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Effect of Time-dependent Pressure Boundary Condition on Flow Transport in a Patient Specific Lung Model during Invasive High Frequency Oscillatory Ventilation MOHAMMED ALZAHRANY, ARINDAM BANERJEE, Lehigh University — Large eddy simulation was used to investigate gas transport in a human lung (image-based) model during high frequency oscillatory ventilation (HFOV). A time-dependent pressure boundary condition as a function of the flow rate and coupled resistance-compliance was imposed at the outlets. The study was conducted for three different HFOV frequencies of 6, 10 and 15 Hz; a constant tidal volume of 50 ml and various compliance ratios (1, 4 and 10). The results are compared to computations that use traditional boundary conditions (such as pre-specified flow and constant pressure), experimental and gamma scintgraphy results. While traditional pre-specified mass fraction boundary condition failed to capture the Pendelluft flow at regional lung units that are observed in experiments, our modified resistance-compliance based pressure boundary condition was successful in predicting this feature. The impact of compliance ratio and frequency on phase-delay at different lung sections and its effect on secondary flow and turbulence will also be presented.

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