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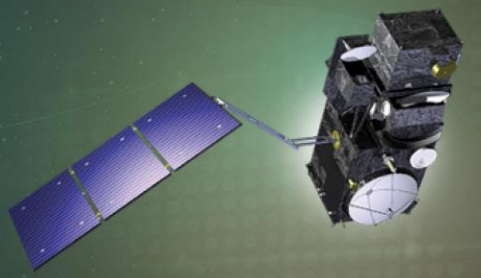

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Comparison of level 1 B data from OLCI-A and OLCI-B in FLEX configuration during Sentinel 3 tandem mission using a transfer function for quality control

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Introduction

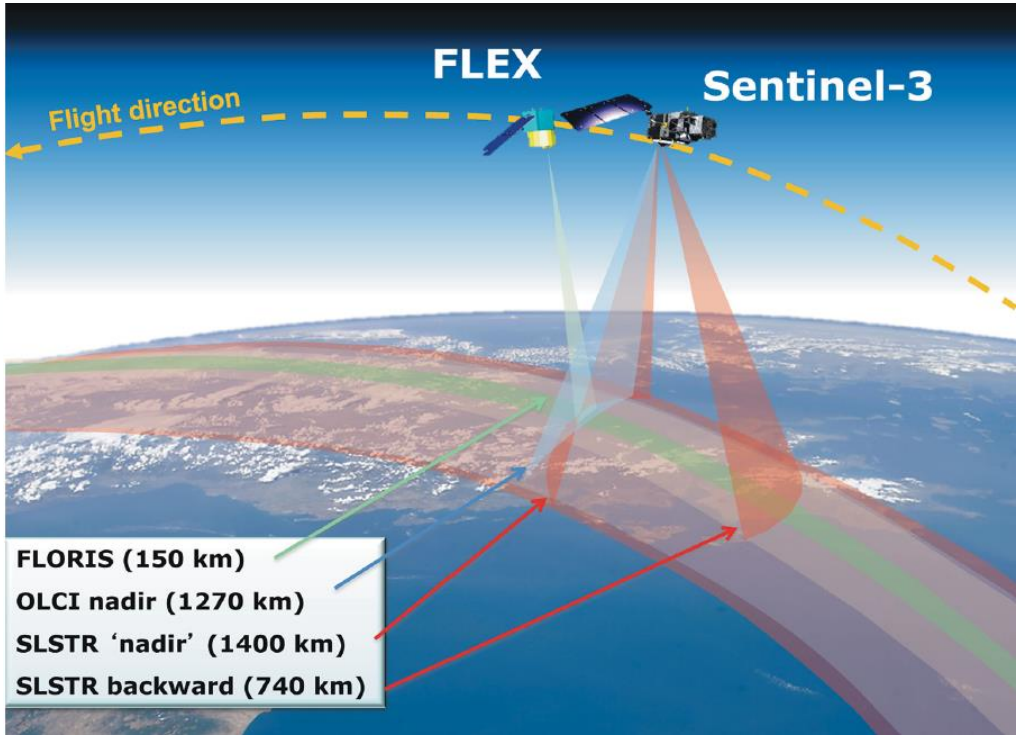


Fig. 1: Tandem mission of FLEX and Sentinel-3 with planned launch of FLEX in 2025 taken from Drusch et al. 2017

- Sentinel 3A/B tandem mission 2018 used to create a FLEX like data set
- OLCI-B was reprogrammed to mimic FLEX
- 24 acquisition scene of 5 minutes in FR over central Europe between Mai-August 2018
- unique test data set
- quality control by compare reprogrammed OLCI-B with OLCI-A

