

High-order fully well-balanced numerical methods for one-dimensional blood flow with discontinuous properties and friction. Application to networks.**Authors:**

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Abstract:

We are interested in the numerical study of the one-dimensional blood flow model with discontinuous mechanical and geometrical properties and friction. We present the mathematical model together with its nondimensional form. The investigation of all its stationary solutions will be the main point of this talk since they are not given in an explicit or implicit form so numerical techniques proposed in [1] will be used. Following the numerical study done in [2] we propose high-order fully well-balanced numerical methods that are able to preserve all the discrete stationary solutions. These schemes are given as a combination of the Generalized Hydrostatic Reconstruction and well-balanced reconstruction operators. Moreover these methods are able to deal with more than one discontinuous parameter. Some numerical tests are shown to prove its well-balanced and high-order properties, and its convergence to the exact solutions. We will also show results applied to blood flow networks.

References:

- [1] Gómez-Bueno, I., Díaz, M. J. C., Parés, C., and Russo, G. (2021). Collocation methods for high-order well-balanced methods for systems of balance laws. *Mathematics*, 9(15), 1799.
- [2] Pimentel-García, E., Müller, L. O., Toro, E. F., and Parés, C. (2023). High-order fully well-balanced numerical methods for one-dimensional blood flow with discontinuous properties. *Journal of Computational Physics*, 475, 111869.