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Energy harvesting from the interaction of a Lamb dipole with a flexible cantilever[1] HUI TANG, CHENGLEI WANG, The Hong Kong Polytechnic University — Energy harvesting from interactions of coherent flow structures with flexible solid structures can be used for powering miniature electronic devices. Although effective, the fundamental mechanism of such an energy extraction process has not been fully understood. Therefore, this study aims to provide more physical insights into this problem. The coherent flow structure is represented by a Lamb dipole, and the solid structure is assumed as a two-dimensional flexible cantilever. The cantilever is placed along the propagation direction of the dipole, with its fixed end initially towards or away from the dipole and its lateral distance from the dipole center varied. As the dipole passes through the cantilever, the latter can extract energy from the former through effective interactions. Such a two-dimensional fluid-structure interaction problem is numerically studied at a low Reynolds number of 200 using a lattice Boltzmann method (LBM) based numerical framework. The simulation results reveal that the flexible cantilever with a moderate stiffness is more beneficial to the energy harvesting, and it can scavenge more energy from the ambient vortices when its fixed end is initially away from the dipole with a relatively small lateral distance.

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