GSICS Annual Meeting 2021
(Virtual)

OLCI-A / OLCI-B cross-calibration from tandem phase analysis, a synthesis

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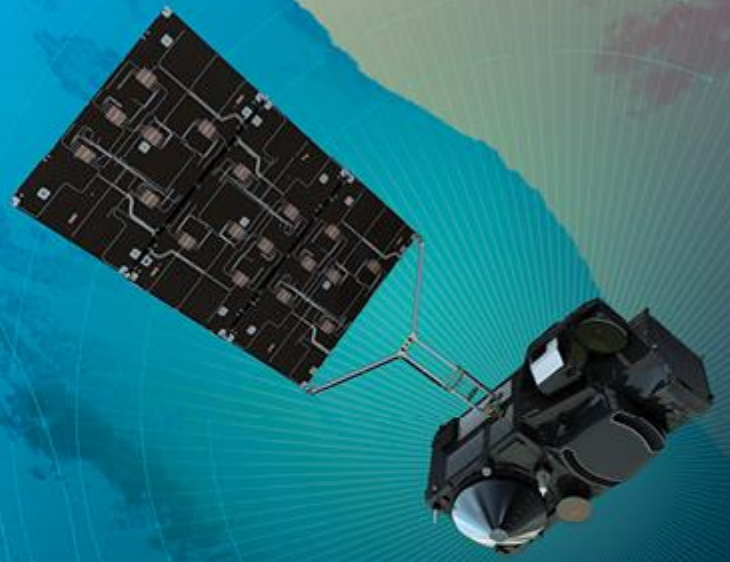
Sentinel-3 Tandem for Climate Study (S3TC): https://s3tandem.eu/



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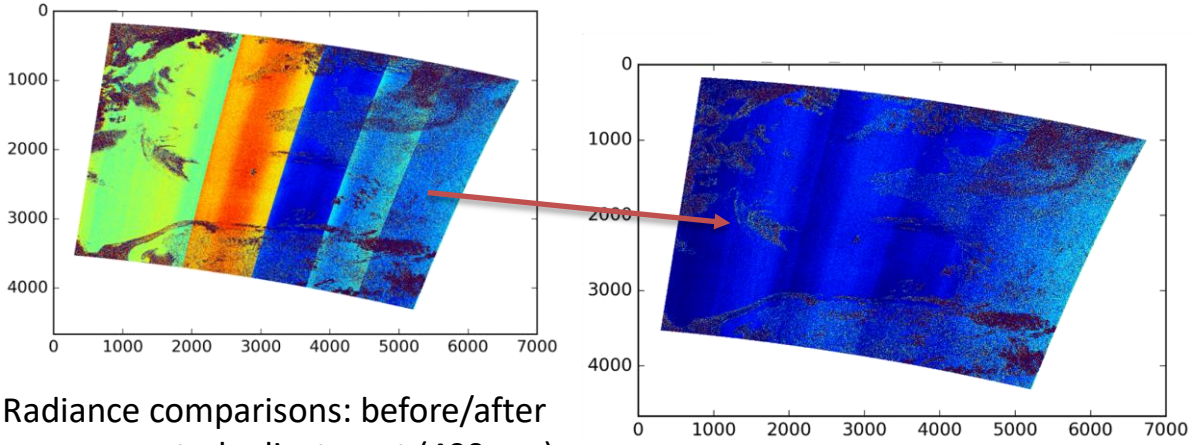
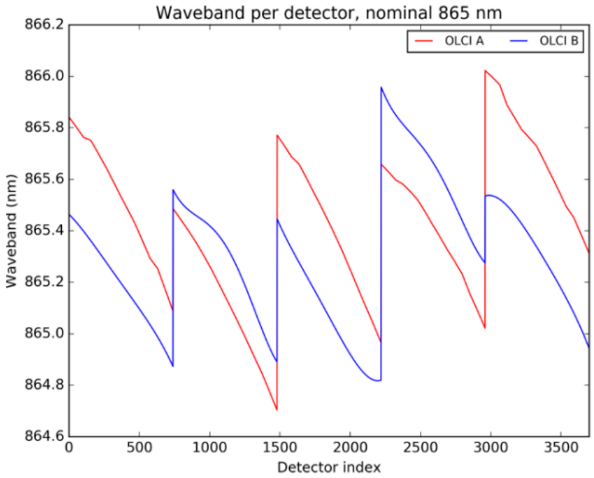
OLCI-A and OLCI-B homogenisation

- Similar yet slightly different sensors (e.g. different spectral characterisation)
- Spatial coregistration → reproject
- Spectral adjustment →smile correction depending on target

