

Interactive comment on “Changes in high intensity precipitation on the Northern Apennines (Italy) as revealed by multidisciplinary data over the last 9000 years” by Stefano Segadelli et al.

Stefano Segadelli

stefanosegadelli@libero.it

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General comments

1) This is a novel dataset of peak precipitations in the mountain area of the Northern Apennines of Italy. The authors discuss a well calibrated core and compare it with part of existing data in the region. Although the topic is of paramount interest for the scientific community and the results interesting, the manuscript is poorly written and it requires a deep reworking prior to the final publishing. A first problem is the language, that in some cases is coupled with or it enhances problems in the flow of the arguments. I urge the authors to polish the paper making the reasoning easier to the

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reader. I have tried to polish the abstract, but, in the text, I did it here and there, and I mostly highlighted some parts where the meaning was obscure.

Reply: the final version text will be edited by native English translator according to the Reviewer's suggestions.

2) An important general scientific problem is the interpretation of the core deposits. From the map of Figure 2, the Lake Moo spill point has an elevation of 1114.2, the S1 core was drilled at 1121. The authors interpret the deposits as lacustrine until – 0.9 m. This implies a lake level at 1120 m around 200 to 60 years ago. The spill point should have incised 6 m in around 100 years. I think this is not possible, in any case I urge the authors to consider in their manuscript the relationships between the spill point and the lake level, a topic completely overlooked. In my opinion, given the young age and the elevation with respect to the spill point, it is very likely that the units 3 and 4 were formed in a subaerial environment, that is the fan environment visible today. From the point of view of the peak precipitation, this is maybe not changing much, but the sedimentological interpretation, such as the hyperpycnal flows, should be completely changed. Interbedded fine- and coarse-grain deposits is something typical of colluvial fans, where dense flows, such as debris flows and grain flows, are common, but there is always the reworking of previous deposits by running water, that winnows the matrix and brings about fine-grained intervals.

Reply: This is a good point. Following the Reviewer's observation, we have precisely measured the elevation of key points using Garmin eTrex 10 to improve and better explore the relationship between the spill point, lake level and core stratigraphy. The results are: S1: 1120.2 m a.s.l. instead of 1121 m a.s.l.; Spill point: 1116m a.s.l. instead of 1114.2 m a.s.l.. The difference is about 4m and not about 7m as shown in the CTR map.

After a confrontation with the municipality and the Carabinieri forest ranger of Ferriere, it emerged that the area of the emissary was modified by human interventions lowering

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its altitude to encourage grazing over the years. These activities were carried out by the owners of the area, and there is no official documentation. We suggest moving the limit of the underwater deposits (now at the base of unit 4) to a depth of 2.3m. Also, unit 3 has been divided into two sub-units: 3a and 3b. Unit 3a retains its depositional characteristics as described in the first version of the article, in a shorezone environment affected by coarse material input through floods. Unit 3b changes its interpretation from a relatively deep lake environment (as shown in Figure 4 above) to a shorezone environment with low coarse debris input due to flooding. Moreover, we have analysed the palinological content of unit 3 to refine its interpretation better.

3) I also recommend the authors not to use the categories proximal/distal to describe grain size variations in this fan or fan-delta, given they have a spatial meaning, and here the spaces are amazingly tight.

Reply: We have replaced the concept of proximal and distal with that of "mature" and "immature" deposits.

4) Another problem is the missing correlation of pollens with the good record of the Lake del Greppo of Vescovi et al. (2010), located in a similar setting (high elevation counterslope related to deep landslide, Northern Apennines) around 100 km to the southeast. This correlation is also hampered by the author's choice to merge data of Pinus and Abies into a common group, therefore making it impossible to appreciate the decline of Pinus and the growth of Abies during the HTM.

Reply: this is a good point. Following the Reviewer's suggestion, we have referred to the pollen record of the Lake del Greppo (Vescovi et al., 2010) in the discussion and we have distinguished Pinus from Abies in our record. For what concerns the correlation of the two pollen records, we are inclined to proceed with caution because of the different stratigraphic/depositional context and the highly different degree of resolution of the two dataset.

5) Finally, the authors announced in the text and the abstract the occurrence of 2 cores

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and an interesting trench. These data are not presented, only located in the Fig. 2 small version, but not reported in the Fig. 2 larger version. What is the reason for this? A trench would help a lot understanding the sedimentary processes!

Reply: In order to optimise the activities, we have focused our attention on the S1 core because it is the most representative and complete of the sedimentary succession. The other core (S2) and the trench were used in support to the stratigraphic and sedimentological study (and a consequence of the second point) of the selected core (S1), on which all the laboratory analyses were undertaken.

