Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Effect of variation of geometric parameters on the flow within a synthetic models of lower human airways ANDRES SANTIAGO ESPINOSA MORENO, CARLOS ALBERTO DUQUE DAZA, Department of Mechanical and Mechatronic Engineering, Universidad Nacional de Colombia — The effects of variation of two geometric parameters, such as bifurcation angle and carina rounding radius, during the respiratory inhalation process, are studied numerically using two synthetic models of lower human airways. Laminar flow simulations were performed for six angles and three rounding radius, for 500, 1000, 1500 and 2000 for Reynolds numbers. Numerical results showed the existence of a direct relationship between the deformation of the velocity profiles (effect produced by the bifurcation) and the vortical structures observed through the secondary flow patterns. It is observed that the location of the vortices (and their related saddle point) is associated with the displacement of the velocity peak. On the other hand, increasing the angle and the rounding radius seems to bring about a growth of the pressure drop, which in turn displaces the distribution and peaks of the maximum shear stresses of the carina, that is, of the bifurcation point. Some physiological effects associated with the phenomena produced by these geometric variations are also discussed.

Andres Santiago Espinosa Moreno
Universidad Nacional de Colombia

Date submitted: 02 Aug 2017 Electronic form version 1.4