Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Quantifying unstable flows in sidewall aneurysms at internal carotid arteries[1] TRUNG LE, North Dakota State University, ELIZABETH EIDENSCHINK, ALEXANDER DROFA, Sanford Health — Complex, unstable flow has been linked to aneurysm growth and rupture. Our previous works (Le et al., J. Biomech. Engr., 2010 and Le et al., Annals Biomedical Eng., 2013) have shown a possible transition from the stable mode (cavity) to the unstable mode (vortex ring). We have proposed the use of a non-dimensional index called Aneurysm Number to characterize this transition (Le et al., 2013). However, the quantification of such a transition is lacking. Currently, there has been no efforts in quantifying unstable flows in intracranial aneurysms, which is essential in stratifying not only rupture risks, but also to guide clinical management. In this work, the aneurysmal geometries from six patients at Sanford Health, North Dakota are reconstructed from Magnetic Resonance Angiogram and Digital Substraction Angiogram data. Using our in-house CFD code (Virtual Flow Simulator), high-resolution flow data is obtained. In this work, we propose the use of enstrophy mapping as a potential index to stratify aneurysm flows. We show that this type of mapping is able to differentiate stable from unstable modes in patient-specific anatomies. We also provide evidence on the link of Aneurysm Number and enstrophy mapping.

[1]This work is supported via the start-up funding of Trung Bao Le at the Department of Civil and Environmental Engineering- North Dakota State University and a grant NSF ND EPSCOR #FAR0030612

Trung Le
North Dakota State University

Date submitted: 23 Jul 2019 Electronic form version 1.4