System of radiative transfer equations for coupled surface and body waves

Josselin Garnier

Centre de Mathematiques Appliquees
Ecole polytechnique
Institut Polytechnique de Paris

In this talk we present and analyze a system of radiative transfer equations associated with surface and body waves. The model is the acoustic wave equation in a two-dimensional waveguide with reflecting boundary. The waveguide has a thin, weakly randomly heterogeneous layer near the top surface, and a thick homogeneous layer beneath it. There are two types of modes that propagate along the axis of the waveguide: those that are almost trapped in the thin layer, and thus model surface waves, and those that penetrate deep in the waveguide, and thus model body waves. The remaining modes are evanescent waves. We introduce a mathematical theory of mode coupling induced by scattering in the thin layer and derive a radiative transfer equation which quantifies the mean mode power exchange. We study the solution of this equation when the width of the waveguide is large.

This is a joint work with L. Borcea (University of Michigan,), M. V. de Hoop (Rice University), and K. Solna (University of California at Irvine).