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Nonlinear Processes in Geophysics
Discussions
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Interactive comment on "Soils' seismic property research on the basis of investigation of their nonlinear properties" *by* V. B. Zaalishvili

Dr. of Scienses Zaalishvili

vzaal@mail.ru

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1. The title says about "soil nonlinearity". However, the soil nonlinearity is nowhere defined. "Soil nonlinearity" is referred here as a nonlinear stress-strain behavior. It is known terminology and the author suggested not to describe what it is because journal is for specialists in this field. There are only two types of nonlinearity physical and geometrical, as it can be seen paper deals with the first one. It is known that nonlinear phenomena appear in spectral changes of seismic signals the paper deal with.
2. The author introduced a term "intensity increment". It must be noted that intensity increment is common for seismic microzonation in post-soviet countries. It describes seismic intensity changes relative to some "average" soil conditions site to which background seismic intensity is assigned by maps of detailed seismic zoning. Intensity is

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measured in MSK-64 macroseismic scale. 3. It seems that the author does not propose a new tool, but just introduces existing empirical tools to estimate the intensity increment which are pretty old. All the empirical data was obtained and collected by the author through the tens of years, some of them were presented and discussed in numerous scientific conferences. New modern data processing techniques allowed author to offer new empirical relations. Developed seismic microzonation techniques are patented in Russian Federation. 4. The author introduced some equations along with figures. Many of these are referred to Georgia 1991 and 1992. However these references are missing in the list. There were no publications in this period due to difficult political and social conditions in the Georgia in 1990-1992. While author make a matter of conscience to mention that data was obtained by his group in this hard times. 5. It is sometimes questionable how the equations are derived from the data show in figures... Curves in mentioned figures (fig. 2-3) are given just to show trends and are not pretend for practical usage. Least squares procedure was used but author don't think these equations parameters are needed to be presented in the paper. Author is sorry about absence of reference on Figure 6 that must be on page 442. Figure 6 demonstrates location of two sites separated by the river (near the villages Barbalaant Kari and Metekhi), so they are close but located on different soils. Referee asked for sites scheme, so here is most presentable one. Elsewhere sites are compared, they are located close so relative site effect is clear. 6. I also don't know the necessity and relevance of Figure 7 and Figure 8. Figures 7 and 8 demonstrates appearance of constant component of soil field of displacements in the zone of intensive dynamic impacts and author thinks that these illustrations are necessary 7. Figure 9 is missing units for the spectra and time series. Spectra and records are normalized to clearly show signal transformation. 8. Figure 10: What do the hollow and solid circles represent in (c)? First ones is rigidity and the second is losses coefficient values. 9. Figure 11: Again, it is not clear that what kind of nonlinearity that the author is looking for... Spectrum area as an energy of signal is very important. Transmitted to buildings foundations energy and its frequency distribution forms seismic effect. While peak ground acceleration val-

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ues are usually used. Figure 11 shows that under some acceleration value (about 0.1 g) we don't observe further growing of spectral area. This figure shows this important border value between nonlinear and linear behavior. As for data source well known SMART-1 network in Taiwan is mentioned in paragraph containing figure 11 reference. 10. Figure 12: Again this is from others' work. Therefore, it should be clearly cited in the caption. It is mentioned in text that data were obtained by French scientists Bonnet and Heitz in 1994 and agree to mark it in caption if it corresponds publisher rules. Due to the units – values after FFT were normalized by analysed length. 11. Figure 13: I guess the author is showing response spectra. However, all of the spectra do not look realistic. Figure 13 shows normalized by maxima values records (accelerograms) spectra, so maximum values are non-dimentional 1. Acronym "c.u." is used for "conditional unit" here. 12. Figure 14: This spectra are typical examples of site effects, which is not surprisingly new... Author considers this figure important, because it clearly shows nonlinear effect in soft soils in connection with destruction. Records in epicentral zone of Spitak earthquake are used. 13. Table 1: I don't know why the first and second rows represent. Seismic intensity increment ΔI is calculated relative to the first site (first row) as a reference one. First column describes geological conditions of sites and others intensity increments depending from released in the source energy which is measured as magnitude. All earthquakes took place in the same zone. Table shows dependence of intensity increments that are commonly used in Russian earthquake construction practice on this energy caused by nonlinear phenomena.

Author is grateful for referee comments and he is opened for further discussion.

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