Solid Earth Discuss., 6, C1441–C1456, 2014
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Solid Earth
Discussions
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Interactive comment on "Fault evolution in the Potiguar rift termination, Equatorial margin of Brazil" *by* D. L. de Castro and F. H. R. Bezerra

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(1) Comments from Referee 2: The Autors provide a significant improvement of the understanding of the Potiguar Basin, along the N-NE margin of South America that faces the main transform zone that separates Northern versus Southern Atlantic. New geophysical data, coupled with existing one, allowed improving the geologic framework of this basin and the finding of new structures that highlights the presence of post-rift tectonics. This is of great importance both for the studied basin and to unravel the meaning and role of major transform fault far from being considered just accommodations between rift offsets. If on the one hand data are well presented and discussed, the representation of the geological picture that derives is somehow partly incomplete and unclear. Few corrections and clarifications will allow the wider reader audience to fully

understand the work with its important implications. The impact of this work could better understood by readers if some discussion/comparison on the role of transform fault development, their re-use of pre-existing regional discontinuities, and their active role to accommodate plate drifting. Specifically, the tectonic framework at transform terminations has been proposed and discussed in other locations (e.g. Balleny and Tasman Fracture zones in the Southern Ocean between Australia and Antarctica, Salvini et al, JGR, 1997; Storti et al., EPSL, 2007; Lesti et al, JGR, 2008). A somehow brief discussion would frame results in the general discussion and attract the interest of a large portion of the geological community. Another area of improvement is the little discussion on the geometry of the faults ascribed to be responsible of the found half-graben structures. Although these are determined by geological profiles from geophysical data, their possible trajectory is never presented in the figures (even just as dashed lines) or their immersion mentioned, as it could be easily derived from them by experienced readers and leaving the non-specialist without their geometry. The authors might refer to papers where, using geological reference layers as the ones presented, it has been possible to propose a reliable model for their geometry (e.g. Cianfarra et al., GJI, 2009). This will surely strengthen the presented interpretation of the depocenters. Along the annotated version of the manuscript suggestions to improve Text and Figure captions are provided. As a conclusion, my suggestion is that the manuscript deserve publication with minor revisions.

(2) Author's response: 1) The impact of this work could better understood by readers if some discussion/comparison on the role of transform fault development, their re-use of pre-existing regional discontinuities, and their active role to accommodate plate drifting. Specifically, the tectonic framework at transform terminations has been proposed and discussed in other locations. R.: We wrote two new paragraphs in the Discussion and included a new figure, where we correlate the fault system in our study area with fracture zones offshore quoting the suggested papers.

2) Another area of improvement is the little discussion on the geometry of the faults

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ascribed to be responsible of the found half-graben structures. Although these are determined by geological profiles from geophysical data, their possible trajectory is never presented in the figures (even just as dashed lines) or their immersion mentioned, as it could be easily derived from them by experienced readers and leaving the non-specialist without their geometry. R.: Following the suggestions gave by the reviewer we have written few sentences in the last paragraph of the Introduction in order to explain our motivation to study the paleocave system in the Potiguar Basin.

3) The authors might refer to papers where, using geological reference layers as the ones presented, it has been possible to propose a reliable model for their geometry. R.: We now state that the end of the Potiguar rift termination represents “a case” and not “a unique case” (line 25). In addition, we included a sentence in the abstract that shows the implications of our study (lines 10-11). We wrote two new paragraphs in the Discussion, where we correlate the fault system in our study area with fracture zones offshore and we quote the bibliography suggested by Reviewer 2.

P. 2885 / Abstract: R.: We corrected the abstract according to suggestions.

P. 2886 / Line 20: A similar framework has been also discussed in... R.: We cited references about transform terminations.

P. 2887 / Line 22: Suggest to add age in Ma in Fig. caption. R.: Figure 1 and its caption were corrected.

P. 2888 / Lines 10 and 13: add age in Ma. R.: Done.

P. 2888 / Lines 18 and 21: could you add the fault immersion? R.: Done.

P. 2889 / Lines 4 to 15: It is obvious but not clear that the covering... R.: The whole paragraph was rewritten to describe the stratigraphic sequence in the study area.

P. 2889 / Line 24: (Reid et al. 1990)? R.: We properly cited this reference in the text below.

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P. 2890 / Line20: This point in figure 4b is not so clearly visible. See comment in Fig. R.: The colored circles were enlarged to make Euler solutions more visible.

