

Interactive comment on “Shallow subsurface geology and seismic microzonation in a deep continental basin. The Avezzano Town, Fucino basin (central Italy)” by Paolo Boncio et al.

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Received and published: 1 February 2017

Author reply to referee #2 comments on “Shallow subsurface geology and seismic microzonation in a deep continental basin. The Avezzano town, Fucino basin (central Italy)” by Paolo Boncio et al.

GENERAL COMMENTS

REFEREE:

This paper has only applicative interest because it focuses on the Level 1 SM, which is a routine practice in Italy.

C1

RESPONSE: We would like to thank the reviewer for the comments. Certainly this work has applicative interests. Nevertheless, we think that the scientific community might be interested to this work for a number of points, including:

The structure of the Geological-Technical Map (G-T Map) proposed in this paper represents a new methodological approach compared to that required by the Italian SM guidelines. In fact, the Italian SM guidelines, published in 2008 (see SM Working Group, 2015 * for the English edition), do not provide technical specifications for the G-T Map. Some implementations have been published more recently (e.g., Martini et al., 2011**; “Standard di rappresentazione e archiviazione informatica. Microzonazione sismica. Versione 4.0b, 2015” available online at http://www.protezionecivile.gov.it/resources/cms/documents/StandardMS_4_0b.pdf).

These implementations provide some guidelines for the G-T Map that favor the mapping of textural features for cover soils (gravel, sand, silt, etc.) and geo-mechanical features for the geological bedrock (lapideous vs pelitic vs interlayering, stratification, fracturing, etc.). A number of basic geologic data, necessary for the 3D reconstruction of geological bodies, are lost (chronostratigraphic relations, sedimentary environments, etc.). In any case, specific instructions for building the G-T Map are not provided. The aim of this work is not to modify the Italian guidelines, but we propose an original methodological procedure for building a G-T Map for SM which might be of interest for scientists and professionals working in the field of SM, in Italy or elsewhere. This procedure was adopted for basic (Level 1) SM of the Abruzzo Region. The proposed methodology and the resulting G-T Map preserve basic geological data, and implement them with additional lithological-technical features useful for SM.

This paper represents a new case history in the scientific literature, with potential interest for other areas with similar geologic context; We also agree with the statement from the anonymous Referee #4 “The study of the geological, morphological and structural factors controlling the local seismic site response can potentially represent a significant contribution of broad interest, considering that several old villages and towns of central

C2

and southern Italy are located in comparable geological and morphological settings”;

This paper contributes to improve the knowledge of the seismic hazard of this area.

In order to clarify these points, we are going to modify the “Introduction”, the “Methodology” and the “Discussion and Conclusion” sections.

The queries about the specific comments have been answered separately in the following section.

SPECIFIC COMMENTS:

REFEREE:

“ They write: “The Fucino basin is a Quaternary graben” but, strictly speaking, the section of figure 1b does not show a graben. Then, in Fig. 1b the trace of the section intersects 5 red faults, but the section below shows 6.

RESPONSE: We agree with this comment. We will draw an original geological transect that takes into account the geometry of the active faults reported in Figure 1b. It is based on our original data for that regarding the western sector and on the data presented in Cavinato et al. (2002) for the central and eastern sectors.

REFEREE:

“ They write that “the SW-dipping Fucino fault system [...] borders the basin towards the east” and “the basin depocenter is localized towards the eastern margin”. Rather, it borders the basin towards the NE, and they refer to the north-eastern margin.

RESPONSE: We will correct E with NE.

REFEREE:

“ Pleistocene medium-to coarse-grained fluvial, alluvial fan, and slope-derived deposits are interfingered with lacustrine sediments (Fig. 1b)”. Non visible in the figure.

RESPONSE: We agree with this comment; we will delete the reference to figure 1b.

C3

REFEREE:

“ from 1400 and 2600 yrs” from 1400 to 2600 yrs (?). However, $33 \text{ kyrs}/9 = 3666$ yrs. So, “from 1400 to 2600 yrs” does not work. Thus?

RESPONSE: We agree with this comment. We realized that there is a mistake in this sentence. We will modify in “There were 9 earthquakes during the last ~19 kyrs, including the 1915 event (Serva et al., 1986; Michetti et al., 1996; Galadini and Galli, 1999; Galli et al., 2008, 2012), with an average recurrence time which according to Galadini and Galli (1999) ranges between 1400 and 2600 yrs”.

REFEREE:

“ I think they used Lennartz 3D/5 sensors. Please mention the used instrumental chain also in this paper, to ensure the reader that detected frequencies < 1Hz are reliable.

RESPONSE: Ok, the information required will be added.

TECHNICAL CORRECTIONS:

REFEREE:

“ The Mt. Parasano and Mt. Serrone ridge and the Val Roveto are not shown in the figures.

RESPONSE: Ok, we will add the missing localities in figure 1.

REFEREE:

“ Fig. 4 is mentioned before Figs. 2 and 3. Change their order.

RESPONSE: We will correct.

REFEREE:

“ (silt and clay, Fig.1b)” are not shown in Fig. 1b.

C4

RESPONSE: We will delete the reference to figure 1b.

REFEREE:

â€” Several cases of irregular spacing throughout the text.

RESPONSE: We will correct.

REFEREE:

â€” The SDTM and the dynamic penetration test, shown in Fig. 3, are not mentioned in the text.

RESPONSE: We will add a mention to the SDTM and the dynamic penetration test in the text.

CITED REFERENCES * SM Working Group (2015) – Guidelines for Seismic Microzonation. Civil Protection Department and Conference of Regions and Autonomous Provinces of Italy. 1 Vol. English edition of: Gruppo di lavoro MS, Indirizzi e criteri per la microzonazione sismica, Conferenza delle Regioni e delle Province autonome – Dipartimento della protezione civile, Roma, 2008, 3 vol. e Dvd. Available online at http://www.protezionecivile.gov.it/httpdocs/cms/attach_extra/GuidelinesForSeismicMicrozonation

** Martini et al. (2011) in *Ingegneria Sismica* XXVIII,2, 2011, available online at http://www.protezionecivile.gov.it/resources/cms/documents/aggiornamento_indirizzi_microzonazione

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., doi:10.5194/nhess-2016-313, 2016.