Abstract Submitted
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Linear proportional control of flow over a sphere[1] SEUNG JEON, HAECHEON CHOI, Seoul National University — In the present study, we apply a linear proportional control to flow over a sphere for reduction of drag and lift fluctuations. For this purpose, the radial velocity at the centerline in the wake region is measured for the feedback and the control input (blowing/suction) varying in the azimuthal direction is provided from a slot located near the separation point. The azimuthal angle of maximum blowing is in phase or out of phase to the measured velocity according to the sign of feedback gain and the amplitude of blowing/suction is proportional to the measured velocity. Zero-net mass flow rate is satisfied during the control. We consider two different Reynolds numbers of $Re = 300$ and 425. We vary the sensing location from $x_s = 0.8d$ to $1.3d$ (d is the sphere diameter). The present control is found to be very sensitive to the sensing location, as was also observed for the control of flow over a cylinder by Park et al. (PoF, 1994). Using the present linear proportional control, the drag and lift fluctuations are significantly reduced for both $Re = 300$ and 425. It is found that the best sensing location for the present control is well correlated with the radial velocity induced by the vortex shedding.

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Haecheon Choi
Seoul National University

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