

Assessment of S3 OLCI chlorophyll-a products in Belgian waters

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Context

In Belgium, remote sensing chlorophyll-a (Chl-a) products are officially used to report on the eutrophication state for European Directives which requires a quality assessment of products. However, retrieving accurate Chl-a from remote sensing reflectance is very challenging as waters are also impacted by non algal particulate scattering. We propose here a first assessment of OLCI chlorophyll-a products in Belgium waters. First, Chl-a OLCI products are compared with other type of Chl-a estimates derived from different algorithms (i.e.: OC5, red-edge) and with climatological patterns. Then, a quality flagging procedure is presented and tested on OLCI Chl-a product. This procedure provides essential information on the applicability of different Chl-a algorithms and allows to create merged products.

Main results

- (1) CHL_NN S3 product doesn't reproduce spring bloom and displays a spatio-temporal variability very close to TSM_NN. No confidence is given to this product.
- (2) During spring bloom, in turbid waters, OC4Me and OC5 algorithms seems to underestimate Chl-a. Gons et al. (2002) algorithm might be more accurate.
- (3) During winter, OC4Me seems to overestimate Chl-a. OC5 estimations are closer to expected values (in situ climatologies).
- (4) Gons et al. (2002) algorithm is highly impacted by radiometric noise. Hence, this algorithm is only valid in very turbid waters and when Chl-a signal is high.
- (5) The reflectance-based procedure developed for Chl-a quality flags in turbid waters produces coherent merging products. However, this procedure is only valid for clear and turbid waters and doesn't apply in high CDOM waters.

Comparison of Chl-a S3 products with insitu climatologies

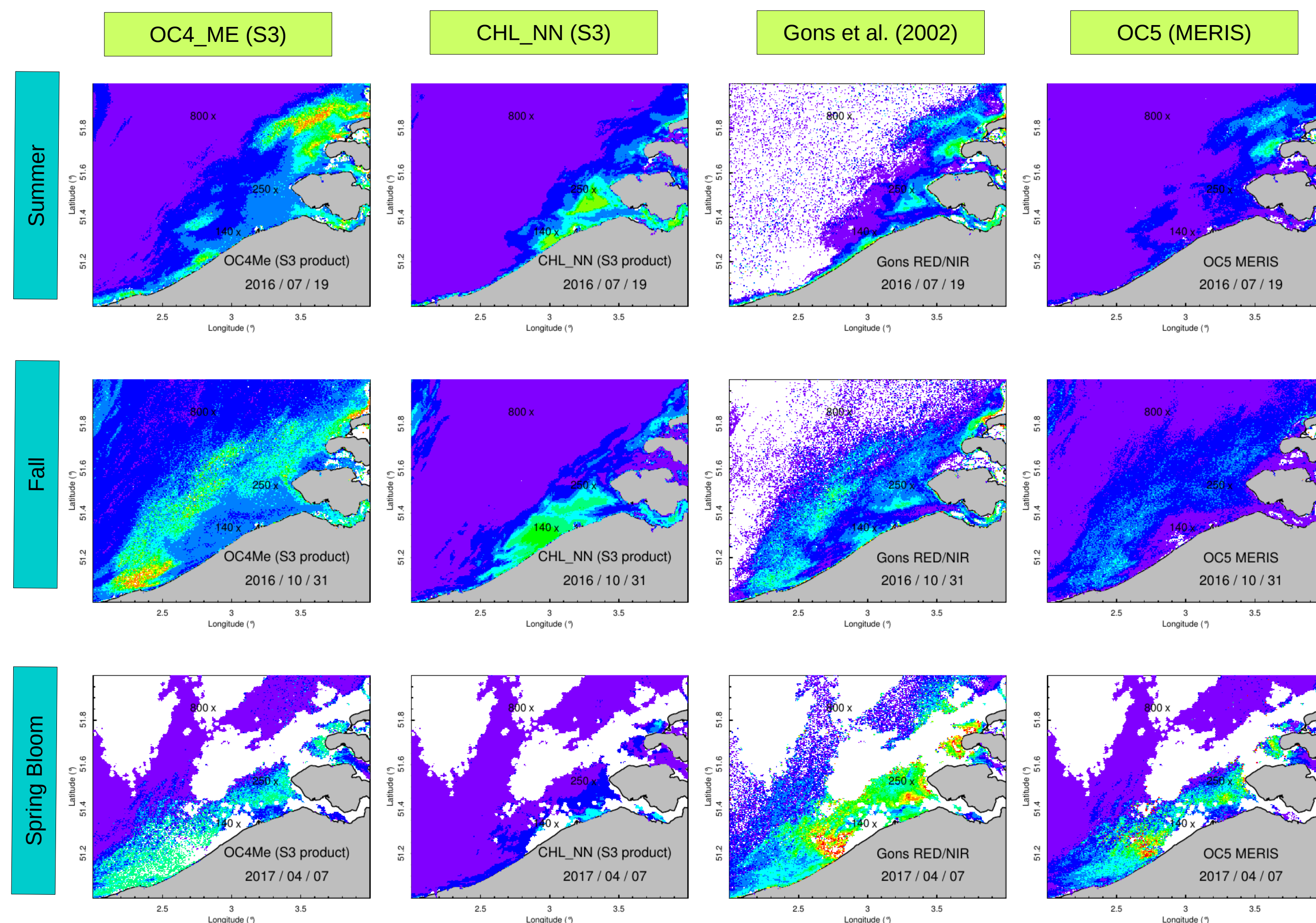
The following sentinel 3 Chl-a products are compared:

