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The potential of Sentinel-5P's high spectral resolution for ocean applications

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Hyperspectral satellite data are a source of the top of the atmosphere radiance signal which can be used for novel algorithms aimed for observations of marine ecosystems and the light-lit ocean. Atmospheric sensors such as SCIAMACHY, GOME-2 and OMI have proven in the past to yield valuable information on phytoplankton diversity, sun-induced marine fluorescence, and the underwater light field, however at low coverage and spatial resolution. Within the ESA Sentinel-5p+ Innovation themes, we explore TROPOMI's potential for deriving the diffuse attenuation coefficient and the quantification of different phytoplankton groups. As commonly used for the retrieval of atmospheric trace gases, we apply the differential optical absorption spectroscopy combined with radiative transfer modeling (RTM) to infer these oceanic parameters. We present results on a measure describing the diminishing of incoming radiation in the ocean with depth, the diffuse attenuation coefficient KD. KD is derived by the retrieval of the vibrational Raman scattering signal in backscattered radiances measured by TROPOMI in the UV and spectral range which then is further converted to the associated KD using RTM. The final TROMPOMI KD data sets resolved for three spectral regions (UV-B+short wave UV-A, UV-A and short blue) agree well with in situ data sampled during an expedition with RV Polarstern in 2018 in the Atlantic Ocean. Further, KD-blue compared to wavelength-converted KD(490nm) products (OLCI-A and the merged OC-CCI) from common, multispectral, ocean color sensors, show that differences between the three data sets are within uncertainties given for the OC-CCI product. Our study shows for the first time KD products for the UV spectral range retrieved from space based data. TROPOMI KD-blue results have higher quality and much higher spatial coverage and resolution than previous ones from SCIAMACHY, GOME-2 and OMI. Additionally, first results on TROPOMI's potential for retrieving three phytoplankton groups will be shown and compared to similar multispectral phytoplankton group data for the same time period and ocean region as shown for TROPOMI KD.