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The low-dissipation high-order accurate hybrid up-winding/central scheme based on fifth-order weighted essentially non-oscillatory (WENO) and sixth-order central schemes, along with the Spalart--Allmaras (SA)-based delayed detached eddy simulation (DDES) turbulence model, and the flow feature-based adaptive mesh refinement (AMR), are implemented into a dual-mesh overset grid infrastructure with parallel computing capabilities, for the purpose of simulating vortex-dominated unsteady detached wake flows with high spatial resolutions. The overset grid assembly (OGA) process based on collection detection theory and implicit hole-cutting algorithm achieves an automatic coupling for the near-body and off-body solvers, and the error-and-try method is used for obtaining a globally balanced load distribution among the composed multiple codes. The results of flows over high Reynolds cylinder and two-bladed helicopter rotor show that the combination of high-order hybrid scheme, advanced turbulence model, and overset adaptive mesh refinement can effectively enhance the spatial resolution for the simulation of turbulent wake eddies.

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