

Abstract Submitted
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Manipulation of flow around bluff bodies by flexible slender filaments MOHAMMAD OMIDYEGANEH, ALFREDO PINELLI, City University London — Manipulation of bluff bodies wakes to control the intensity of fluid forces and the induced solid vibrations is of paramount importance. A biomimetic passive control based on the use of flexible slender appendages protruding from the body into the separated region has shown promising achievements in drag reduction and moderating force fluctuations. The present research aimed at understating and optimizing the physical properties and the arrangement of elongated flexible filaments to delay the 3D transition of the wake in terms of Reynolds number, mean drag reduction, and mitigation of the force fluctuations. The numerical campaign unveiled the role of flexural stiffness of the filaments: matching the natural frequency with the vortex shedding frequency enhances the mixing at the lee side. However, softer filaments (i.e. larger time scales) lock-in on either side of mid plane breaking the symmetry of the flow field (inducing a net lift force). In addition to 2D effects, the presence of filaments can interfere with the 3D bifurcation process resulting in a delay of the spanwise destabilization of the wake. The most effective parameter for this transitional interference is the spacing between filaments that should be smaller than the wavelength of the dominant 3D unstable mode.

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