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Validation of Ocean Colour Products

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Validation
of Ocean Colour Products

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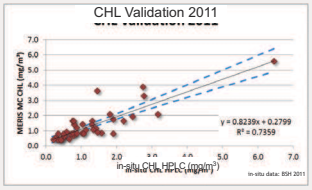
Validation Methods

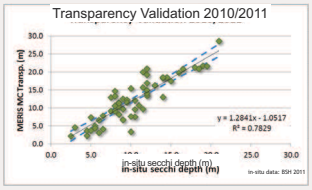
Within the validation process, parameters derived from remote sensing data are compared with ground truth and model data. This includes statistical analysis of the similarity of the distribution of the data sets, a point to pixel comparison, transect comparison or time series plots. These approaches provide an assessment of the reliability of measurements keeping in mind drawbacks like spatial extent of sampling, different measurement techniques or patchiness.

Point to Pixel comparison

In-situ data provided by the users are compared to EO water quality parameters. Plotting both data sets in a scatterplot and providing coefficients for the regression and correlation provides a first picture of the agreement of the data sets.



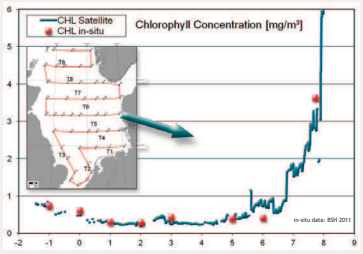
⇦ Comparison of in-situ data collected 2011 during the yearly summer cruise conducted by BSH (German Federal Maritime and Hydrographic Agency). The in-situ data were collected during 21 days at 54 sample points distributed over the North Sea. The chlorophyll concentration derived from MERIS sensor were averaged over the same period.



⇦ Secchi depth data from the same data set as described above were used for comparison with the transparency provided by the MC OC service of ACRI-ST.

The Spatial Dimension

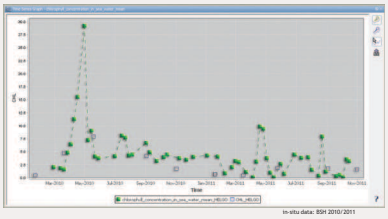
The surroundings of sampling stations is taken into account by plotting transects along a ship line plus the in-situ data points on the respective position in the transect. This enables the detection of trends and algal bloom events in both data sets although they might be spatially shifted due to time differences in acquisition.



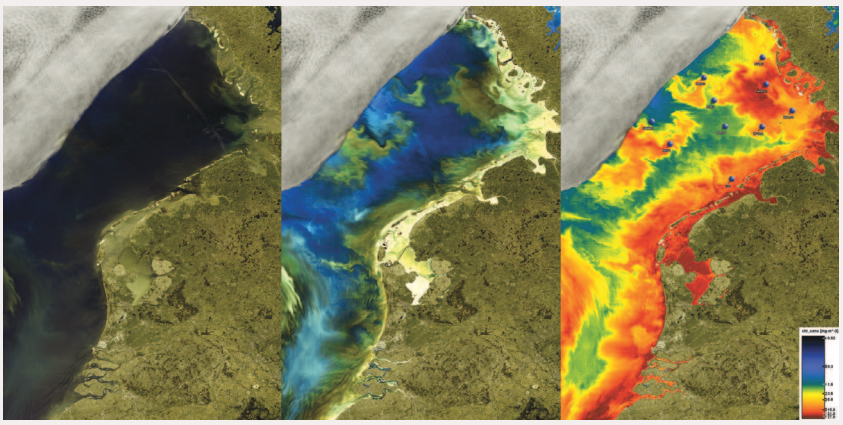
⇦ Transect plots for a line along measurement stations acquired during the summer cruise 2011 conducted by BSH. Both measurement techniques show a good agreement between absolute chlorophyll concentrations values and trends along the transect.

The Temporal Dimension

Time series plots show the temporal evolution of a parameter at a dedicated position. Thus, events such as spring blooms can be detected as the MERIS data show the development of chlorophyll concentration during the season. The comparison of both measurement techniques show the agreement with in-situ at the dedicated dates of measurements.



