

**Young, D. L.; Hu, S. P.; Wu, C. S.**

**Localized radial basis function scheme for multidimensional transient generalized Newtonian fluid dynamics and heat transfer.** (English) Zbl 1403.76143

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Summary: The local radial basis function (RBF) scheme is developed to simulate 2D and 3D heat transfer and flow dynamics of generalized Newtonian fluids (GNF). The local RBF scheme is a meshless numerical method based on radial basis functions with localized technique. The procedure of localization reduces the computational cost more efficiently than the traditional global RBF method. This meshless method does not require mesh generation, numerical integration and only needs point collocation. Besides, it is very easy to interpolate physical values and its derivatives everywhere in the domain. We consider one isothermal and three non-isothermal multidimensional transient GNF fluid and heat problems in this paper. The dynamic viscosity of the GNF is specified as two different models: the power law model (temperature independent) or Cross model (temperature dependent). The viscous heating is also considered in this work. Numerical results show that the local RBF scheme is stable and accurate as far as the four tested cases are concerned.

**MSC:**

- [76M22](#) Spectral methods applied to problems in fluid mechanics
- [65M70](#) Spectral, collocation and related methods for initial value and initial-boundary value problems involving PDEs
- [76A05](#) Non-Newtonian fluids

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**Keywords:**

meshless; radial basis functions; non-Newtonian flow; transient flow; heat transfer; multidimensional

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