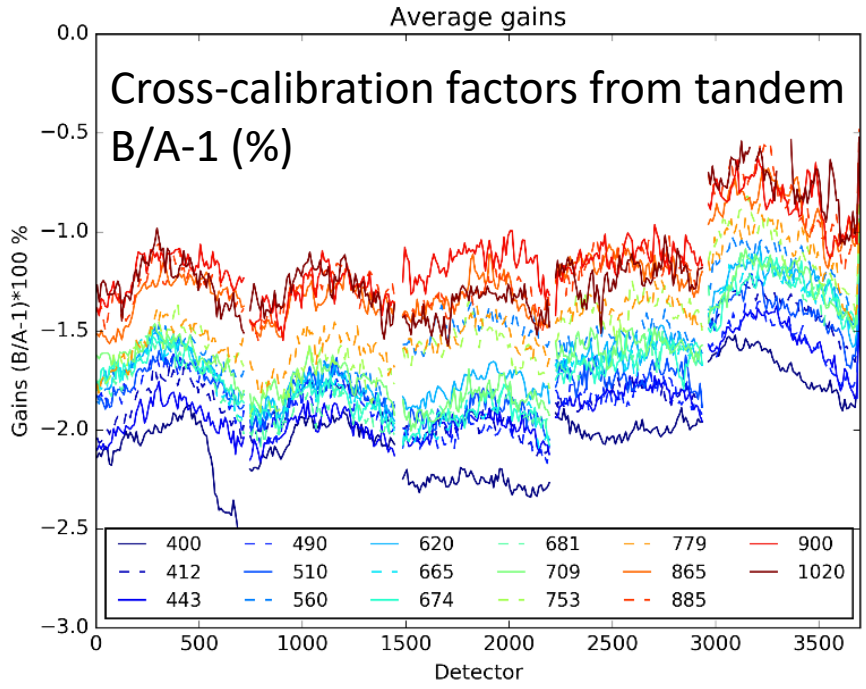


Radiance comparisons: before/after spectral adjustment (400 nm)

