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A new hyperbolic model for breaking waves

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The aim of this presentation is to introduce a new hyperbolic model to describe the breaking wave phenomenon. The breaking wave model is obtained by depth averaging the Large Eddy Simulation (LES) equations. In the derivation, the small-scale turbulence is modeled by a turbulent viscosity, while the large scales are considered by an additional variable called enstrophy. Typically, the non-hydrostatic pressure is associated with high order derivative. To obtain the hyperbolic structure of the model, we replace the depth-averaged non-hydrostatic pressure by an additional variable and take into account the finite character of the sound velocity. In the incompressible limit, the new model has the same dispersive properties as the Serre Green-Naghdi equations. Moreover, 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 the wave. This local behavior allows the model to be fully predictive. We perform a validation by comparing the numerical data with experimental results of the literature on the propagation of a one-dimensional waves.

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