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Uncertainty estimation of Sentinel-3B tandem data for OLCI-B in the FLEX configuration

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During the tandem phase of Sentinel-3A and B the channels of the spectrometer of the Ocean and Land Imager (OLCI) on Sentinel 3-B were reprogrammed to imitate measurements of ESA's 8th Earth Explorer mission FLEX [1]. FLEX is designed to retrieve the complete fluorescence spectrum from the high resolution visible spectrum and to quantify the contribution of the two photocycles in green plants [2]. Fluorescence is a valuable proxy of plant photosynthesis activity [3], [4]. By measuring the emitted light of plants on satellites, plant distribution and state can be monitored on a global scale.

The reprogrammed OLCI-B measurements consist of 45 bands between 500 and 800 nm with a bandwidth of about 1.8 nm (FWHM). The spectral and radiometric calibration of the 45 bands has not the same level of maturity as the one for the nominal setting, thus their radiometric uncertainty needs to be quantified. This is done by comparing the 45 FLEX-like bands with the co-located nominal 21 bands of OLCI on Sentinel-3A. The comparison is realised using a transfer function based on radiative transfer simulations. In a first step surface and atmosphere parameters are estimated from the OLCI-B FLEX-like measurements, that explain the measurements. The second step simulates the according OLCI-A measurements at nominal band settings and compares them with the real measurements made by OLCI-A.

This study serves also as a precursor experiment for the FLEX mission, where the radiometric calibration of FLEX will be verified using co-registered OLCI-A (or B) measurements. Based on this study the strategy for the uncertainty of the FLEX intensity measurements will be developed and tested.

The uncertainty estimation is a key factor of the Fluorescence retrieval as the Fluorescence contribution to the top of atmosphere signal is very small. To distinguish between signal and noise, the uncertainty must be kept as small as possible. Additionally, the uncertainty serves as input parameter for subsequent retrieval algorithms.

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