Synergistic Exploitation of Hyper- and Multispectral Sentinel-Measurements to determine Phytoplankton Functional Types at Best Spatial and Temporal Resolution (SynSenPFT)

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**Abstract**

To overcome the short-comings of current multi-spectral PFT products (supplying either knowledge on dominant groups or size fractions only, data products with strong linkage to a-priori-information) and PhytoDOAS data products (with only low temporal and spatial coverage), this ESA SEOM project's objective is a substantial improvement of retrieving phytoplankton groups with defined accuracy and good spatial and temporal coverage. This shall be done by developing a synergistic product which contains the Chl-a (biomass) of several PFT by using complementary information from multi- and hyper-spectral satellite ocean colour data. This algorithm can be later applied to produce a synergistic PFT product from TROPOMI (on Sentinel-5-Precursor, Sentinel-4, Sentinel-5) and OLCI (on Sentinel-3).

To enlarge the coverage and to reduce the uncertainty of the PFTs and total Chl-a satellite products, as a ESA-ESRIN funded Sentinel for science synergy research and development (SY-4SCI Synergy R & D) study focusing on PFTs we will

* review available PFT algorithms based on hyper- and multi-spectral datasets;
* develop an improved PFT algorithm by the synergistic use of low spatial resolution hyper-spectral data (i.e. SCIAMACHY) with high spatial multi-spectral data (i.e. MERIS). This can be later adapted to TROPOspheric Monitoring Instrument (TROPOMI, on Sentinel-5Precursor) and Ocean and Land Colour Instrument (OLCI, on Sentinel-3) measurements.
* perform a sensitivity study, based on radiative transfer calculations, to determine the band-set needed by multi-spectral instruments (e.g. OLCI) to retrieve PFTs based on hyper-spectral data (now SCIAMACHY, future TROPOMI) PFT algorithms
* provide a scientific roadmap for future Chl-a and PFT retrievals from ocean colour (multi- and / or hyper-spectral) data

The project started at the end of 2014 and we will show first results obtained within the study.