Existence of strong solutions in a larger space for the shallow-water system

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This paper is dedicated to the study of both viscous compressible barotropic fluids and Navier-Stokes equation with dependent density, when the viscosity coefficients are variable, in dimension $d\geq2$. We aim at proving the local and global well-posedness for respectively {\it large} and \textit {small} initial data having critical Besov regularity and more precisely we are interested in extending the class of initial data velocity when we consider the shallow water system, improving the results in \cite{CMZ1,H2} and \cite{arma}. Our result relies on the fact that the velocity u can be written as the sum of the solution u_{L} of the associated linear system and a remainder velocity term $\bar {u}$; then in the specific case of the shallow-water system the remainder term $\bar{u}$ is more regular than u_{L} by taking into account the regularizing effects induced on the bilinear convection term. In particular we are able to deal with initial velocity in $\dot{H}^{\N-1}$ as Fujita and Kato for the incompressible Navier-Stokes equations (see \cite{FK}) with an additional condition of type $u_{0}\in B^{-1}_{\infty,1}$. We would like to point out that this type of result is of particular interest when we want to deal with the problem of the convergence of the solution of compressible system to the incompressible system when the Mach number goes to 0.

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