Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Effects of Aortic Irregularities on the Blood Flow IRIS GUTMARK-LITTLE, Cincinnati Childrens Medical Center, LISA PRAHL-WITTBERG, STEVIN VAN WYK, MIHAI MIHAESCU, LASZLO FUCHS, Royal Institute of Technology, Sweden, PHILIPPE BACKELJAUW, Cincinnati Childrens Medical Center, EPHRAIM GUTMARK, University of Cincinnati — Cardiovascular defects characterized by geometrical anomalies of the aorta and its effect on the blood flow are investigated. The flow characteristics change with the aorta geometry and the rheological properties of the blood. Flow characteristics such as wall shear stress often play an important role in the development of vascular disease. In the present study, blood is considered to be non-Newtonian and is modeled using the Quemada model, an empirical model that is valid for different red blood cell loading. Three patient-specific aortic geometries are studied using Large Eddy Simulations (LES). The three geometries represent malformations that are typical in patients populations having a genetic disorder called Turner syndrome. The results show a highly complex flow with regions of recirculation that are enhanced in two of the three aortas. Moreover, blood flow is diverted, due to the malformations, from the descending aorta to the three side branches of the arch. The geometry having an elongated transverse aorta has larger areas of strong oscillatory wall shear stress.

Iris Gutmark-Little
Cincinnati Childrens Medical Center

Date submitted: 09 Aug 2013 Electronic form version 1.4