

Dear Editor,

We carefully read the comments made by Riccardo Civico and co-authors and their concerns about the results of our work, in open discussion on Solid Earth.

We find two major problems on their comments, that we analyse in detail in the following: one regards the scientific outcomes of our research in relation with the "state of the art" on the available literature at the moment of the submission of our manuscript; one regards the timing of publication.

Reply to Civico and co-authors:

(Comments of Civico and co-authors in **bold**, followed by our reply to each point)

1) My coauthors and I recently carried out an extensive geophysical campaign integrating time-domain electromagnetic soundings and ambient seismic noise recordings in the Middle Aterno Valley (central Italy), where the Fossa-San Demetrio depression is located. We imaged the deep architecture of the Middle Aterno Valley and its relations with the 2009 L'Aquila earthquake causative fault. The results of our work have been published as two extended abstract and as a poster presentation, and are currently under review on Journal of Geophysical Research - Solid Earth.

At the moment of the submission of our manuscript, only the extended abstracts by Civico et al. (2015) and Pucci et al. (2016) were available (we have not cited the latter in the original manuscript; we have now added it). As for the paper currently under review, I hope we are not to blame for not being able to foresee the future.

As far as the poster presentation related to the extended abstract by Civico et al. (2015) is concerned, the authors uploaded on ResearchGate website (is it an official literature source?) their poster just on august 23, 2016 (Figure 1-reply), i.e. more than one month after the submission of our paper to Solid Earth. So, we could not know what the authors wrote on the conclusions of their poster, and I hope we are not to blame if the authors did not report on the abstract the conclusions of the poster!

2) Reading the manuscript it clearly appears that the sources of the data for imaging the Fossa-San Demetrio depression at depth are neither documented nor properly cited. The authors presented ambient seismic noise data supporting exclusively the reconstruction of the deep architecture of the Subequana Valley, their core study area

As can be read in our submitted manuscript (page 12, lines 1 to 5), we discuss about the outcomes of previous studies on the Fossa-San Demetrio basin (**we did not claim that they were the results of our study**), citing the proper references: Cesi et al. (2010), Di Nezza et al. (2010), Di Filippo et al. (2011) and, of course, **Civico et al. (2015) (also adding Pucci et al., 2016 in the updated and corrected version)**. We properly cited all the available literature. As for the description of the available information, we dedicated 5 lines to it. This means a very very few "space" used for the Fossa-San Demetrio basin. The structural characteristics of the area have been discussed simply because the available data are necessary to show and foster our interpretation.

3) At a closer look the overall subsurface geometry of the San Demetrio-Fossa depression fully matches the reconstruction made by Civico et al., 2015 for the same area, presented in a published extended abstract (http://www.earthprints.org/bitstream/2122/9773/1/Civico_etal_2015_INGV_misellanea.pdf). In more detail, both the shape at depth of the Fossa-San Demetrio depression and the outline/mask of Figure 8 in that area clearly resemble what presented in Figure 3 by Civico et al., 2015 (see above-mentioned abstract).

At a closer look, Civico and coauthors should note that we present in Figure 8 a very small image of the deep geometrical feature of the Fossa-San Demetrio basin (shown together with other basins), with resolution and extent much lower than that provided by Civico et al. (2015) and Pucci et al. (2016).

Moreover, Civico and coauthors should note that our figure 8 derives from crossing information on the subsurface geometry of the basin derived from electric surveys made by Bosi and Bertini (1970), from gravimetric analysis (Cesi et al., 2010; Di Nezza et al., 2010; Gruppo di Lavoro MS-AQ, 2010; Di Filippo et al., 2011), as well as from the other geophysical techniques applied by Civico et al. (2015). We cited all of them in the original manuscript (plus Pucci et al., 2016 in the revised version). We thus simplified the reconstruction of the deep structure of the basin, as we only meant to provide an overall view of this! We never ever “copy and paste” other works, as can be easily seen in the Figure 2-reply.

4) Although the manuscript (Line 4, page 12) cites Civico et al. (2015), we think that the citation is not fully appropriate. In fact, our data do not represent only a support to gravimetric prospection, instead we reconstruct for the first time the 3D image of the Middle Aterno Valley, including the estimate of the depth of the main buried depocenters.

Civico and coauthors should note that the reconstruction of the 3D image of the Middle Aterno Valley was already made by Bosi and Bertini (1970) (who drawn, **more than forty years ago**, contour lines describing the deep geometry of the basin, and we mainly used them for depicting the general shape of the deep basin) and by Linee Guida MZS (2010), as we show in Figure 2-reply. Civico et al. (2015) confirmed the general 3D shape of the Fossa-San Demetrio basin (as shown in Figure 2-reply) by applying other geophysical techniques.

