Dear Editor,

I carefully read the manuscript submitted by Mowbray and co-authors for publication in your journal. The manuscript presents a database of "potentially active faults" for southeastern France, northwestern Italy, and Switzerland, with the stated objective of supporting seismic hazard assessment.

In my view, there are several critical issues, in terms of both methodological framework and uncertainty definition, that are not sufficiently robust for that purpose.

I list my main concerns below:

1) The authors combine different databases, maps, and fault compilations that differ substantially in terms of detail, accuracy, and methodological approach to active fault recognition. For instance, the authors state that they use maps such as that of Pantaloni et al. (2021), which is a synthesis of 150 years of geological mapping in Italy and therefore necessarily reflects a strong heterogeneity in survey approaches and in fault knowledge, which has changed profoundly over time. Such a map might instead serve as a reference for broad regional geological considerations and analyses. It certainly cannot be used as the database basis for compiling potentially seismogenic faults, which may have a significant applied impact, namely on seismic hazard estimates for such an important area of the European continent, which is the goal of this work.

2) The statement that "active faults are structures capable of releasing seismic energy in the near future" should be better explained. Indeed, there can be active faults that undergo creep, or there may be secondary faults, such as bending-moment faults, which, although active, are not seismogenic by themselves.

3) The criteria adopted to classify a fault as possibly active and seismogenic are highly problematic. The authors state that: "In this study, we consider a fault as potentially active when it meets one or various of the following criteria:"

"it is located near significant observed seismicity"

This is highly problematic. Indeed, there may be faults located near regions characterized by high seismicity that are not seismogenic by themselves. For instance, there may be faults that were active during the early stages of the Quaternary but are no longer active or seismogenic owing to the complex structural evolution of the region, that is, because they have been abandoned. On this topic, see Pan et al. (2021) (DOI: 10.1111/bre.12613) and the references therein .

"it lies within an area undergoing above-average crustal deformation (> 5 nanostrains)"

Again, just because a fault is located in a region characterized by significant crustal deformation does not mean that it is active and seismogenic. The authors do not consider that the current tectonic deformation may be accommodated by only some faults, and not by all of the faults located within the deforming region, even though they may be geometrically consistent with the orientation of the principal axes of the stress field. The authors do not explicitly state how they considered the superposition of faults and the possible occurrence of stress shadows that may prevent a fault from remaining active.

"there is evidence of Quaternary activity"

This criterion, although more robust than the previous ones, since it is based on geological evidence of Quaternary activity, does not consider the possibility that deformation is no longer accommodated by some faults owing, for example, to the linkage of nearby faults, generating a stress shadow, or owing to changes in the orientation of the stress field during the Quaternary, which may have led to the deactivation of some fault sections or fault segments.

4) The integration of different fault databases is risky because the authors are combining datasets that have different scales, different types of information for each fault, and different levels of reliability in the information associated with each fault. For example, the BDFA database includes a large amount of information concerning the geometric characteristics and kinematic behavior of faults. By contrast, the Italian ITHACA database does not contain comparable information, either in terms of quantity or quality. Furthermore, as explicitly stated by the developers of the ITHACA database, the mapped capable faults are not to be considered seismogenic faults, because the purpose of the database is precisely to map capable faults, without reference to their potential to generate earthquakes. Since the aim of the present work is to create a fault database for seismic hazard evaluation, the ITHACA database cannot be used, because its own developers make clear that it is a database of capable faults and not necessarily of seismogenic faults. In addition, the compilation of faults in the ITHACA database is also derived from literature or fault cartography in which faults are represented only as structural elements, and not as seismogenic elements.

5) Another critical element is the definition of the importance index, which is derived from the information reported in the databases. Again, with regard to the ITHACA database, an examination of the information reported in the database shows that the developers do not make clear how they classified elements as primary or secondary. This makes the hierarchical ranking, in the framework of the present work, unusable.

6) It is not clear on what basis the authors choose one of the fault traces when the literature reports different traces for tectonic elements assumed to be the same. This issue is crucial not so much because of small variations in strike or dip, but rather because of the length of the structural elements, since length is relevant to the definition, for example, of the maximum expected magnitudes and, consequently, of the possible expected surface ruptures. These choices are not explicitly stated. Nor are the proposed indices sufficient to justify the choices made by the authors. This is absolutely relevant and indispensable for a database that aims to provide information for seismic hazard estimates.

Overall, although the structure of the proposed database is formally organized in a way that is consistent with its intended purpose, it contains such a large number of assumptions, uncertainties, and weaknesses that it is not robust with regard to the criteria used to define a fault as active and seismogenic, nor with regard to the homogeneity of the information in the underlying cartographic sources.

Before proposing a database of this kind, I suggest that the authors consider the logical-epistemological and interpretative complexities that I have pointed out in this review.

For this reason, the work cannot be accepted in its present form.

Sincerely.