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Robust estimation of the integral scale for quantifying uncertainty of the sample mean from non-independent velocity data GEORDIE RICHARDS, Utah State University, DOUGLAS NEAL, LaVision Inc., BARTON SMITH, Utah State University — Using large data sets, we evaluate statistical bootstrapping schemes for approximating uncertainty in the sample mean of highly correlated velocity field measurements. Interest in time-resolved velocity field data has led to sampling rates high enough that non-independent samples are commonplace. Uncertainty of the sample mean collected from stationary but correlated data is given by $s/\sqrt{N_{eff}}$, where s is the standard deviation of the samples, and N_{eff} is the "effective" number of samples, that is, the number of samples N divided by twice the integral time scale T_u. We can approximate T_u using of a sum of auto-correlation coefficients, but it is necessary to truncate the sum at a prescribed lag K. This lag parameter K is equivalent to a bootstrapping parameter in statistics, and we can optimize selection of K using techniques from the bootstrapping methodology. With highly resolved data from laminar and turbulent velocity field measurements we will evaluate different strategies for this statistical bootstrap optimization.

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