Central-Upwind Schemes for Weakly Compressible Two-layer Shallow-Water Flows

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We present a weakly compressible approach to describe two-layer shallow water flows in channels with arbitrary cross sections [**?**, **?**]. The standard approach for those flows results in a conditionally hyperbolic balance law with non-conservative products while the current model is unconditionally hyperbolic. A detailed description of the properties of the model is provided, including entropy inequalities and entropy stability. Furthermore, a high-resolution, non-oscillatory semi-discrete central-upwind scheme is presented. The scheme extends existing central-upwind semi-discrete numerical methods for hyperbolic balance laws. Properties of the model such as positivity and well balance will be discussed. Along with the description of the scheme and proofs of these properties, we present several numerical experiments that demonstrate the robustness of the numerical algorithm.

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