

Editorial

Inverse Fluid Convection Problems in Enclosures

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Efficiency, security, and reliability of industrial and domestic processes essentially depend on the deep understanding of their actual processes of fluid flow and heat transfer. Actual processes of fluid flow control and measurements need the development of effect-cause inverse modeling. Extensive investigations on the effect-cause inverse modeling could effectively enhance the efficiency, security, and reliability of these industrial and domestic fluid flow processes.

This special issue on the inverse fluid flow compiles 10 papers, merging from different academic disciplines and engineering application backgrounds. Three branches of inverse modeling and application have been discussed. These include inverse identification of pollutant sources, inverse determination of boundary conditions, and inverse measurement of heating devices.

Inverse identification of pollutant source location was addressed in the paper by S. Abe et al., who extended the quasi-reversibility methodology into the situation of airborne pollutant dispersions in the urban street canyons. Timely identification of these pollutant sources could facilitate occupants to evacuate from the dangerous areas.

Unknown boundary conditions always pose the classic modeling of inverse heat transfer and fluid flow. J. Wu et al. employed the hybrid immersed boundary lattice Boltzmann method to determine the unknown heat source term in the immersed boundary, such that the interpolated temperatures accurately satisfy the thermal boundary conditions.

Comparing with the aforementioned theoretical identifications of unknown boundary condition or source information, monitoring and measurement on the transport processes

could involve the noise data and many uncertainties. C. Solisio et al. applied Tikhonov regularization rules to successfully reconstruct the temperature profiles in the landfills of bio-reactor with heat recovery fluids measurements.

In addition to the research papers on the inverse modeling and applications, a few papers concerning the direct modeling of industrial multiphase flows, hydrogen-air detonation, square cylinder flows, and convergent channel flows have also been included in this issue. Outlook optimization and process control on these complicated flows will be investigated in the future.

By compiling these papers, we expect that this special issue on inverse flow problems in the industrial and domestic processes could enrich our readers and researchers.

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