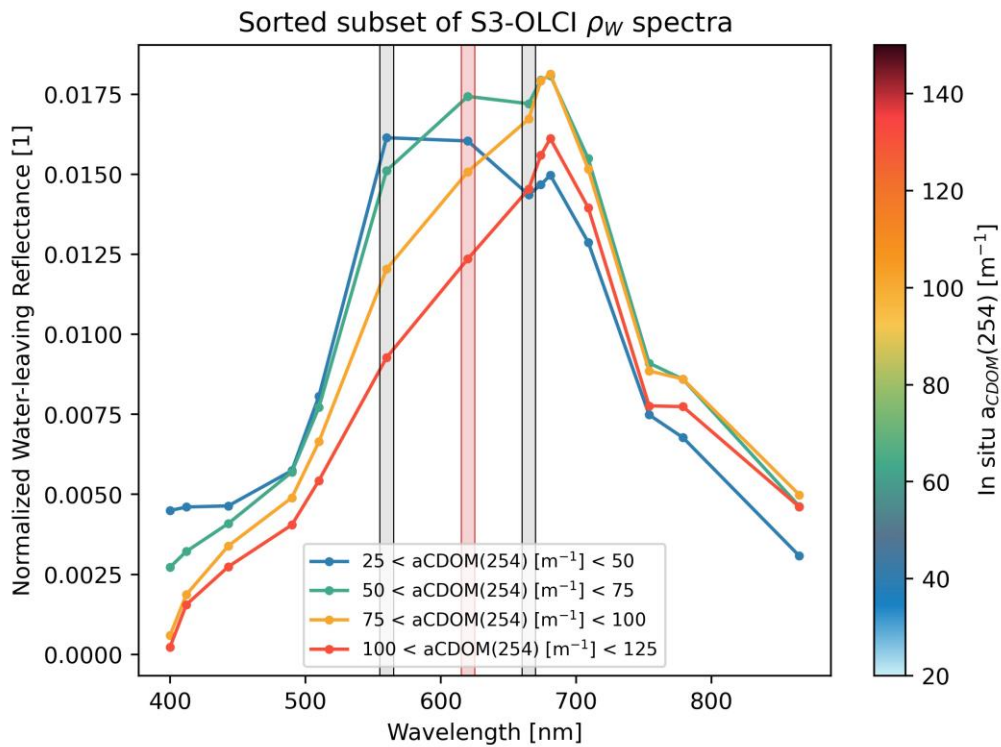
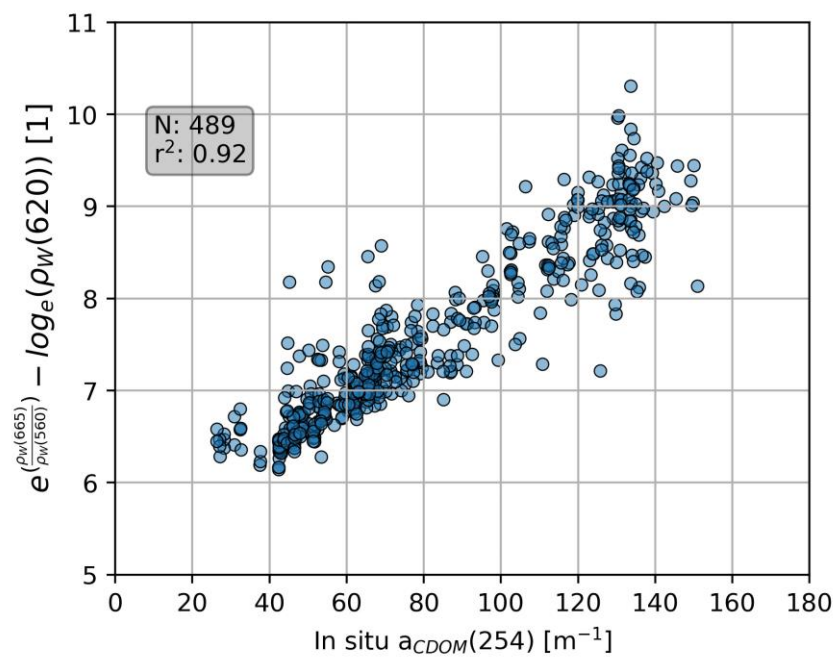