Data set

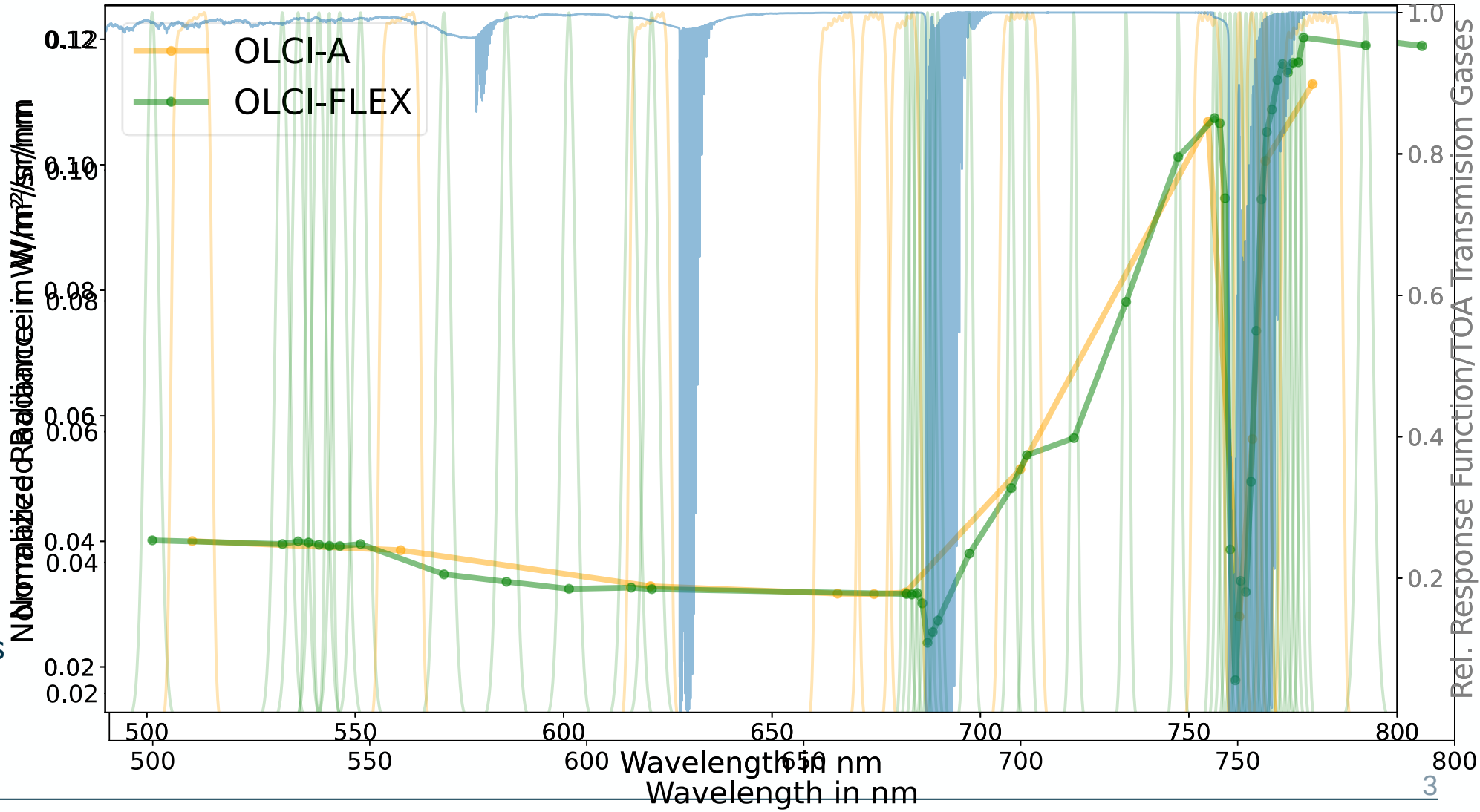
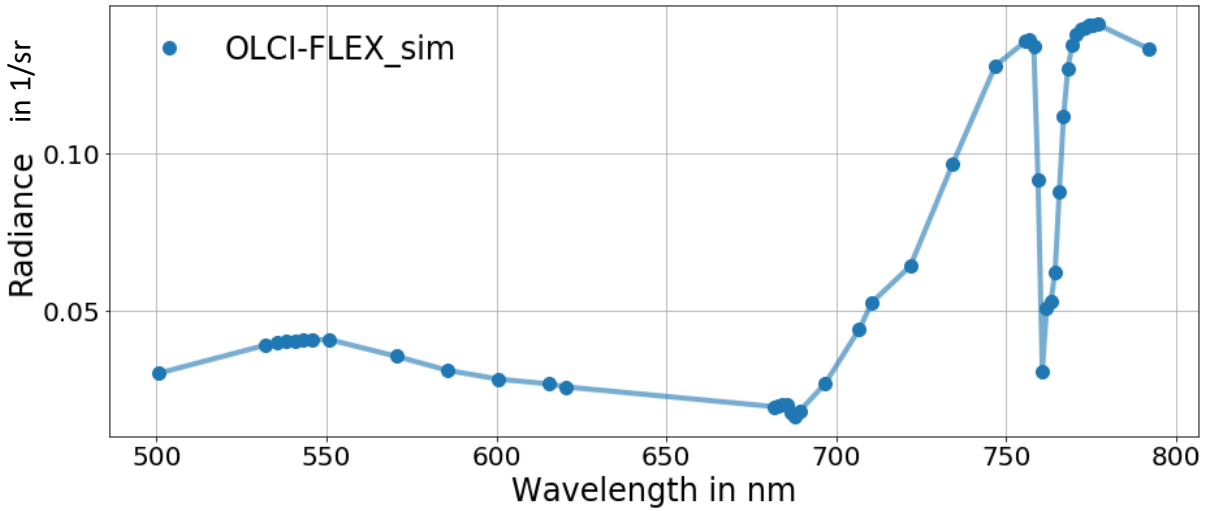
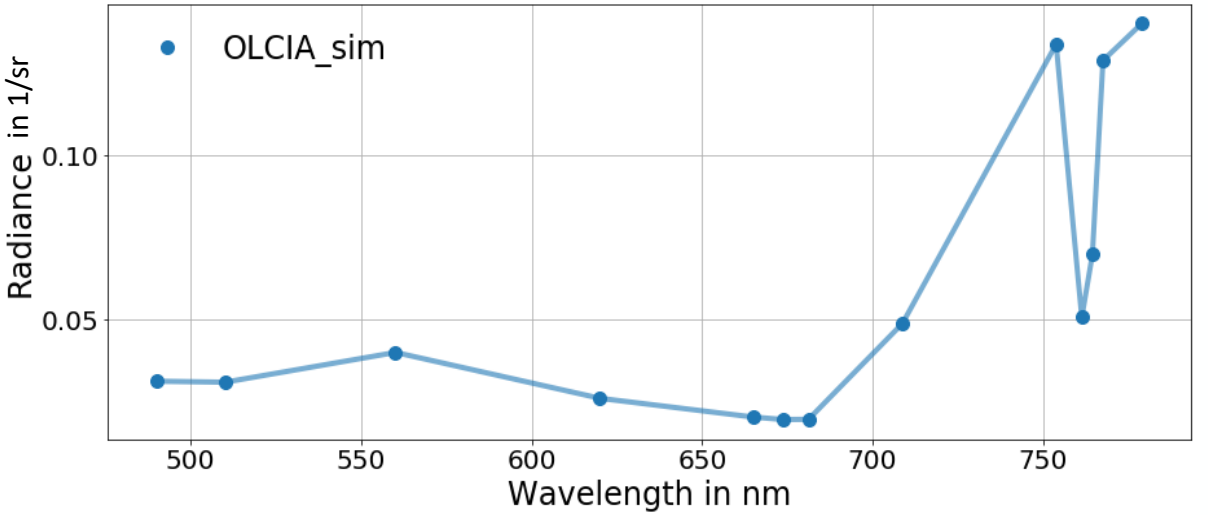