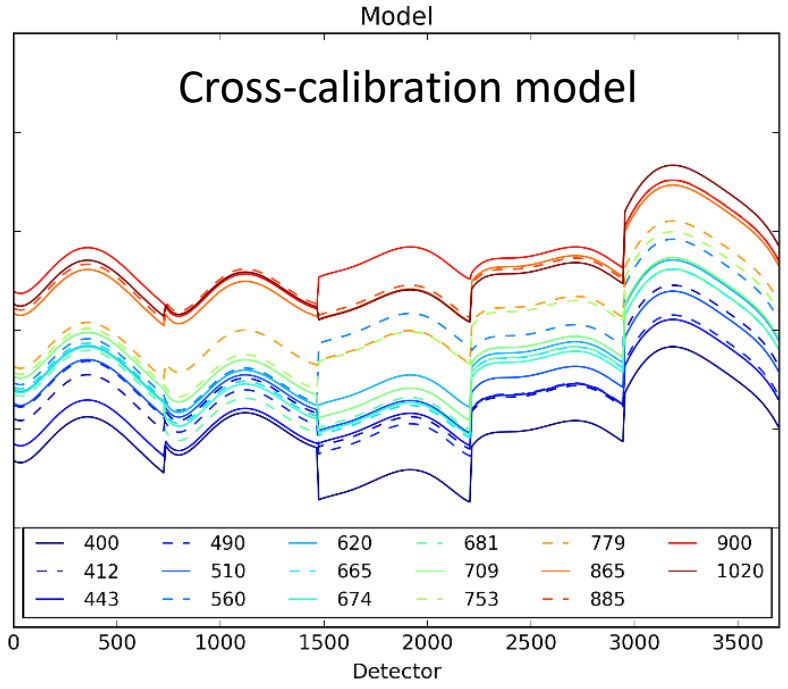


OLCI-A vs OLCI-B
Spectral characterisation
(e.g.) 865 nm

L1 tandem comparisons, synthesis



1-2%

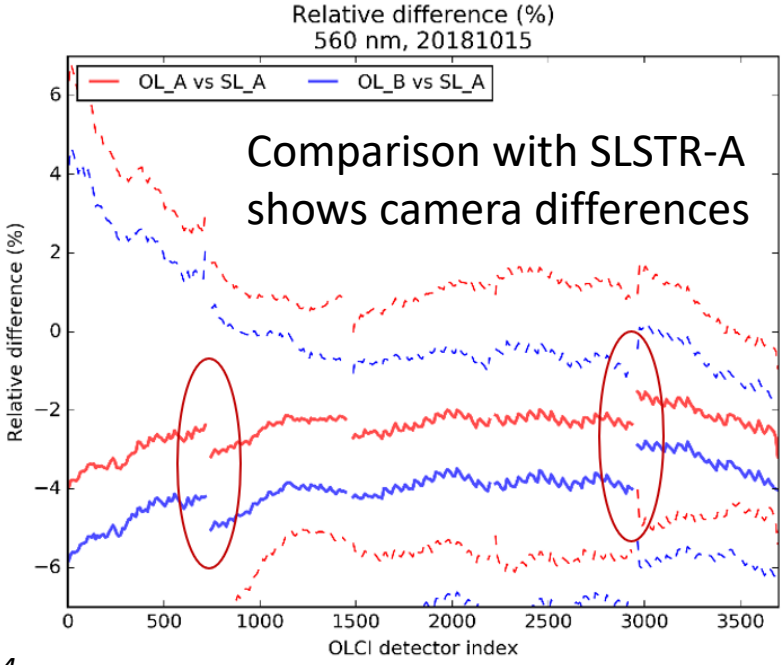


OLCI-A is found brighter than OLCI-B between 1 (in the red) and 2% (in the blue)

L1 conclusions: which reference ?

- Question of the harmonisation reference: new investigations provides evidence of ACT radiometric misalignment for both OLCI-A and OLCI-B
- Affects more cameras 1/2 and 4/5 interfaces
- Very similar for both OLCI

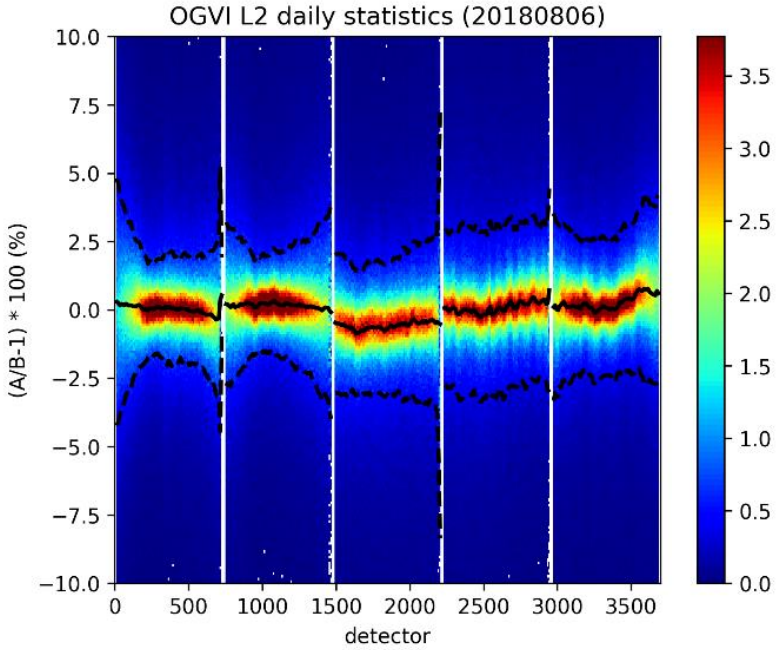
→ **which reference if none is better ?**

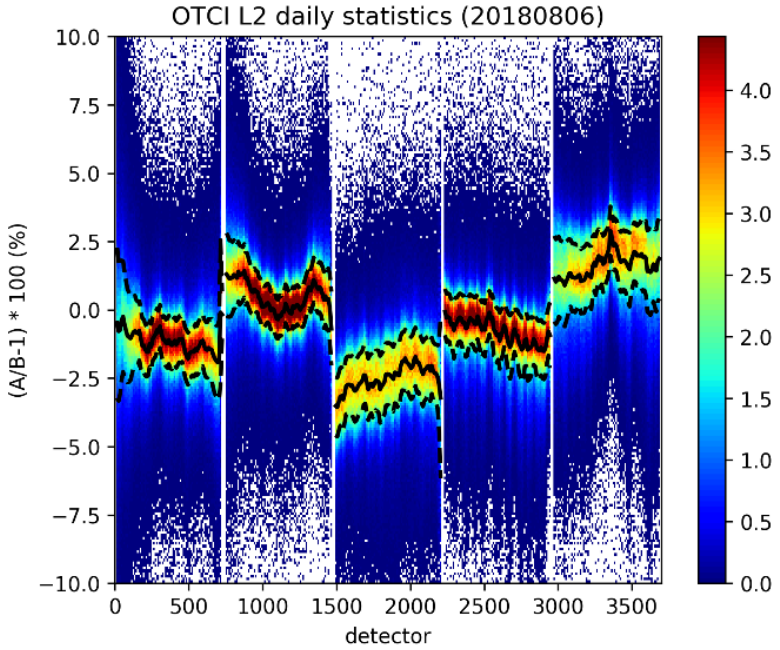


All details in:

Lamquin, N.; Clerc, S.; Bourg, L.; Donlon, C. OLCI A/B Tandem Phase Analysis, Part 1: Level 1 Homogenisation and Harmonisation. Remote Sens. 2020, 12, 1804.

