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Mean, coherent and stochastic flow structure interactions in the near-wake of an oscillatory foil FIRAS SIALA, Oregon State University, JAMES LIBURDY, Oreogn State University — Particle image velocimetry measurements are conducted to investigate the transport mechanism of flow kinetic energy in the near-wake of an oscillating foil at a reduced frequency of 0.18-0.2. Velocity triple decomposition is used to decompose the flow into mean, coherent and stochastic fields, and the kinetic energy evolution equations are utilized to study the energy exchange between the three components of the flow fields. The results show that the leading edge vortex (LEV) is responsible in extracting the majority of the free stream kinetic energy via the coherent shear strain. Furthermore, a scale-based model that characterizes the energy content of the LEV is developed. It is shown that coherent kinetic energy produced by the mean rate of strain scales remarkably well with the LEV energy content estimated by the model.

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