

# A numerical method for a non-Fickian diffusion problem based on the inversion of Laplace transforms

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## ABSTRACT

We consider an hyperbolic telegraph equation, which describes a non-Fickian diffusion, taking into account the variation of the relaxation time of the mass flux and the existence of a potential field. This work extends the results presented in [1], for a more general initial condition. The idea is to use an inverse Laplace transform algorithm [2] to remove the time-dependent terms in the governing equation and boundary conditions, obtaining a second order ordinary differential equation in the spatial domain. We discuss different approaches for the spatial discretisation, focusing on the way they damp the oscillations in the vicinity of sharp discontinuities. Some numerical tests are presented that illustrate the effect of the potential field and the initial and boundary conditions in the diffusion process.

## REFERENCES

- [1] C. Neves, A. Araújo, E. Sousa “Numerical approximation of a transport equation with a time-dependent dispersion flux”, *Numerical Analysis and Applied Mathematics, AIP Conference Proceedings* **1048**, pp 403-406 (2008)
- [2] Ahn J, Kang S, Kwon Y, “A flexible inverse Laplace transform algorithm and its application”, *Computing* **71(2)**, pp 115-131 (2003)