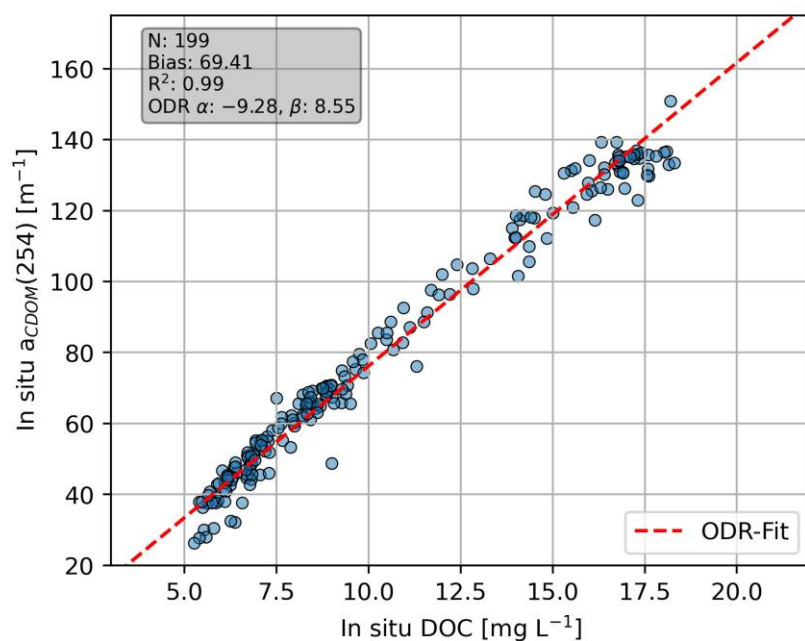
## Supplementary Figure Captions:



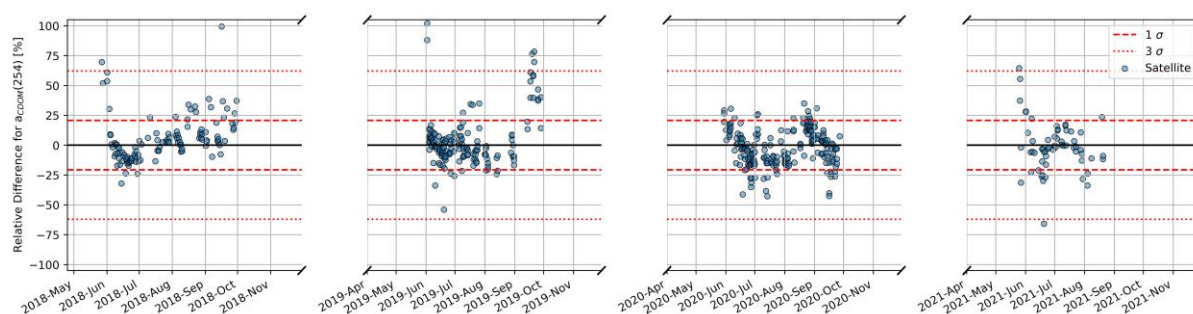
**Supplementary Figure 1:** Median  $\rho_w$  spectra for four classes covering the observed range of in situ DOC concentration. The gray shaded areas mark the bands at 560 and 665 nm, the red shaded area marks the band at 620 nm.



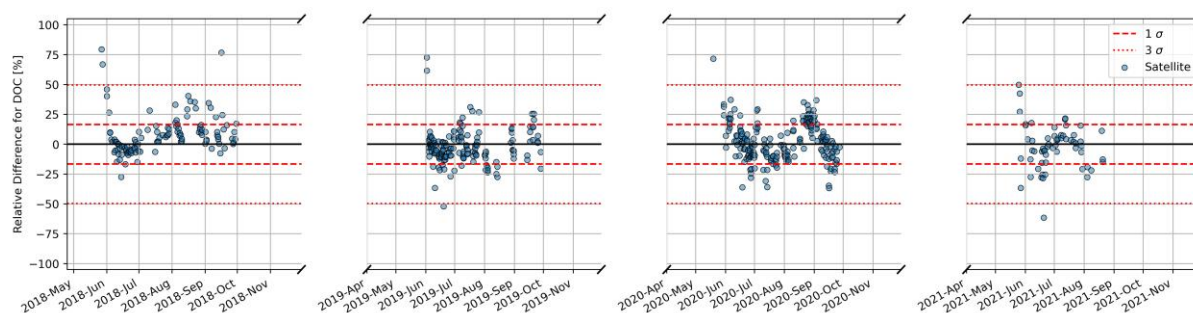
**Supplementary Figure 2:** Scatterplot of the chosen reflectance ratio and reflectance against in situ  $a_{CDOM}(254)$ .



