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Conformable Heat Equation With Singular Potential

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Abstract

We study a conformable heat equation with singular and distributional spatial potentials. To address the low regularity of the coefficients, we develop a framework for very weak conformable solutions based on regularization techniques. We prove the existence and uniqueness of solutions, along with consistency results that ensure agreement with classical conformable solutions for regular data. Numerical simulations illustrate the theoretical findings and demonstrate the influence of the conformable order on diffusion dynamics in the presence of spatial singularities

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References

- [1] T. Abdeljawad, On conformable fractional calculus, *Journal of Computational and Applied Mathematics*, 279, 2015, 57–66.
- [2] T. Abdeljawad and M. Al Horani, Fractional calculus with conformable fractional derivatives, *Chaos, Solitons & Fractals*, 89, 2016, 1–5.
- [3] A. Altybay, M. Ruzhansky and M. E. Sebih, Very weak solutions of the heat equation with singular potentials, *Applied Mathematics and Computation*, 399, 2021, 126006.
- [4] P. Baras and J. A. Goldstein, Remark on the inverse square potential in quantum mechanics, *North-Holland Mathematics Studies*, 92, 1984, 31–35.
- [5] P. Baras and J. A. Goldstein, The heat equation with a singular potential, *Transactions of the American Mathematical Society*, 284, 1984, 121–139.
- [6] K.-J. Engel and R. Nagel, *One-Parameter Semigroups for Linear Evolution Equations*, Springer, New York, 2000.
- [7] L. C. Evans, *Partial Differential Equations*, American Mathematical Society, Providence, 1998.
- [8] L. C. F. Ferreira and C. A. A. S. Mesquita, An approach without using Hardy inequality for the linear heat equation with singular potential, *Communications in Contemporary Mathematics*, 17, 2015, 1550041.
- [9] C. Garetto and M. Ruzhansky, Hyperbolic second order equations with non-regular time dependent coefficients, *Archive for Rational Mechanics and Analysis*, 217, 2015, 113–154.
- [10] R. Khalil, M. A. Horani, A. Yousef and M. Sababheh, A new definition of fractional derivative, *Journal of Computational and Applied Mathematics*, 264, 2014, 65–70.