Fig. 2: TOA signal of OLCI-A and OLCI-FLEX with spectral response function in shaded colours and TOA transmission by atmospheric gases without H2O and O3

Transfer function

Instrument 1 ⇔ Instrument 2



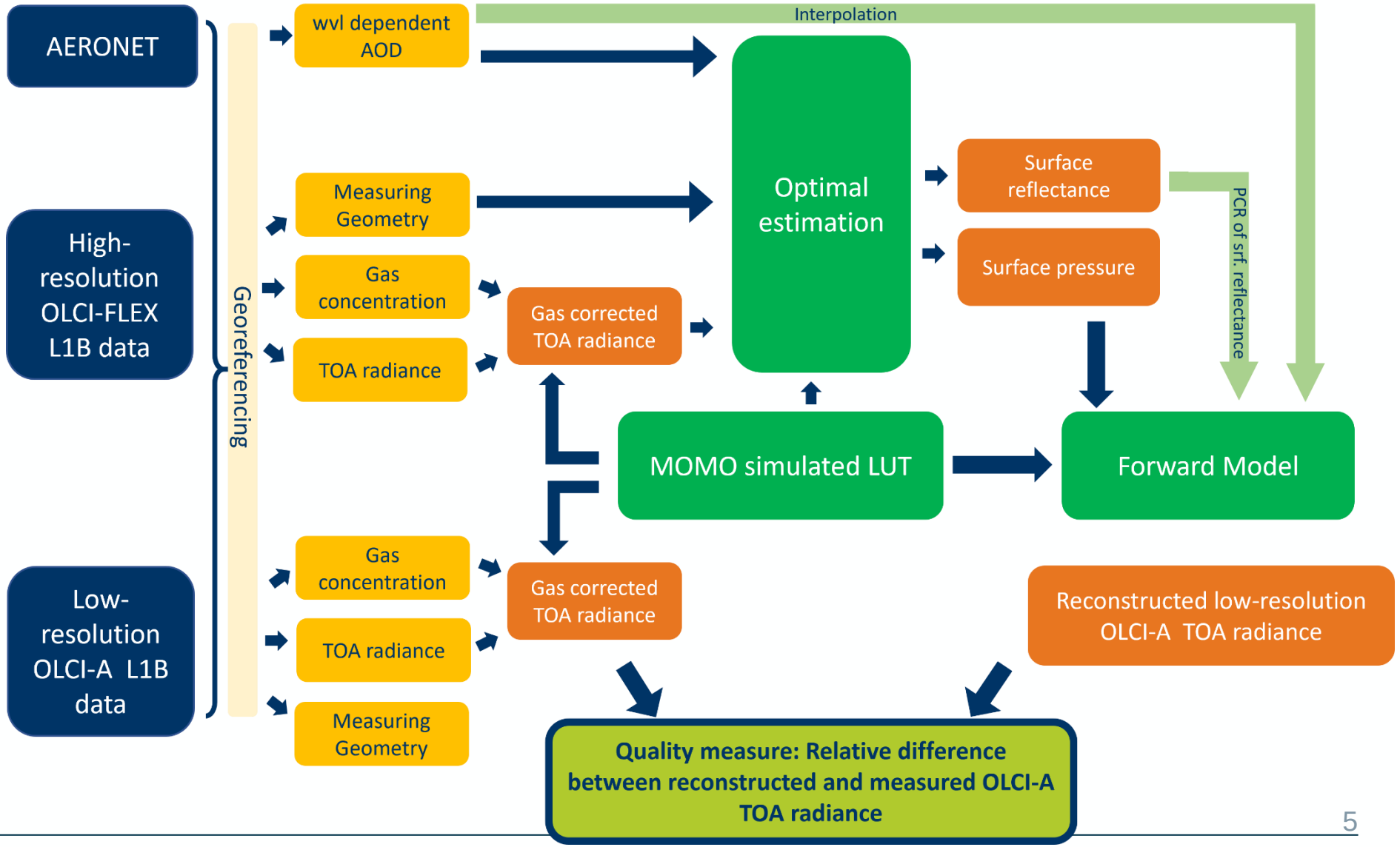


Find state of atmosphere and surface that explains measurement of instrument 1 → Transfer atmosphere and surface parameter to settings of instrument 2 → Forward simulate measurement of instrument 2

Transfer function

Preprocessing:

- reprojection on common regular grid
- selection of valid pixels → land pixels, IDEPIX cloud mask, unsaturated
- radiance is normalized
- utilisation of temporal model for central wavelength (instead of L1b data) → R. Preusker



Transfer function for pixel

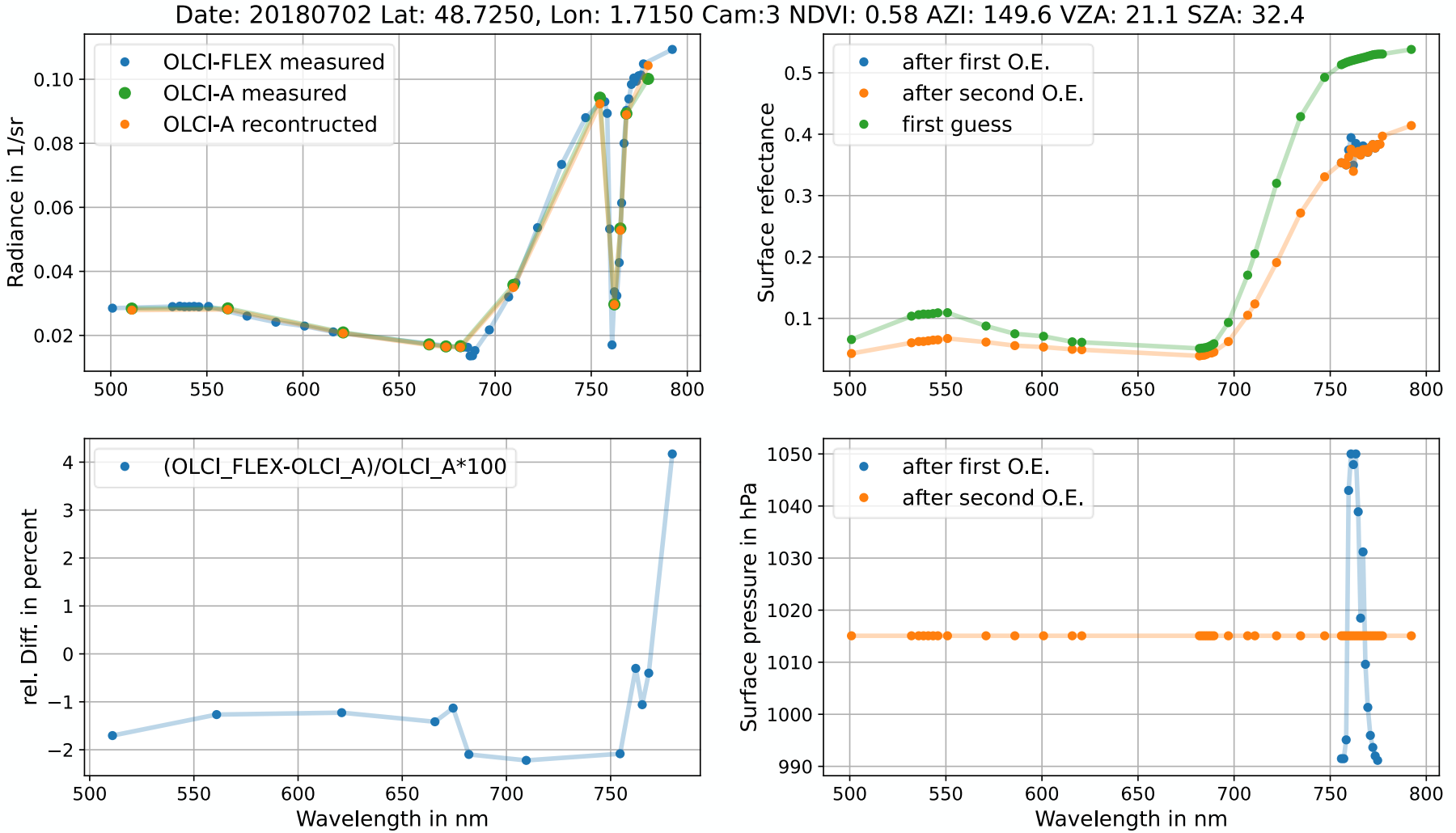
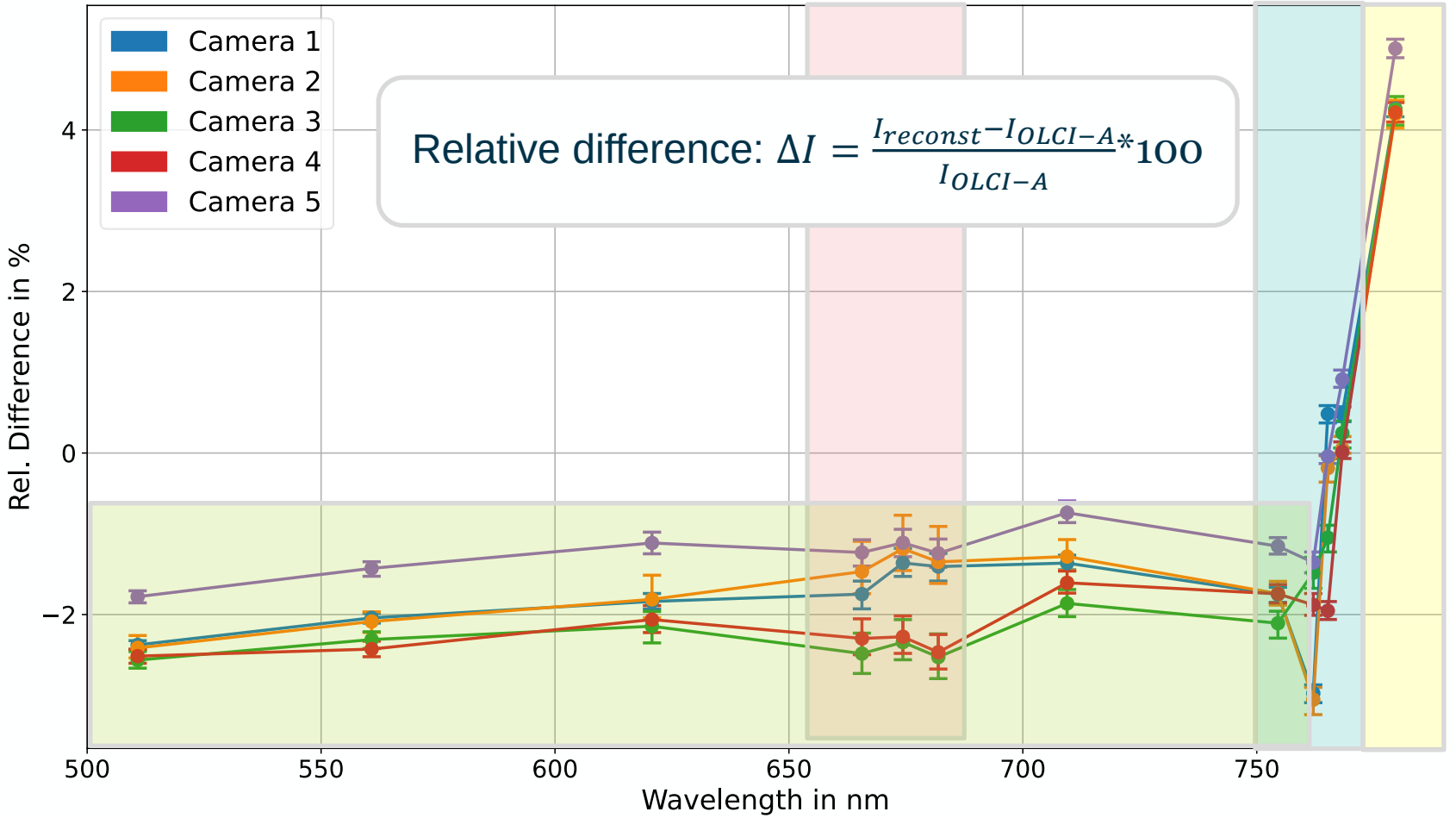