5) The authors of the manuscript under review should thus remove the portion of the text where they discuss the main findings on the Fossa-San Demetrio depression or add a section (including the caption of Figure 8) in which these data are properly attributed to the original sources.

In order to make the source of the data a little clearer (even if we don't think it is needed), we will add in Figure 8 caption that the provided view of the deep geometry of the Fossa-San Demetrio basin derives from crossing the results of all the above mentioned works, i.e. Bosi and Bertini (1970), Cesi et al. (2010), Linee Guida MZS (2010), Di Nezza et al. (2010), Di Filippo et al. (2011), Civico et al. (2015).

6) In addition, the thoughts and concepts expressed in the final part of the Discussion section (lines 1-7 and 11-15 of page 12) are very similar to those presented both in the above-mentioned extended abstract by Civico et al. (2015) and in the related conference poster presentation (DOI: 10.13140/RG.2.2.11186.20160) as well as to those found in the Pucci et al., 2016 (Page 203 of the Proceedings of the 7th International INQUA Meeting on Paleoseismology Active Tectonics and Archeoseismology, available at https://www.researchgate.net/publication/303864531_Proceeding_of_the_7th_International_INQUA_Meeting_on_Paleose

As a matter of fact, the thoughts and concepts expressed in Civico et al. (2015) are much more general than those expressed in our submitted paper. Civico et al. (2015) reports:

“As a consequence, the SE side of the depocenter is characterized by a strong topographic gradient, in coincidence with the tip of the Quaternary basin. Notably, the shape of this maximum depocenter is not coherent with the NW-trending, Quaternary normal faults affecting the eastern side of the basin. This evidence suggests that the onset of the Middle Aterno

*Quaternary basin was controlled by the long-term activity of **a differently oriented fault system** that could have played a key role before or together with the PSDFS segments through time".*

Pucci et al. (2016) reports:

"The data illustrate the important role of the NNE- and WNW-trending conjugate extensional system in the formation of a different shaped Early Pleistocene basin";

And *"This evidence suggests that the onset of the Middle Aterno Quaternary basin was controlled by the long-term activity of **a differently oriented fault system** that could have played a key role before or together with the PSDFS segments through time, and that now act as segment boundaries".*

The use of "*differently oriented fault system*" in both the abstracts is a rather general conclusion, not pointing to specific trends or kinematics of faults.

We could not know whether the authors meant, for instance, that the basin was first controlled by sets of N-S or E-W structures or whatever. Moreover, they did not define the kinematics of these supposed "*differently oriented fault system*", i.e. inverse, strike-slip or normal structures. Also, these supposed "*differently oriented fault system*" are not shown in any figure of Civico et al. (2015) and Pucci et al. (2016).

As for the latter paper, on Pucci et al.'s figure 3 one can see many fault traces, but we cannot figure out which faults the authors refer to and in which part of the large area they investigated these faults are located; they did not clearly state it in the abstract nor clearly indicate in any figure.

Instead, we propose in our work that, comparably to the Fucino, Subequana and Sulmona basins, the early phase of the Fossa-San Demetrio basin formation was led by NE-SW structures, having local extensional kinematics (Pucci et al. 2016, mentioned undefined "*NNE- and WNW-trending conjugate extensional system*", without specifying where they are located in the large area they analysed!).

We already presented the ideas and concepts of cross-chain extensional faults leading the early phases of formation of central Apennine intermontane basins at the 8th IAG International Conference on Geomorphology, on 27-31 Agosto 2013 (Gori S., Falcucci E., Ladina C., Marzorati S., Valensise G., 2013. Fault activity, basin architecture and structural evolution of extensional tectonic depressions: case studies from central Apennines (Italy), investigated through geological and geophysical surveys. 8th IAG International Conference on Geomorphology, 27-31 Agosto 2013, Parigi). And it is stated in the Ph.D Thesis of Emanuela Falcucci (2011).

A noteworthy aspect is that the Gruppo di Lavoro MS-AQ (2010) and Cesi et al. (2010) defined that the sharp boundaries of the Fossa-San Demetrio basin were probably controlled by NW-SE and NE-SW tectonic structures (Figure 3-reply).

Nonetheless, the interpretation proposed by the Gruppo di Lavoro MS-AQ (2010) and Cesi et al. (2010) has not been neither discussed nor even mentioned in the extended abstracts by Civico et al (2015) and Pucci et al. (2016), although Cesi et al. (2010) and the Gruppo di Lavoro MS-AQ (2010) published their interpretations (therefore available to the scientific community) about 5 years before the Civico and Pucci et al.'s work!

It clearly appears to a reader that the "thoughts and concepts" expressed in Civico et al. (2015) "are very similar to those presented" by Cesi et al. (2010) and by the Gruppo di Lavoro MS-AQ (2010).

