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Aerodynamics of a golf ball with grooves[1] JOOHA KIM, KWANG-MIN SON, HAECHEON CHOI, Seoul National University — It is well known that the drag on a dimpled ball is much lower than that on smooth ball. Choi *et al.* (Phys. Fluids, 2006) showed that turbulence is generated through the instability of shear layer separating from the edge of dimples and delays flow separation. Based on this mechanism, we devise a new golf ball with grooves on the surface but without any dimples. To investigate the aerodynamic performance of this new golf ball, an experiment is conducted in a wind tunnel at the Reynolds numbers of $0.5 \times 10^5 - 2.7 \times 10^5$ and the spin ratios (ratio of surface velocity to the free-stream velocity) of $\alpha = 0 - 0.5$, which are within the ranges of real golf-ball velocity and spin rate. We measure the drag and lift forces on the grooved ball and compare them with those of smooth ball. At zero spin, the drag coefficient on the grooved ball shows a rapid fall-off at a critical Reynolds number and maintains a minimum value which is lower by 50% than that on smooth ball. At non-zero α, the drag coefficient on the grooved ball increases with increasing α, but is still lower by 40% than that on smooth ball. The lift coefficient on the grooved ball increases with increasing α, and is 100% larger than that on smooth ball. The aerodynamic characteristics of grooved ball is in general quite similar to that of dimpled ball. Some more details will be discussed in the presentation.

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