

Artificial stress diffusion in numerical simulations of viscoelastic fluids flows

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This contribution presents an overview and summary of the artificial diffusion concept applied to numerical simulations of viscoelastic fluids flows. The classical Oldroyd-B model is considered as an example and prototype of viscoelastic rate type fluids models. The broader concept of numerical diffusion is presented, with special focus on tensorial artificial stress diffusion that proved to be a valuable tool in stabilizing the viscoelastic fluids flows simulations at higher Weissenberg numbers. Several variants of tensorial artificial diffusion are presented and discussed, focusing on practical aspects of their implementation and use.

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References

- [1] M. Pires and T. Bodnár. On the influence of diffusion stabilization in Oldroyd-B fluid flow simulations. In *Topical Problems of Fluid Mechanics 2020*, pages 176–183, Prague, 2020. Institute of Thermomechanics CAS.
- [2] M. Pires and T. Bodnár. Numerical tests of vanishing diffusion stabilization in Oldroyd-B fluid flow simulations. In *Topical Problems of Fluid Mechanics 2021*, pages 102–109, Prague, 2021. Institute of Thermomechanics CAS.
- [3] M. Pires and T. Bodnár. Application of vanishing diffusion stabilization in Oldroyd-B fluid flow simulations. 2022. (to appear).
- [4] M. Pires and T. Bodnár. Temporal artificial stress diffusion for numerical simulations of Oldroyd-B fluid flow. *Mathematics*, 10(3), 2022.
- [5] M. Pires and T. Bodnár. Artificial Stress Diffusion in Numerical Simulations of Viscoelastic Fluids Flows. *Recent Advances in Mechanics and Fluid Structure Interaction with Applications: The Bong Jae Chung Memorial Volume*. Springer, 2022.