Adaptive physic based preconditioning for a linearized Discontinuous Galerkin Shallow water scheme

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In this project we are interested by implicit discretization for hyperbolic system with high order spatial discretization. A classical problem is the Exner model which describe the sedimentation. Indeed the CFL condition is given by the gravity waves but we are interested by very long time behavior comparing to the timescale associated to the wave. Consequently for this type of problem we want study implicit scheme. It is known that the hyperbolic system are ill-conditioned consequently we propose a preconditioning based on some approximations (approximative splitting in the equations and second order formulation of some operators) in the equations and in the discretization (lower order spatial scheme to compute the preconditioning). The method will be tested on the Shallow water model before a potential extension to Exner equations.

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