

Two-Layer Stratified Flow in Pipes with General Channels

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We formulate a model for two-layer fluid flow in pipes with arbitrary cross sections, where one layer is completely incompressible, and the other layer is fully compressible. This new two-layer model is proposed to address the stratified regime, and the resulting model is strictly hyperbolic with non-conservative products[1]. We derive the entropy pair that accounts for both layers and prove the entropy inequality, which is useful for selecting the correct weak solution. Furthermore, a high-resolution, non-oscillatory, entropy-conservative, path-consistent scheme[2] is presented. Additionally, we provide numerical tests in general channels to demonstrate the merits of the scheme.

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