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Computational Analysis of Vortex Formation Over a Flat Plate with Gradient-Based Slip Condition JOHN PALMORE, AMY LANG, MUHAMMAD SHARIF, University of Alabama — A thorough understanding of small scale aerodynamics is important for the design of micro air vehicles. Since they fly in the same Re regime as that of insects, these animals can provide biologically inspired designs. Butterflies have small scales (on the order of 100 microns in length) that line the surface of their wings; these scales can affect the slip condition over their wings, altering vortex formation and possibly leading to improved flight characteristics. In particular, it is believed that the scales impose a preferential direction for flow over the wing. To test this hypothesis, 2D flow over an infinitely thin flat plate was studied using the CFD software FLUENT. The slip condition was specified by defining an imposed velocity gradient on the plate's surface. Differences in vortex growth and formation are discussed with the goal of ascertaining whether the existence of a preferential flow direction leads to improved flight performance.

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