

On Hirota-Satsuma's equation

Didier PILOD

Universidade Federal do Rio de Janeiro (UFRJ)

(Joint works with Rafael Iório (IMPA) and Jerry Bona (UIC))

Abstract: We are interested in the initial value problem associated to the Hirota-Satsuma equation

$$\begin{cases} u_t + u_x - 2uu_t + 2u_x \int_x^\infty u_t dx' - u_{txx} = 0, \\ u(0) = u_0, \quad x \in \mathbb{R}, \end{cases} \quad (1)$$

where u is a real valued function. This equation models the unidirectional propagation of shallow water waves as the well-known Korteweg-de Vries (KdV) and Benjamin-Bona-Mahony (BBM) equations. Here we show local well-posedness for initial data u_0 in the space

$$\Omega_1 = \{\phi \in H^1(\mathbb{R}) / -1 \notin \sigma(-\partial_x^2 - 2\phi)\}.$$

Equation (1) also possesses solitary-wave solutions just as do the related KdV and BBM equations. Using an analysis of an associated Liapunov functional, nonlinear stability of these solitary waves is established.