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Validation of Magnetic Resonance Thermometry by Computational Fluid Dynamics GRANT RYDQUIST, MARK OWKES, Montana State University, CLAIRE M. VERHULST, MICHAEL J. BENSON, BRET P. VANPOPPEL, United States Military Academy, West Point, SASCHA BURTON, JOHN K. EATON, CHRISTOPHER P. ELKINS, Stanford University — Magnetic Resonance Thermometry (MRT) is a new experimental technique that can create fully three-dimensional temperature fields in a noninvasive manner. However, validation is still required to determine the accuracy of measured results. One method of examination is to compare data gathered experimentally to data computed with computational fluid dynamics (CFD). In this study, large-eddy simulations have been performed with the NGA computational platform to generate data for a comparison with previously run MRT experiments. The experimental setup consisted of a heated jet inclined at 30injected into a larger channel. In the simulations, viscosity and density were scaled according to the local temperature to account for differences in buoyant and viscous forces. A mesh-independent study was performed with 5 mil-, 15 mil- and 45 mil-cell meshes. The program Star-CCM+ was used to simulate the complete experimental geometry. This was compared to data generated from NGA. Overall, both programs show good agreement with the experimental data gathered with MRT. With this data, the validity of MRT as a diagnostic tool has been shown and the tool can be used to further our understanding of a range of flows with non-trivial temperature distributions.

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