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Efficient numerical models for the prediction of acoustic wave propagation in the vicinity of a wedge coastal region. (English) Zbl 1259.76024

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Summary: In this paper, numerical frequency domain formulations are developed to simulate the 2D acoustic wave propagation in the vicinity of an underwater configuration which combines two sub-regions: the first one consists of a wedge with rigid seabed and free surface, and the second one is assumed to have a rigid flat bottom and a free flat surface.

The problem is solved using two different numerical methods: the boundary element method (BEM) and the method of fundamental solutions (MFS). Two models are developed by using a sub-region technique, where only the vertical interface between sub-regions of different geometries has to be discretized. These formulations incorporate Green's functions that take into account the presence of flat rigid and free surfaces and of a wedge. Green's functions are defined using two approaches: the image source method is used to model the rigid flat bottom and free flat interface, whereas the response provided by the wedge sub-region is based on a normal mode solution. Additionally, a MFS and a BEM model are also implemented which require the discretization of the sloping rigid seabed of the wedge, therefore making use of Green's functions for a rigid flat bottom and a free surface (using the image source method).

A detailed discussion on the performance of these formulations is performed, with the aim of finding an efficient formulation to solve the problem. It is found that the model based on the MFS and on the sub-region technique has a significantly lower computational cost and is stable, therefore being the most suitable for the analysis of acoustic wave propagation in the studied configurations.

MSC:

- [76M15](#) Boundary element methods applied to problems in fluid mechanics
- [76M25](#) Other numerical methods (fluid mechanics) (MSC2010)
- [76Q05](#) Hydro- and aero-acoustics
- [65N80](#) Fundamental solutions, Green's function methods, etc. for boundary value problems involving PDEs

Cited in 8 Documents

Keywords:

underwater acoustics; wedge; waveguide; boundary element method; method of fundamental solutions; Green's functions

Software:

[OASES](#)

Full Text: [DOI](#)

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