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Influence of plant flexibility on turbulent aquatic canopy flow
SIDA HE, LIAN SHEN, University of Minnesota — Aquatic plant plays an important role in the hydrodynamics of aquatic environments, such as river, lake, and ocean. We have simulated the turbulent flow in submerged aquatic canopy with plant flexibility varying from absolute rigid to extremely flexible. Different from the classical approach of modeling the hydrodynamic effect of canopy as a volume drag force, we resolved the hydrodynamic effect of every plant by an immersed boundary method. Our approach has two benefits: (1) the interaction between the turbulence and every plant can be inspected directly; (2) *a priori* constant drag coefficient is not required. We then studied the influence of plant flexibility on the turbulent flow and canopy waving motion, i.e., *monami*. For all canopy flexibility, the velocity profile is self-similar in the mixing layer, though it does not completely follow the hyperbolic tangent profile of pure mixing flow. Our comparison of the mean momentum transport in the flexible and rigid canopy shows the significance of Reynolds stress and dispersive flux in the flexible canopy. We also studied the dispersion relation of *monami* and found that the wave speed of the high-wavenumber component depends on the plant flexibility.

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