This figure shows time ⇨ series at one measurement station for a 2 years-period. The green line illustrates chlorophyll concentration derived from MERIS data, the blue points show the chlorophyll concentration of the respective in-situ measurements. The evolution of the spring bloom in both



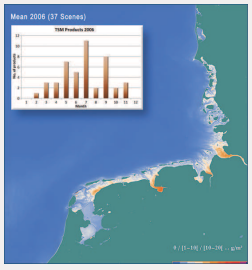
⇧ Processing of satellite products from L1b containing top of atmosphere radiances (left) to L2 by performing an atmospheric correction (middle) and derivation of geo-physical parameters such as chlorophyll concentration (right). Finally, for validation the pixel values are extracted at the positions of the in-situ measurements in order to apply the methods described on the left side.

The Service

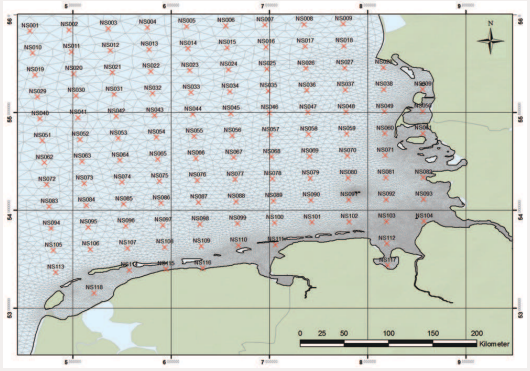
Brockmann Consult is running different services in the framework of the GSE project Marcoast. Products dedicated to the user requirements are generated in automated processing chains and delivered routinely to the users. Products comprise water quality parameters derived from satellite data such as chlorophyll concentration, suspended matter concentration, transparency and yellow substance absorption. Value added products such as temporal averages or time series plots are derived from the above mentioned parameters and complete our portfolio. Validation is a central part of the service, as it demonstrates how the products fit to the in-situ or model data of the user.

Comparison with Model data

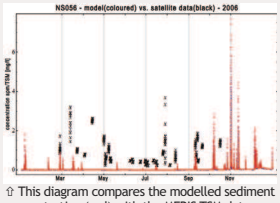
The Federal Waterways Engineering and Research Institute (BAW) in Germany is one Brockmann Consult GmbH user within Marcoast. The Institute receives MERIS data products of total suspended matter (TSM) and transparency for the German Bight and the North Sea. Within the project AufMod (http://www.kfki.de/prj-aufmod/en), the BAW develops a model for long-term morphodynamic processes in the German Bight. The MarCoast products are used for the validation of the modelled sediment transport. The presented figures show exemplarily the data sets, the availability of MERIS data for 2006 as well as preliminary validation results.



⇧ Mean TSM values processed from MERIS data (Case2-Regional). The data have a spatial resolution of 300m. The embedded histogram shows the data availability per month.



⇧ A raster of 118 positions has been used to compare the results of the model (SPM) with TSM calculated from MERIS FR for 2006. Within the model, each position consists of 17521 points in time (every 30 min) as well as 16 vertical layers. The satellite data provide integrated information about the photic zone, which must not be compliant with the vertical depth of the



⇧ This diagram compares the modelled sediment concentration (red) with the MERIS TSM data (black). The vertical distribution reflects the spreading of values surrounding one position (5x5 pixels). The concentrations calculated from the model are lower than from MERIS. The model does not include waves and is not yet calibrated in terms of TSM. Therefore further simulations and comparisons are needed.

Conclusion

The different validation methods provide a unique insight into the relationship between in-situ/model and EO-data. Considering that point data are compared to 300m or 1.2km pixels and the high patchiness in the water, the results are very convincing and users have expressed their confidence in the data based on these analyses. The comparison with the BAW model data is an ongoing process and helps in understanding and learning more about the processes in the water body and the models. Validation will always be an important part of the services we provide and part of the results communicated to the users.

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