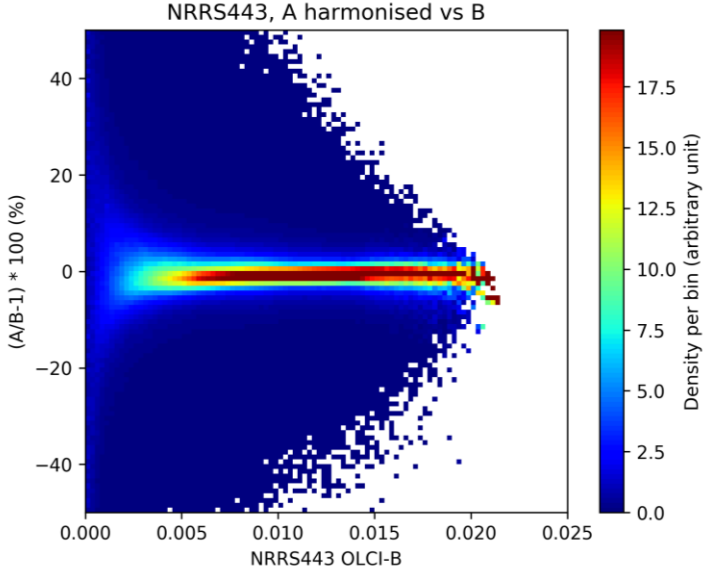
L2 tandem results (Land: OGVI, OTCI)



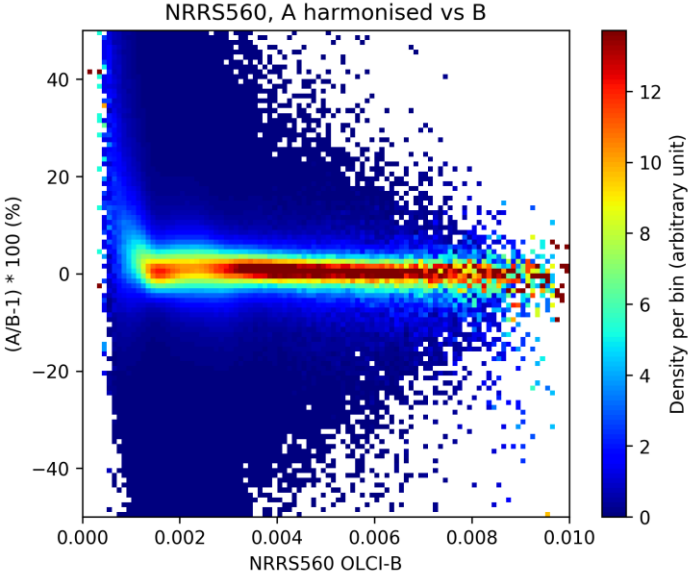


After harmonisation: OGVI alignment, OTCI residuals → need to revise the spectral adjustment@709nm

L2 tandem results (Water: nRrs, Chl)



