Numerical Simulation Of Particle Deposition In Cross Flow

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Particle Deposition in Respiratory Tract**Wave particle duality at the workshop - Numerical Simulation** DNS of particle-laden turbulent duct flow **LES of particle deposition in a channel** ~~Numerical simulation of interaction between particles and free surface flow~~ *Particle Transport and Deposition* ~~Regional deposition of inhaled particles in human lungs using Rocky DEM~~ **Meet The 14-Year-Old Quantum Physics Whiz Who's Already Graduating College | TODAY Dust and pollutants at work - Go Home Healthy** *Cyclone separator CFD analysis | Particle simulation | Discrete phase model | Efficiency calculation Physics simulation - forming solids, liquids and gases from particles*
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Size-Dependent Particle Deposition
Moving mesh lung model with particle Deposition*samadii DEM, Metariver Technology : numerical simulation of granular flow on GPUs (CUDA)* Chemical Reaction Engineering Modeling and Simulation in COMSOL Multiphysics® *Computational Physics with python tutorials- Book Review. Python for physics* ~~OpenFOAM -- ASHEE: 3D numerical simulation (LES) of a planar turbulent plume with particles~~ Younger Dryas Impact Hypothesis (YDIH) - Prospects for a physics-based model Numerical Simulation Of Particle Deposition
Deposition fraction profiles versus particle diameter are demonstrated in Figs. 6(a) and 6(b) in two different ranges of particle diameters. As observed in Fig. 6(a) , under inlet velocity of 0.15 m/s, particles have slightly higher deposition fraction in majority of sizes comparing.

Numerical Simulation of Particle Transport and Deposition ...
In recent years, numerical simulation based on CFD method has become a powerful tool to investigate particle deposition process in various engineering problems,,,,. Many numerical investigations have been carried out to successfully predict particle deposition in duct air flows with uniform section,,,,.

Numerical simulation of particle deposition in duct air ...
Particle deposition in fully developed turbulent square duct flows is simulated using large eddy simulation combined with Lagrangian particle tracking under conditions of one-way coupling, with the particle equation of motion solved with Stokes drag, lift, buoyancy, and gravitational force terms. The flow considered has bulk Re = 83 K, with three particle sizes 50, 100, 500 μm. Results ...

Numerical Simulation of Particle Deposition in Turbulent ...
A Lagrangian approach is utilized to provide a two-dimensional, numerical simulation of particle motion within the entire turbulent boundary layer of a duct (pipe or channel) flow. The turbulent flow is simulated by a random velocity field of random time scales, through which many thousands of particle trajectories are solved from the equation of motion to yield an average deposition rate.

A numerical simulation of particle deposition in turbulent ...
Recently, with the advent of computational fluid dynamics (CFD), numerical simulation has the potential to provide predictions for particle deposition in bends (McFarland et al., 1997). Although USP throats have been used for decades when drug formulations or inhalation devices were tested, there is little experimental data as to whether the USP throats mimic the filtering capabilities of the human mouth and throat.

Particle deposition measurements and numerical simulation ...
Numerical simulation of transient breathing cycles in a realistic human URT model was used to investigate the instantaneous airflow patterns and particle deposition during the inspiratory and expiratory processes. The transient deposition fraction (DF) depended on breathing time (mainly the breathing flow rate) and on particle diameter.

Numerical simulation of micro-particle deposition in a ...
1. J Biomech Eng. 2014 Dec;136(12):121010. doi: 10.1115/1.4028800. Numerical simulation of particle transport and deposition in the pulmonary vasculature.

Numerical simulation of particle transport and deposition ...
In this work, we use direct numerical simulation (DNS) and Lagrangian tracking to study turbulent transfer and deposition of inertial particles in vertical upward circular pipe flow. Our objects are: (i) to quantify turbulent transfer of heavy particles to the wall and away from the wall; (ii) to examine the connection between particle transfer mechanisms and turbulence structure in the boundary layer.

