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Comment on se-2021-29

Hugo Ortner (Referee)

Referee comment on "Geodynamic and seismotectonic model of a long-lived transverse structure: The Schio-Vicenza Fault System (NE Italy)" by Dario Zampieri et al., Solid Earth Discuss., <https://doi.org/10.5194/se-2021-29-RC3>, 2021

Review of the manuscript „Geodynamic and seismotectonic model of a long-lived transverse structure: The Schio-Vicenza Fault System (NE Italy)“ by Dario Zampieri, Paola Vannoli and Pierfrancesco Burrato

This review manuscript starts out with a revision of the literature about the Schio-Vicenza fault since the beginning of geologic investigations in the area. Then the available evidence on present-day activity along the fault and the neighbouring areas is reviewed. It then presents a few geologic data, mainly on the foundation of previous work of the first author, and again from recently published work. In the discussion, the authors apply two models on the Schio-Vicenza fault: (1) A „zipper“ model on its northern part, (2) and a model of transtension on its southern part.

In the end, the authors conclude that the Schio-Vicenza fault is an inherited Mesozoic fault and that this fault and potential other parallel faults in the subsurface of the foreland basins present a potential earthquake hazard.

While the manuscript is generally written in good English, there are some phrasing problems. I am not a native speaker, but nevertheless made a few annotations in the manuscript. The review paper arrives at significant conclusions regarding the earthquake risk in the area. It is well suited for publication and within the scope of this journal. I suggest publication after minor to major revision, and hope that my comments help to improve the manuscript.

Problems

In their conclusions, the authors arrive at an indenter model in which the Adriatic plate

indents Eurasia in the eastern Southern Alps. However, in previous studies it has been shown, that the „main indentation“ in the eastern Southern Alps is delimited by the Giudicarie fault and the Pustertal-Gailtal fault (Ratschbacher et al., 1991; Reiter et al., 2018; Rosenberg et al., 2004; Rosenberg et al., 2007). This concept is neither introduced in the introduction, nor discussed in relation to the indentation model proposed here. This should be done.

I have the impression that the review of geologic research is trying to be complete, even if not every study did really bring new results. Therefore, it is somewhat cumbersome to go through this section, and I would recommend to concentrate on the studies that did really advance knowledge about the Schio-Vicenza fault.

There are some problems with the models applied.

- The zipper model of Passchier and Platt (2016) is definitely a major advance to understand possible relations of faults. However, when applying such a model, it is necessary to show that the fault in question have been active at the same time. In the manuscript, there is no information on timing of the second fault (Gamonda fault) involved in the „zippering“. If it cannot be shown that the involved faults moved contemporaneously, an interpretation of truncation of an on older by a younger fault seems to be more probable.
- I do not know the Schio-Vicenza- and Gamonda fault personally, but in my experience it is a common observation to see contradicting observations of shear sense on brittle faults. Any brittle fault is a discontinuity, and will be reactivated during its younger history; especially if the orientation of the fault is sub-parallel to the stress field, minor changes in the orientation of the regional stress can produce fault reactivation wit opposite sense of shear. Usually, observation of offset of larger geological features is more reliable.
- Unfortunately, I do not understand the „30° transtensional model“. I have no idea what it is about – this must either be explained in a much clearer way, or omitted (see also annotations in the manuscript).

Not all figures are well suited to illustrate the content of the manuscript:

I miss a true tectonic map of the eastern Southern Alps and the adjacent forelands that illustrate the faults discussed in the text and show at least some units like the „plain region“ and the „chain sector“, which have not been defined in the manuscript. I suspect that these expressions refer to the foreland of the Venetian plain, and the Southern Alps thrust belt, respectively. It would also help if such a figure would include the Adamello pluton, and the Athesian and Trento platforms, and other names used is the manuscript, and which are not explained otherwise.

The present Figure 1 needs to be enlarged, and it would be nice to use color. Grey

symbols on a grey background are not easy to read. Use a thicker stroke for the faults. Looking at the GPS velocity field, I ask myself, why there is neither a change of direction nor a change in velocity across the Schio-Vicenza fault system, if this is an active fault. This should be discussed in the text.

Hugo Ortner

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Please also note the supplement to this comment:

<https://se.copernicus.org/preprints/se-2021-29/se-2021-29-RC3-supplement.pdf>