

Interactive comment on “A hybrid model for mapping simplified seismic response via a GIS-metamodel approach” by G. Grelle et al.

Anonymous Referee #2

Received and published: 7 April 2014

Dear Authors Grelle, Bonito, Revellino, Guerriero and Guadangno, Dear Editorial board of NHESS, Töpfer Hereby My review comments. But first congratulations with the excellent work behind the modelling, python coding and data structuring and input.

1. General comments (according to the NHESS criteria)

Does the paper address relevant scientific and/or technical questions within the scope of NHESS? Yes about earthquake hazard and local variations due to soil conditions.

Does the paper present new data and/or novel concepts, ideas, tools, methods or results? Yes it is a new concept in site characterization.

Are these up to international standards? Yes.

C353

Are the scientific methods and assumptions valid and outlined clearly? Mostly yes, the 'outlined clearly' might be improved, especially for a more general audience.

Are the results sufficient to support the interpretations and the conclusions? Yes, however it remains a model

Does the author reach substantial conclusions? Yes

Is the description of the data used, the methods used, the experiments and calculations made, and the results obtained sufficiently complete and accurate to allow their reproduction by fellow scientists (traceability of results)? Mostly yes for the methodology. The input data into the model is not really presented.

Does the title clearly and unambiguously reflect the contents of the paper? Yes. The terminology in the title is rather technical but this reflects the rest of the text.

Does the abstract provide a concise, complete and unambiguous summary of the work done and the results obtained? Yes, although it might start with the interest for the public = reduce risk at local scale by modeling site response. Like in the last sentence of the abstract.

Are the title and the abstract pertinent, and easy to understand to a wide and diversified audience? both may be made less technical.

Are mathematical formulae, symbols, abbreviations and units correctly defined and used? If the formulae, symbols or abbreviations are numerous, are there tables or appendixes listing them? OK.

Is the size, quality and readability of each figure adequate to the type and quantity of data presented? OK, but almost all captions contain insufficient instructions to understand the figures and tables.

Does the author give proper credit to previous and/or related work, and does he/she indicate clearly his/her own contribution? Yes, OK.

C354

Are the number and quality of the references appropriate? OK.

Are the references accessible by fellow scientists? Yes.

Is the overall presentation well structured, clear and easy to understand by a wide and general audience? This might be problematic. But NHESS readers are probably not a general audience.

Is the length of the paper adequate, too long or too short? OK.

Is there any part of the paper (title, abstract, main text, formulae, symbols, figures and their captions, tables, list of references, appendixes) that needs to be clarified, reduced, added, combined, or eliminated? Main text contains some grammar and spelling mistakes. Figure captions are too concise and abstract may be rewritten for a more general audience.

Is the technical language precise and understandable by fellow scientists? Mostly yes, sometimes not due to some broken English.

Is the English language of good quality, fluent, simple and easy to read and understand by a wide and diversified audience? It is well readable but contains several small grammatical errors and some unclear sentences.

Is the amount and quality of supplementary material (if any) appropriate? No supplementary material available.

2. Specific comments The readability of the manuscript can be greatly improved by a native English speaker/writer review (I am not, but I've done my best in the next section 'Technical corrections'). The way many sentences are constructed adds to the complexity. The topic is difficult but the language should not be.

The abstract could benefit from an introductory sentence that introduces earthquake hazard and its spatial variation due to sediment amplification as a concern for everybody, especially those in high risk areas. This may persuade readers to have a closer

C355

look. The relevance to the public is repeated at the end of the abstract where the hybrid model is applied to a real case. At the end of the abstract I would advise to add, in short, the conclusions of the application of the modeling procedure to the real 'test' case. What new results are obtained and how did the model perform. Something like 'The result of ... maps with the spatial distribution of acceleration response spectra at 8 different periods of shaking. The modeling procedure performed well (robust and accurate) at the control points in the back-validation.' The middle section of the abstract could, in my opinion, be shortened and simplified to highlight not how painfully difficult the work (certainly) is but rather your new approach to model the spatial variability of sediment parameters which are not abundantly available in most settings and of the resulting soil response and the spectral response at surface level. My main advice is to check if every difficult word which might 'scare' people is really needed in the abstract. A probably too extreme example: 'This discretizes the seismic underground half-space in a pseudo-tri-dimensional way.' contains the same information as 'The area and its subsurface are divided into blocks'.

The same language simplification may be applied in the main text, but here it is not that necessary. The specific terminology used in modelling, Hazard and site response should be kept in the main text for clarity.

Throughout the article it is sometimes difficult to know where you are in the modelling process and how much (or few) original measurement data is represented. Possibly you could add the geo-data or an impression of it as electronic supplement. The hybrid model validation is performed for four down-hole locations where the sediment parameters are known but this data was probably also used as input in the GCM and the depth dependent litho-dynamic units. In this situation a good fit between model and input is to be expected. Another test would be how well would the model perform at a new site or after removing all the input geodata at one of the four down-hole sites? Maybe I miss the point here as I am not a modelling expert. The discussion of the uncertainties or simplifications in the model at Pg 13 lines 9 to 17 seems short.

C356

The twofold explanation of the theory of the model first and then the application to the case study is good. This way there is redundancy in the presented methodology and its application.

In the Discussion and the Conclusions section, there is no real reference to the relevance of this study for the general public and more specifically for the people at Giorgio del Sannio. What do the values mean and how can/will/should they be used for new and existing buildings?

The captions of most of the figures should contain more information about what is shown.

