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Investigation of Large-Scale Coherent Structures in Flow past a Sphere for Scale-Resolving Simulations (SRS) CHETNA KAMBLE, FREDDIE WITHERDEN, SHARATH GIRIMAJI, Texas A&M University — Success of Scale-Resolving Simulations (SRS) depends on accurately reproducing the large-scale structures in complex turbulent flows. Yet, no clear procedure exists for a quantitative assessment of the fidelity of these flow structures. The objective of this work is to develop such an assessment framework in the context of wake flow past a sphere which is chosen due to its inherent complexity and three-dimensional features. Numerical computations at different degrees of physical resolution are performed using the Partially-averaged Navier-Stokes (PANS) bridging-SRS method. Proper Orthogonal Decomposition (POD) is employed for a quantitative analysis of the computed large-scale structures in the wake. Most energetic structures resolved at different physical resolution are extracted and compared. Furthermore, the dominant structures are also qualitatively examined using the iso-surfaces of Q-criterion, i.e., second invariant of velocity gradient tensor. These results are compared to Direct Numerical Simulations (DNS) studies to establish the efficacy of the PANS-SRS simulations in capturing the large-scale vortical structures.

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