

# BOTTOM DETECTION THROUGH SURFACE MEASUREMENTS ON WATER WAVES

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## Abstract

The direct problem of water-wave equations is the problem of determining the surface and its velocity potential, in time  $T > 0$ , for a given initial profile and velocity potential, where the profile of the bottom, the bathymetry, is known. In this paper, we study the inverse problem of recovering the shape of the solid bottom boundary of an inviscid, irrotational, incompressible fluid from measurements of a portion of the free surface. In particular, given the water-wave height and its velocity potential on an open set, together with the first time derivative of the free surface, on a single time, we address the identifiability problem. Moreover we compute the derivatives with respect to the shape of the bottom, which allows us to obtain the optimality conditions for this inverse problem.

## Keywords

**Author Keywords:** [inverse problems](#); [water waves](#); [free boundary problems](#); [identifiability result](#); [unique continuation property](#); [shape derivative](#)

**KeyWords Plus:** [BOUNDARY-VALUE-PROBLEMS](#); [WELL-POSEDNESS](#); [SOBOLEV SPACES](#); [RESPECT](#); [DOMAIN](#)

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