

Interactive comment on “Three-dimensional approach to understanding the relationship between the Plio-Quaternary stress field and tectonic inversion in the Triassic Cuyo Basin, Argentina” by L. Giambiagi et al.

L. Giambiagi et al.

lgiambiagi@mendoza-conicet.gob.ar

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General Observations

Reviewer comment “General credit is given to the existing literature, both methodological and regional. However, papers specifically dedicated to structural controls on inversion, to the 3D aspects of precursor basins and to the mechanics of repeated reactivation resulting from fault-zone weakening are not mentioned. By coincidence, I happen to have authored several contributions on these topics. In general, I am reluctant to sel-

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preferentialism and to encourage other colleagues to cite my own research; however, under this specific circumstance, given my experience in the inversion tectonics field (which probably led to their choice of my person for reviewing this contribution), I feel that I can point a short list of papers to the Authors' attention. The manuscript would, in my view, benefit from acknowledgement of those studies on positive inversion, mainly derived from the circum-Mediterranean fold-and-thrust belts, such as the Alps and especially the Apennines. These papers, a reference to which is provided separately, should be taken into account and acknowledged in the text and reference list."

We acknowledge previous works in 3D reconstruction of inverted basin, as suggested by the reviewer in the new Discussion section (see new lines 355-374).

Reviewer comment: "The illustrations and tables are all clear, legible and informative. As a structural geologist trained to constrain geometry and kinematics of deformation structures, in examining the Cacheuta (Fig. 5a), the La Pilona (Fig. 5b) and the Tupungato (Fig. 6a) balanced sections I found that the depth to the main décollements at the base of these sections are not always justified by first-hand evidence. The Authors should, in my view, discuss the reasons that led to the choice of the depth to the main décollements more extensively in the text."

More specification about the selection of the detachment level are given (new lines 84-88)

Specific comments from the reviewer

1 - Page 462, line 9. The Authors quote the use of the MOVE academic software. A reference to its Author (Alan Gibbs) or to his firm (Midland Valley, Inc.) is required in the reference list.

We properly cite the Move software (new lines 79-80 and 618)

2 – Page 462, line 21. Here and elsewhere in the text. Use is made of the term "meso-scale". This is not wrong, in principle, although I would rather use the term

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“mesoscopic”.

We change meso-scale into mesoscopic

3 – Page 462, line 26. The Authors quote the use of the T-Tecto 3.0 software. A reference to it, that is indicated in the text, should also be acknowledged in the reference list. Fixed. See new line 714.

4 - Page 463, line 10. See point 1.

Fixed

5 – Page 463, line 15. The Authors use the term “the seismically active front suffers a pronounced along-strike segmentation”. I would rather state that “the seismically active front exhibits a pronounced along-strike segmentation”.

The phrase has been changed accordingly

6 – Page 464, line 13. “partially” instead of “parcially”.

Fixed

7 – Page 464, line 20. “Zavattieri and Arcucci, 2007”, quoted in the text, is not found in the reference list.

The correct reference in Zavattieri and Prámpano (2006).

8 – Page 465, line 5. “Kokogian and Mansilla, 1989” in the text, is spelt “Kokogian and Mancilla, 1989” in the reference list.

Kokogian and Mancilla is the correct reference

9 – Page 465, line 5. The reference to the paper by “Dellapé and Hegedu, 1995” in the text, is spelt “Dellapé and Hegedus, 1995” in the reference list.

Hegedus is the correct reference

10 – Page 465, line 22. “With the advance of the deformation front toward the foreland,

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the basin became: : :”.

Changed

11 – Page 466, line 1. The Authors use the term “bivergent” when referring to a fault system. Although the sentence is intelligible, the use of vergence is wrong when referring to faults, since vergence is an attribute of asymmetrical folds (inferred from the dip of a fold axial surface). I would rephrase stating that “The Precordillera is uplifted by a fault system with similar strike and opposite downward dip (Fig. 2), that can be structurally divided into: : :” .

