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# Characterization of Extremal Waves in KdV-type models

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Conservative waves above flat bottom preserve energy and momentum. In a Hamiltonian description of the basic wave equations, the Hamiltonian character implies that relative equilibria are found as extremizers of the energy at given momentum. Taking the classical KdV-equation as model, it was shown in [1,2] that waves with maximal crestheight have cornered profiles, i.e. are cornered solitons or cnoidal waves, except for the relative equilibria which are smooth.

The approximation of the energy (Hamiltonian) in the KdV model severely overestimates the surface slopes, rendering the functional to be coercive on momentum levels. A more accurate AB-equation of KdV-type has been proposed in [3]; it is exact in dispersion for finite and infinite depth and second order accurate in waveheight. In this model the momentum is now coercive on energy sets, resembling the exact physical properties. We will present the consequences for extremal properties of high waves.

[1] E. van Groesen & Andonowati, Finite energy signals of extremal amplitude in the spatial NLS dynamics, *PhysLett A*, **357** (2006) 86–91

[2] E. van Groesen & Andonowati, Extremal periodic wave profiles, *Natural Hazards and Earth System Sciences*, **6**(2006) 8 pages

[3] E. van Groesen & Andonowati, Variational derivation of KdV-type of models for surface water waves, submitted October 2006