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Direct numerical simulation (DNS) study of the effect of wake structure on drag coefficient of thin flexible cylinder at low Reynolds numbers HARIKA GURRAM, University of Texas, CHELAKARA SUBRAMANIAN, Florida Institute of Technology, MAYTAL DAHAN, TRACY BROWN, University of Texas — Previous experimental and numerical study conducted by the present author [1,2] shows the occurrence of a drag crisis at low Reynolds numbers (less than 250) for a thin flexible cylinder of diameters in the range of 0.7mm to 1mm. The transition and unsteadiness in the wake structure cause the drag reduction and a periodic vortex shedding as also observed in the far-field downstream. The reduction of wake width in the downstream indicates that low Re, suggests that transitional unsteadiness increases in the near-field wake which tends to decrease the pressure drag. In order to explain the wake transition structure, the present work focuses on investigating the fluid-structure interaction of the thin flexible cylinder for a lower Re ranging from 50 to 250 for the same cylinder diameters. The direct numerical simulations (DNS) are conducted using ICEM CFD grid generator and ANSYS solver on the Stampede2 supercomputer. The preliminary results capture the laminar, transitional, and turbulent regions of the wake in the downstream. This study has some implication on the drag of underwater tethered systems.
[1] C. Subramanian and H. Gurram, "Drag coefficient of thin flexible cylinder," APS Division of fluid dynamics, Boston, 2015.
[2] Chelakara S. Subramanian, Harika Gurram, A Computational and Experimental Study of Wake of Thin Flexible Wires, Journal of Fluid Flow, Heat and Mass Transfer (JFFHMT, Volume 7, 2020, DOI: 10.11159/jffhmt.2020.004

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