# Hyperbolic models for dispersive phenomena

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I will present the "augmented Lagrangian" method for dispersive equations admitting variational formulation (the NLS equation, the Benjamin-Bona-Mahoni equation, the Serre-Green-Naghdi equations etc.). It "transforms" the original equations into an approximate system of equations that is hyperbolic. The advantage of such an approach is obvious: the full range of finite volume methods developed for hyperbolic equations can now be used for dispersive equations. In particular, with the hyperbolized model, the study of the Riemann problem (Gurevich-Pitaevskii's problem) becomes legitimate. The generalization of this method to reversible equations that do not have the variational structure (e.g. the "conduit" equation), or to dissipative equations (the Euler equations with thermo-conductivity, or the Cahn-Hilliard equation) is also proposed. I will illustrate this approach with a number of applications: surface wave dynamics, phase transition, etc.