

Introduction and first Results within the Project “Nautical Depth” in Hamburg

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Introduction: For future strategies in water depth maintenance in the Port of Hamburg, determining the navigability limit (i.e. the nautical safe depth) is of major importance. For this purpose, a project “Nautical Depth” was set up at the Hamburg Port Authority (HPA), which is dedicated to dealing with this issue. The aim is to measure a nautical safe depth under various boundary conditions and to identify limits for a safe passage of high concentrated soil suspensions. Among other things, the project cooperates with the Antwerp Port Authority, the Port of Rotterdam and the TU Delft. The project is also embedded in a research platform or network named “MudNet”.

Figure 1 gives an overview of the project aims and the boundary conditions of a nautical safe depth.

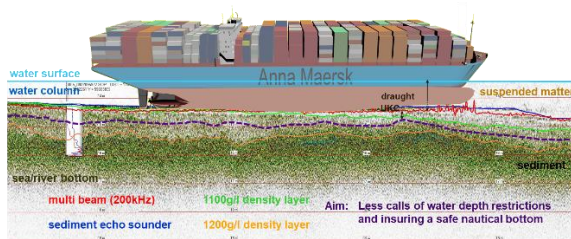


Fig. 1: Aims and boundary conditions of a nautical safe depth in Hamburg

Methods: In order to achieve the required acceptance for a reassessment of the nautical depth, it is necessary to determine the rheological properties of soil suspensions in situ. The rheological parameters which will be used to describe the nautical depth have still to be determined. For a permanent identification of nautical relevant rheological properties of the soil suspensions, existing in-situ measuring devices must be tested and, under certain circumstances, new equipment has to be developed. However, these devices cannot be used for the spatial determination of the rheological properties but will reproduce these on cross-sections and depth profiles. Therefore, new evaluation algorithms should be developed in echo-sounding technology - which have to be correlated with the rheological properties - in order to ensure spatial representations of a safe nautical depth.

In a first step, measurements of nature conditions in the water column and at the river bed will be carried out in 9 areas and in 5 measuring campaigns in 2018 in the Hamburg Port. Therefore 2 sediment profiler devices (Rheotune and Graviprobe) will be used besides other standard equipment's of HPA including multibeam echo-sounders, sub-bottom profilers with Silas processing, multi-parameter devices and ADCP current measurements.

Moreover, further investigation regarding the signal processing of multi-beam echo-sounders are carried out with the company General Acoustics and the Fraunhofer Institute for Biomedical Engineering. Investigation to the navigability of the fluid mud layers are carried out with Technical University of Hamburg involving the Institute of Geotechnical Engineering and Construction Management and the Institute of Fluid Dynamics and Ship Theory.

Results: The paper will give an introduction to first results within the project “Nautical Depth” of the Hamburg Port Authority and will give an outlook to further objectives and aims, which shall be achieved with the partners in the project.

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