

UCCS Math Colloquium Presents:
Dr. Yuji Kodama
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Thursday

NOV 29, 2012

12:30 pm

UC 307

(Refreshments at

12:15pm)

KP Solitons in shallow water: Mach reflection and tsunami

Abstract: The KP (Kadomtsev-Petviashvili) equation is a two-dimensional extension of the KdV equation describing small amplitude and long waves on a surface of shallow water.

In this talk, I start to give a short review on the derivation of the KP equation from the three dimensional Euler equation for irrotational and incompressible fluid. Using the normal form theory, I further discuss the higher order corrections to the KP equation for real application of certain particular solutions of the KP equation, called KP solitons.

The talk then includes a brief summary of our recent study (with S. Chakravarty) on a classification of the KP solitons, and show that some of those soliton solutions are so useful to analyze the Mach reflection problem. This problem describes a resonant interaction of solitary waves appearing in the reflection of an oblique incident wave onto a vertical wall, and indicates that the nonlinear interaction leads to a fourfold amplification of the incident wave. I will explain some historical remarks on the problem and show that the KP equation with just next order higher order correction can provide an excellent model to describe the problem. Finally I will discuss an application of those results to the Tohoku-tsunami on March 2011.

The talk is elementary, and presents several movies and pictures of real water waves and experiments.

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