Fig. 3: Input and output of transfer function for one pixel west of Paris on 02/07/2018.

Transfer function for median over camera



OLCI-FLEX about 2 % darker than OLCI-A
→ absolute calibration

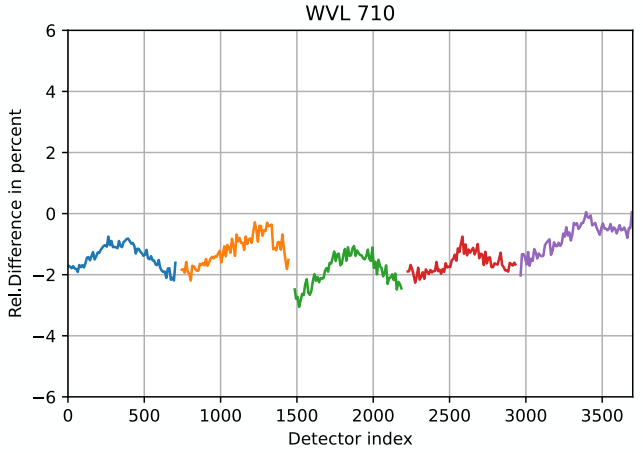
OLCI-FLEX about 5 % brighter
→ e.g. processing of OLCI-FLEX L0-L1

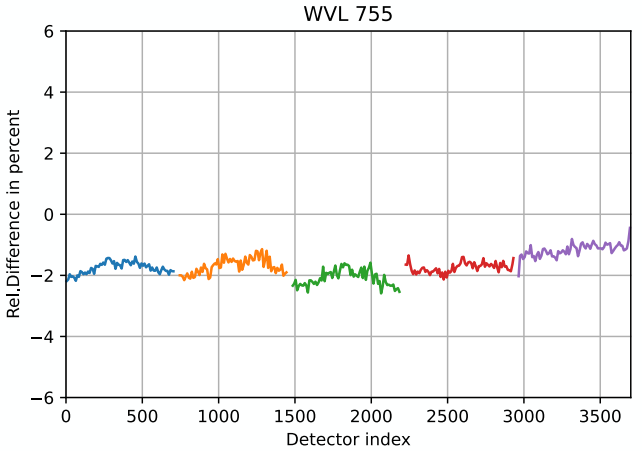
Oxygen absorption band: spectral characterization important

