

Reply to reviewer 1

Manuscript entitled “Modeling of the in situ state of stress in elastic layered rock subject to stress and strain-driven tectonic forces” by Vincent Roche and Mirko van der Baan

MS No.: se-2016-141

General aspects

RC1: The introduction chapter is in some parts is patchy and not straightforward.

In several places we modified the structure of the introduction in order to improve the flow according to the comments.

RC1: the paragraph from line 55 to 59 would fit much better before paragraph starting line 48.

We moved these lines in the introduction.

RC1: From my personal point of view, the appendix A (B) would fit well within the introduction or chapter 2.

We agree that appendix A and B could be part of the main text. Although those calculations are important in order to understand the rationale behind stress calculations, we think that they are better in appendix because they are mainly reviews of calculations previously described and this makes the manuscript more focused.

RC1: SV, SH and Sh are well known. However, the relative position to each other could be mentioned in the introduction.

We added a sentence in section 2.1 to specify Sh and SH.

RC1: The reader is often misled that one of the model parts (e.g. uniaxial, strain driven or critical) are separate models. A small sketch showing the relative position of model parts/boundary conditions would help.

I am not sure we understand the comment and further details would be great. There is already a Table and a figure giving details on the modelling strategies.

Minor issues

RC1: line 25: both cited papers from Reiter et al. and Reiter and Heidbach (2014) are not overview paper on crustal stresses in general, these papers are focused on crustal stresses in Alberta and Canada. May other paper would fit much better as a general introduction.

We added two references.

RC1: lines 108-120: introduction ?

The lines have been moved in the introduction.

RC1: lines 187-189: introduction ?

We think that those line are unnecessary details for the introduction and fit better in this section.

RC1: line 198: ‘horizontal stress profile’ ?

We removed “horizontal”

RC1: line 220: 'depth-dependent Poisson's Ratio'? or lithology dependent Poisson's Ratio?
We replaced depth-dependent by lithology dependent.

RC1: line 245: The max. (regional) horizontal stress is 'negligible'. That could be an assumption, but the maximum horizontal stress as well the correction are introduced and mentioned by several equations in chapter 2. I think that could be mentioned in the introduction.
We provide more information about the max. (regional) horizontal stress in the manuscript.

RC1: lines 254-256: discussion ?
These lines has been moved in the discussion

RC1: lines 269-271: introduction ?
These lines has been moved in the introduction

RC1: line 636: 'E' is introduced, but not explained except line 651.
We added a sentence to explain E

RC1: line 642: 'A' and 'B' are introduced, but not explained. May avoid A and B by combining Eq. B 8 and B 9?
We modified this part to make clear what is A and B

RC1: line 660: Atkinson
We modified the reference.

RC1: some references includes the month (line 805 and 810)
We modified the reference.

RC1: Table 1: I would write b) and c) in the head of the table
We modified the table.

RC1: Figure 2: Usage of colours instead of several grey tones in the stress profiles would allow much better to distinguish the shown properties/stress profiles
We added colours in the figure.

RC1: Figure 4: It should be mentioned that Muskwa, Otter Park and Evie member are together the Horn River Formation, which is mentioned only once in line 291. 'The white stars represents the injection levels.' Injection level is may be a little bit ambiguous for the location of stress measurements.
We added a sentence in the caption to specify that Muskwa, Otter Park and Evie member are together the Horn River Formation. We replaced injection levels by location of stress measurements.

RC1: Figure 5 and 6. Usage of colours instead of several grey tones in the stress profiles would allow much better to distinguish the shown stress profiles. The stratigraphic column (E and I respective D) should indicate the Keg river and Horn river formation, as they are discussed related to the figures. The stratigraphic column is not the same as shown in Fig 4. Sub-figure 5H is not explained.
We modified the figures, the captions and added colors.