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ACCEPTED MANUSCRIPT

The influence of moving walls on respiratory aerosol deposition modelling

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Abstract

Almost all prior models for respiratory aerosol deposition have utilised rigid analogues of airways, which do not account for the effects of lung motion on particle deposition. This work initially examines particle deposition in a Weibull-type geometry, comparing traditional computational fluid dynamics approaches with a novel moving mesh method. A distinct difference was found to exist between the results obtained using a stationary geometry (with either constant or oscillating flow) and a moving mesh. The second part of the work applies the moving mesh method to a Sprague-Dawley rat airway. It was found that a hybrid moving mesh and oscillating flow method was required to produce optimal results. The new method agrees well with in-vivo experimental data for local and global deposition in rat airways.

Keywords:
Computational fluid dynamics, Lungs, Deposition, Moving mesh

1. Introduction

Simulation of lung airflow and aerosol deposition is an interesting case where bio-mechanics, biomedical engineering, medicine and aerosol science

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