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Drag reduction of flexible beams in shear flow TRISTAN LECLERCQ, EMMANUEL DE LANGRE, Ecole Polytechnique — Flexible systems bending in steady flows are known to experience a lesser drag compared to their rigid counterpart. This effect can be quantified by the Vogel exponent $\nu < 0$ such that the total drag force on the structure increases as $U^{2+\nu}$ instead of the classical quadratic drag-velocity relationship. In this work, an analytical expression of the Vogel exponent of cantilever beams in cross-flow is derived by dimensional analysis, in the case of shear flow with vertical self-similarity. Numerical simulations are also performed and show excellent agreement. The results of the self-similar case provides insight regarding the scaling of drag with respect to the magnitude of the flow in more complex situations. The example of reconfiguration in a Blasius boundary layer is discussed.

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