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Direct Numerical Simulations of the Flow around a Golf Ball: Flow Structure and Forces CLINTON SMITH, Arizona State University, Tempe, AZ, NIKOLAOS BERATLIS, Univiversity of Maryland, College Park, MD, KYLE SQUIRES, Arizona State University, Tempe, AZ, ELIAS BALARAS, Univiversity of Maryland, College Park, MD, MASAYA TSUNODA, SRI R&D Ltd, Kobe, Japan.
— The drag on a golf ball can be reduced by as much as 50% compared to a smooth sphere. There have been very few studies, primarily experimental, that provide quantitative information on the details of the underlying mechanisms. To illuminate the underlying mechanisms, Direct Numerical Simulation (DNS) is applied to the flow around a golf ball using an immersed boundary method. Computations are performed using up to 500 processors on a range of mesh resolutions from 61 million points to 1.2 billion points. Results are presented from simulations performed at Reynolds numbers of $Re = UD/\nu = 0.25 \times 10^5$ and 1.0×10^5. Flow visualizations reveal the location of turbulent transition, as well as the delay of complete separation due to shear layer instability and the local separation within individual dimples. Prediction of the drag coefficient appears in reasonable agreement with measurements. Time-averaged statistics of the velocity and pressure are being acquired and will be presented at the meeting.

Elias Balaras
University of Maryland, College Park, MD, 20742

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