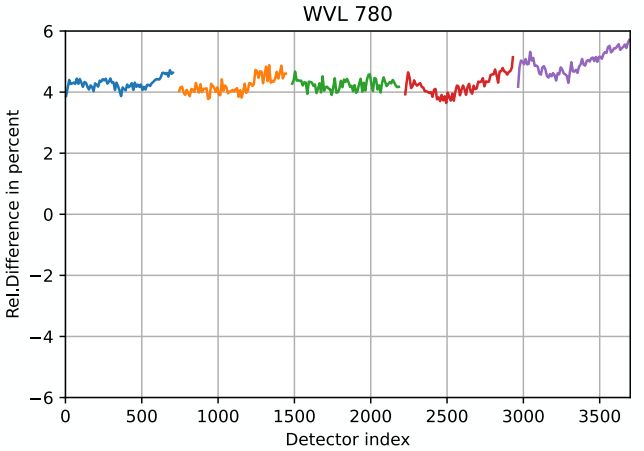
Lack of information in vegetated surface reflectance
→ additional information (PCR) for FLEX won't be necessary

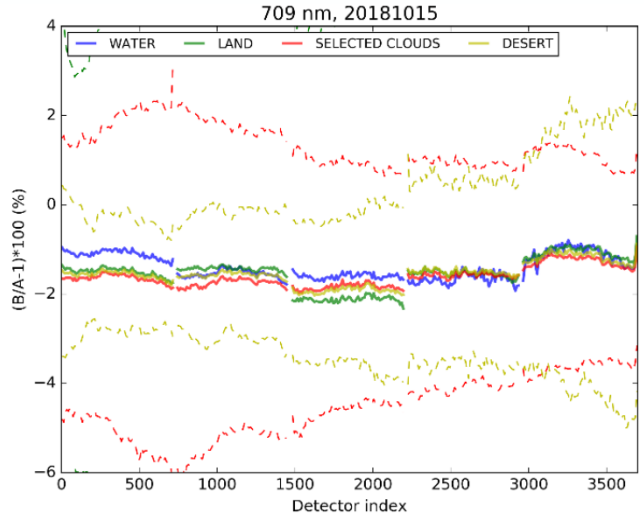
Fig. 4: Median rel. difference for each camera of one acquisition scene (02/07/2018). Data set for each camera about 200 000 pixel.

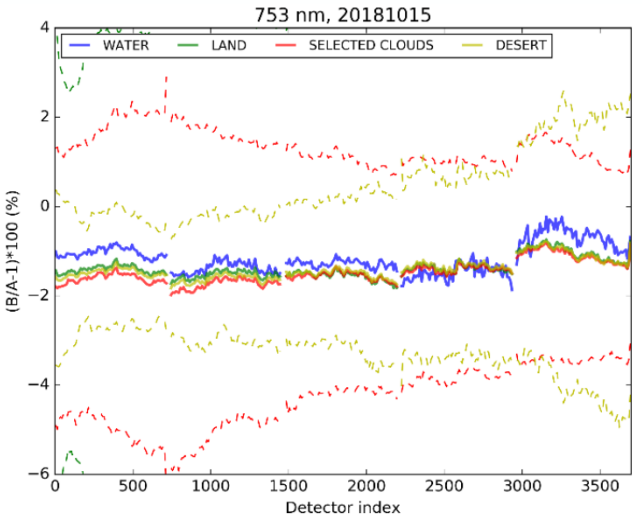
Transfer function for median over detector index

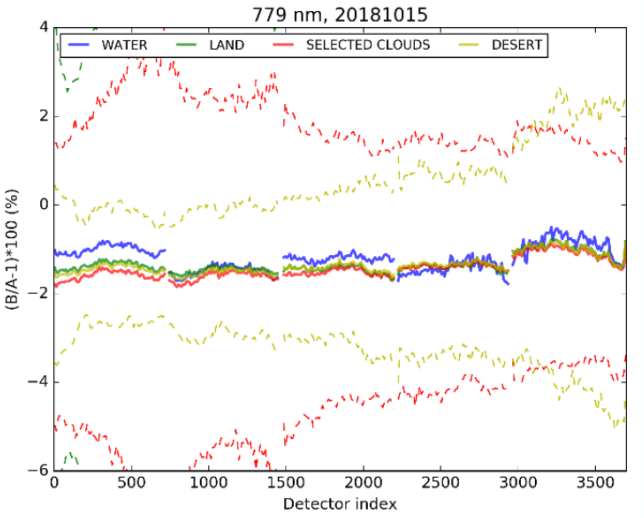












From *Lamquin, N., Clerc, S., Bourg, L., & Donlon, C. (2020). OLCI A/B tandem phase analysis, part 1: Level 1 homogenisation and harmonisation. Remote Sensing, 12(11), 1804*

Summary

- quality control of new OLCI-FLEX data set possible with transfer function
- comparison sensitive to absolute calibration error and other issues
- greatest source of uncertainty is description of surface reflectance and geographic miss match → no pixel by pixel evaluation by statistical
- further application: comparison with ground based measurements

OLCI-FLEX about 2 % darker than OLCI-A
→ absolute calibration

OLCI-FLEX about 5 % brighter
→ e.g. processing of OLCI-FLEX L0-L1

Oxygen absorption band: band characterization important

Lack of information in vegetated surface reflectance
→ additional information (PCR) for FLEX won't be necessary

