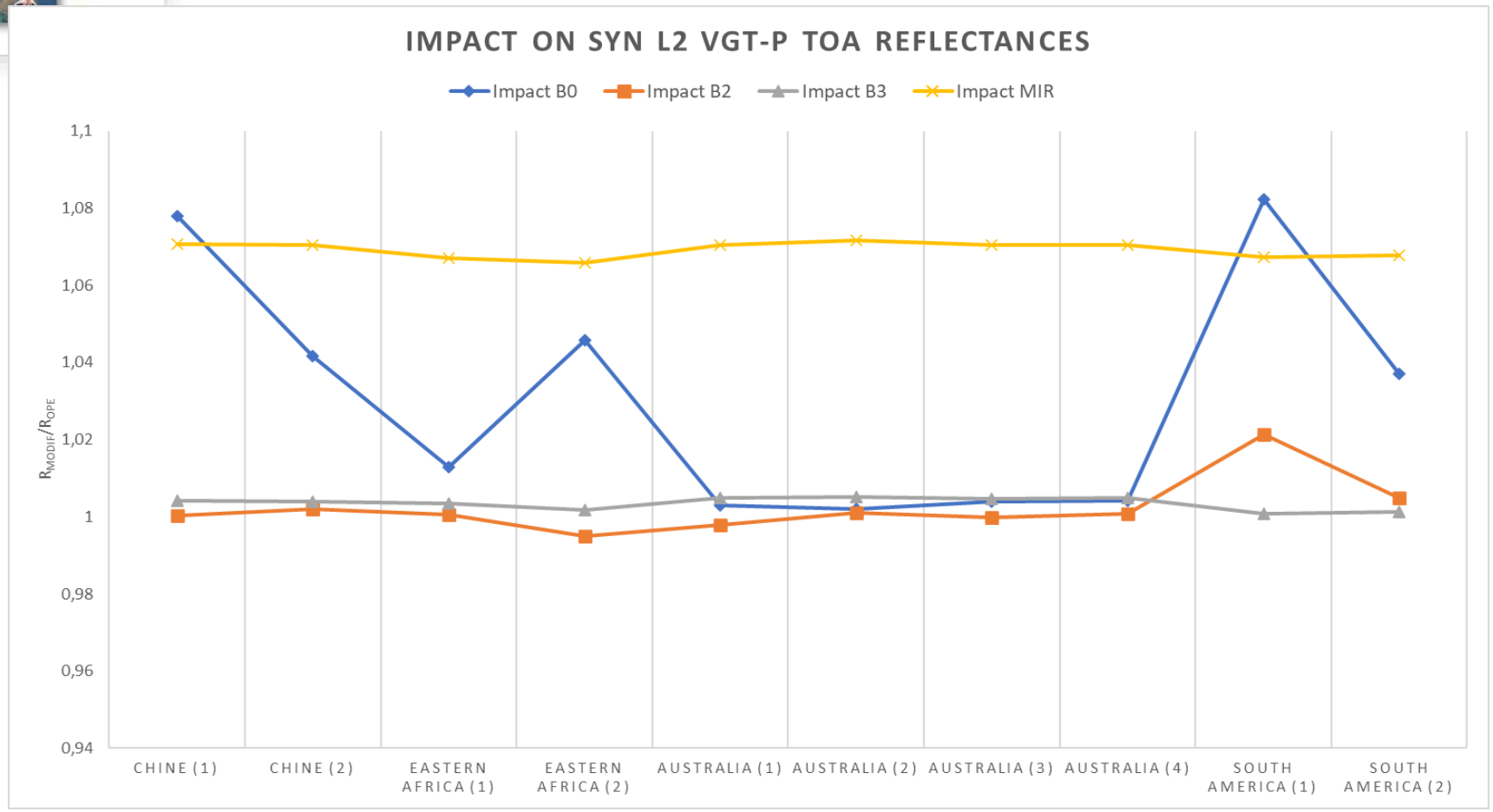
VGT-P like product = TOA reflectances ➔ No impact of the reduced AOD, mainly driven by SLSTR calibration factor

➔ Factor (R_TOA_{mod}/ R_TOA_{ope})

