

Minisymposium proposal: Computational Techniques for Cardiovascular Blood Flow and FSI Simulations

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ABSTRACT

The fields of computational fluid mechanics and fluid-structure interaction (FSI) for applications in the heart and cardiovascular system have developed a burgeoning array of computational techniques aimed at addressing critical challenges facing these applications. From limitations in data, uncertainty in model boundary conditions or parameters, demanding computational problems, to the need for increasingly fast computational processing times – these problems present key challenges and opportunities.

In this minisymposium, we will bring together experts on computational techniques for the simulation and analysis of blood flow and fluid-structure interaction (FSI) for the heart and other cardiovascular applications. We welcome novel contributions that model cardiac, cardiovascular, or cerebral flow with a focus on the important state-of-the-art computational techniques being developed to advance these applications. Sample topics of interest include (among others):

- computational techniques for patient-specific modeling,
- fluid-structure interaction,
- coupled models of different dimensionality,
- model reduction,
- uncertainty quantification,
- physics-informed neural networks.

Contributions will be sought which cover a range of technical developments: from key developments in numerical techniques and theory (e.g., discretization of differential equations) to integration and assessment of data (e.g., machine learning and data assimilation). Contributions are also welcome that present novel computational techniques for the analysis of blood flow. Examples are transport of (reacting) agents, stress analysis, estimation of platelet activation, etc.