Direct numerical simulation of particle wall transfer and ...
Equation illustrates the numerical algorithm based on the Euler's method for tracking fine particle movement in the three-dimensional (3D) pore space using the LB-simulated 3D pore flow field (Chen et al., 2010): (12) x (t + Δ t) = x (t) + v (x (t)) · Δ t + v s (x (t)) Δ t + 6 D Δ t ξ where x is the vector indicating the position of the fine particle in the 3D space (m); t is time (s); Δt is the time step used in fine particle tracking (s); v is the pore flow velocity vector which is ...

Numerical simulation of the migration and deposition of ...
Pan et al. included the deposition, rebound and removal criteria in their numerical simulation of the fouling on economizer tubes. The deposition rates and distributions were studied. Han et al. also added a user-defined function in FLUENT software to simulate the particle deposition on the tube bundle heat exchangers. The deposition rates for different particle diameters, flow velocities, tube shapes and arrangements were compared, and the staggered elliptical tubes were suggested to reduce ...

Simulation of real time particle deposition and removal ...
This numerical simulation is conducted by the CFD software of ANSYS FLUENT 14.0. The number of particles used in each simulation case is about 5000,000, and, for each numerical simulation, one week computation time is needed.

Numerical Simulation of Particles Deposition in a Human ...
Particle deposition in fully developed turbulent square duct flows is simulated using large eddy simulation combined with Lagrangian particle tracking under conditions of one-way coupling, with the particle equation of motion solved with Stokes drag, lift, buoyancy, and gravitational force terms.

Numerical Simulation of Particle Deposition in Turbulent ...
Effect of particle size on aerosol deposition and removal from the classroom model as a function of time since particle release from student 5's mouth. This figure shows the deposition fraction for (a) 1 μ m particles, (b) 4 μ m particles, (c) 10 μ m particles, (d) 15 μ m particles, (e) 20 μ m particles, and (f) 50 μ m particles.

Numerical investigation of aerosol transport in a ...
Micro-particles with aerodynamic diameters in the range of 1–30 μm were simulated to examine a wide range of nasal deposition efficiencies. While particles greater than 20 μm are typically not inhalable by the human nose, the simulations were performed up to 30 μm for completeness. 4.

Numerical simulation of airflow and micro-particle ...
Numerical simulation of emitted particle characteristics and airway deposition distribution of Symbicort(®) Turbuhaler(®) dry powder fixed combination aerosol drug Eur J Pharm Sci . 2016 Oct 10;93:371-9. doi: 10.1016/j.ejps.2016.08.036.

Numerical simulation of emitted particle characteristics ...
Numerical simulation results were compared with experimental and simulation data from other authors. Results for different variants of problem statement were compared. Asymmetry of breath cycle should be accounted in calculation of particle deposition efficiency.

Numerical simulation of particle deposition in the human ...
A steady simulation was performed in asymmetric tracheobronchial airway mode consisting of 19 outlets to observe the characteristics of airflow fields. The discrete phase model (DPM) was employed to predict the particle trajectories and deposition in the airway model.

Numerical Simulation of Transport and Deposition of Dust ...
Numerical Simulation of Particle Deposition in Turbulent Duct Flows . ... The particle deposition velocity is found to increase with particle size, with the tendency for deposition at the duct corners increasing with the variable. From dynamic analysis, gravity most significantly affects particle deposition in the vertical direction, while drag ...

Numerical Simulation of Particle Deposition in Turbulent ...
van Haarlem, Bas Boersma, Bendiks J. and Nieuwstadt, Frans T. M. 1998. Direct numerical simulation of particle deposition onto a free-slip and no-slip surface.

Keywords: CFD, drug delivery, airflow, particle deposition, nasal airway.

