Long time existence results for the *abcd* systems: from long crested water waves to bores

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Abstract

The *abcd* systems describe the evolution of small amplitude, long wavelength water waves flowing in a channel. More precisely, by denoting A a typical amplitude, l a typical wavelength respectively h the depth of the channel, the physical regime described by the *abcd* models is characterized by the relation $A/h \approx (h/l)^2 \ll 1$. The long time existence problem consists in constructing solutions for the Cauchy problem associated to these systems on time scales T such that Th/A is of order 1. In this talk we review some long time existence results that we recently obtained for initial data that is non-localized in the space variable. This situation corresponds to bore propagation. In the proof of these results two essential ingredients are used. First, we construct a nonlinear energy functional witch controls appropriate Sobolev norms on the desired time scales. This is done by working with spectrally localized equations and employing Littlewood-Paley theory. The second ingredient is to use a well-chosen high-low frequency decomposition of the initial data in order to be able to construct solutions witch manifest nontrivial behavior at infinity.

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