

## ***Interactive comment on “Transverse jointing in foreland fold-and-thrust belts: a remote sensing analysis in the eastern Pyrenees” by Stefano Tavani et al.***

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This manuscript deals with the character of jointing in the foreland of the Pyrenees through mapping their trend in aerial imagery. The manuscript describes a pronounced N-S trend of joints, i.e. perpendicular to the trend of the Pyrenees and provides an explanation for their formation. I navigated myself across this area with Google Earth and it is really fascinating to see the clarity and spatial extend of this joint system making also this manuscript, which is very well written and accompanied by nice figures, an interesting read.

C1

Nevertheless, before accepting the manuscript for publication, I think a few improvements or clarifications need to be made.

Please allow me to be a bit provocative at the beginning of this review. In the introduction, you outline a mechanism to explain transverse jointing in the foreland. Then you continue with the outlook that the acquired remote sensing data allows to investigate the primary mechanism for this joint formation. Hence I wonder: Haven't you proposed already before the data collection and discussion of what the primary mechanism is? Does this lead to a bias in the data interpretation? Maybe it would be better to present the model after the data presentation in the discussion to avoid that such an impression might arise.

Also on that regard, a discussion on the potential driving force behind the suggested orogen-parallel stretching of the foreland basin is largely missing (or well hidden, in case I missed it), which would be very interesting though. In the introduction, it is briefly referred to two publications invoking the possibility of lithospheric bending to account for such kind of stretching (Doglioni, 1995; Quintà and Tavani, 2012; although the process described by Doglioni is regarded as not applicable for the study area, which is comprehensible). In the discussion, this subject is covered with only two sentences (page 7 line 31 to page 8 line 3; half of it being a repetition of the introduction statement). Here, foreland-parallel stretching is suggested to form the N-S joints and an analogue reference is made to the process of release faulting (Destro, 1995). I think this requires much more attention: Destro (1995) describes a purely extensional setting and it is therefore not straightforward to understand how this applies to the Pyrenean foreland, especially in the light that you propose foreland-parallel extension from the Paleocene until the end of convergence (page 7, line 22). Hence, I believe a more elaborate discussion for the use of this model is necessary, in particular, and potential driving mechanism for such stretching, in general.

C2

Adding to this, you mention the westward plunge of the foredeep basin and refer to figure 3a. I am not sure if this is actually visible in the figure or if it requires previous knowledge of the region to identify it!? I think an E-W cross-section would be very helpful.

A second issue revolves around the timing of joint formation. You state that the dominant N-S trending joint system formed prior to folding and refer to figure 2b, where joints are supposedly tilted. Unfortunately, from the picture alone, it is very hard to see this. How did you determine that these joints are tilted? How can you exclude the possibility of joint formation after folding? Such a determination appears to me as a very difficult asset, since you would have to know their original orientation and at the same time line out why its present orientation is not the original one. I think this is a very important issue that needs to be clarified.

A second argument for the age of joints is their absence in Quaternary sediments. First, there is still a large age span from the Quaternary to the Eocene (using the word "evidence" (page 7, line 9) for an Eocene formation age is therefore maybe a stretch), and second: what is the character of these sediments? Are they solidified to a degree where fractures would be able to form in case the joints in the Eocene rock were of Quaternary age?

Another thing: As you have been in the field, it would be great to see a comparison of field data with the remote lineament data. E.g. do the joints have a preferential dip direction, are they all just vertical?

Some other minor comments to the figures:

Figure 1: This is a very nice figure, but some features can only be identified when

C3

zooming in a lot, i.e. the text "peripheral bulge", veins, and stylolites. Please improve this. Also, I recommend to place the names forebulge, foredeep, foreland fold-and-thrust belt into/above the block figure and not just mention them in the figure caption.

Figure 2: please show the locations of these outcrops in figure 3. Also, I would prefer to show field photos after showing a map of the study area. In Figure 2b, please point at the joints as it is not super clear that the big surface is, I assume, the bedding surface.

Figure 3: add some placemarks (e.g. towns) to the map, so that it's a bit easier for the reader to capture the location of the study area. (took me a little bit to find the exact area on google earth).

Figure 5: I think it would be really nice, if you exemplarily show a few rose plots (joint length-weighted) for different colored regions in figure 5. I believe this would make it much easier for the reader to understand how to read the color code of the figure.

I hope these comments are useful for you.

Eric Salomon

C4