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Wall-resolved LES of a complex turbulent flow MUJEEB MALIK, NASA Langley Research Center, ALI UZUN, National Institute of Aerospace — Implicit, wall-resolved large eddy simulation, using a fourth-order compact difference scheme, is performed for a relatively high Reynolds number flow involving shock-induced flow separation. This is perhaps one of the most ambitious such simulations employing 24 billion grid points, pushing the boundary of flow simulations on high performance computing hardware. The particular case selected for this simulation is that of the well-known Bachalo-Johnson experiment conducted on a cylindrical body with an axisymmetric bump, which involves transonic shock-induced boundary layer separation with subsequent reattachment downstream of the bump. The Reynolds number based on the hump chord is 2.763 million. The relatively high Reynolds number of the test case makes the wall-resolved simulation very challenging, requiring billions of grid points. We will discuss the various issues and challenges encountered during the course of this research. Comparison of the simulation results is made with the available experimental measurements, with a view toward assessing the predictive capability of the simulations. Work supported by NASA's Transformational Tools and Technologies Project.

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