Abstract Submitted
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On locating the obstruction in the human upper airway[1] YONG WANG, S. ELGHOBASHI, University of California, Irvine — The fluid dynamical properties of the air flow in the human upper airway (UA) are not fully understood at present due to the three-dimensional, patient-specific complex geometry of the airway, flow transition from laminar to turbulent and flow-structure interaction during the breathing cycle. One of the major challenges to surgeons is determining the location of the UA obstruction before performing corrective surgeries. It is quite difficult at present to experimentally measure the instantaneous velocity and pressure at specific points in the human airway. On the other hand, direct numerical simulation (DNS) can predict all the flow properties and resolve all its relevant length- and time-scales. We developed a DNS solver with lattice Boltzmann method (LBM), and used it to investigate the flow in two patient-specific UAs reconstructed from CT scan data. Inspiration and expiration flows through these two airways are studied and compared. Pressure gradient-time signals at different locations in the UAs are used to determine the location of the obstruction.

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