



EGUsphere, referee comment RC2
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Comment on egusphere-2022-629

Patrice Baby (Referee)

Referee comment on "A contribution to the quantification of crustal shortening and kinematics of deformation across the Western Andes (\square 20–22° \square S)" by Tania Habel et al., EGU sphere, <https://doi.org/10.5194/egusphere-2022-629-RC2>, 2022

The paper of Habel et al. presents a structural study of two sites of the western Andes in Chile (20–22°S), where the authors use numerical trishear forward modelling to evaluate minimum horizontal shortening and analyse the kinematic evolution of two fault-related anticlines.

Before being published, this paper must better document the structural observations, which are not always convincing (see below). These data can be used to construct in each area a balanced section to validate structural interpretations and calculate shortenings more rigorously. The authors need to better explain why they chose a fault propagation fold model rather than a tectonic inversion model in their structural interpretation.

GENERAL COMMENTS:

The title must be modified. The studied areas are too small to represent the entire western Andes. It would be interesting to locate the two sites on a regional cross-section through the western Andes.

The stratigraphic and geologic background (2.2.1) needs a figure with a synthetic stratigraphic column.

Structural and kinematic context (2.2.2):

In their last paper, Martinez and Fuentes (2022)([https://doi-org.insu.bib.cnrs.fr/10.1016/B978-0-323-85175-6.00037-7](https://doi.org/insu.bib.cnrs.fr/10.1016/B978-0-323-85175-6.00037-7)) show the importance of

tectonic inversion of the Jurassic rift in this region. The analysed seismic sections are just west of the study areas of this paper and must be taken into consideration and discussed.

Data and structural observations:

It is important to better document the field data. For example, it is necessary to localise the field structural data in the structural map of Figure 4 to validate the cross-sections construction and structural interpretations.

Field pictures interpretations must be also validated by field data. These field data, as structural dip measurements, must be placed on the pictures. I am not at all convinced by the structural interpretation of the picture in Figure 7b. I can't really see the axis of the anticline of the Quebrada Tambillo, which is a key element of the structural interpretation. This picture interpretation must be absolutely validated by field measurements.

The structural map of the Quebrada Blanca zone shows structural dips values, which is not the case for the structural map of the Pinchal area. I understand that strike and dip measurements are extracted from 3D mapping. These 3D mapping and data extraction must be documented with some detailed illustrations.

Structural interpretations:

I don't understand why the authors didn't try to construct balanced cross-sections, the best way for thrust system modelling and calculation of shortening. The proposed interpretations are not geometrically validated. The footwalls of the thrusts have not been constructed (?).

The authors propose a model of fault propagation fold (or fault bend fold (?)) for each section. Why? Why not a tectonic inversion? How do you explain such a steep frontal ramp in the cross-section of Figure 9C? Are there lithologies compatible with the levels of detachment?

The calculation of shortening is confusing ("Folding" + "Folding + thrusting"(?)).

The discussion would require an integration of results in a regional cross-section through the Western Andes.

My detailed comments are highlighted in the attached pdf version.

Please also note the supplement to this comment:

<https://egusphere.copernicus.org/preprints/2022/egusphere-2022-629/egusphere-2022-629-RC2-supplement.pdf>