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A HIGH-ORDER FINITE VOLUME METHOD FOR THE SIMULATION OF PHASE TRANSITION FLOWS

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Two-phase flows with phase transition modelling is an extensive area of research.

Navier-Stokes-Korteweg equation system, which models this kind of phenomenon, can be solved through diffuse interface methods, in which the properties of the substance variate smoothly in the interface between phases. The key idea of these methods is the use of the same set of equations in the entire computational domain, avoiding the necessity of tracking the interface [1]. However, these methods lead to systems of equations with high-order derivatives. In this work, we propose the use of Moving Least Square approximations for a direct and accurate discretization of high-order derivatives, on a finite volume context for unstructured meshes [2].

Furthermore, Navier-Stokes-Korteweg equations require an appropriate equation of state to be completed. Traditionally, the Van der Waals EOS is used. However, this equation of state is not very accurate in the specific case of water at low temperatures. In this work, we also propose a new method to obtain new equations of state, which can represent accurately both liquid water and steam and verify necessary thermodynamic requirements for its use in Navier-Stokes-Korteweg equations system.

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