

Abstract Submitted
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An Accelerated Macroscopic Forcing Method for Determining Eddy Viscosity Operators¹ DANA LYNN LANSIGAN, DANAH PARK, ALI MANI, Stanford University — The macroscopic forcing method (MFM) is a statistical technique for determining turbulence closures (Mani and Park (2019), arXiv:1905.08342). Specifically, the method is useful for determining the eddy viscosity operator of turbulent flows. One challenge with this technique is the requirement of multiple high-fidelity simulations for a reasonable characterization of the closure operator. Depending on the desired accuracy in details, i.e. relying on the leading-order moments of the closure operator or requiring assessment of all degrees of freedom, the number of required MFM simulations can vary from one to much larger than 10 for a given configuration. In this work, we present and verify a speed up technique for statistically stationary flows that reduces the cost of MFM by multiple orders of magnitude. As an example, we consider the standard turbulent channel flow and show that full characterization of the eddy diffusivity operator can be achieved by essentially dedicating the cost of a single high-fidelity simulation.

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