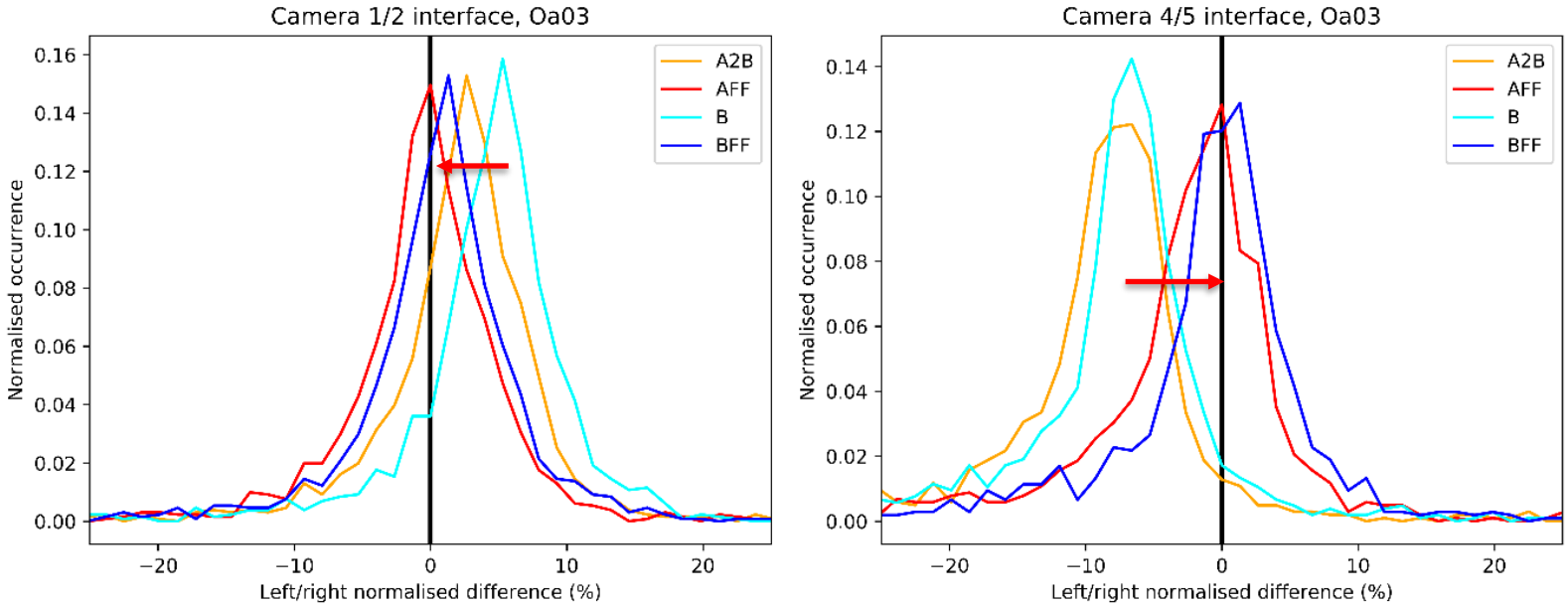
Quantity	Mean rel. diff. (%)
nRrs 400	-0.4
nRrs 412	-1.2
nRrs 443	0.3
nRrs 490	0.9
nRrs 510	1.0
nRrs 560	1.6
Chl	4.0



After harmonisation: nRrs alignment provides room for joint OLCI « system of systems » SVC

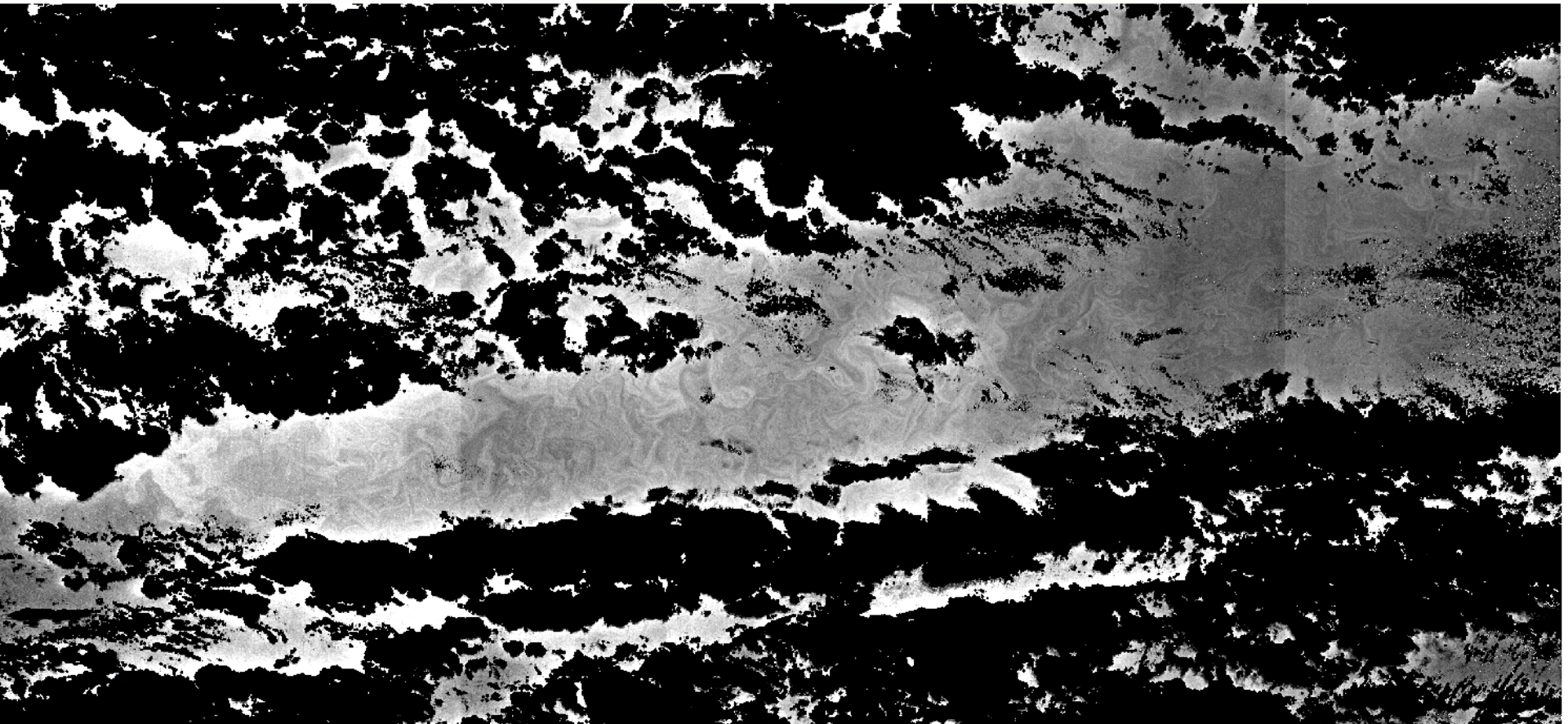
more in: *Lamquin, N.; Déru, A.; Clerc, S.; Bourg, L.; Donlon, C. OLCI A/B Tandem Phase Analysis, Part 2: Benefits of Sensors Harmonisation for Level 2 Products. Remote Sens. 2020, 12, 2702.*