P. 2891 / Lines 10 and 14: better to place reference to Sect. 3.3 when you introduce first geoelectrical data R.: The information was replaced in Section 3.3.

P. 2891 / Line 22: open to misunderstanding. Clearly the interpretation does NOT derive form the missing information. Suggestion: Despite the lack of... R.: Suggestion accepted.

P. 2892 / Line 22: This name appears just here. Is it necessary? R.: Pendência Formation deleted.

P. 2894 / Line 11: It would be very useful to add the fault immersion (i.e. dipping to the NW for P01) to let the reader easily understand the relation between the half-graben geometry of the basin and the fault. R.: We trace master faults and schemaatic profiles in Figures 6, 8 and 9 and located the graben zones in Figure 7 in order to enhance rift geometries.

P. 2894 / Line 19: There is a general tendency to convert units in MKS system. Could you convert in Kg m-3 (multiply by 1000) R.: Now the densities are in kg/m3.

P. 2895 / Line 4: help the readers: add appropriate reference R.: Done.

P. 2895 / Line 16: approximate fault trace (dashed line?) in Fig will help R.: We included schematic geological profiles in Figures 8 and 9.

P. 2898 / Line 10: Better: "Relative geometry of the two fault sets indicate..." R.: Suggestion accepted.

P. 2899 / Line 21: Here it is not clear enough: is this oblique rifting correlated to the rift termination that is referred in the manuscript as I understood? or is it another event? Again: avoid confusion between WNW strike-slip, oblique-slip, and oblique rifting R.: We have simplified the sentence and we now quote only “rifting” to avoid confusion.

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P. 2891 / Lines 10 and 14: better to place reference to Sect. 3.3 when you introduce first geoelectrical data R.: The information was replaced in Section 3.3.

P. 2891 / Line 22: open to misunderstanding. Clearly the interpretation does NOT derive form the missing information. Suggestion: Despite the lack of... R.: Suggestion accepted.

P. 2892 / Line 22: This name appears just here. Is it necessary? R.: Pendência Formation deleted.

Figures 1: Chron C34 (84 Ma); pre rift 3: New rift boundaries were traced and caption corrected. 4: New rift boundaries were traced, colored circles enlarged and caption corrected. 5: New rift boundaries were traced and caption corrected. 6: Master faults and grabens were traced. 7: Graben areas were located. 8 and 9: Schematic geological profiles were inserted. 11: New figure illustrating the main framework of the Potiguar Basin with its possible continuation offshore, the evolution of the Apodi faults and the N-S-trending graben during the rift phase and the post-rift phase.

(3) Author's changes in manuscript: Please find attached PDF file with changes in manuscript.

Please also note the supplement to this comment:
http://www.solid-earth-discuss.net/6/C1441/2014/sed-6-C1441-2014-supplement.pdf

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Interactive Comment

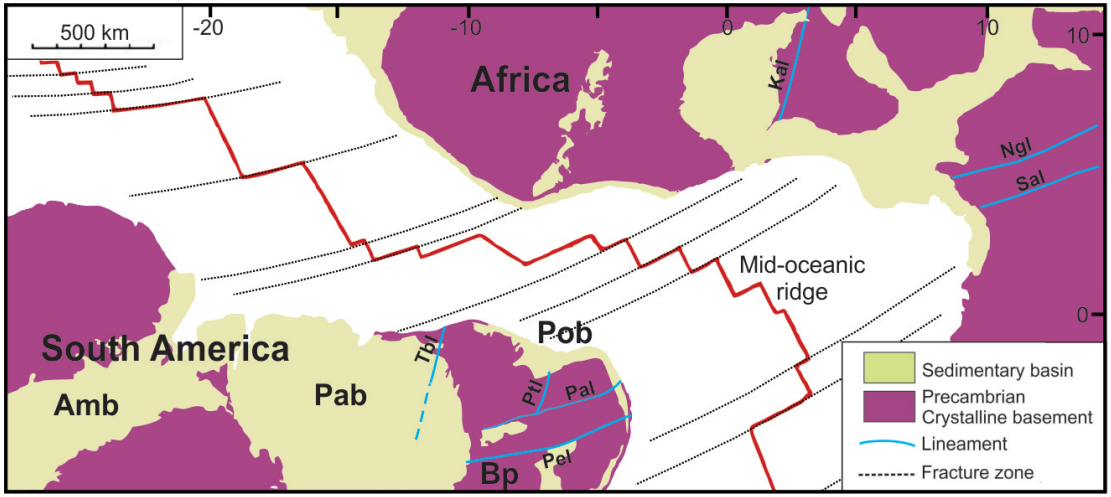

Fig. 1. Schematic reconstruction of northeastern Brazil and western Africa at Chron C34 (84 Ma) showing the main pre rift piercing point and sedimentary basins (Amb - Amazon, Pab - Parnaíba; Pob - Potiguar) i