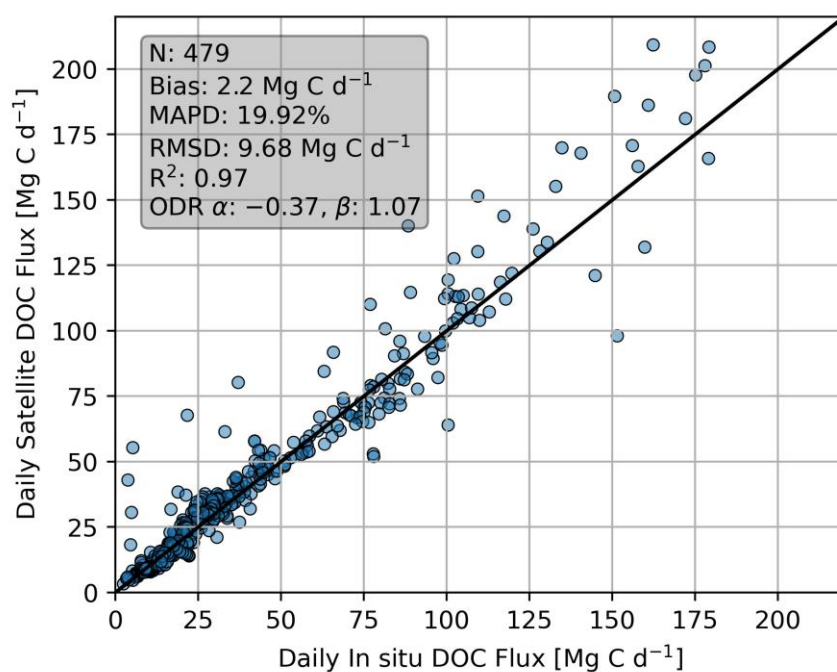
**Supplementary Figure 3:** In situ measured  $a_{CDOM}(254)$  against in situ measured DOC for the ice-free period. The line marks the ODR linear fit used in the later conversion of  $a_{CDOM}(254)$  to concentrations of DOC.



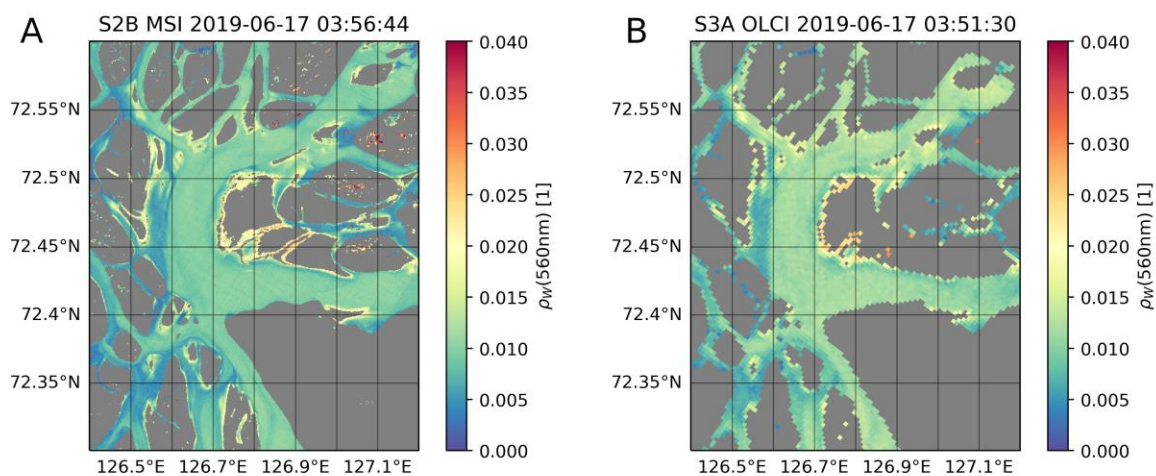
**Supplementary Figure 4:** Time series showing the relative error of  $a_{CDOM}(254)_{SAT}$  compared to in situ measured  $a_{CDOM}(254)$ .



