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Mechanics of fluid flow over compliant wrinkled polymeric surfaces SHABNAM RAAYAI, GARETH MCKINLEY, MIT, MARY BOYCE, Columbia University — Skin friction coefficients (based on frontal area) of sharks and dolphins are lower than birds, fish and swimming beetles. By either exploiting flow-induced changes in their flexible skin or microscale textures, dolphins and sharks can change the structure of the fluid flow around them and thus reduce viscous drag forces on their bodies. Inspired by this ability, investigators have tried using compliant walls and riblet-like textures as drag reduction methods in aircraft and marine industries and have been able to achieve reductions up to 19% [1]. Here we investigate flow-structure interaction and wrinkling of soft polymer surfaces that can emulate shark riblets and dolphin's flexible skin. Wrinkling arises spontaneously as the result of mismatched deformation of a thin stiff coating bound to a thick soft elastic substrate. Wrinkles can be fabricated by controlling the ratio of the stiffness of the coating and substrate, the applied displacement and the thickness of the coating. In this work we will examine the evolution in the kinematic structures associated with steady viscous flow over the polymer wrinkled surfaces and in particular compare the skin friction with corresponding results for flow over non-textured and rigid surfaces. 1. K-S Choi et al.: Proc. R. Soc. Lond. A. 1997

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