

Reviewer's comments on the article called:

On the role of trans-lithospheric Faults in the long-term seismotectonic segmentation of active margins: a case study in the Andes.

General comments

The paper entitled: On the role of Trans-Lithospheric Faults in the long-term seismotectonic segmentation of active margins: a case study in the Andes by the authors Gonzalo Yáñez, José Piquer and Orlando Rivera, seeks to establish the hypothesis that the large structures called Trans-Lithospheric Faults recognized in the active continental margin of Chile, could have an influence in the seismotectonic segmentation of large subduction earthquake ruptures, because these structures would be able to transport and contribute an important amount of fluids to the subduction zone, producing a creeping zone surrounded in a more coupled zone. To prove this, the authors establish spatial relationships with different observations and factors determined at the margin among them are: historical seismicity, distance between the trench and the continent, coupling models and Pearson correlation parameters. Although it is a novel hypothesis and the manuscript is clear and well written, there are certain aspects that are not clear to me both in the writing, the postulated and the Figures presented that in my opinion are necessary and I request to improve the article. These aspects are specified below.

Specific comments

In lines 106-110 of the manuscript, it is explained how Trans-Lithospheric Faults (TLF) have been defined through several observations. One of these aspects you point out is the seismicity associated with this type of structures, with which we could have an idea of the depth that these structures reach. However, I am very surprised that in Figure 1 (introductory) none of the TLFs have associated seismicity. This is why I ask that in Figure 1 they incorporate a panel B showing the cortical seismicity associated with this type of structures. In the manuscript they indicate that thanks to temporal networks it has been possible to detect seismicity, therefore, it seems to me relevant to incorporate in Figure 1 a panel B showing this seismicity. Showing this seismicity associated with these faults is something powerful that would undoubtedly help to improve the quality of the article.

On the other hand, a doubt: ¿are TLFs restricted in depth and spatially to the continental upper crust or can they also partly affect the oceanic crust? Please make this clear when introducing TLFs in the manuscript (**lines 106-110**).

2.- In Figure 2, it strikes me that the Iquique 2014, Tocopilla 2007 and Antofagasta 1995 earthquakes do not follow the hypothesis put forward in the article. In these earthquakes the zone of greater slip or roughness, is just located in the trace of the TLF recognized in this place and not so in the earthquakes of the south, where if the postulated by you in the article

is fulfilled, ¿how can I explain this difference between the earthquakes of the north and the south with respect to your hypothesis? Please deepen this through a deeper discussion.

Line 305: although the coupling models indicated are good, there are new models published especially in the segment between Antofagasta and Copiapo. I recommend perhaps updating the models of this article with the most recent models published and incorporating to the references of these articles: Yáñez-Cuadra et al., 2022 (Geophysical Research Letters) and González-Vidal et al., 2023 (Geophysical Research Letters).

In **lines 453-458** it is explained that at 25° and 30°S there is a potential barrier zone due to the high correlation of the Pearson index. However, these zones also coincide with the Taltal ridge subduction at 25°S (León-Rios et al., 2024 G3) and the Challenger Fracture zone at 30°S (Poli et al., 2017 Geology; Maksymowicz, 2015 Tectonophysics). In that sense, further discussion of this correlation is lacking in the manuscript. Please discuss these points, as, while there is a spatial correlation between these barrier zones with TLFs, there is also correlation with other important bathymetric structures, which can either carry a significant amount of fluids or produce a considerable degree of fracturing, enhancing creeping seismogenic behavior. Incorporate a deeper discussion considering other possibilities to the correlations you find, i.e., incorporate to the article that, although you find a correlation between TLFs and creeping barrier zones, this would not be the only possibility. When improving this discussion, please incorporate the references mentioned above.

Specific comments for Figures

Figure 2:

In panel A, the symbology used of gray lines indicating magnitude is very confusing and not well understood. Although it may be useful for higher magnitude earthquakes, for magnitude 7 events the line is too thin and cannot be identified well in the Figure. On the other hand, the word magnitude is in Spanish and not in English.

The caption of the Figure is incomplete and is not in tune with what is written in the manuscript. The segmentation says that it is marked by semitransparent yellow ribbons when in fact they are pink.

In panel B, please point out to which earthquake (earthquake name) each slip patch corresponds. There may be readers who are not familiar with Chile's earthquakes, so indicating or pointing out each earthquake in the Figure (panel B) may be helpful to readers.

I recommend improving or rewriting the caption of this Figure to be more precise in the information provided.

Figure 3:

It is missing to indicate in the caption that the seismicity was extracted from the National Seismological Center.

I think there is an error in indicating the 2015 earthquake as "Vallenar 2015" in the caption, is it not the Illapel earthquake of 2015? I have no recollection of a Vallenar earthquake in that year.

Incorporate the abbreviation DTC in panel B, it could be indicated on the color scale indicating distance.

In general, I recommend rewriting or rephrasing all the captions of the Figures as well as the wording of these. As they are written they give very little information and are inaccurate. They could definitely be much better.

Figure 7

Enlarge the letters of the symbology

Technical corrections

Line 23: specify in a better way what type of observations are referred to, these can be seismotectonic, seismological, geodetic...etc.

Line 44: take out "including the development of asperities and barriers in the same spatial and time frame".

Lines 49 to 51: In this part it seems necessary to include Scholz's reference that indicates these different landslide states.

Line 67: add reference Moreno et al., 2014 Nature Geoscience.

Line 81: Hayes et al., 2018? Or just Hayes, 2018? In this publication it is not just Hayes, 2018, it is Hayes et al., 2018.

Line 82: Yanez to Yañez et al., 1988.

Line 152: Add reference Calle-Gardella et al., 2021 Journal of Seismology.

Lines 196-199: this sentence is confusing, please rewrite or rephrase.

Line 209: Vi to VI

Line 219: Magnitude Mw 9.3 What reference determines this magnitude? Please incorporate reference or change the magnitude.

Line 237: remove double parenthesis in "Omori's Law".