Introduction of image-based water transparency descriptors to quantify marine snow and turbidity features – a study with data from a stationary observatory

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Water transparency is dependent of different types of particles in the water column. Both turbidity and marine snow are of high interest to marine sciences and industry operating in marine areas, for instance in the context of impact assessment for drilling and/or mining activities or construction.

The turbidity in water caused by suspended particles is often measured with a turbidity-meter. However, light scattering of particles is dependent on number, size, shape, colour and reflectivity. Since the turbidity sensor used detects at 880 nm (wave band maximum), this sensor can not be used for qualitative measurements as long as field samples are not made for validation of the accurate composition and concentration of the light scattering particles in situ. As a new alternative and /or a second technique for turbidity measurements we consider the use of images from stationary time-lapse cameras to measure organic and inorganic particulates in the water column. Water transparency features are analysed on the level of particle segmentation and thon the global level of image grey value statistics time series in this study.

For the segmentation-based feature we developed an algorithm that automatically identifies and counts in the underwater image series with high precision and determines the size of the marine snow. This allows us to compute statistics features for the density and composition of the marine snow. In addition, the global grey value statistics are evaluated as well.

In addition to the digital imaging, the turbidity was monitored by the use of an optical sensor that measure scattered light at 880 nm. From the image data features are derived based on grey value statistics and image segmentation results. We can show that the grey-value statistics feature is correlated to the conventional turbidity measurements using skriv full tut as unit (NTU), while the correlation of the marine snow features to the turbidity sensor data is rather low.

Hence our results indicate that image-based water transparency descriptors can both validate and complement traditional turbidity measurements.