From the Guest Editors

In view of the complex behaviors in the heat and fluid flow involving the different differential and integral operators, *e. g.*, classical, fractional-order, local fractional (fractal), and other operators, our chief aims of the special issue is to propose the new methods for finding the approximate or exact, or analytical or, numerical solutions for the ODE and PDE for the descriptions of more reasonable models for the problems as well as the new computational technologies with the fractal dimension, and to present the new and novel operators as mathematical tools to handle the more reasonable models for the heat and fluid flow.

This special issue, entitled *Advanced Computational Methods for Linear and Nonlinear Heat and Fluid Flow*, consists of 44 papers. It is divided into three main parts.

The *first part* of the special issue consists of 16 papers based on very high level results containing the heat-flow with classical, fractional-order, local fractional (fractal) operators, and self-similar technology.

The mathematical models, methods and theory for the heat-flow were discussed. For example, In order to describe the heat-flow with the power law, anomalous diffusion models with the non-singular Mittag-Leffler-function kernel were firstly presented. Gao (in this issue, p. S11) proposed a new general fractional calculus operator and investigated the anomalous diffusion models with non-singular power-law-function kernel. The analytic solution for the fractal heat extraction in geothermal system with local fractional derivative was solved by the non-differentiable travelling-wave transformation technology. The ultraslow diffusion with the structural derivative (fractal derivative) was discussed. The fractional-order Emden-Fowler type equation was solved by the homotopy analysis method.

Integral transforms are the important mathematical tools for find the heat transfer problems. For example, new theory for the integral transforms was proposed to solve the steady heat transfer problem. The 1-D heat diffusion equation was solved by the different technologies, *e. g.* differential-integral transform and Fourier-Yang integral transform. The heat transfer equation was solved by the variational iteration method integral transform technique. The steady heat transfer problem in the half-plane was solved by the Fourier-like integral transform. The linear diffusion and wave equations in semi-infinite domains were considered by the Sumudu-like integral transform. The 1-D heat transfer equations with radiative loss were investigated by the Sumudu type integral transform. The temperature field distribution of the coal seam in heat injection was considered. The numerical study of the heat transfer enhancement with the help of the fractal geometry was presented, the entropy production approach for the 2-D heat transfer system was analyzed, and the human transient response under local thermal stimulation was proposed.

The *second part* of the special issue consists of 12 papers based on very high level results for investigating the solutions of the non-linear PDE for the heat- and fluid-flow in the integer-order and fractal order operators.

New models, methods and theory for the fluid-flow were discussed. For example, the Burgers equation in the 1-D condition was solved by the decomposition Sumudu-like integral transform method. The new multi-soliton solutions of the Whitham-Broer-Kaup equations for the shallow water wave were proposed. The shallow water waves in porous medium were investigated. The inverse scattering transform was adopted to find the solutions for a new non-

isospectral integrable non-linear Ablowitz-Kaup-Newell-Segur model. The condensing flow of low pressure steam turbine at different flow rate conditions was studied. The new periodic wave solutions of the (3+1)-D soliton equation were presented. The transient pressure and productivity analysis in carbonate geothermal reservoirs with changing external boundary flux was considered. The steady and unsteady performance of a SCO_2 centrifugal compressor with splitters was investigated. The fluid-flow induced by thermal effect was considered. Mathematical models for the hydrodynamic bearing were investigated. The supercritical water flow past shpere-particel at low Reynolds numbers was discussed. In order to describe the fractal fluid-flow, the Burgers (non-linear diffusion) equation with local fractional derivative was analyzed.

The *third part* of the special issue consists of 16 papers based on very high level results on the topics related to the heat- and fluid-flow in solid, liquid and gas, new technology for the PDE containing them, the solid mechanics involving the different geometries and so on.

New models, methods and theory for the previous topics illustrated were discussed. For example, the series expansion Laplace transform method was used to find the non-differentiable solutions for the local fractional telegraph equations. A novel integral transform technology was considered to handle the convection-dispersion equations. The coal permeability and crack distribution characteristics in the unloading confining pressure experiments under different water pressures were investigated. The steady-state stress analysis in a SCO_2 radial-inflow impeller using fluid-solid interaction was considered. A fully coupled thermo-hydro-mechanical model associated with the inertia and slip effects was studied. A prediction method of temperature distribution and thermal stress for the throttle turbine rotor was presented. The gas migration patterns in the fractured coal rocks under actual mining conditions were analyzed. The topological representation of the porous structure and its evolution of reservoir sandstone under excavation-induced loads were investigated. A new theoretical model for guiding the gas extraction in coal mines was proposed. The crack closure and initiation stresses of the coal subjected to thermo-gas-mechanical coupling were discussed. The multi-objective optimization on supercritical CO_2 recompression Brayton cycle using Kriging surrogate model was investigated. The influence of the water-soaking time on the acoustic-missions characteristics and the spatial fractal dimensions of coal under uniaxial compression were considered. The effect of the cyclic temperature impact on the coal seam permeability was considered. The linear viscoelasticity within general fractional derivatives without singular kernel was studied and a variable-order fractional creep model of the mudstone under high-temperature was investigated. Finally, the anomalous relaxation models described by general fractional derivative operators containing the generalized Mittag-Leffler functions were investigated to present the special relaxation behaviors for the heat transfer problems.

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