6) On the other hand, what is the role of Table 1? Does the forest composition play any role in the story? The pollen data are not referring to it!

Reply: For the sake of clarity, we deleted Table 1 and moved all the available data about the present-day vegetation cover of Lake Moo in text (section 2.1). In our opinion these data, which represent a general overview potentially useful to the readers, cannot be directly compared with the pollen record as they derived from a botanic study.

Specific comments

- Geographic coordinates and elevation of the drilling are missing.

Reply: done and the data has been added to the text. S1 elevation: 1120.2 m S1 geographic coordinates: 44° 37' 25"N - 9° 32' 43"E

- Fig. 1 Middle frame, graphic scale is wrong.

Reply: the figure has been modified according the Reviewer's suggestions.

- Fig. 2 geologic/geomorphic map: very poor! In the published 1:50000 map, the geology of the catchment is given by large olistoliths of serpentinite embedded into "Complesso di Monte Ragola" an Upper Cretaceous blocky clayshale. This latter unit is not mentioned in the map or in the text. The surficial units are not sound: the hillslopes of the Lake (beside one mapped as serpentinite bedrock) consist of two units. The first,

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a “detritical (it should be detrital) cover, from boulder to granule, Holocene”. Granule is not an official grain size: what does it correspond to? (valid for the colluvium too). Does granule imply mud, or should it be something larger? Is there any mud in this detritus? Second, most of this field is mapped as serpentinite in the published small-scale map. Finally, if this is detritus, where is it coming from? If not transported, then it could be the in-situ weathering of the substrate. In fact, the weathered blocky clayshales of the Complesso di Monte Ragola, when removing the fines, would make it visible on the surface only the blocks of any size, without the clay, transported toward the Lake Moo. In any case this field should not be named “detritus”, but eluvial or colluvial cover, or simply weathered bedrock, if the thickness is less than 1 m or so. The second surficial unit in Fig. 2 consists of a large field named “Complex landslide, from cobble to silt”. Again, strange there is no clay in this unit, whereas in the depression it is full of clay. In any case, does this field refer to a landslide body? Coming from where, the south? And what created this topography? Is this the original landslide topography? Or has it been subsequently eroded? The steep wall on the eastern margin of the map is steep, suggesting bedrock. I think the two fields represent the same feature: a deeply weathered bedrock, but I never was there in the field. In the northwest side of the depression three alluvial fans are mapped that are missing a supplying channel. This is odd: they are clearly fan and wedges of colluvium, not alluvium. Actually, given the size and the mass flow processes, also the fans mapped at the end of channels should be considered colluvial, but this is a matter of debate, therefore I could accept them mapped as they are, except for the small sign of fan to the west of the main fan: this is clearly part of the main fan and there is no feeding channel, therefore it should be cut. Finally, the classic symbol for the fan are fanning lines that should be perpendicular to the contour: in the main fan they are badly drawn. The author should better map the area.

Reply: the figure 2 has been modified as follows: we used the latest update of the geological database of the Emilia-Romagna Region, scale 1:10.000 (available at the following link: <https://geo.regione.emilia->

romagna.it/cartografia_sgss/user/viewer.jsp?service=geologia) and on this geological basis, the flood deposits of 13 - 14 September 2015 have been reported. In this way we have also simplified the map and made it functional to the objectives of the article.

- Fig. 5 scale is missing

Reply: Done

- Fig 6 It would be interesting to have the stratigraphic units plotted in the figure, since the change in sedimentation rate at the end of unit 2 should be better placed at the unconformity.

Reply: the figure will be modified as required

- Fig. SUP1 In the profile BB', the core S1 is wrongly reported at 22 m at depth, instead of 12.5 m. Unclear why the authors did not calibrate the profile with the core. After a simple graphic correlation, one can appreciate that the substrate starts at around 1800 m/sec, therefore providing a much simpler and more likely geometry of the substrate/sediment contact. Please reconsider your interpretation.

Reply: the figure has been modified according the Reviewer's suggestions.

- More specific comments on the annotated manuscript.

Reply: Done

- Literature cited Vescovi, E., B. Ammann, C. Ravazzi, and W. Tinner. 2010 a. A new Late-glacial and Holocene record of vegetation and fire history from Lago del Greppo, northern Apennines, Italy. *Vegetation History and Archaeobotany* 19: 219– 233.

Reply: Included in references

- Please also note the supplement to this comment: <https://www.clim-past-discuss.net/cp-2019-135/cp-2019-135-RC1-supplement.pdf> C4.

Reply: Done

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Interactive comment on Clim. Past Discuss., <https://doi.org/10.5194/cp-2019-135>, 2019.

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