

## **Referee 2 - Ioan Munteanu**

**Comment:** Basin inversion occurs also as extensional not just as compressional. Please mention that you refer to compressional inversion of extensional basins.

**Answer:** Thank you for your comment. In this manuscript, we talk about basin inversion, which means a phase of (oblique) extension, followed by a phase of (oblique) shortening. We believe the reviewer is referring to “negative inversion”, which means that you first have contractional structures such as reverse faults and thrusts that have been reactivated during subsequent extension, whereas “positive inversion” means one has first extensional structures that are subsequently affected by shortening. However, here we talk about “basin inversion”, and we believe this can only mean that you have first a basin, and then reactivation of the basin due to (oblique) shortening. However, in order to avoid any confusion, we now specify that the basin inversion in the manuscript refers to positive inversion.

### **Line 11**

- **Comment:** Basin inversion occurs either in extensional or compressional settings, like negative or positive inversion.
- **Answer:** This comment is not very clear to us

### **Line 42**

- **Comment:** These aborted rifts are actually part of the early intra-continental stage. And like the North Sea is actually part of the Atlantic system.
- **Answer:** Thank you for your comment, this is more or less what we have written in the text

### **Line 47**

- **Comment:** I can't see this E-W direction in your fig. 1
- **Answer:** Thanks for the suggestion, it is modified.

### Line 56

- **Comment:** A rift can't push so much that you invert a a basin. The formation of oceanic crust will bring exhumation especially on the rift shoulder. Other must be the case
- **Answer:** It is not only because of that, it's the combination of the mid Atlantic ridge push and Andes mountains initial subduction to the west

### Line 77 – figure 1

- **Comment:** Can you have an seismic like or a geological cross-section to illustrate the inversion?
- **Answer:** We can't reproduce the seismic lines in this manuscript due to copyright restrictions, but we cited a recent work in the discussion that show two interpreted seismic lines for the Araripe Basin.
- **Comment:** The offset of this fault is similar with the one in the extensional stage, where is the inversion?
- **Answer:** This is a representation of the inversion model proposed by Marques et al. (2014), where, according to the authors, previous rift faults went under large-scale inversion. The offset is clearly different from the rift stage though, and the proposed reactivation of rift faults is indicated by arrows.

### Line 236

- **Comment:** and how much extension?
- **Answer:** this is after 30 minutes, so that is 10 mm of divergence, given a divergence velocity of 20 mm/h. We have added some quantification of divergence and convergence wherever we felt it would be good to do so.

### Line 243

- **Comment:** Is better to represent this in extension rate etc.

- **Answer:** We agree that it may be better to specify the amount of divergence for a given time step and have added these details (see also previous comment)

#### **Line 247**

- **Comment:** Which means in % of extension
- **Answer:** What is specified is the width of the graben. The total divergence at that time step is 40 mm (see also previous comments)

#### **Line 280**

- **Comment:** As I stated earlier, will be easy to quantify also in % relative to you crust
- **Answer:** The original sand layer (upper crust) is 6 cm thick, so the subsidence is similar to 33% of the thickness of the upper crust. Note however, that the lower crust is also rising up below the graben (see Fig. 3), so that the total thickness of the sand layer is ca. 33% of the original at this point. We have added some quantification here and elsewhere where we thought it helpful.

#### **Line 304**

- **Comment:** you want to say relay ramps. En echelon we use more for strike-slip, which is not the case.
- **Answer:** En echelon is also routinely used for oblique extension settings, we prefer to keep it as is.

#### **Line 502**

- **Comment:** This natural case scenario has to be supported by an geological cross-section, the sketch in the Figure 1 is not enough
- **Answer:** We don't have field data, this is not a field study, and we can't reproduce seismic sections. We are proposing a model based on the experiments and it fits with the general data on the area. We believe this is ok.

**Line 513**

- **Comment:** reactivation or inversion?
- **Answer:** Thanks for the suggestion, it is modified with inversion.

**Line 514**

- **Comment:** Inversion
- **Answer:** Thanks for the suggestion, it is modified.