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Direct Numerical Simulations of the Flow around a Golf Ball: Methodologies and Approach NIKOLAOS BERATLIS, University of Maryland, College Park, MD, CLINTON SMITH, Arizona State University, Tempe, AZ, ELIAS BALARAS, University of Maryland, College Park, MD, KYLE SQUIRES, Arizona State University, Tempe, AZ, MASAYA TSUNODA, SRI R&D Ltd, Kobe, Japan. — An approach to Direct Numerical Simulations (DNS) for the flow around a golf ball is being developed. The spatio-temporal resolution that is required to capture all essential scales of the flow at realistic Reynolds numbers is severe, and highly efficient numerical tools that can scale up to hundreds of processors are required. In the present study an embedded boundary approach is adopted, where the Navier-Stokes equations are solved on a structured, staggered grid in cylindrical coordinates, and boundary conditions on the solid surface, which is not aligned with the grid, are imposed using interpolation. The code is parallelized using a domain decomposition strategy and message passing interface (MPI). In this first part, an assessment of the computational approach is presented, including an examination of grid dependence and a study of the parallel performance for grids up to 1.2 billion nodes on 500 processors.

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