Abstract for an Invited Paper
for the DFD09 Meeting of
The American Physical Society

Modeling golf ball fluid mechanics - challenges and opportunities

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Numerical simulation presents a powerful tool for understanding the fundamental fluid mechanics that influence golf ball aerodynamics, as well as providing an approach for ultimately analyzing and designing golf balls for manufacture. Robust and accurate simulation strategies are central to providing a means to screen designs prior to costly prototyping and field measurement. Results from a hierarchy of simulation strategies applied to the flow around golf balls will be presented, ranging from Reynolds-averaged Navier-Stokes (RANS) computations to Direct Numerical Simulation (DNS). RANS methods, while leading to computationally efficient approaches, are challenged to represent using ad hoc turbulence models the subtle effects induced by surface dimpling. DNS on the other hand, offers a first-principles approach that enables detailed examination of mechanisms though carries a significant computational cost. Predictions from both techniques are contrasted; opportunities for advancing each technique are identified.

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