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Satellite observations in monitoring the water quality in the coastal waters of Finland

Title of the dissertation	Water quality monitoring and assessment of the Northern Baltic Sea using Earth Observation Suomen rannikkovesien vedenlaadun seuranta ja tila-arvio kaukokartoitusmenetelmin
Contents of the dissertation	Earth observations (EO), i.e. satellite instrument observations, can capture extensively the spatial and temporal changes in water areas. This thesis analyses how accurately water quality can be estimated using satellite observations in the coastal waters of Finland. Water quality refers to the characteristics of water, like the level of its turbidity or the amount of algae in the water. Phytoplankton chlorophyll-a – as a direct indicator of eutrophication – is one of the key water quality parameters in the status assessment of for example the European Union Water Framework Directive (WFD). Earth observations capability to cover the spatial and temporal variability of the water quality is beyond the possibilities of conventional station-wise water sampling. Summarising results over the coastal monitoring sites confirm that EO methods perform well to estimate chlorophyll-a. The EO methods accuracies are close to the determination accuracies of contemporary station samples. Automated flow-through measurement systems on board coastal vessels and merchant ships provided fluent material for EO algorithm validation. In some optically specific estuaries the estimation of chlorophyll-a via EO can still be improved in the future. Similar methods to those developed in this thesis with the past EO instruments – medium resolution satellite and high resolution airborne – are now being used with the new EU Copernicus programme Sentinel-series instruments for the monitoring of Finnish coastal and lakes water areas.
Field of the dissertation	Geoinformatics, remote sensing, Earth Observation
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