Olomoucký seminář z matematické analýzy

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z Matematického ústavu AVČR v Brně

pronese přednášku na téma

The Inverse Problem for Periodic Travelling Waves of the Linear 1D Shallow-Water Equations

Abstract: This is a joint work with Pedro J. Torres, University of Granada, Spain. The motion of small amplitude waves of a water layer with variable depth along the x-axis is described by the equations of the shallow water theory. The shallow water equations conform a system of coupled PDEs of first order that can be easily decoupled into a single wave equation for the surface displacement, resp. for the wave velocity, i.e.,

$$\frac{\partial^2 \eta}{\partial t^2} - \frac{\partial}{\partial x}\left[h(x)\frac{\partial \eta}{\partial x}\right] = 0, \qquad \text{resp.} \qquad \frac{\partial^2 u}{\partial t^2} - \frac{\partial^2}{\partial x^2}\left[h(x)u\right] = 0.$$

There is a considerable number of papers devoted to finding sufficient conditions on the bottom profile $h(x)$ to ensure the existence of travelling waves or other explicit solutions. A travelling wave is a special solution of the form $q(x)\exp i\left[\omega t - \Psi(x)\right]$, where both q and Ψ are scalar real-valued functions. In the related literature, $q(x)$ is known as the amplitude of the travelling wave, ω is the frequency and $\Psi(x)$ is the phase, which is called non-trivial if it is non-constant. In this talk, we are going to study the following inverse problem: *given a prescribed amplitude $q(x)$, can we determine a suitable bottom profile $h(x)$ allowing the equation to admit a travelling wave with amplitude $q(x)$?*

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