



Wave propagation through bimodular medium: 1D discrete and homogenised models

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In many cases the Earth's crust exhibits bimodular behaviour characterised by different moduli in tension and compression. This paper analyses the effect of the bimodularity on the wave propagation. Two different models of the bimodular media have been considered: a chain of discrete masses coupled by bilinear springs (bilinear oscillators) and its 1D homogenised approximation – a rod made of a bimodular material. We analysed the process of longitudinal wave propagation under several types of external harmonic excitation. The prominent feature of the behaviour of bimodular medium is a phenomenon of gradual change of the sign of displacement, which we term sign inversion of the displacement. It occurs only when a faster compressive phase of the excitation follows the tensile phase.

The systems considered are conservative, which is confirmed by the conservation of the total energy throughout the entire numerical solution. Thus the hypothesis (commonly used in e.g. fluid mechanics) of the energy loss due to the impact of compressive and tensile phases is not confirmed for bimodular solids.