- ◆ OC4Me (delivered in S3 L2 product)
- ◆ CHL_NN (neural network, delivered in S3 L2 product)
- ◆ OC5 (Gohin et al., 2002); OC5 algorithm with MERIS LUT is applied to S3 reflectances.
- ◆ Gons et al. (2002) Red/NIR algorithm is applied to S3 reflectances.

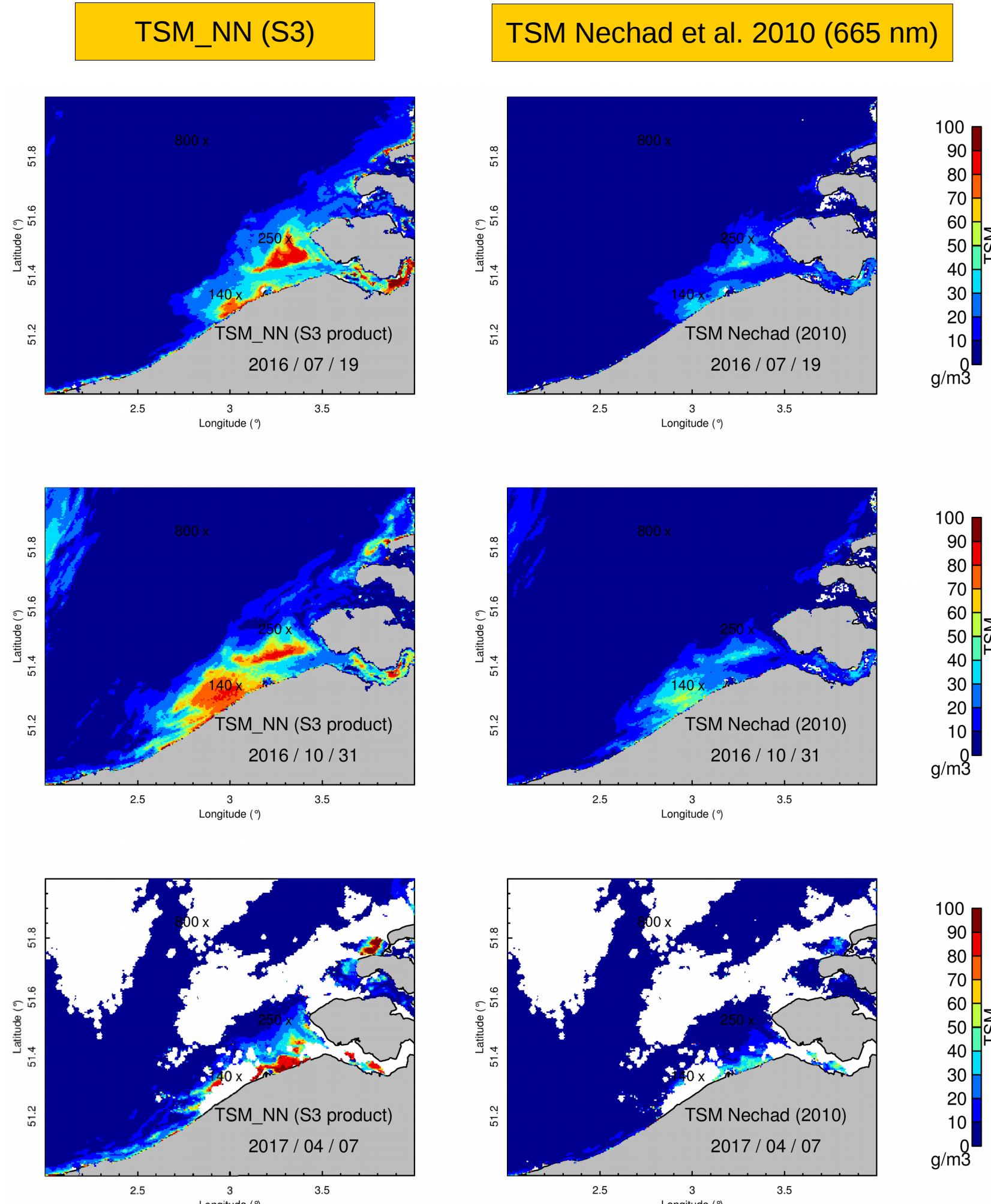
The following sentinel 3 TSM products are compared:

- ◆ TSM_NN (neural network, delivered in S3 L2 product)
- ◆ TSM calculated with Nechad et al., (2010) algorithm for band 665 nm.

