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Kansa method for two-dimensional advection-dispersion equation with fractional dispersion

G. F. Pang [1,2], *W. Chen[1], and K.Y. Sze[2]

[1]Department of Engineering Mechanics, Hohai University, Nanjing 210098, China.
[2]Department of Mechanical Engineering, The University of Hong Kong, China.

*Corresponding author: chenwen@hhu.edu.cn. Part of the work was done when the first author was visiting the University of Hong Kong.

Multi-dimensional advection-dispersion equation with weighted fractional directional dispersion term can well describe the super-diffusive flow and generate the full range of the Lévy-stable motions. The Kansa method with MQ and TPS functions is extended to the numerical solution of this type of equation using Gauss-Jacobi-type quadrature rules for deriving the spatial fractional derivatives of radial basis functions. Numerical results on square and circular computational domains show that the present method can achieve higher accuracy than the Vector Grünwald-Letnikov formula and the finite element method, and better convergence than the differential cubature method. The method can be easily generalized to solve three-dimensional problems.
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