Impact of camera radiometric differences

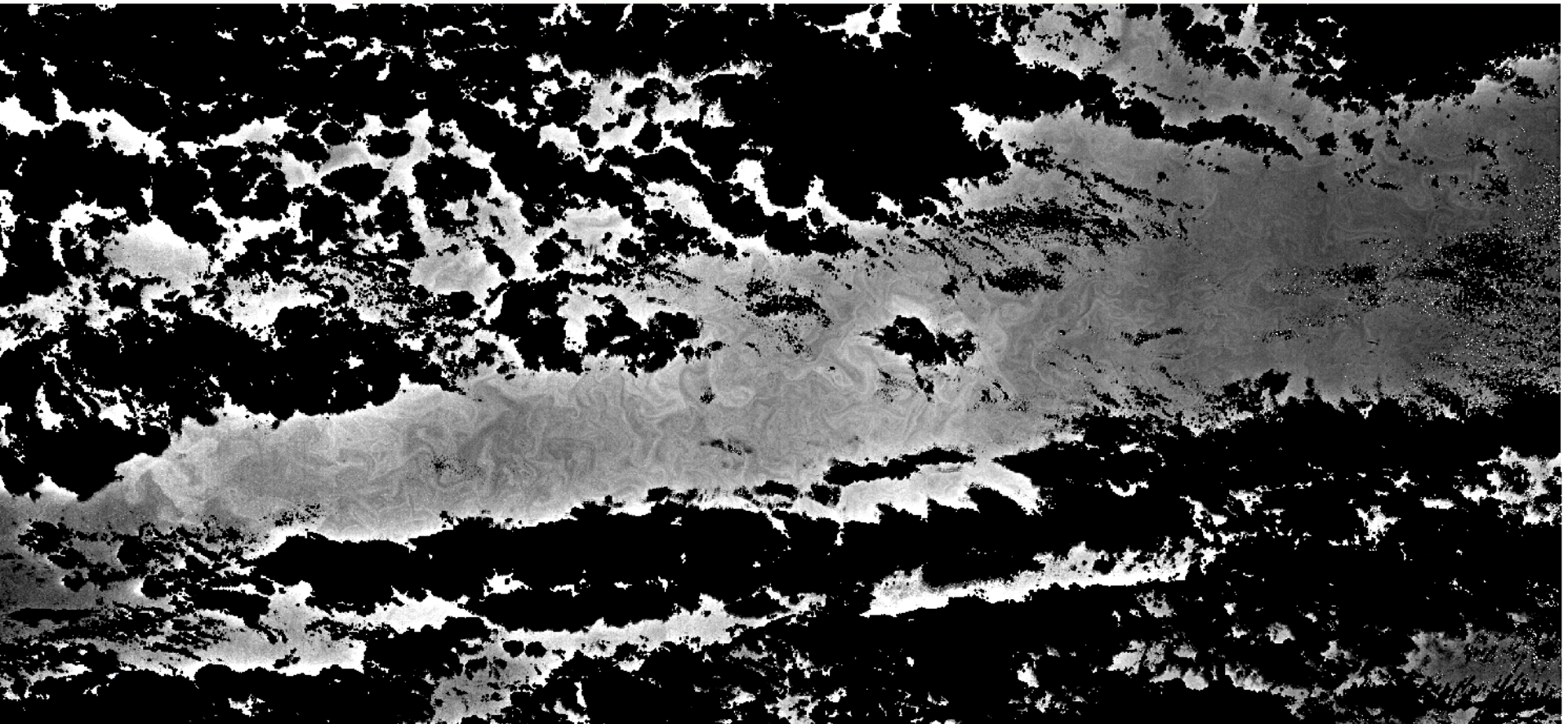


Statistics of nRrs differences at camera interfaces shows the benefit of performing flat-fielding (at L1)

Example of an OLCI water reflectance image



Same after applying empirical flat-fielding



What after tandem phase ?

- The tandem phase provides a “truth” cross-calibration at one “moment” (summer 2018)
- Only can we rely on the independent calibration of each instrument to propagate this “truth” to time *t*

