Guest editorial

Fluid flow and heat and mass transfer through passages with complex geometries for advanced technology applications

New engineering equipment and cutting-edge technology require state-of-the-art knowledge of processes that govern the fluid flow through passages with complex geometries. Numerical techniques have varying accuracy which is dependent upon many factors such as discretization method, geometrical features, grid generation and solution algorithm. As a result, the goal is to find the best method that is capable of producing solutions with sufficient accuracy while minimizing computational demands and costs.

Many of advanced engineering applications contain fluid passing complex geometries, as whole or as building box of bigger structures. There are many diverse works try to designing methodologies to treat, to optimize and to study the physics of such complex geometries. Yet there are not many publications that are considering such complex fluid system behaviors in whole as a target subject. Therefore, this special issue tries to bring these related topics together.

As mentioned above, this special issue is interdisciplinary and brings different, yet interrelated topics in the field together. This brings unique opportunity for the community to target a complex and advanced industrial system from different points of view. As such, well-known leading researchers from different communities participate and present their recent works and findings toward this goal.

This special issue of the *International Journal of Numerical Methods for Heat and Fluid Flow*, specifically dedicated to *Fluid Flow, Heat and Mass Transfer through Passages with Complex Geometries for Advanced Technological Applications*, aims to highlight some of the most recent results achieved in the field.

The special issue concentrates on most recent developments, related to convective transport phenomena modeling with computational and numerical methods for fluid flowing through passages with complex geometries. It contains contributions in the field of numerical simulation of complex fluid flows, e.g. multiphase flows containing soft and solid particles. Advances using the meshfree smoothed particle hydrodynamics method, high-order compressible flows and turbulent spiral double-pipe flow in heat exchangers, rotating pipe flow, diverging pipes by using numerical simulation with different numerical methods are presented. A comparison between different fluid solvers, such as Fluent and OpenFOAM, for bubbly flows, investigations of design of micro-channels for nanofluid flows with a focus on electronic applications as well as entropy generation is complemented by a review on fluid-structure interaction in porous media as well as investigations on the up-scaling method called asymptotic homogenization. A link to applications is made by analysis of PCM and porous media, such as humidifier, for PEM fuel cell applications or turbine performance and permeation in porous membranes with comparison to experiments.

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