Simulation-based Measurement Strategies for Dune Tracking with Multi Beam Echosounders
Beam Echosounders

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SUMMARY

The static as well as the morphodynamic component

of the river bed are of great importance due to the

maintenance of waterways. Such maintenance is in the responsibility

of the German FederalWaterways and Shipping

Administration (WSV). Water currents can cause parts of

the riverbed sediments to move in the form of dunes. By the

dune tracking method the shape, migration and finally bed

load transport rates of dunes are determined.

Using multibeam echosounders on vessels, area-covering

measures of the river bed can be conducted in a certain time.

Therefor, the single stripe like measurements have to be merged

to an overall image. Besides technical and environmental

conditions, especially the morphodynamic component

imposes

certain requirements on the measuring concept. Due

to the dune migration during the measurement of one measuring

stripe the overall image can be distortet.

This paper deals with a simulation-based approach to develop

and evaluate an optimized measuring concept in order

to achieve the best possible measurement data. Using a geometrical

simulation of known river bed form data, best possible

measurement settings of vessels operated by the WSV

can be found.

The impact of various measurement settings on the detection

of river bed form can be quantified by nominal-actual

comparisons. The spatial resolution in along track direction

is more important than in cross track direction in order to

determine small structures and the start and end points of a

single dune.

The findings are based on surveys of the river Rhine,

where a coherent and consistent 3D point cloud of the river

bed for a limited river area has been obtained. Using the presented

methods and approaches, knowledge about a

suitable

measurement concept can be transferred to other waterways

with their own environmental conditions. Based on the simulations

a procedure has been developed, to refine the measurement

concept during the actual survey.