



Higher Order Terms in Multiscale Expansions: A Linearized KdV Hierarchy

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Résumé en anglais We consider a wide class of model equations, able to describe wave propagation in dispersive nonlinear media. The Korteweg-de Vries (KdV) equation is derived in this general frame under some conditions, the physical meanings of which are clarified. It is obtained as usual at leading order in some multiscale expansion. The higher order terms in this expansion are studied making use of a multi-time formalism and imposing the condition that the main term satisfies the whole KdV hierarchy. The evolution of the higher order terms with respect to the higher order time variables can be described through the introduction of a linearized KdV hierarchy. This allows one to give an expression of the higher order time derivatives that appear in the right hand member of the perturbative expansion equations, to show that overall the higher order terms do not produce any secularity and to prove that the formal expansion contains only bounded terms.

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