The phrase has been changed as suggested

12 – Page 466, line 22. In commenting the geometry of structures illustrated in Fig. 5 and 6, the Authors clearly state the reasons for their choice to locate a main décollement in shallow levels. However, the sections of Figs. 5 and 6 also show deeper décollements. The Authors should clarify the reasons that led them to locate those décollements at that depth.

This is now explained in new lines 84-88 in the Methodology section

13 – Page 467, line 24. See point 2.

Fixed

14 – Page 469, line 21. See point 2.

Fixed

15 – Page 470, line 15. “: : : as the result of local permutation of: : :” (of local, 2 separate words!).

Fixed

16 – Page 472, lines 6 and 9. I would use the term “suitably” rather than “optimally”.

Changed as suggested

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17 – Page 472, line 17. The Circum-Mediterranean orogenic belts have long been and are increasingly been recognized as a suitable ground for the study of inversion tectonics (Butler et al., 2006). In spite of many previous studies focused on the 2D geometrical analysis across structures resulting from inverted basins in the Apennines (e.g. Tavarnelli, 1996a) there is still a remarkable paucity of examples focused on the attempt at unraveling the 3D geometrical aspects of the precursor inverted basins. One pioneering reconstruction is that described by Tavarnelli (1996b). These studies (Butler et al., 2006; Tavarnelli 1996a, 1996b) should, in my view, be acknowledged in the text and cited in the reference list of the present contribution. The references are as follows: - Butler R.W.H., Tavarnelli E. & Grasso M. (2006) – Structural Inheritance in Mountain Belts: an Alpine-Apennine Perspective. *Journal of Structural Geology*, 28, 1893-1908. - Tavarnelli E. (1996a) - The effects of pre-existing normal faults on thrust ramp development: an example from the Northern Apennines, Italy. *International Journal of Earth Sciences*, 85, 363-371. - Tavarnelli (1996b) - Tethyan heritage in the development of the Neogene Umbria- Marche fold-and-thrust belt , Italy: a 3D approach. *Terra Nova*, 8, 470-478.

All new references are incorporated into the new Discussion section (see new lines 355-374).

17 – Page 472, line 19. The Authors correctly state that, after a first period of studies on geometrical and kinematic controls on positive inversion, during the last two decades particular attention was also devoted to questions on mechanics. An example, described by Tavarnelli et al. (2001) is provided by episodes of recognized, repeated reactivation during episodes of tectonic inversion, an evidence supporting the hypothesis of fault weakening through time. This study should, in my view, be acknowledged in the text and cited in the reference list of the present contribution. The reference is as follows: - Tavarnelli E., Decandia F.A., Renda P., Tramutoli M., Gueguen E. & Alberti M. (2001) - Repeated reactivation in the Apennine-Maghrebide system, Italy: a possible example of fault-zone weakening? *Geological Society of London Special Publication*

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186, "The Nature and Tectonic Significance of Fault Zone Weakening" (Holdsworth, R.E., Strachan, R.A., Magloughlin, J.F. & Knipe, R.J. , Eds.), 273-286.

All new references are incorporated into the new Discussion section (see new lines 355-374).

18 – Page 472, line 21. “: : : there is a good agreement that the degree of sentence.

Fixed

19 – Page 472, lines 25-26. “: : : of the Cuyo Basin have assumed : : :” (have instead of has).

Fixed

20 – Page 473, line 3. “Sarewicz, 1988” in the text, is spelt “Sarewitz 1988” in the reference list.

The correct reference is Sarewitz

21 – Page 473, line 28. “: : : to slip under reverse/strike-slip: : :” I believe that the best term to use here is “transpressional”.

We prefer the term reverse/strike-slip instead of transpressional in order not to mix stress and strain terms when we are dealing only with deformation data.

22 – Page 474, line 12. See point 21.

See comment above

23 – Page 475, line 9. See point 22. reverse-reactivation of the inherited normal faults: : :”. I would use the term “reversereactivation”, as also used by Kelly et al. (1999), rather than “inversion” in this specific

We changed the phrase accordingly to the suggestion.

Interactive comment on Solid Earth Discuss., 7, 459, 2015.

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7, C210–C215, 2015

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