

Existence, uniqueness and variational methods for scattering by unbounded rough surfaces

This talk reports on joint work with Simon Chandler-Wilde (Reading UK). We study, via variational methods, the problem of scattering of time harmonic acoustic waves by an unbounded sound soft surface. The boundary ∂D is assumed to lie within a finite distance of a flat plane and the incident wave is that arising from an inhomogeneous term in the Helmholtz equation whose support lies within some finite distance of the boundary ∂D . Via analysis of an equivalent variational formulation, we provide the first proof of existence of a unique solution to a 3D rough surface scattering problem for arbitrary wave number. Our method of analysis does not require any smoothness of the boundary which can, for example, be the graph of an arbitrary bounded continuous function. An attractive feature is that all constants in a priori bounds, for example the inf-sup constant of the sesquilinear form, are bounded by explicit functions of the wave number and the maximum surface elevation.