A new hyperbolic model for breaking waves

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In this study, we propose a new hyperbolic model for wave breaking phenomenon description. The modelling of breaking waves is obtained by depth-averaging the equations of Large-Eddy Simulations (LES) where the small scale turbulence is modeled by a turbulent viscosity, whereas the large scales are taken into account in the model by an anisotropic tensor variable called enstrophy. The hyperbolic structure is obtained by replacing the depth-averaged non-hydrostatic pressure with an additional variable and taking into account the finite character of the sound speed. In the incompressible limit, the new model have the same dispersive properties that Serre Green-Naghdi equations. The wave breaking is characterized by a sudden increase of the enstrophy which allows us to propose a new robust breaking criterion based on local parameters of wave. This local behavior allows the model to be completely predictive. We perform a validation by numerical tests and by comparison with experimental results of the literature on the propagation of a one-dimensional waves.