

# Gravity wave propagation in inhomogeneous media : wave scattering and interference process

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## Abstract

This lecture aims to give an overview of water waves and their propagation in inhomogeneous media. Effects of varying bathymetries, varying currents, or structures including porous media are then considered. After some generalities on 1st and 2nd order Stokes waves, governing equations for regular plane waves for the study of wave scattering due to either varying bathymetry and currents or structures are presented for both 2D and 3D cases. Analytical and numerical solutions are then presented and compared to experiments. For 2-D cases, examples are given for wave reflection through interference process including Bragg resonance. For 3-D cases, various examples including wave scattering due to a shoal, a structure, periodic structures or varying currents are given. Applications to both shore protection solutions and wave energy device are presented.

*Keywords:* Gravity waves, Higher order Stokes waves, Interference process, Reflection-refraction-diffraction, Bragg scattering, Wave propagation equations, Mild slope equations, Multi-scale expansions, Eigenfunction extension matching methods, Wave damping, Nearshore dynamics, Wave energy power device.