
SMARTSEA: Safe navigation by optimizing sea bed monitoring and waterway maintenance using fundamental knowledge of sea bed dynamics

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Safe navigation in the North Sea calls for accurate nautical charts and adequate maintenance of the waterways to the ports of e.g. Amsterdam and Rotterdam. However, the North Sea is a shallow sea with a highly dynamic seabed, mostly caused by the behavior of bed forms known as tidal sandwaves. Hence, smart surveying and maintenance policies are required. A risk-based approach is the step forward for the responsible authorities. However, setting up such policies is unfeasible unless we gain more knowledge on (i) sandwave dynamics, (ii) waterway morphodynamics and (iii) the combined interpretation of such knowledge and bathymetric data. This is the goal of SMARTSEA, a multidisciplinary project with three subprojects P1, P2 and P3. Subproject P1 aims to improve our understanding of sandwave equilibrium heights and shapes, by modeling the influence of storm events and wind waves on sandwave dynamics. This will be done by means of complex morphodynamic modeling, supported by bathymetric data. By developing new data analysis techniques, P2 investigates the feedback among waterways, the associated maintenance operations and the surrounding marine environment (including megaripples). Combined with modeling results (also from P1), we will develop a tool that helps to optimize maintenance strategies. In P3, a geodetic algorithm will be developed for a risk-based survey policy. Next to the innovations of each subproject, the project overall's innovation lies in the fact that we make a big step towards a probabilistic approach in bathymetric surveying, waterway maintenance and, hence, in safe navigation. A user group has been formed representing Rijkswaterstaat, Netherlands Hydrographic Service, Deltares, engineering consultancy firms and the Flemish Hydrographic Service. A workshop will be held to disseminate the project's results to a wider scientific, governmental and engineering community. In addition to applications on the Netherlands Continental Shelf (also including risk analysis for marine spatial planning), successful utilization will also provide opportunities abroad.

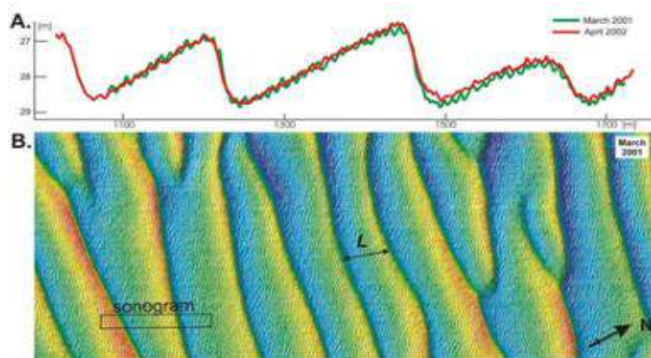


Figure 1. Sandwave field in the North Sea. Top: migrating profiles; bottom: plan view (Van Dijk & Kleinhans 2005).