Contribution ID: **463** Type: **Oral Presentation**

Numerical Simulation of Effective Models for Transport Processes in Deformable Porous Media within Mixed Eulerian/Lagrangian Framework

Thursday, 25 May 2023 14:15 (15 minutes)

We present in this talk an effective model for transport processes in periodically perforated elastic media, taking into account also cyclic elastic deformation as it occurs e.g. in lung tissue due to respiratory movement. The underlying microscopic problem consists of a linear elasticity equation for the displacement within the Lagrangian framework, posed on a fixed domain and a diffusion equation for the concentration within the Eulerian framework, posed on the current deformed domain. After a transformation of the diffusion equation onto the fixed domain, we derive the upscaled model by means of a formal asymptotic expansion. The system is nonlinearly coupled through effective coefficients, which also take into account the periodic microstructure. We develop and study numerical methods for our problem and perform simulations that are inspired by a bioengineered microdevice which is able to reconstitute critical lung functions (Lung-On-A-Chip). The simulations shed light into the sensitivity of the model with respect to several experimental parameters such as frequency or magnitude of the cyclic mechanical strain.
This is joint work with Markus Gahn (Heidelberg), Nicolas Neuß (Erlangen) and Maria Neuss-Radu (Erlangen).

Participation

In-Person

References

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Energy Transition Focused Abstracts

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