VGK product = surface reflectance ➔ Impact of reduced AOD

➔ Percentage (SDR_{mod}*100 / SDR_{ope}) - 100

Impact on VGT-P TOA reflectances



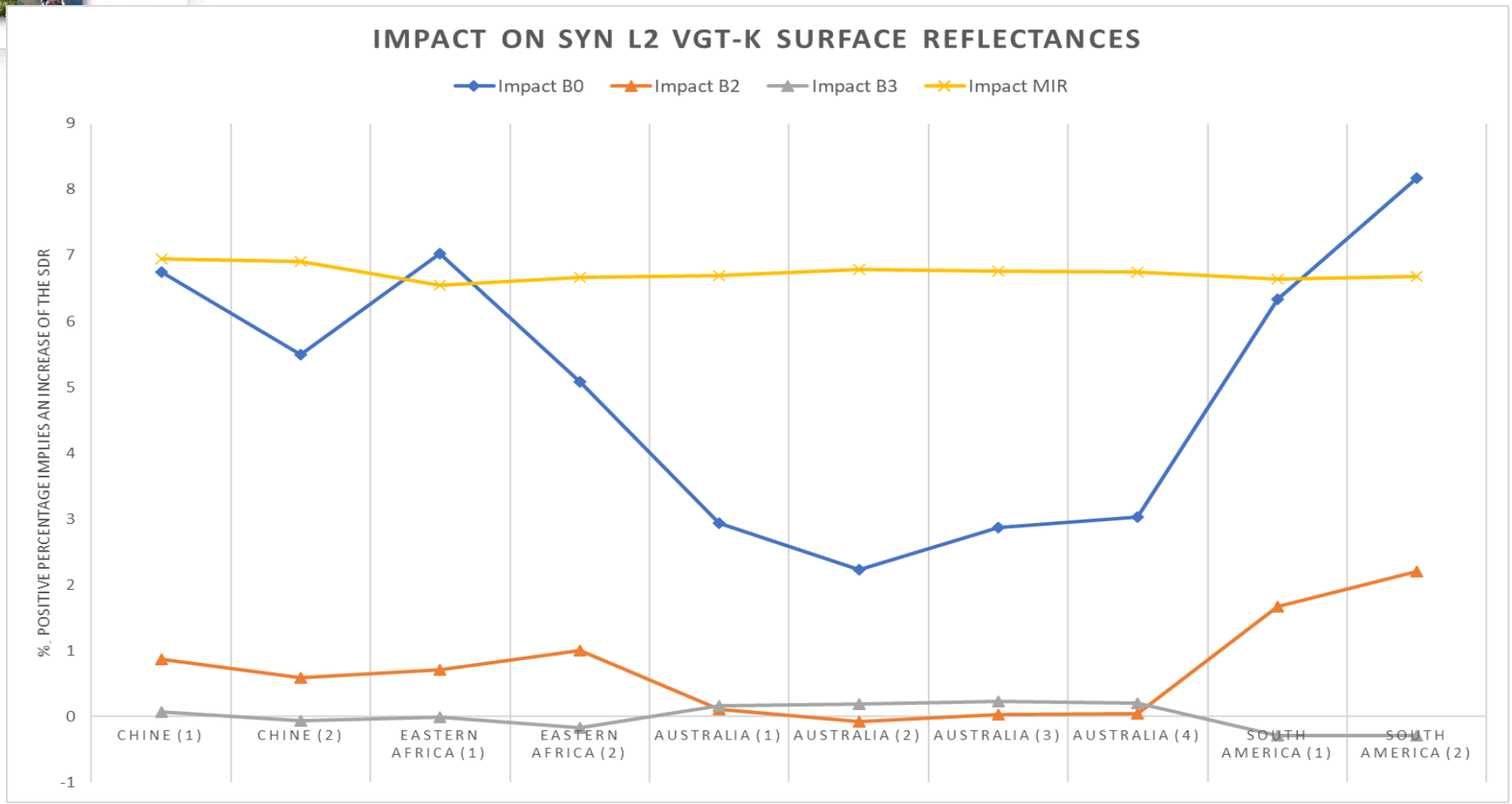
Mean (R_TOA_{mod}/ R_TOA_{ope}) computed over pixels flagged « B0/B2/B3/MIR_GOOD » :

➔ No impact on B2 and B3

➔ Increase of MIR TOA reflectance - 1,07 factor close to the SLSTR ones

➔ B0 reflectance variation close to the one observed in SYN L2

Impact on VGT-K surface reflectance



Mean ((SDR_{mod}*100 / SDR_{ope}) - 100) computed over all pixels, but excluding outliers

➔ No impact on B3, smaller one on B2

➔ Increase of MIR TOA reflectance about 7% everywhere

➔ B0 reflectance variation close to the one observed in SYN L2 (except for EAFR 1 and SAM 2)