The graph inset of figure 9 and especially the range of fundamental periods of zones is difficult to understand because the second scale is also the color legend of the period-disaggregation for the different zones.

3. Technical corrections

These are suggestions by a non-native English speaker who can make mistakes too but who can miss mistakes while reading as well.

At several occasions there seem to be double spaces in the printed version. This is maybe just due to the typography but it can easily be checked.

VS, the expression for shear wave velocity, is written with capital S in subscript (if I am well informed) in this article it is capital V with small s

further comments are structured as follows Page nr-line nr: 1-12 'An Hybrid model' = 'A hybrid model'. 1-17 to help the reader, add commas after 'metamodel' and 'function'. 1-22 'regarding' = 'based on' or 'calculated from' 2-1 consider changing 'Conversely from' to 'In contrast to' for the general audience 2-3 consider deleting 'usually' this is incorporated in 'Many building codes' at start of sentence 2-4 consider deleting 'mainly' this is incorporated in 'Many building codes' at start of sentence 2-4+5 consider changing sentence to '...expressed in terms of spectral acceleration at surface level, derived

C357

from spectral acceleration at bedrock level in combination with the amplification due to the sediment column.' or something similar. 2-10 omit the abbreviated first name letter from the 'Kolat et al., 2006' reference. 2-11 'seismo-induced' = 'seismic-induced' seems better to me but not certain 2-12 'To this regard' = 'In this regard' 2-12 to 14 consider changing sentence to '...based on either experimental geophysical methods, such as dynamic low strain (linear) measurements, mainly from ambient noise, or else numerical simulation methods of linear or non-linear stress strain ...' 2-18 to 21 rewrite sentence, message is not clear. The 'However' at the start does not represent a juxtaposition with the previous sentence whereas the 'in addition to' near the end is a change from positive point to criticism of H/V method. 2-23 'characterized' = 'characterize' 3-1 consider 'In the light of ...' = 'Building upon ...' 3-7 to 10 can this be rephrased in a clearer or simpler way to avoid confusion with 'some Hokus Pokus was applied' or refer to the paragraph where it is explained in more detail. 3-30 'regards' = 'regard'. 4-8+9 consider changing to '...corresponds to a "litho-dynamic unit" with specific lithology and dynamic properties. This "litho-dynamic unit" is mainly defined in ...' 4-10 'secondarily' = 'secondly' but can be omitted. 4-13 not sure what is meant by 'fully extended' probably you mean in the matrix of the model as explained in the next sentence. 5-8 to 18 As reader I expect to see the minimum depth and layer thickness value which is used in this study but it is not given. 5-15-16 consider changing to '... indicating the absence of the litho-dynamic unit.' 5-21 'Shear waves' = 'Shear wave' 5-23 to 26 consider moving 'the function is a non linear...' together with equation [1] upward after 'To a space-invariant function'. After equation [1] the sentence 'Rigid bedrock assumes...' introduces equation [2]. 6-2 consider changing to '... representative values as they take into account the increase...' 6-6 'regression Vs' = 'regression for Vs' 6-32 consider changing 'admit inversion' = 'allow inverted' 7-6 'waves' = 'wave' 8-1 'layering' = 'layered' 9-21 change to either 'Bk are the polynomial coefficients' 2* plural or else 2* singular 'Bk is the polynomial coefficient'. 10-33 Not clear what 'smaller, thickened' means in this sentence. finer grained, but a thicker package? or coarser grained and thinner package? 11-3 again 'thickened' here I suggest to put 'thick'. 11-21 consider

C358

changing 'in relation to' to 'than' 11-33 'simulate' = 'simulated' 12-1 'simulate' = 'simulated' 12-12 reference link missing to (NTC 2008), this reference is also missing in reference list 12-18 'afore-mentioned' = 'aforementioned' 12-19 consider changing to 'north-south component of the real time history' 12-24 'granular' = 'grain' 13-10+11 consider replacing 'this aspect may be attributed to the following features:' by 'These simplifications include:'. 13-13 what does 'is associated with such a coherence;' mean? do you mean 'depends on this identification;'. 13-22 'spectra' = 'spectral'. 13-26 'spectra' = 'spectral'. 13-28 to 30 consider changing to 'The identification of the average shear wave velocity of the shallow layers, V_{sup} , must be carried out with accuracy. 13-30 unclear what 'defined taking into account that it is referred to a litho-dynamic unit' maybe add comma after 'defined' or better rephrase. 14-3 'estimate' = 'estimation' and 'amplified' = 'amplification'. 14-4 'errors disaggregated' = errors of disaggregated'. 14-5 'that error' = 'that the error'. 14-6 'subordinate to' = 'less near'. 14-17 two times defined in different context in the sentence. Maybe replace the second by 'spatially predicted' or something similar. 14-21 'consider 'regarding' = 'from' 14-22 consider omitting 'observable' 14-25 'shear waves velocity' = 'shear wave velocities' 15-9 after 'third level' add again the reference to (ISSMGE-T4, 1999) and maybe change to 'third level of reliability' or something similar.

Figures and captions

19-2 Figure 1 'identification of the litho-dynamic units units' delete the extra 'units' or do you mean the physical units that describe the litho-dynamic units? 22-1 Figure 4 is 'survey' the same as 'borehole'? 24-2 Figure 7 'Simulate' = 'Simulated' and also comma after 'Vs-profiles'. 24-3 'in NERA' = 'in the NERA'. 26-1 Figure 9 'No Smoothed' = 'Unsmoothed'. 26-4 'showed' = 'shown'.

Hopefully you can agree with most of these comments. Good luck

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 2, 963, 2014.