

MATHEMATICS DEPARTMENT
North Carolina State University

DIFFERENTIAL EQUATIONS SEMINAR

Wednesday, October 31, 2007
3:00 p.m. 330 Harrelson Hall

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Bragg resonance of water waves by corrugated bottom

A series of corrugations on the bottom of a layer of water of otherwise uniform depth can have a significant effect on an incident water wave, if the latter has a wavelength close to twice the spacing of the corrugations. This phenomenon is usually referred to as ‘Bragg scattering’, ‘Bragg resonance’, or ‘Bragg reflection’, from its analogy to the similar effect with X-ray in crystals. In this talk, I will discuss some recent studies on the subject, and its relevances to coastal engineering problems, such as the formation of multiple longshore sand bars. Particular attention is on situations where reflection other than Bragg scattering exists, e.g. reflection from the shoreline. Solutions from an asymptotic theory, which is based on the general idea of slowly varying waves and formulated using the multi-scale analysis, will be presented, illuminating the physics. For the normal mode problem of a tank with corrugated bottom, an exact theory utilizing continued fraction has been constructed, including the rapidly varying components of the flow. The comparisons of the two theories will be discussed, showing that the rapidly varying parts are needed to accurately satisfy the true boundary conditions hence of importance to the flow near the boundaries.

Graduate students are invited to attend

For questions, comments, and offers to talk, contact Dmitry Zenkov, dvzenkov@math.ncsu.edu. Please visit the DE Seminar web page at <http://www.math.ncsu.edu/DE/>