

FLOW DYNAMICS AND MAGNETIC RESONANCE: VALIDATION AND PREDICTION

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ABSTRACT

Nuclear Magnetic Resonance (NMR) is a powerful experimental tool applied to various fields of physics, chemistry, engineering and the life sciences. In materials science, for example, the study of complex fluids based on NMR, so called Rheo-NMR [1], is a wide-spread technique that reveals material properties and flow behaviour non-invasively, and at steadily improving resolution. In the life sciences, the application ranges from the determination of microscopic transport at the cellular level [2], all the way to macroscopic flow dynamics, as for example in haemodynamics [3], or diffusion tensor imaging of the cranial cavity. In mechanical engineering, NMR is increasingly applied to analyse the complex fluid dynamics of real systems, e.g. fluidic mixers [4,5], textiles [6], and gas turbine flow [7].

The purpose of this minisymposium is to bring together practitioners that apply NMR in order to extract fluid-dynamically relevant information (structure, constitutive parameters, transport coefficients, flow dynamics) with those that develop the modelling and simulation tools for this special setting. This will facilitate a dialogue among these scientists towards validation of the separate approaches, for example by underscoring modelling and simulation results with appropriate experiments [8], but also to explore more intimate connections and research opportunities.

The minisymposium will feature at least 6 contributions, taken from the fields of NMR and flow modelling. The first of two groups of talks will focus on macroscopic measurements and the validation of CFD methods. The second group will be concerned with the modelling and simulation of NMR flow phenomena starting from a microscopic picture, towards moving up the length and time scale by considering model order reduction and coarse graining of the underlying methods [9]. Our preferred speaker list includes the pioneers of this very exciting emerging research area.

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