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4D pressure MRI: validation through in-vitro experiments and simulations. DANIELE SCHIAVAZZI, University of Notre Dame, OMID AMILI, FILIPPO COLETTI, University of Minnesota — Advances in MRI scan technology and recently developed acquisition sequences have led to the development of 4D flow MRI, a protocol capable of characterizing in-vivo hemodynamics in patients. Thus, the availability of phase-averaged time-resolved three-dimensional blood velocities has opened new opportunities for computing a wide spectrum of totally non-invasive hemodynamic indicators. In this regard, relative pressures play a particularly important role, as they are routinely employed in the clinic to detect cardiovascular abnormalities (e.g., in peripheral artery disease, valve stenosis, hypertension, etc.). In the first part of the talk, we discuss how the relative pressures can be robustly computed through the solution of a pressure Poisson equation and how noise in the velocities affects their estimate. Routine application of these techniques in the clinic, require however a thorough validation on multiple patients/anatomies and systematic comparisons with in-vitro and simulated representations. Thus, the second part of the talk illustrates the use of numerical simulation and in-vitro experimental protocols to validate these indicators with reference to aortic and cerebral vascular anatomies.

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