

## ***Interactive comment on “Distribution, microphysical properties, and tectonic control of deformation bands in the Miocene accretionary prism (Whakataki Formation) of the Hikurangi subduction zone” by Kathryn E. Elphick et al.***

**Kathryn E. Elphick et al.**

elphickk@qut.edu.au

Received and published: 20 October 2020

Julien Bailleul

Comment

The study proposed by Elphick et al. appears to perfectly fit with this Special Issue of SOLID EARTH. The paper describes for the first time deformation bands in synsubduction turbidites of the Hikurangi margin (New Zealand) and brings insights concerning their relation to deformation episodes that have affected the subduction wedge. This

C1

study is original in New Zealand and for such a geological context and relies on recent development concerning the understanding of deformation bands. In my opinion, emphasis should be given on: 1) the geological context, and above all, 2) the turbidites which are particular host rocks for deformation bands. The paper is well written with globally a well-organized and clear structure even if some specific and technical points have to be amended to improve the manuscript (see next section and annotation in the PDF file).

Response

We thank Julien Bailleul for the constructive comments and critical analysis of the research. The comments from the reviewer have enabled us to significantly improve the manuscript. The associated changes of the manuscript are described in detail in the following.

Main comments

Comment

- As accretion did not occurred all across the thrust wedge, I rather prefer to avoid the use of accretionary prism to talk of the entire deformed area between the trench and the Forearc basin (please, see also my point of view on that in the PDF file of the manuscript).

Response

Thank you for pointing out this semantic oversight. We have amended the manuscript accordingly.

Comment

- An absolute porosity reduction of ca. 10% (from 20% to 10%) is given in the conclusions whereas between 5 and 14% is given in the abstract. Also, c.a. 9 m is given in the conclusions while 10 m is given in the abstract for the spacing between faults. I

C2

think it can be clearer to give the same values in both the abstract and conclusions.

Response

Thank you for alerting us to these inconsistencies. They have been corrected.

Comment

- The Background section could be clarified with a better separation between what concern the geological context and what concern deformation bands.

Response

In response to comments from Reviewer 1, we have changed and reduced the background and the main points have been added into the introduction. We believe that this change also accommodates the comment from this reviewer.

Comment

- Proto-Deformation Bands (section 4.4.3.3): The description is quite short, could you give us more detail and explain more clearly why you interpret these as proto-DB?

Response

Dataset removed. Not important for the study and can be focussed on with future study.

Comment

- It is said in the discussion that deposition of the Whakataki Fm occurred till the end of D2. As far as I know, it's not the case, the typically thin-bedded turbidites of that Formation being Waitakian-Otaian in age, so latest Oligocene to earliest Miocene.

Response

This has been amended in lines 895-897.

Comment

C3

- The section 5.4. Implications for fluid flow is very general and could be consolidated a little bit, notably incorporating references to papers that specifically deals with fluids on the Hikurangi margin – that literature is abundant so only a few key papers could be cited: (e.g. . . . See annotation in the manuscript for suggestion of references). That would give weight to the consequences of the compartmentalization demonstrated in the paper on reservoir properties and for pressure regimes.

Response

This section has been extended and given more focus surrounding literature about the Hikurangi margin to contextualise the study while still making it applicable to different settings. The southern Hikurangi subduction wedge has been given more focus (e.g., lines 938-950).

Comment

- The paper could gain from a last figure acting as a synthesis summarizing most of the observations and results, on a 3D block for example. Such a figure could highlight the work and make it more visible.

Response

We already include a 3D block diagram for the deformation phases in Figure 3, which focuses on the macro-structures and includes an inset for DB for D3. The orientation of DBs for D2 share the same orientations as D3 DBs hosted in damage zones. This relationship has been added to the figure caption for Figure 3.

Comment

- Some figures deserve to be more cited in the text (e.g. fig. 15 is not cited at all) and some more precisely (i.e. what part of the figure is used).

Response

We agree with this comment and have amended the text to have a better link between

C4

the text and figures.

Comment

- References: some inconsistencies are still present in the list and a few references could be added. Please, verify all the references to be sure that they are OK.

Response

Agreed and modified. Again, we thank the reviewer for their attention to detail and it has made the work more reproducible.

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Interactive comment on Solid Earth Discuss., <https://doi.org/10.5194/se-2020-80>, 2020.