Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Global Instability and Transient Growth in a Model Fusifom Aneurysm with Steady Inflow[1] GREGORY SHEARD, HUGH BLACKBURN, Department of Mechanical and Aerospace Engineering, Monash University, VIC 3800, Australia — The stability of the flow through a model aneurysm is computed using a global linear stability analysis and a direct transient growth analysis. The geometry consists of sinusoidal expansion in a circular pipe. Dimensions are chosen to represent a human abdominal aortic aneurysm near to the critical bulge size requiring surgical intervention. The bulge length and maximum width are 2.9 and 1.9 times the pipe diameter, respectively. Subject to a steady inflow, the flow is found to be weakly unstable to quasi-periodic global eigenmodes with azimuthal wavenumbers of 4 and 5 at a Reynolds number (based on area-averaged velocity and pipe diameter) of $Re \approx 3900$. Perturbation structures in these eigenmodes are concentrated in the outer part of the bulge towards its downstream end. A transient growth analysis reveals that the flow is sensitive to transient disturbances beyond $Re = 33$, well below the time-averaged Reynolds numbers of blood flow in the human abdominal aorta.

[1]Supported by a Monash University Faculty of Engineering Small Grant, and the NCI high-performance computing facility.

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Date submitted: 13 Aug 2010 Electronic form version 1.4