# Adiabatic limit of Benney type systems

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We consider the nonlinear system:

$$\begin{cases} i\partial_t u + \partial_{xx} u = (\tau|u|^2 + \alpha v + \nu w)u, \quad (x,t) \in \mathbb{R} \times \mathbb{R}^+, \\ \varepsilon\partial_t v + \lambda\partial_x v = \beta\partial_x|u|^2, \\ \varepsilon\partial_t w + \gamma\partial_x w = \eta\partial_x|u|^2, \end{cases} \tag{1}$$ {?}

where $u$ is a complex-valued function, $v$ and $w$ are real-valued functions, all parameters are real, and $0 < \varepsilon \ll 1$.

This model contains the 1d-Zakharov-Rubenchik type system which describes the dynamics (non resonant) of small amplitude Alfven waves propagating in a plasma, the 1d-Zakharov system which models Langmuir turbulence, and the Benney system used to study general theory of water wave interactions in a nonlinear medium.

Our main purpose is to show that solutions of the cubic nonlinear Schrodinger equation are asymptotic limit of solutions to the Benney system, in the natural topology given by the energy space $H^1 \times L^2$. Due to the special feature of the transport equation same result is obtain for solutions to the 1d-Zakharov system and 1d-Zakharov-Rubenchik system.

Joint work with Adán J. Corcho (UFRJ)