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Reconstruction of turbulent mean flow statistics in the presence of uncertainty in measurements[1] SOUVIK GHOSH, Imperial College London, VINCENT MONS, DENIS SIPP, ONERA, France, PETER SCHMID, Imperial College London — Measurements from experiments are usually under-resolved in space and contain partial information about the true state of the flow. Data assimilation has proven to be an effective approach to accurately reconstruct the full flow field from limited information. With the presence of strong outliers in the sparse measurements, the adjoint-based methodology with mixed-norm regularized optimization has shown to be more efficient and accurate than more common least-squares techniques. We extend our previous work on mixed-norm data-assimilation and present a robust framework using a non-linear turbulence closure model to reconstruct the time-averaged mean flow field from limited experimental measurements with associated strong outliers. The framework shows promising result for the precise recovery of the Reynolds stress, via a volumetric forcing correction in the non-linear turbulence closure model equations. Applications of this framework will be presented for the case of a turbulent separated flow at sufficiently high Reynolds number for which the point-wise sparse measurements are obtained from an actual experiment.

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