

ANALYSIS OF NATURAL BACKGROUND AND DREDGING-INDUCED CHANGES IN TSM CONCENTRATION FROM MERIS IMAGES NEAR COMMERCIAL HARBOURS IN THE ESTONIAN COASTAL SEA

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THEME: Marine and coastal environment, resources and dynamics

KEY WORDS: Dredging, MERIS, remote sensing.

ABSTRACT:

We studied the changes of total suspended matter (TSM) distribution in Estonian coastal sea with special focus on Paldiski harbor at the Pakri Bay. Pakri Bay is environmentally sensitive area: most of the bay is covered by Natura 2000 Special Protection Area. The purpose of current study was to examine the suitability of remote sensing data to detect the turbidity differences caused by dredged sediments and to evaluate the impact of monthly mean dredging amount to the surface TSM concentration retrieved from satellite images.

The MERIS (Medium Resolution Imaging Spectrometer) Full Swath Geo-located (FSG) products with 300m resolution from years 2006-2010 were used. Images were processed using Case II Regional (C2R) and Free University of Berlin (FUB) processors available in BEAM software. Validation with in situ measurements showed that both processors represent the changes in TSM concentration adequately. C2R processors showed better statistics ($R^2=0.61$, root mean square error = 0.82 mg l⁻¹, SD = 0.77 mg l⁻¹, mean bias = -0.28 mg l⁻¹) compared to the FUB processor.

For analysis of environmental impact we calculated the differences between monthly mean maps from dredging period (2008) versus non dredging period (monthly mean 2006-2010). A threshold TSM concentration value of >2.26 mg l⁻¹ difference from background TSM was defined as a criterion for dredging impact detection for Pakri Bay. The area of dredging-induced turbidity was between 0.56 and 1.25 km² and did not reach the environmentally sensitive NATURA 2000 region adjoining Paldiski South Harbour.