- The tandem phase allows to develop and validate methodologies for the cross-calibration verification of OLCI-A and OLCI-B
- A new methodology based on the observation of Deep Convective Clouds has been investigated for monitoring of the cross-calibration after tandem

Using DCCs to monitor OLCI A/B cross-cal

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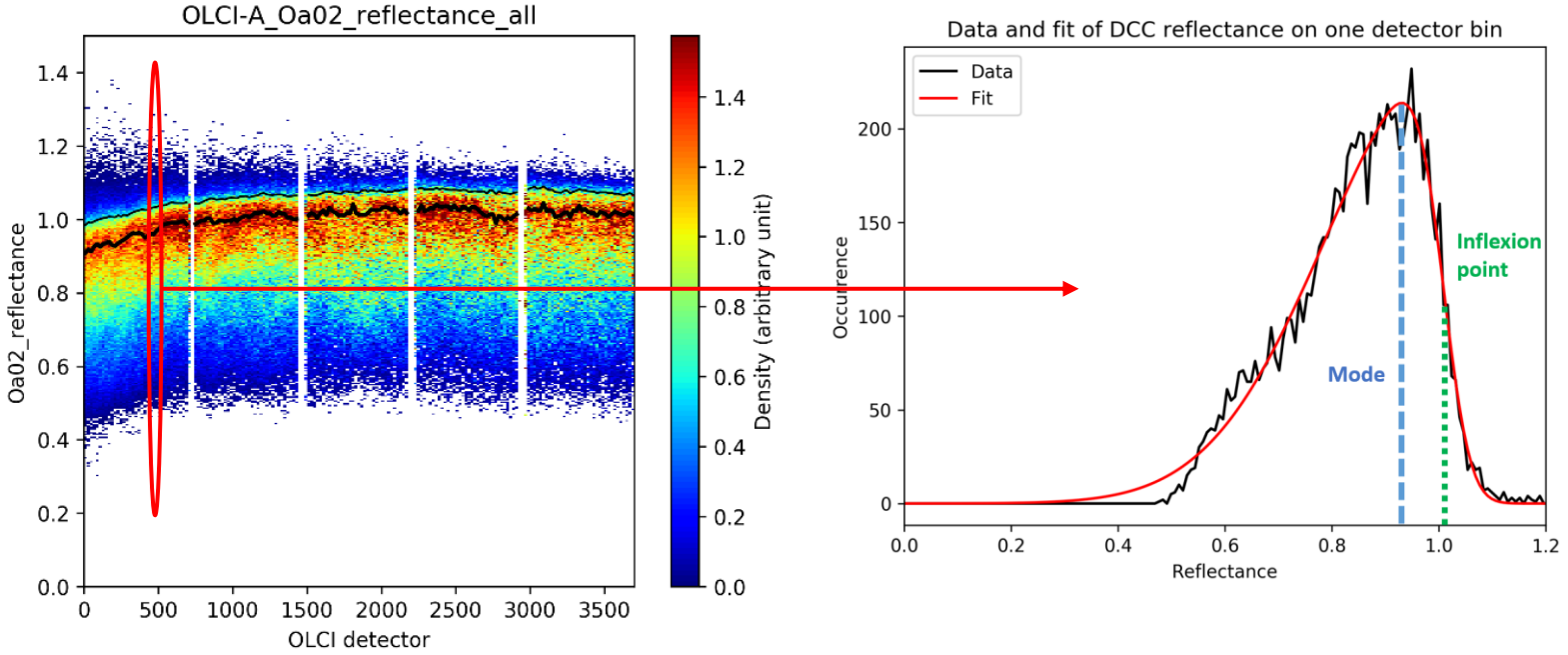

Deep Convective Clouds reflectance statistics are used as absolute calibration indicators for both OLCI-A and OLCI-B, independently. Methodology is first developed from tandem data, then applied far from tandem.

