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Experimenatal analysis of the effect of cartilaginous rings on human tracheobronchial flow JOSE MONTOYA SEGNINI, University of Turabo, HUMBERTO BOCANEGRA EVANS, LUCIANO CASTILLO, Texas Tech University — We present a set of high-resolution PIV experiments carried out in a refractive index-matched model of a trachea with cartilage rings at Re $\approx$ 2800. Results show a higher vorticity along the walls of the trachea in the model with cartilaginous rings as well as small recirculation areas on the upstream side of the wall cavities created by the rings. Furthermore, the ringed model experiences higher shear stress in the trachea due to the sudden change in the wall position created by the rings. Additionally, small recirculation areas are identified in the cavities between rings. For the smooth model, a stronger separation bubble is observed at the bronchi entrance, generating a stronger shear layer and increasing the wall shear stress on the bottom bronchi wall. The differences observed go against the notion that the main airway, i.e. trachea and main bronchi, may be modeled as smooth. Our results suggest that cartilage rings will have an impact on the wall shear stress and may affect particle deposition, which is of importance in inhaled drug delivery and pollutant deposition in the airway. Additionally, the effects introduced by the rings may change the flow characteristics in further generations.

Humberto Bocanegra Evans
Texas Tech University

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