Nonreflecting boundary conditions for a CSF model of the fourth ventricle - spinal SAS dynamics

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Abstract

In this talk we will introduce a one-dimensional model for analyzing the cerebrospinal fluid (CSF) dynamics within the fourth ventricle and the spinal subarachnoid space (SSAS). The model has been derived starting from an original model of Linninger et al. ([2]) and from the detailed mathematical analysis of two different reformulations developed in [1]. We will show the steps of the modelization and the rigorous analysis of the first-order non-linear hyperbolic system of equations which rules the new CSF model, whose conservative-law form and characteristic form are required for the boundary conditions treatment. By assuming sub-critical flows, for the particular dynamics we are dealing with, the most desirable option is to employ the *nonreflecting boundary conditions* ([3], [4]), that allow the simple wave associated to the outgoing characteristic to exit the computational domain with no reflections. Finally, we will show some numerical simulations related to different cerebral physiological conditions.

References

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