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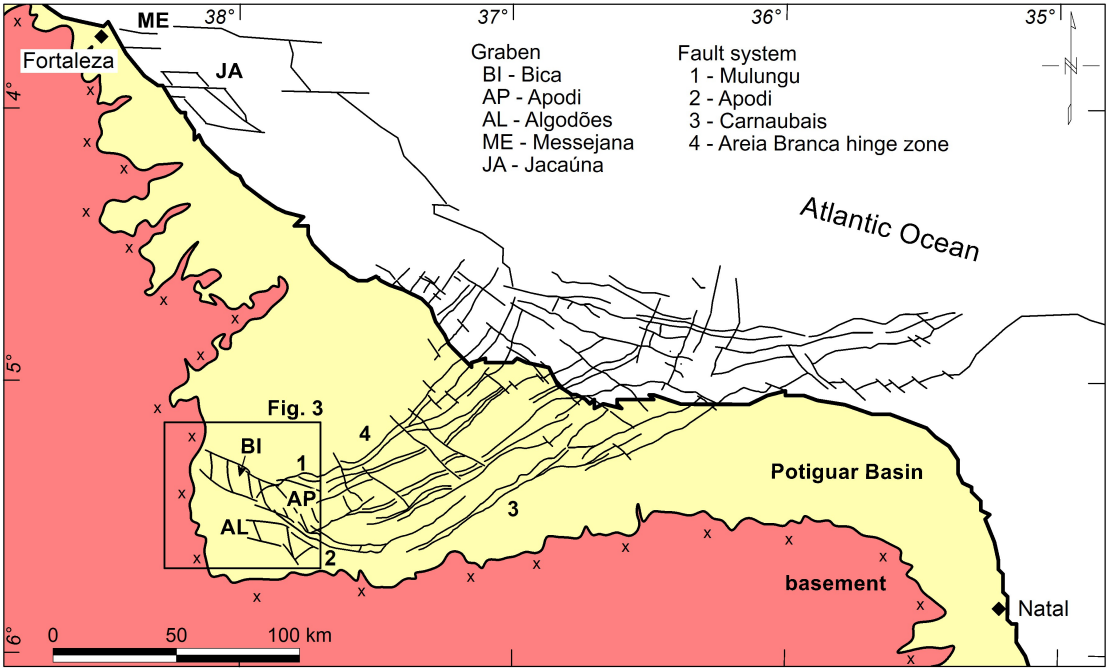

Fig. 2. Simplified geologic map of the Potiguar Basin in NE Brazil (adapted from Angelim et al., 2006). The rift structures in the maps of Figures 2 and 4 are inferred from interpretation of seismic sections

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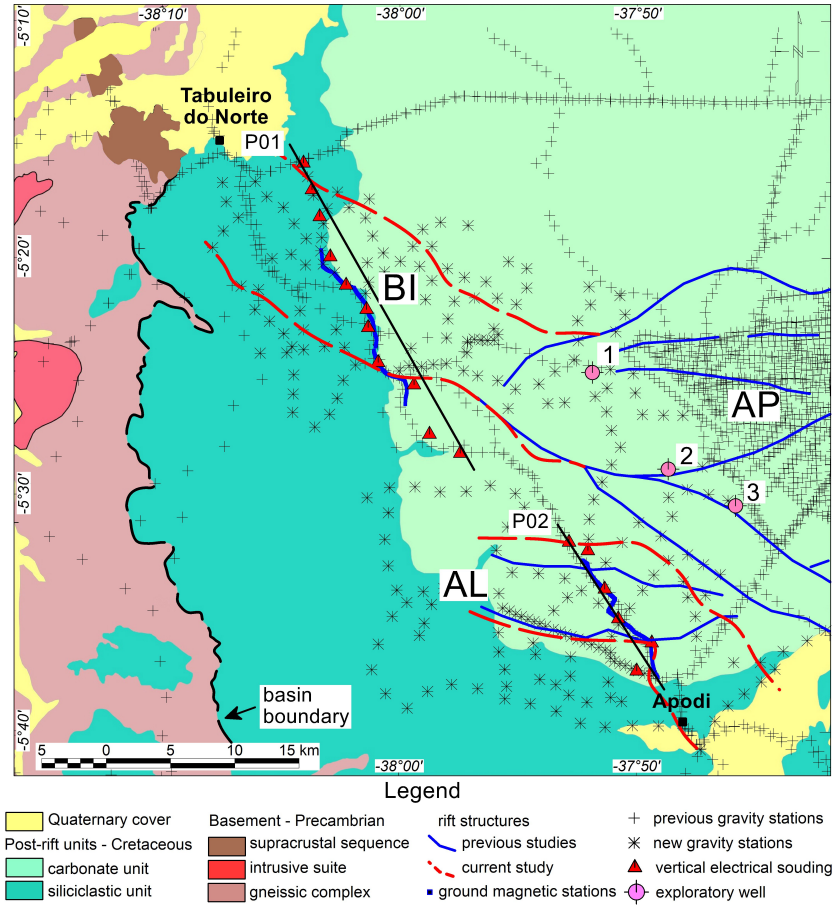

