Wave scattering by undulating bed topography in a two-layer ocean

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摘要: The problem of wave scattering by undulating bed topography in a two-layer ocean is investigated on the basis of linear theory. In a two-layer fluid with the upper layer having a free surface, there exist two modes of waves propagating at both the free surface of the upper layer and the interface between the two layers. Due to a wave train of a particular mode incident on an obstacle which is bottom-standing on the lower layer, reflected and transmitted waves of both modes are created by the obstacle. For small undulations on the bottom of the lower layer, a perturbation method is employed to obtain first-order reflection and transmission coefficients of both modes for incident wave trains of again both modes in terms of integrals involving the bed-shape function. For sinusoidal undulations, numerical results are presented graphically to illustrate the energy transfer between the waves of different modes by the undulating bed.

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参考文献/REFERENCES

[1] MILES J W. Oblique surface-wave diffraction by a cylindrical obstacle[J]. Dynamics of Atmospheres and Oceans, 1981, 6(2): 121-123.

[2] DAVIES A G. The reflection of wave energy by undulations on the seabed[J]. Dynamics of Atmospheres and Oceans, 1982, 6(4): 207-232.

[3] MANDAL B N, BASU U. A note on oblique water wave diffraction by a cylindrical deformation of the bottom in the presence of surface tension[J]. Arch. Mech., 1990, 42: 723-727.

[4] LAMB H. Hydrodynamics[M]. Cambridge: Cambridge University Press, 1995.

[5] LINTON C M, MCIVER M. The interaction of waves with horizontal cylinders in two-layer fluids[J]. Journal of Fluid Mechanics, 1995, 304: 213-229.

[6] CADBY J R, LINTON C M. Three-dimensional water-wave scattering in two-layer fluids[J]. Journal of Fluid Mechanics, 2000, 423: 155-173.

[7] SHERIEF H H, FALTAS M S, SAAD E I. Forced gravity waves in two-layered fluids with the upper fluid having a free surface[J]. Canadian Journal of Physics, 2003, 81(4): 675-689.

[8] SHERIEF H H, FALTAS M S, SAAD E I. Axisymmetric gravity waves in two-layered fluids with the upper fluid having a free surface[J]. Wave Motion, 2004, 40: 143-161.

[9] SHAW D C. Perturbational results for diffraction of water waves by nearly vertical barriers[J]. IMA Journal of Applied

Mathematics, 1985, 34(1): 99-117.

[10] MANDAL B N, CHAKRABARTI A. A note on diffraction of water waves by a nearly vertical barrier[J]. IMA Journal of Applied Mathematics, 1989, 43(2): 157-165.

[11] MANDAL B N, KUNDU P K. Scattering of water waves by a submerged nearly vertical plate[J]. SIAM Journal on Applied Mathematics, 1990, 50(5): 1221-1231.

[12] RHODES-ROBINSON P F. On wave motion in a two-layered liquid of infinite depth in the presence of surface and interfacial tension[J]. The Journal of the Australian Mathematical Society, 1994, 35: 302-322.

[13] TEN I, KASHIWAGI M. Hydrodynamics of a body floating in a two-layer fluid of finite depth. Part I. Radiation problem[J]. Journal of Marine Science and Technology, 2004, 9: 127-141.

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