

Dear Editors of Solid Earth,

We have submitted/posted a revised version of our paper: “Analogue experiments on releasing and restraining bends and their application to the study of the Barents Shear Margin» and hope the revisions make the paper ready for publication in Solid Earth.

We are indebted to the anonymous reviewer on the corrected version of our manuscript for his/her comments/suggestions concerning the scientific content and linguistic details as well.

Abstract

All simplifications as suggested by Reviewer have been acknowledged.

Introduction

The text has been improved on all points as suggested by the Reviewer.

Line 94: We disagree that the term “halokinesis” is uncommon. We use the term in accordance with the original definition by Trusheim (1957) and modern textbooks of salt tectonics (e.g. Jackson & Hudec 2017): Halokinesis: “Salt tectonics in which salt flow is powered by gravitational forces”. The term is a standard term in textbooks and scientific literature on salt tectonics, and we have therefore chosen to keep it as it is.

Description

The text has been improved on all points as suggested by the Reviewer and all unclear statements have been rephrased.

The descriptions of all structural elements have been surveyed.

Particularly the description of the **Vestbakken Volcanic Province** has been revised. Unclear points identified by the Reviewer have been straightened, and the architecture of the section has been adjusted.

Definitions have been added (eg. COT-margin).

The section on the **Senja Ridge** has been expanded with information requested by Reviewer.

Lines 397-418: The reviewer requests information on deformation velocities in the experiments: This information is given in lines 397-398 (constant $v=10 \text{ cmhr}^{-1}$) after initial experiments demonstrated that changes in shear velocity did not considerably alter the geometry of the shear zone. An addition has been made better to explain Phase 3).

Modelling results

Deformation phase 1

PSE-1-structures: Figure caption Figure 8 expanded for explanation of location (segment 1) and fold geometry. Figure 8 was included after the previous comments of the referee. The figure is extensively referred to in this section, and combined with an expanded figure caption, we now think that the characteristics of SPE-structures are now duly documented.

Some references to previous works are considered superfluous by the reviewer and have been taken out.

Lines 575-579: The description of the development has been rephrased and reference to Figure 4 has been added to enhance clarity.

Line 701-703: It has been explained above that experiment BarMar6 was used as a reference to evaluate the difference between orthogonal and the oblique angle of extension/contraction. We do not feel that is necessary to repeat this.

Deformation phase 2

Line 718-743: We apply the whole circle for describing the extension direction of the western plate. The eastern plate was kept in a fixed position during the experiments as explained in the Experimental set-up. Accordingly, extension angle of 315° means NW-directed extension.

Description of widening of the strike-slip basins has been rephrased.

All items pointed to by the reviewer have been simplified and partly re-written to avoid unclear phrasings.

Deformation phase 3

Technical information on last phase of the experiments have been transferred to the set-up chapter.

The section has been re-phrased on the points suggested by reviewer. Some statements regarded to be superfluous by the reviewer have been omitted.

Some figure references have been adjusted and/or added as requested.

Discussion

We agree with the reviewer that the experiments generated much new information on multistage continental margins in general and that it would be tempting and beneficial to include a full discussion on this. In the present discussion (as also pointed to by the reviewer) we have tried to explain the regional observations in light of the experiments. Because the manuscript is already voluminous, we however found that expanding the

discussion to a general evaluation of shear margins would explode the framework of the paper. We still acknowledge the reviewer's views on this and will consider writing a separate paper in the near future to cover these general aspects.

We have therefore tried to fulfill the reviewer's suggestions by:

- 1) breaking the discussion down into sections separated by sub-headings
- 2) restructuring and rephrasing parts of the discussion
- 3) adding a short final section on general aspects of the experiments/structuring of shear margins

Figures/figure captions

Figures 5,6 and 7 have been expanded to ease reference between figures and the main text.

Captions of figures 9,11 and 12 have been expanded and/or adjusted as suggested by the reviewer.

Figure 13: The reviewer requests a reference for this, but this is an original figure not previously published. The figure still is an expansion/up-date of a figure presented by one of the present authors (Faleide et al. 2008) and we have included a reference to his previous work).

We look forward to hear the final decision of the editors.

With best regards,

Roy H. Gabrielsen
(corresponding author)