Anisotropic wave propagation within strain gradient framework: a focus on a mixed static-dynamic numerical procedure for parameter identification.

Giuseppe Rosi, Luca Placidi, Nicolas Auffray

The objective of this talk is to present recent results in the domain of anisotropic and dispersive wave propagation within the framework of linear strain-gradient elasticity. This analysis reveals significant features of this extended theory of continuum elasticity. First, and contrarily to classical elasticity, wave propagation in hexagonal (chiral or achiral) lattices becomes anisotropic as the frequency increases. These points are first theoretically derived, and then numerically experienced on hexagonal chiral and achiral lattices. The use of a continuum model for the description of the high frequency behaviour of these microstructured materials can be of great interest in engineering applications, allowing problems with complex geometries to be more easily treated.
When using these continuum models, one of the main problems is the identification of the homogenised parameters. In this talk I will illustrate a mixed numerical static-dynamic approach, that uses static measures with rich boundary conditions and dynamic measures of phase velocity based on Bloch analysis. This procedure can also be used experimentally.

References:

G. Rosi and N. Auffray, "Anisotropic and dispersive wave propagation within strain-gradient framework," Wave Motion, vol. 63, pp. 120–134, 2016.

N. Auffray, J. Dirrenberger, and G. Rosi, "A complete description of bi-dimensional anisotropic strain-gradient elasticity" Int. J. Solids. Struct., vol. 69, pp. 195–206, 2015.