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Computational Analysis of Low Reynolds Number Couette Flow Over an Embedded Cavity Geometry[1] CHASE LEIBENGUTH, AMY LANG, WILL SCHREIBER, The University of Alabama — A butterfly utilizes an efficient and complex flight mechanism comprised of multiple interacting flow control devices that include flexible, micro-geometrically surface patterned, scaled wings. The following research attempts to deduce any aerodynamic advantages that arise from the formation of vortices in between successive rows of scales on a butterfly wing. The simplified computational model consists of an embedded cavity within a Couette flow with the flat plate moving transversally over the cavity. The effects of cavity geometry and Reynolds number are analyzed separately. The model is simulated in ANSYS FLUENT and provides qualitative insight into the interaction between the scales and the boundary layer. Preliminary results indicate that vortices form within the cavity and potentially contribute to a net partial slip condition. Further, the embedded cavities contribute to a net reduction in the drag coefficient that varies with Reynolds number and cavity geometry.

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