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# A new fractional operator of variable order: application in the description of anomalous diffusion

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**Abstract**

In this paper, a new fractional operator of variable order with the use of the monotonic increasing function is proposed in sense of Caputo type. The properties in term of the Laplace and Fourier transforms are analyzed and the results for the anomalous diffusion equations of variable order are discussed. The new formulation is efficient in modeling a class of concentrations in the complex transport process.

*Key words:* fractional derivative of variable-order, Laplace transform, Fourier transform, anomalous diffusion.

## 1 Introduction

Fractional-order derivatives (FOD) of the Riemann-Liouville and Caputo types with respect to the power-law-function kernel [1–7] are important for developing mathematical models in the areas of the control, nuclear physics, electrical circuits, signal processing, economy and biology. FOD were used to describe anomalous diffusion (AD) problems [8–13]. For example, the Riemann-Liouville-type model of the AD was considered in [14,15], the Caputo-type

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