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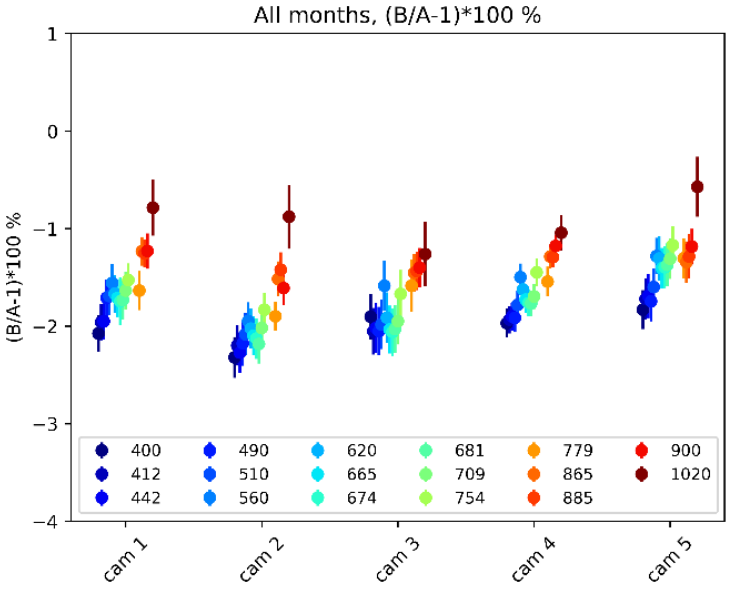
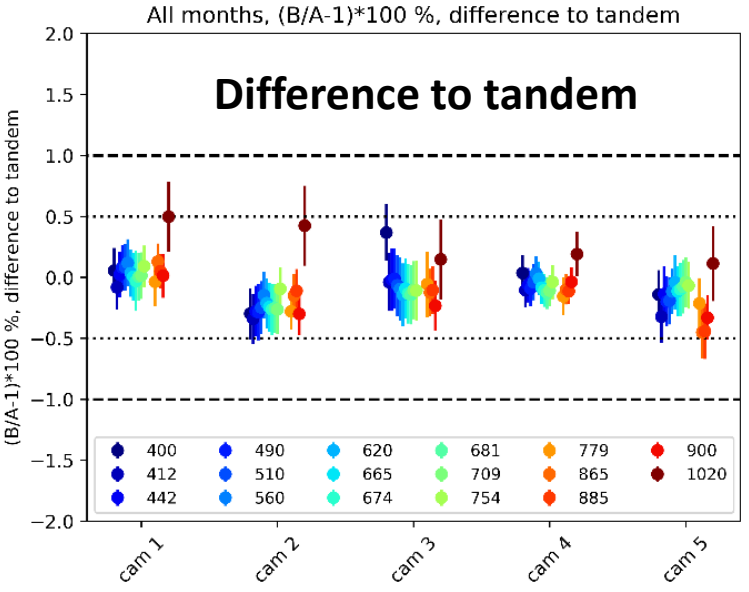
DCC cross-cal, far from tandem





Far from tandem, comparisons between OLCI-A and OLCI-B statistics are close to differences found from the tandem analysis (to the exception of Oa01 and Oa21). All details and explanations in:

Lamquin, N.; Bourg, L.; Clerc, S.; Donlon, C. OLCI A/B Tandem Phase Analysis, Part 3: Post-Tandem Monitoring of Cross-Calibration from Statistics of Deep Convective Clouds Observations. Remote Sens. 2020, 12, 3105.

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Final words

- Sentinel-3 tandem phase is a unique opportunity to increase our knowledge in sensors differences, their uncertainties, their complementarity (see *Clerc et al., 2020*)
- OLCI A vs B differences investigated at L1 with very high level of details (<0.5%)
- Much more investigations have been made (see *Hammond et al., 2020*) and even more can be pursued, notably exploiting the drift phase
- A very valuable dataset to test (potentially new) algorithms

Thank you