Abstract Submitted
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Effect of morphological variability on particle deposition in idealized human airways[1] ELEANOR LIN, JORGE A. BERNATE, Stanford University, DANIEL A. PARADA SAN MARTIN, Pierre and Marie Curie University, YUZO MAKITANI, California Polytechnic State University, ERIC S. G. SHAQFEH, GIANLUCA IACCARINO, Stanford University — This study is focused on the effects of variability in airway morphology on particle deposition in the lungs, which in turn impacts disease inception and drug delivery. We generated a parameterized geometry of the human airway derived from Lola: a realistic geometry obtained from CT scans (Zhang et. al J AEROSOL SCI 46, 34 (2012)). The upper airway geometry is parameterized using an elliptic model from Xi and Longest (ANN BIOMED ENG 35,560 (2007)), with the glottis modified to a realistic triangular shape, based on measurements taken from Lola. The trachea and bronchi are generated using rules adapted from Kitaoka et. al. (J Appl Physiol 87, 2207-2217 (1999)), with the first 3 generations closely matching those of Lola. We perform simulations corresponding to a full breathing cycle and illustrate the preferential deposition in each generation. In addition, we compared the deposition features in the idealized geometry to those from simulations in the original scanned airways. Perturbations are then applied to the parameterized geometry to study the effects of morphological variability on deposition patterns.

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