Further application: Compare TOA and BOA radiance

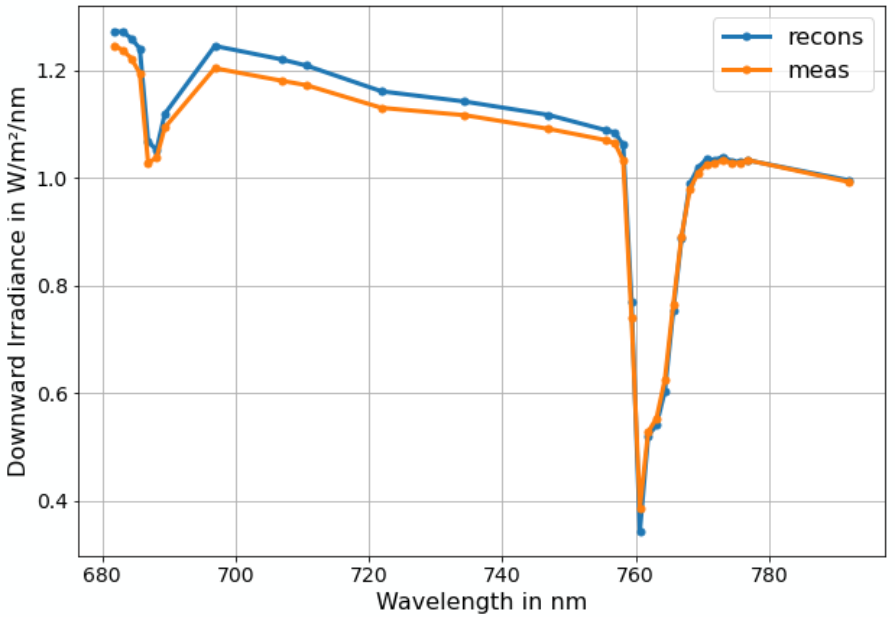
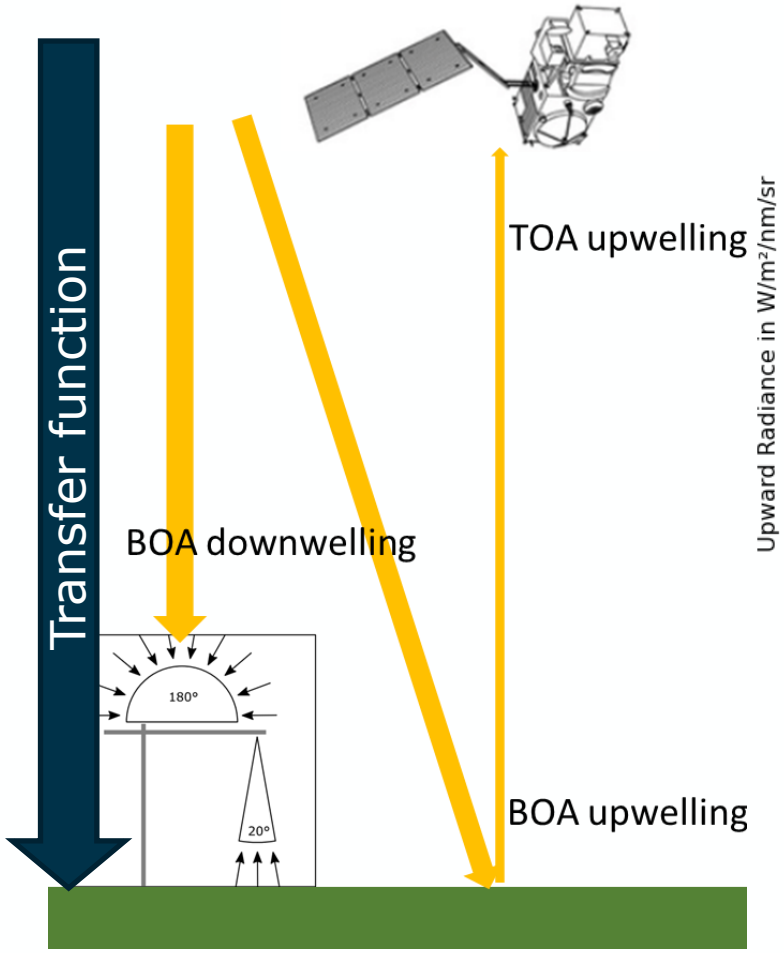


Fig. 5: FLOX spectrum of downward irradiance in OHP France 10/07/2018 and reconstructed from OLCI-FLEX.



