

A gridded archive of remote sensing data for Belgian waters

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Polar orbiting satellites with high quality moderate resolution, multi-spectral sensors have been capturing the state of the world's oceans for almost fifteen years. Here we present an archive of all data available for the Belgian waters and the Southern North Sea (50.8°-52.1°N; 0.5°-4.0°E) from the SeaWiFS, MODIS Aqua and MERIS sensors, collocated on a common one kilometre grid (details on gridding and data processing given in Vanhellemont *et al.*, 2011; Vanhellemont and Ruddick, 2011). Parameters that can be derived from the colour of the ocean include chlorophyll *a* concentration, turbidity and total suspended matter concentration (Nechad *et al.*, 2009; 2010), and more recently the attenuation of light and photosynthetically available radiation (PAR) in the water column (Lee *et al.*, 2005, Wang *et al.*, 2009) and euphotic zone depth (Lee *et al.*, 2007). Thanks to bands in the thermal infrared, MODIS can also be used to determine sea surface temperature.

Time-series of these parameters can be extracted from the archive for any point in the region. Multi-temporal composites can be generated for different periods or seasons, and even across years. Match-ups with in situ data varying in space and time, such as underway data collected by research vessels or given sample locations, can be readily extracted and used for validation.

Time-series and composites reveal an annual spring phytoplankton bloom, followed by moderate chlorophyll concentrations throughout summer and autumn. Spatial variability of the spring bloom reflects the nutrient distribution at the end of the winter, with highest concentrations near-shore. The satellite data shows considerable inter-annual variability, for example for spring bloom timing and amplitude. Suspended matter concentrations also show a strong annual cycle, with highest concentrations in winter, related to wind-induced resuspension. Spatial variability of the suspended matter is highly correlated to water depth. The sea surface temperature shows a strong annual cycle, obviously related to solar heating. Spatial variability is strongest in spring and autumn, due to differences in water depth of the near-coast and offshore waters, i.e. shallow waters heat and cool faster. The inter-annual variability of sea surface temperature is also analysed.

A dataset of this scope is useful for sediment transport and ecosystem modelers, but also for monitoring, management, and general marine science. The data archive is available for any interested parties, and an extraction interface for time-series is provided on our website.

References

- Lee Z.P., A. Weidemann, J. Kindle, R. Arnone, K.L. Carder and C. Davis. 2007. Euphotic zone depth: Its derivation and implication to ocean-color remote sensing. *Journal of Geophysical Research* 112:C03009.
- Nechad B., K. Ruddick and G. Neukermans. 2009. Calibration and validation of a generic multisensor algorithm for mapping of turbidity in coastal waters. In: SPIE 'Remote Sensing of the Ocean, Sea Ice, and Large Water Regions' Conference held in Berlin (Germany), 31 August 2009. Proc. SPIE 7473:74730H.
- Nechad B., K. Ruddick and Y. Park. 2010. Calibration and validation of a generic multisensor algorithm for mapping of total suspended matter in turbid waters. *Remote Sensing of Environment* 114:854-866.
- Vanhellemont Q. and K. Ruddick. 2011. Generalized satellite image processing: eight years of ocean colour data for any region on earth. Proc. SPIE 8175:81750Q. doi:10.1117/12.898300
- Vanhellemont Q., B. Nechad and K. Ruddick. 2011. GRIMAS: Gridding and archiving of satellite-derived ocean colour data for any region on earth. In: Proceedings of the CoastGIS 2011 conference held in Ostend, 5 - 8 September, 2011.
- Wang M., S. Son, and L.W. Harding, Jr. 2009. Retrieval of diffuse attenuation coefficient in the Chesapeake Bay and turbid ocean regions for satellite ocean color applications. *Journal of Geophysical Research* 114:C10011. doi:10.1029/2009JC005286.