Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

A Generic Mechanism for Splitting and Shedding of Vortices and Recirculation Regions KEVIN CASSEL, MICHAEL BOGHOSIAN, Illinois Institute of Technology — Vortex shedding is a common feature in many high-Reynolds number internal and external flows. While several mechanisms have been put forth to explain this important phenomenon in specific settings, a general framework that unifies these mechanisms and applies in a broad class of flows has not been forthcoming. A surprisingly simple minimal flow unit is identified in the present study and shown to apply in a wide variety of settings in which vortices or recirculation regions are found to split and shed in the vicinity of smooth surfaces. There are two necessary conditions for this mechanism: 1) a region of low momentum fluid (as found at the center of a slowly moving vortex or recirculation region), and 2) a pressure or body force having a particular structure acting on the region of low momentum. While the impetuous for the pressure or body force may vary, its action on the vortex or recirculation region is generic. The basic framework is illustrated and causality established through calculation of several simple model problems, and computational results for some canonical flows, such as shedding behind a circular cylinder and flow over a forward-facing step, are used to illustrate how the generic mechanism can be identified in real flows.

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Date submitted: 01 Aug 2014 Electronic form version 1.4