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AEROACOUSTICS: MODELLING AND NUMERICAL SIMULATION

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ABSTRACT

Since the beginning of computational aeroacoustics (CAA), several numerical methodologies have been proposed, each trying to overcome the challenges that the specific problems under investigation pose for an effective and accurate computation of the radiated sound. The main difficulties that have to be considered for the simulation of flow induced sound include energy and length scale disparity, preservation of the multi-pole character of the acoustic sources and dispersion and dissipation occurring in numerical schemes. Currently available aeroacoustic methodologies overcome only some of these broad range of physical and numerical issues which not only restricts their applicability but also makes them problem dependent in many cases.

The interaction effects and distinct properties of flow and sound engage scientist's interests. Inherently, the physics of flow and sound is described by the general compressible flow equations. Therefore, one branch of aeroacoustic modelling treats flow and acoustics directly as a united field by solving the compressible flow equations. The applications of direct aeroacoustic simulations reach from airframe noise, to acoustic simulations of landing gears, and turbomachinery. On the other hand, for low Mach number flows, hybrid approaches are mainly used, where an incompressible flow computation is performed, and via an aeroacoustic analogy or perturbation ansatz the acoustic sound sources are determined and used to compute the sound propagation.

The main objective of this mini-symposium is to bring together engineers from fluid dynamics and acoustics with physicists and mathematicians and focus on the physical modelling and numerical simulation of flow induced sound. The goal is to have a vivid forum for researchers to investigate in the multi-physical phenomena of aeroacoustics. Both, fundamental as well as application oriented contributions are welcome.