Nonlinear Processes in Geophysics
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Interactive comment

Interactive comment on "Effect of Disorder on Bulk SoundWave Speed : A Multiscale Spectral Analysis" *by* Rohit Kumar Shrivastava and Stefan Luding

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The manuscript aims to report the results of investigation of wave propagation in a 1D chain of particles with randomly assigned masses. The particles are connected by longitudinal springs with power law dependence between the force and displacement. The exponent is assumed either 0 (conventional linear spring) or 0.5 (Herzian contact). The manuscript however considers only linear contacts (exponent=0). The way it is implemented cannot be considered as a linearization of Herzian contact for small displacement, since to do so one needs to specify the point around which linearization is performed and then linearize the force-displacement law around it. As a result the linearized law will contain the exponent as a parameter. This is shown in eq. (8), which is linearization by itself. Then a parametric analysis of the influence of

the exponent needs to be performed. Otherwise, the claim about non-linearity is not justified. In the simple linear case such an investigation could have already existed in the literature, as the lit review does not make it clear. If the non-linearity focus of the paper is kept one needs more thorough literature review. In particular, discussing the cases when linearization cannot be performed as in the case of Herzian contact with zero displacement or the case of bilinear springs (see e.g., Dyskin, A.V., E. Pasternak and E. Pelinovsky, 2012. Periodic motions and resonances of impact oscillators. Journal of Sound and Vibration 331(12) 2856-2873; Dyskin, A.V., E. Pasternak and I. Shufrin, 2014. Structure of resonances and formation of stationary points in symmetrical chains of bilinear oscillators. Journal of Sound and Vibration 333, 6590–6606; Guzek, A., A.V. Dyskin, E. Pasternak and I. Shufrin, 2016. Asymptotic analysis of bilinear oscillators with preload. International Journal of Engineering Science, 106, 125-141 and the literature cited there). The literature review needs to be expanded, as the other components of displacements and rotations are barely mentioned. The review should include more papers where dynamics and wave propagation in particle sets and chains is investigated (see e.g., Pasternak, E. and Mühlhaus, H.-B. (2005) Generalised homogenisation procedures for granular materials, Eng Math, 52, Number 1, 199-229; Dyskin, A.V., E. Pasternak and G. Sevel, 2014. Chains of oscillators with negative stiffness elements. Journal of Sound and Vibration, 333, Issue 24, 6676–6687; Esin, M., Pasternak, E. and Dyskin, A.V. (2016) Stability of 2D discrete mass-spring systems with negative stiffness springs, Physica Status Solidi (B) Basic Research, 253, 7, 1395-1409 and the literature cited there). It is not clear from the text whether the disorder manifests itself through the non-uniformity of masses only or non-uniformity of the inter-particle distance is included as well. The measures of disorder adopted in the paper need to be explained in more detail. Figures, especially Figs. 4-6 need to be made larger. Caption to Fig. 5 is not informative and should be rewritten. Abstract: the references should be removed or shortened. English needs to be improved, the use of articles checked. Word "media" is plural; with article "a" should go singular, "medium". I suggest major revision to address the above comments.

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Discussion paper