

Abstract Submitted
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Towards a thorough use of the Mori-Zwanzig formalism for statistical coarse-graining of turbulent flows¹ AYOUB GOUASMI, ERIC PARISH, KARTHIK DURAISAMY, Univ of Michigan - Ann Arbor, COMPUTATIONAL AEROSCIENCES LABORATORY TEAM — The Mori-Zwanzig formalism provides a mathematically-consistent framework to represent the unresolved physics in coarse-grained simulations. The closure terms that arise can be formally represented as memory or non-Markovian effects. However, the general procedure to compute these memory effects is not tractable in fluid flow problems. Accordingly, existing Mori-Zwanzig closure models only scratch the surface of the framework: they simplify the memory effect by making assumptions that cannot be numerically assessed. We propose a more tractable procedure to approximate memory effects with a good level of accuracy. This approach is demonstrated on the Viscous Burgers Equation and the Kuramoto-Sivanshinsky Equation. Building on these results, we provide perspectives in the development of Mori-Zwanzig-based coarse-grained models for turbulent flows.

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