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Statistical Inference of a RANS closure for a Jet-in-Crossflow simulation[1] JAN HEYSE, WOUTER EDELING, GIANLUCA IACCARINO, Stanford Univ — The jet-in-crossflow is found in several engineering applications, such as discrete film cooling for turbine blades, where a coolant injected through hols in the blade's surface protects the component from the hot gases leaving the combustion chamber. Experimental measurements using MRI techniques have been completed for a single hole injection into a turbulent crossflow, providing full 3D averaged velocity field. For such flows of engineering interest, Reynolds-Averaged Navier-Stokes (RANS) turbulence closure models are often the only viable computational option. However, RANS models are known to provide poor predictions in the region close to the injection point. Since these models are calibrated on simple canonical flow problems, the obtained closure coefficient estimates are unlikely to extrapolate well to more complex flows. We will therefore calibrate the parameters of a RANS model using statistical inference techniques informed by the experimental jet-in-crossflow data. The obtained probabilistic parameter estimates can in turn be used to compute flow fields with quantified uncertainty.

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Jan Heyse
Stanford Univ

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