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Analysis of energy dissipation during wave propagation in fragmented geomaterials by forced oscillations of a simple impact element

Maxim Khudyakov (1), Arcady Dyskin (1), and Elena Pasternak (2)

(1) The University of Western Australia, School of Civil, Environmental and Mining Engineering, Crawley, Australia (maxim.khudyakov@research.uwa.edu.au), (2) The University of Western Australia, School of Mechanical Engineering, Crawley, Australia (maxim.khudyakov@research.uwa.edu.au)

When a wave propagates through fragmented geomaterials, adjacent blocks can perform mutual rotation, which leads to energy dissipation due to impact interaction between the blocks. This type of behaviour cannot be analysed thoroughly by continuous models because of a discrete character of the energy dissipation.
In this paper, the process of wave propagation through fragmented geomaterials can be simulated by forced oscillations of a simple impact element representing a single mass with impact damping occurring at the neutral position. The simplest model is reduced to a second order differential equation with an additional condition on the reduction of the velocity by a restitution coefficient when the system passes through the neutral position is analysed.
For small restitutions zero energy dissipation for superharmonic frequencies and the emergence of several peaks on the dissipation energy response curve was observed. The results of the impact dissipation model are compared with the ones obtained by a simpler continuous Kelvin-Voigt model with equivalent damping and the applicability of the latter is analysed.