MODELLING HEAT AND MASS TRANSFER PHENOMENA
New Trends in Analytical and Numerical Methods

Transport phenomena form a broad area of applications of modelling techniques especially when fluid and heat flow are involved. Commonly local (integer order) derivative are used in models, but with deficiencies to model relaxation processes in new materials and effects of memory. In such cases fractional operators (derivatives and integral) with different memory kernels are useful tools for modelling such complex processes.

Fluid flow with or without accompanying mass or heat transfer, attains almost all aspects of the natural and engineering world, and thus is of interest to engineers, mathematicians, physicists, and biologists. It contains an implausibly extensive range of scales from flows in biological cells, technological processes, natural flows in seas and rives and convective flows in stars. There is the miraculousness of turbulence in fluid-flows. The methods to model transport problems involving fluid-flow with heat and mass transfer have evolved over time, initially being mostly mathematical with strong idealizations of the real problems. General attributes of the main set of fluid mechanics equations, for example, accepted for describing fluid flows are analysed considering the compatibility condition. Fractional calculus performs an important role in the fields of mathematics: physics, electronics, mechanics, and engineering in recent years. The methods of this type of calculus are continuously generalized and enhanced especially during the last few decades. Many operations in physics and engineering can be defined accurately by using systems of differential equations containing different type of fractional derivatives.

The collection of research results published in this supplement contains 40 high quality papers by prestigious authors deeply involved in modelling by fractional calculus tools of problems emerging in fluid mechanics as well as heat and mass transfer.

We believe that the articles included in this supplement will allow speeding new results in ideas in the contemporary hot area of modelling involving fractional operators of different kind thus providing useful tools for solving actual engineering and physical problems.

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