

HOMOGENIZATION OF A FLUID STRUCTURE MODEL FOR THE PROPAGATION OF SOUND IN THE LUNGS

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In this presentation, we propose the mathematical modeling of the propagation of sound waves in the lung parenchyma, which is a foam-like elastic material containing millions of air-filled alveoli. In this study, the parenchyma is governed by the linearized elasticity equations and the air by the acoustic wave equations. The geometric arrangement of the alveoli is assumed to be periodic with a small period $\varepsilon > 0$. We consider the time-harmonic regime forced by vibrations induced by volumic forces. We use the two-scale convergence theory to study the asymptotic behavior as ε goes to zero and prove the convergence of the solutions of the coupled fluid-structure problem to the solution of a linear-elasticity boundary value problem.