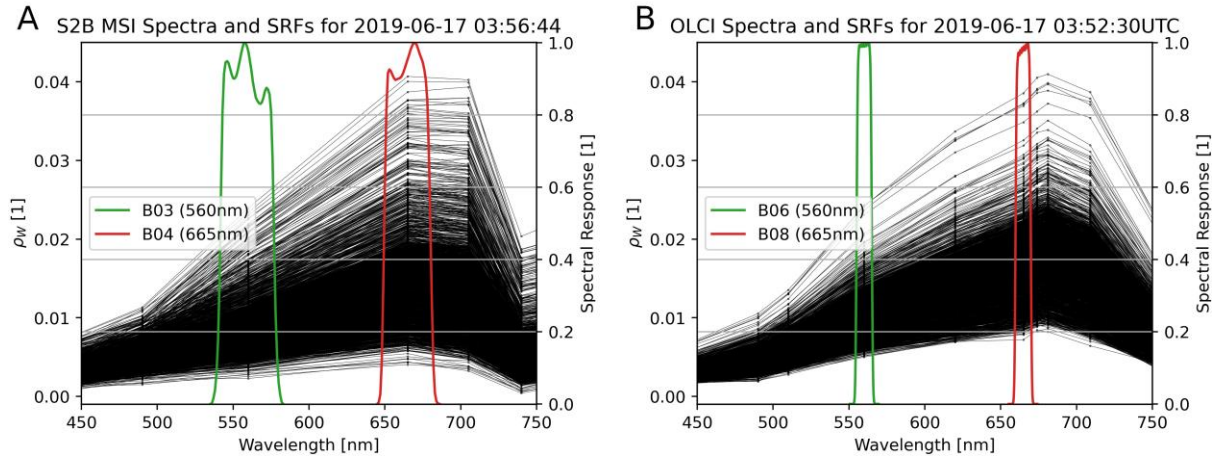
**Supplementary Figure 5:** Time series showing the relative error of  $DOC_{SAT}$  compared to in situ measured DOC.



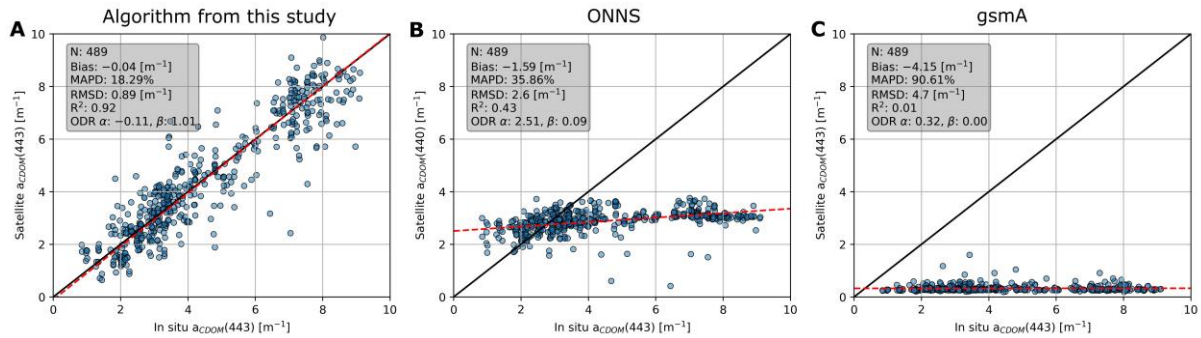
**Supplementary Figure 6:** Interpolated, daily DOC flux from satellite observations against DOC flux from *in situ* measurements.



**Supplementary Figure 7:** Comparison of  $\rho_w$  at 560 nm observed by 1) Sentinel-2 MSI and 2) Sentinel-3 OLCI within 5 minutes of one another. Both images were processed using POLYMER.



**Supplementary Figure 8:** Comparison of  $\rho_w$  spectra observed by 1) Sentinel-2B MSI and 2) Sentinel-3 OLCI within 5 minutes of one another. In green and red the associated SRFs of MSI and OLCI at 560 and 665 nm respectively are marked.



**Supplementary Figure 9:** Comparison of  $a_{CDOM}(\lambda)_{SAT}$  vs.  $a_{CDOM}(\lambda)_{in situ}$  using A) the retrieval presented in this study (Eq. 8), B) ONNS [Hieronymi et al. 2017] and C) gsma [Matsuoka et al., 2013].

## References:

- Hieronymi, M., Müller, D., and Doerffer, R. (2017). The OLCI neural network swarm (ONNS): A bio-geo-optical algorithm for open ocean and coastal waters. *Front. Mar. Sci.* 4 (MAY). doi: [10.3389/fmars.2017.00140](https://doi.org/10.3389/fmars.2017.00140)
- Matsuoka, A., Hooker, S. B., Bricaud, A., Gentili, B., and Babin, M. (2013). Estimating absorption coefficients of colored dissolved organic matter (CDOM) using a semi-analytical algorithm for southern Beaufort Sea waters: Application to deriving concentrations of dissolved organic carbon from space. *Biogeosciences* 10 (2), 917–927. doi: [10.5194/bg-10-917-2013](https://doi.org/10.5194/bg-10-917-2013)