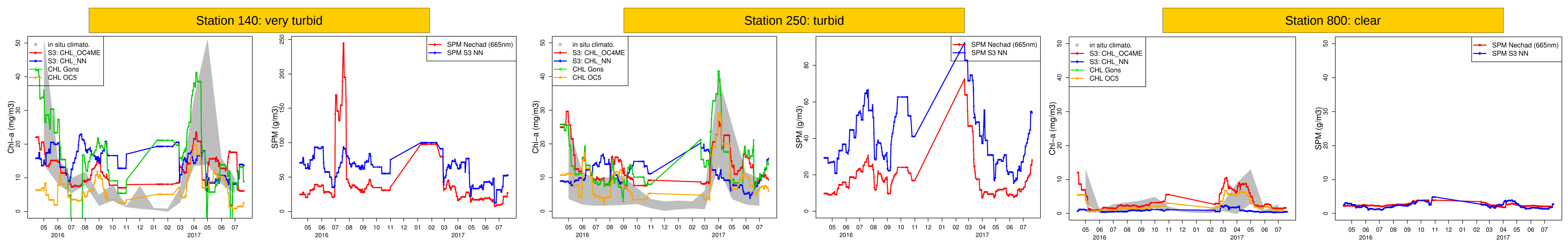
Comparison of different Chl-a products



Comparison of TSM products

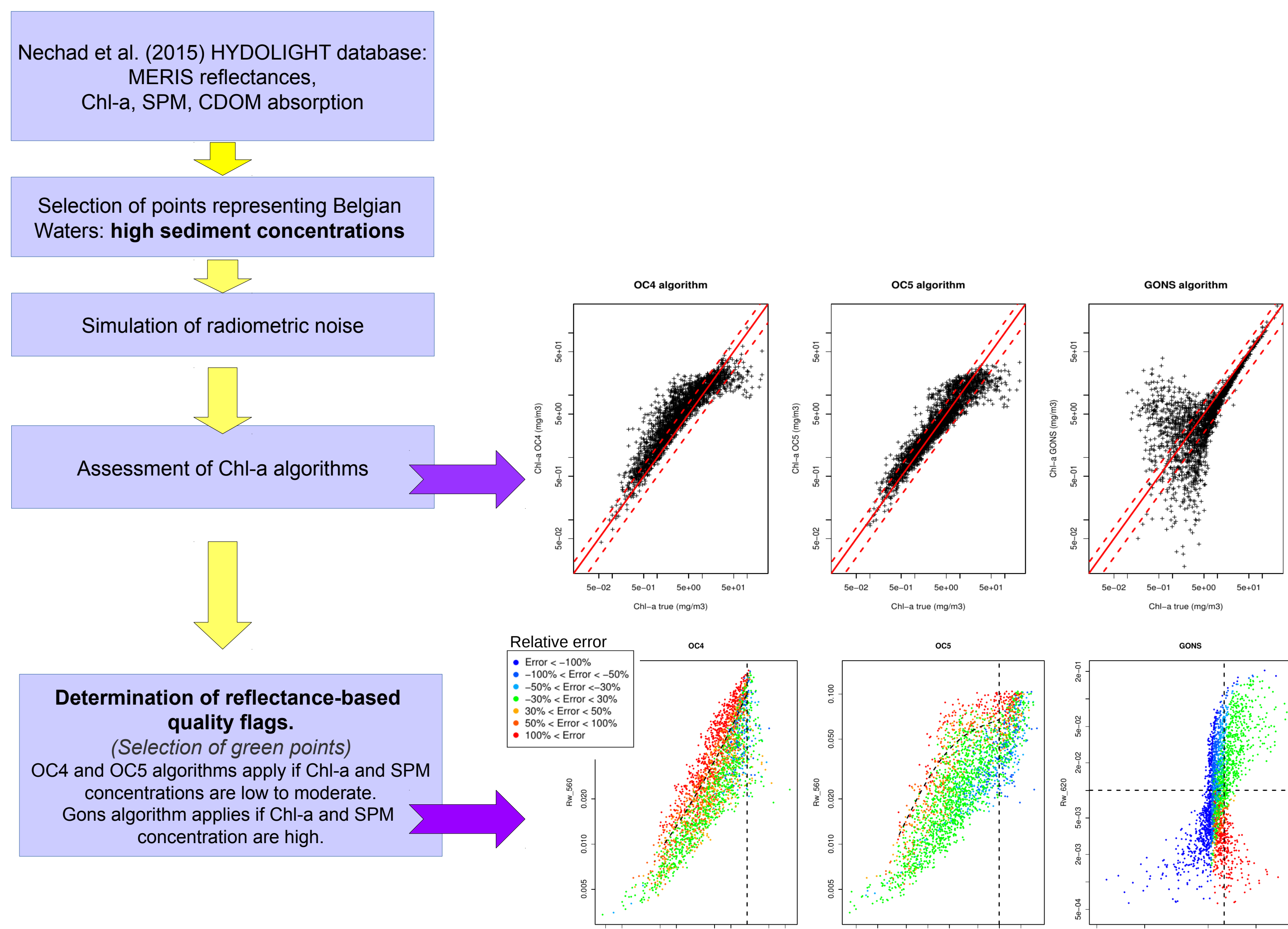


Comparison of S3 time-series with in situ Chl-a climatologies



Application to Sentinel 3 / OLCI images in the Belgian waters

The validity range of Chl-a algorithms OC4Me, OC5 and Gons et al., (2002) in their MERIS configuration are tested with the synthetical database produced by Nechad et al. (2015) with HYDROLIGHT. Then, reflectance based criterias are defined to provide quality flags.



Application to Sentinel-3 L2 products

