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Interactive comment on "The Piuquencillo Fault System: a long-lived, Andean-transverse fault system and its relationship with magmatic and hydrothermal activity" *by* Jose Piquer et al.

Anonymous Referee #2

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This paper deals with the structural characterisation of the Piuquencillo Fault System, a NW-striking structure intersecting the central-southern Andes. The authors provide an original structural dataset (orientation and kinematics of fault strands, orientation of hydrothermal veins, orientation of dikes and other intrusive contacts), coupled with U-Pb geochronology on zircons from two samples. The core of the manuscript is represented by stress inversion analysis on the structural dataset, to estimate paleostress tensor responsible for both fault architecture and fluid migration. The provided dataset has been integrated with geophysical one with the aim to discuss the importance of transversal structures as a pathway for endogenic fluids and as a potential seismic hazard in the Andean tectonic evolution. In my opinion, the scientific topic of this arti-

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cle is of interest for a broad audience and the paper is suitable for publication on Solid Earth. One of the main strengths of the paper is the new structural dataset provided. On the other hand, the paper suffers from several limitations for what concerns both the text organisation and the data discussion/interpretation.

My major comments follow here, whereas I refer the authors to the attached file for my minor comments.

Text organisation 1) The Introduction should be broadened by emphasising the importance of a multidisciplinary approach in characterising the evolution (in time and space) of lithospheric-scale faults. Moreover, it should be clarified how it is possible to link structural information from exposed structures to deeply-seated tectonic lineaments. Some examples around the world should be mentioned for reference. Moreover, it should be emphasised the importance of constraining the time of tectonic evolution for the lithospheric-scale faults, to link a tectonic event to a hydrothermal/magmatic/volcanic process. 2) The Geological Background should be improved. In particular, I propose to better describe: (i) the subduction framework controlling the geodynamics of South America; (ii) the tectonic setting of South America (Western Cordillera, Eastern Cordillera, Coastal Range); (iii) the tectonic relationships between on-shore and off-shore occurrence of regional fault systems. This is recommended to better follow the tectonic framework illustrated within paragraph #5.3 and figures 16-17. 3) Results. I believe this paragraph should be improved by reorganising the text in three sub-paragraphs: a. #4.1 - Study areas (lines 113-116; lines 128-142) b. #4.2 - Structural analysis (lines 110-114; 144-165) c. #4.3 - U-Pb geochronology (lines 117-127; lines 532-538) Therefore, Figures 4 to 11 should be renumbered accordingly.

Data presentation/interpretation 1) I recommend providing structural constraints for the kinematics of the measured faults. The authors mentioned the faults are characterised by “low pitch angles, indicating predominantly strike-slip movements” (line 165). It is important to document what is reported in lines 203-204 (Syn-mineral displacement of the faults was mainly dextral for ENEtoNE-striking faults, sinistral for WNW-striking

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faults, and sinistral-reverse for NNW-striking faults). Figure 4, alone, does not provide enough information. 2) Within the dynamic analysis, it should be clarified that the orientation of $\sigma 1$ should bisect the acute angle between the two system faults (sinistral WNW-ESE-striking faults and dextral ENE-WSW-striking faults) that are considered conjugate (lines 201-202) by the authors. Therefore, the resulting $\sigma 1$ should be more E-trending. 3) The relationships between the fault system and magmatic/hydrothermal products are not clear to me. Are the hydrothermal veins syn-kinematic to the conjugate fault systems? Do you have constraints about the ages of dikes? Is it possible to consider more than one generation of dikes (at least for those that are misoriented to the estimated stress regime)?

I hope that these comments and suggestions can improve the scientific quality of the present manuscript.

Sincerely

Please also note the supplement to this comment:
https://se.copernicus.org/preprints/se-2020-142/se-2020-142-RC2-supplement.pdf

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