The human nasal cavities, each with an effective length of only 10cm, feature a wide array of basic flow phenomena due to their complex geometries. Dependent on such airflow fields are the transport and deposition of micro- and nano- particles in the human nasal cavities, of interest to engineers, scientists, air-pollution regulators, and healthcare officials. By utilizing advanced CAD and reverse engineering skills, a realistic model of the human nasal cavity was constructed from MRI image data for 3-D computer simulations. Assuming laminar quasi-steady airflow, dilute micro- and nano-particle suspension flows and local deposition efficiencies were analyzed for 7.5

The transport of solid particles inside a laboratory-scale turbulent boundary-layer is studied by numerical simulations, to obtain a better understanding of the mechanisms associated with wind erosion of soil. The presence of one or several Gaussian hills allows a study of the topographic effects on the transport, deposition and re-emission of solid particles. The carrier fluid motion is resolved in a Large Eddy Simulation (LES). Wall models are implemented to better account for the effects of turbulent flow near the terrain. Particle trajectories are calculated using a Lagrangian tracking. Take-off and rebound models are developed in order to take into account particle emissions and impacts at the wall. In the first part, the flow over transversal Gaussian hills is simulated and validated by comparison with different experiments. According to Oke [1988], the flow inside an urban canopy can be schematically characterised into different flow regimes depending on the relative localisation of the obstacles at the ground. This concept is applied to the case of sand dunes, assimilated to 2D hills in this study. The focus is on the recirculation zone (RZ) on the lee side, which has the characteristic of increasing the residence time and the interaction fluid/particle in general, particle trapping and deposition in particular. The variations of RZ with different hill geometries and Reynolds numbers are examined. A study on the roughness sublayer is conducted in order to determine the roughness effects due to the layer of solid particles on the wall. The second part of the work is devoted to the simulation of solid particle transport over the Gaussian hills. The objective is to improve the modelling of particle take-off, rebound and the two-way coupling between the fluid and the particle. A first work of validation is conducted by using the complete model of solid particle transport developed in this thesis. In particular, the evolution of particle emission flux predicted by the take-off model is in accordance with classical saltation models and experiments from the literature. Over the Gaussian hills, analysis of particle transport is conducted using concentration and mean velocity fields. Two mappings are realised. The first indicates the intensity of the local and instantaneous flow structures that arguably regulate the re-entrainment of particles trapped inside the RZ. The second shows the accumulation of particles on the wall. These results highlight zones prone to wind erosion and particle deposition around the hills. Last but not least, the fluxes of particle trapping and deposition inside the RZ are quantified and compared to the incoming flux from upstream. These fluxes, albeit relatively weak in comparison to the incoming one, contribute potentially to dune migrations and desertification.

Nanoparticle holds significant promise as the next generation of drug carrier that can realize targeted therapy with minimal toxicity. To improve the delivery efficiency of nanoparticles, it is important to study their transport and deposition in blood flow. Many factors, like particle size, vessel geometry and blood flow rate, have significant influence on the particle transport, thus on the deposition fraction and distribution. In this thesis, computational fluid dynamics (CFD) simulations of blood flow and drug particle deposition were conducted in four models representing the human lung vasculature: artificial artery geometry, artificial vein geometry, original geometry and over-smoothed original geometry. Flow conditions used included both steady-state inlet flow and pulsatile inlet flow. Parabolic flow pattern and lumped mathematic model were used for inlet and outlet boundary conditions respectively. Blood flow was treated as laminar and Newtonian. Particle trajectories were calculated in each of these models by solving the integrated force balance on the particle, and adding a stochastic Brownian term at each step. A receptor-ligand model was integrated to simulate the particle binding probability. The results indicate the following: (i) Pulsatile flow can accelerate the particle binding activity and improve the particle deposition fraction on bifurcation areas; (ii) Unlike drug delivery in lung respiratory system, particle diffusion is very weak in blood flow, no clear relationship between the particle size and deposition area was found in our four-generation lung vascular model; and (iii) Surface imperfections have the dominant effect on particle deposition fraction over a wide range of particle sizes. Ideal artificial geometry is not sufficient to predict drug deposition, and an accurate image based geometry is required.