Several planned evolutions on VGT-like branch

1. Temporal compositing strategy for SYNERGY VGT-S like products

- Modifying the 10-daily compositing in 1-10; 11-20 and 21-end of the month.
- Currently tested and put in place at PDGS level

2. Including a specific land/sea classification module in VGT-Like product

- Surface classification distinct from SLSTR/OLCI one directly computed on the Plate Carrée grid
- Reference Classification to define

3. Including cloud shadows detection

- Upgrade the current IDEPIX version to V7

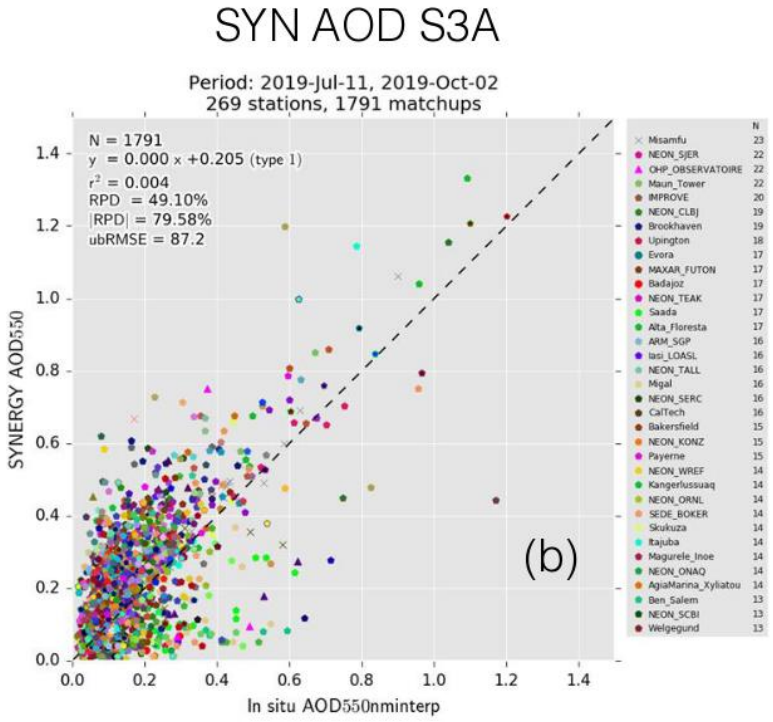
4. Including SLSTR calibration factors

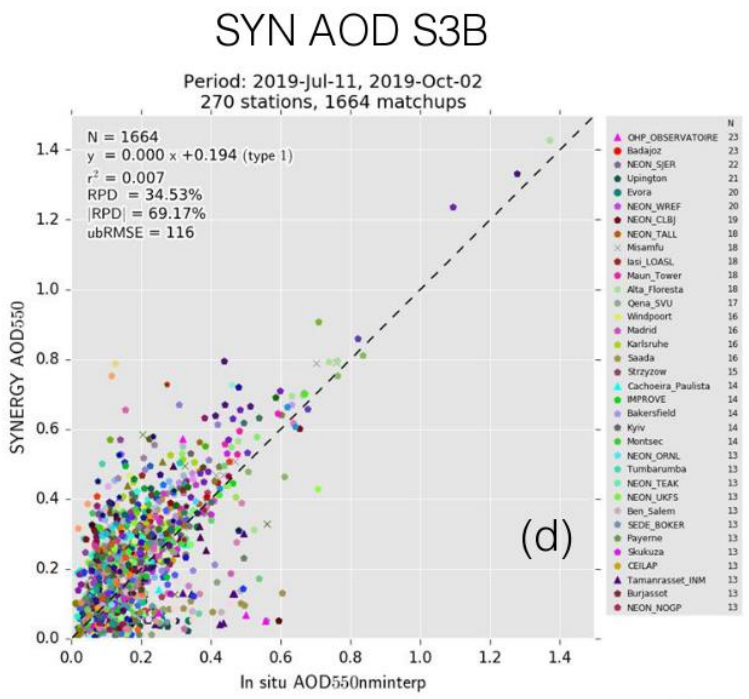
5. Few issues raised by VITO

- Along track striping on OLCI interfaces
- Edge artefacts

Status of the SYN AOD product

- New product providing AOD @440, 550, 670, 865, 1600, 2250 at 4,5 km resolution
- 35 continuous aerosol models
- Operational since January and currently under validation Phase (@SWANSEA and LAW project)





THANK YOU FOR YOUR ATTENTION