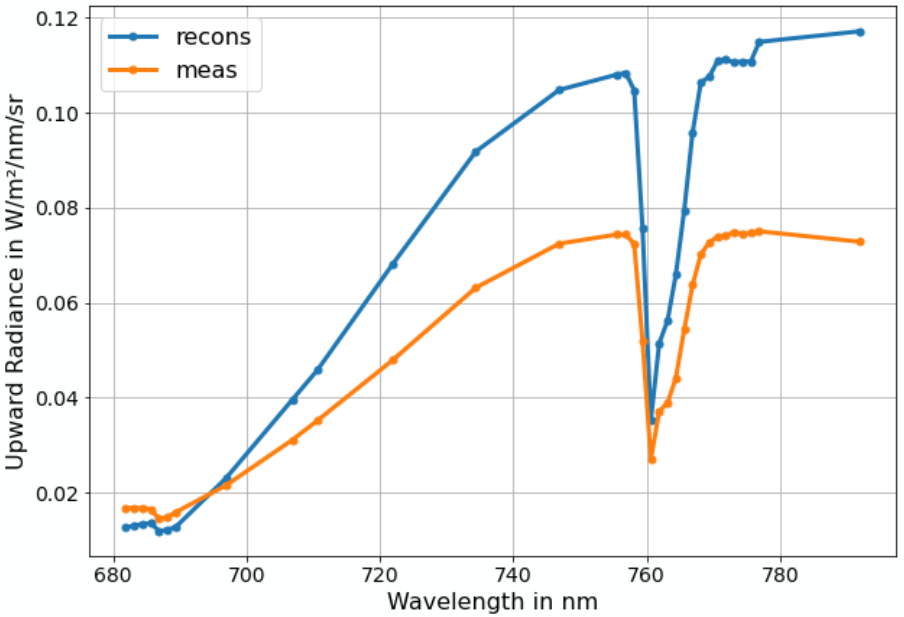
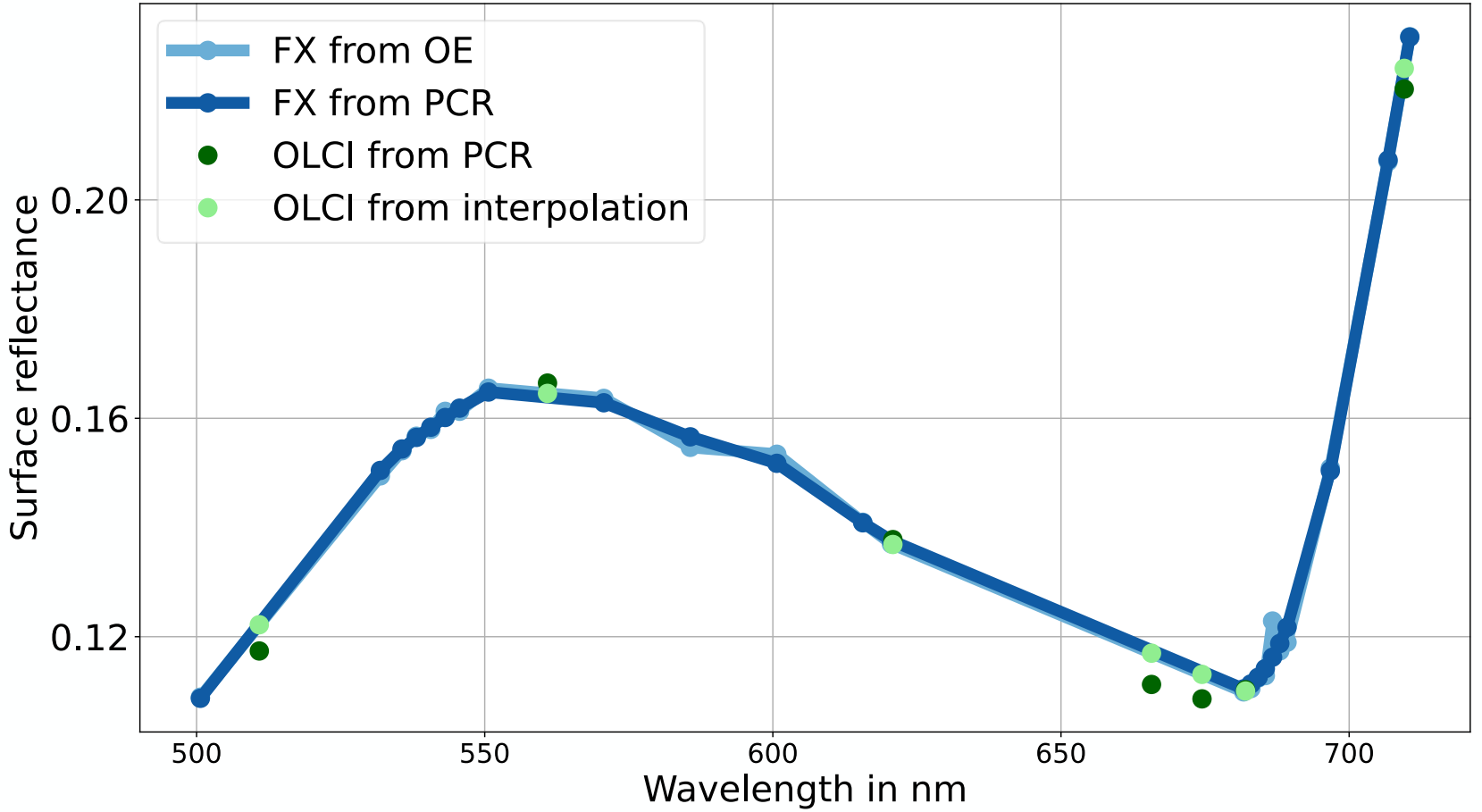


Fig. 6: FLOX spectrum of upward radiance in OHP France 10/07/2018 and reconstructed from OLCI-FLEX.

Principle Component Regression



- External information necessary due to lack of information
- high resolution surface reflectance spectra from ASTER and USGS are decomposed in principle components (PC)
- Linear combination of PC can reconstruct any natural surface reflectance spectrum
- Applied on OLCI-FLEX data
- With found PCs OLCI-A SR spectrum found

Fig. 7: Surface reflectance spectrum retrieved from OLCI-FLEX and reconstructed at OLCI-A bands with PCR and interpolation.