Therefore, we find quite inappropriate that Civico and coauthors *"ask the Editor to protect the integrity of our published works by urging the authors to give proper credit to previously published works, clearly indicating the sources of the data presented in Figure 8, as well as of the **ideas and concepts expressed** in the final part of their Discussion section"*, when they first did not give proper credit to previously published works. Again, in the extended abstracts by Civico et al (2015 and Pucci et al. (2016), the authors did not provide any clear reference to which structures they refer to!

As far as our work is concerned, conversely, we find appropriate to add in the revised version of our manuscript that our interpretation is in very good agreement with the hypothesis first made by Cesi et

al. (2010) and by the Gruppo di Lavoro MS-AQ (2010), in order **to give proper credit to previously published works**.

Gruppo di Lavoro MS-AQ (2010). Microzonazione sismica per la ricostruzione dell'area aquilana. Regione Abruzzo – Dipartimento della Protezione Civile, L'Aquila, 3 vol. e Cd-rom.

7) In the following, we report the portions of the text that contain ideas and concepts already presented in Civico et al., 2015 (both in the extended abstract and in the poster presentation) and in Pucci et al., 2016: - Lines 1-2, page 12 “the available literature suggests that one of these structures may have determined the early nucleation of the Fossa-San Demetrio depression: : :”. This statement, for the Middle Aterno Valley area, has been proposed by Civico et al., 2015 in the “Preliminary results and discussion” section of the extended abstract.

Not, really. Civico et al. (2015) and Pucci et al. (2016) just stated that *“This evidence suggests that the onset of the Middle Aterno Quaternary basin was controlled by the long-term activity of a differently oriented fault system that could have played a key role before or together with the PSDFS segments through time”*.

Again, they did not clearly state which structure they refer to, and which was the trend and kinematics of these supposed structures! It was impossible to be understood from Civico, Pucci and coauthors abstracts!

8) Similar findings are also reported by Pucci et al., 2016.

Not really. See above.

9) These boundaries coincide with an abrupt deepening of the carbonate bedrock (which sharply sinks into the basin) and seem to align with local NE-SW trending cross-basin faults”. This concept has been already proposed by Civico et al., 2015 in the “Preliminary results and discussion”.

Not, really. Civico et al. (2015) in the “Preliminary results and discussion” state that *“This evidence suggests that the onset of the Middle Aterno Quaternary basin was controlled by the long-term activity of a differently oriented fault system that could have played a key role before or together with the PSDFS segments through time”*. They did not evidently mention – as we instead do – any NE-SW trending structure! And Pucci et al. (2016) just refer to undefined NNE- and WNW-trending conjugate extensional system.

7) In wider terms, the imaging of the deep geometry of the Fossa-San Demetrio depression and the related discussion elements are the original results of Civico et al., 2015 and Pucci et al., 2016. We ask the Editor to protect the integrity of our published works by urging the authors to give proper credit to previously published works, clearly indicating the sources of the data presented in Figure 8, as well as of the ideas and concepts expressed in the final part of their Discussion section.

Based on what we previously reported, we believe that no intervention by the Editor should be invoked by Civico et al. on the issues above mentioned.

Indeed, as we extensively discussed above, Civico et al. (2015) and Pucci et al. (2016) (the latter now cited) proposed general interpretations of their results, neither expressing the trend nor the kinematics nor the location of the supposed faults that ruled the opening of the Fossa-San Demetrio basin. Again,

the poster supposed to be related to their extended abstract has been uploaded on ResearchGate (is it an official source of scientific literature?) by Civico and coauthors on august 23, 2016, i.e. more than one month after the submission of our paper to Solid Earth.

Sincerely

Figure captions

Figure 1-reply. Screenshot from ResearchGate website showing the date since the poster related to the Civico et al. (2015) poster was uploaded.

Figure 2-reply. a) View of the deep geometry of the Fossa-San Demetrio basin showed in figure 8 of our submitted paper. b) Reconstruction of the deep geometry of the Fossa-San Demetrio basin made by Bosi and Bertini (1970); the red line marks the deep boundary of the Fossa-San Demetrio basin, that we adopted as surface border of the deep basin. c) Reconstruction of the deep geometry of the Fossa-San Demetrio basin derived from gravimetric analyses (Cesi et al., 2010; Gruppo di Lavoro MS-AQ, 2010). d) Subsurface geometry of the Fossa-San Demetrio basin defined by Civico et al. (2015). As it can be easily seen, the Civico et al.'s reconstruction is highly comparable to that provided by the former authors.

Figure 3-reply. Gravimetric map and related text of Gruppo di Lavoro MS-AQ (2010). The text in Italian in the red box is translated in English.