Fig. 3. Geologic map of the SW border of the Potiguar Rift with the location of the geophysical datasets. (Grabens: BI - Bica, AP – Apodi and AL – Algodões; Profiles: P01 and P02 (black lines); Exploratory we

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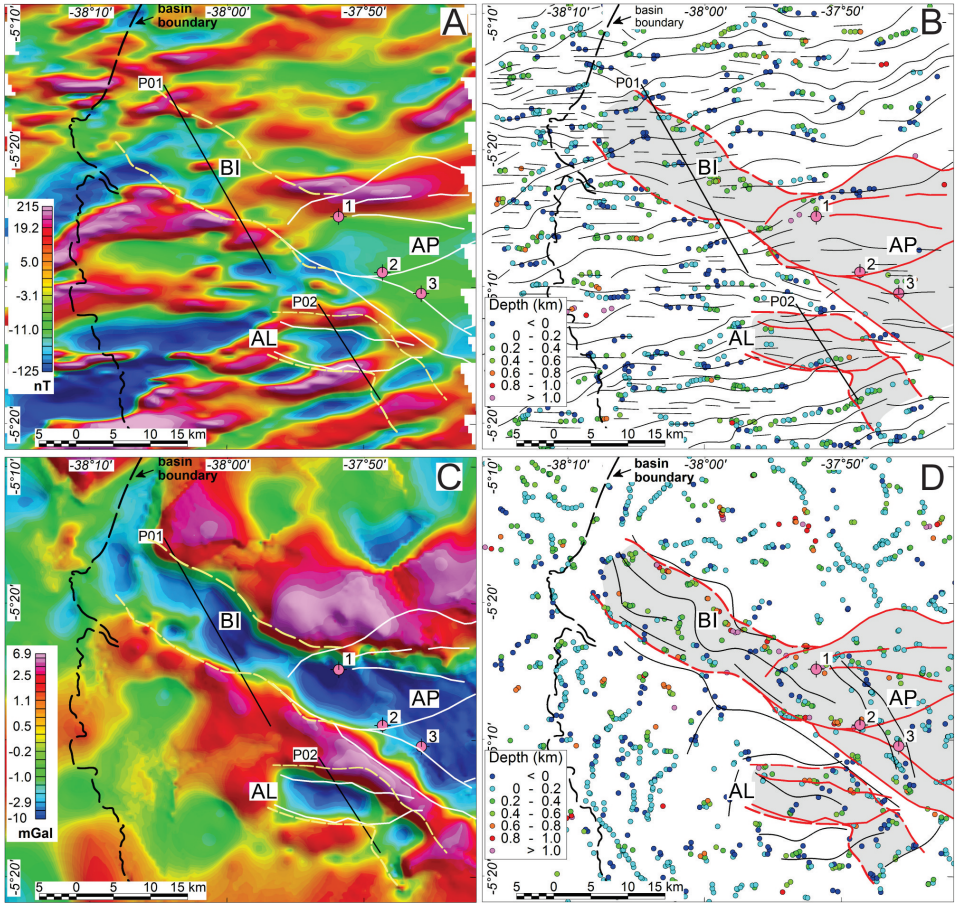

Fig. 4. (A) Residual component of the magnetic field reduced to the pole and (B) major magnetic lineaments and Euler solutions; (C) Residual gravity anomaly map and (D) major gravity lineaments and Euler solu

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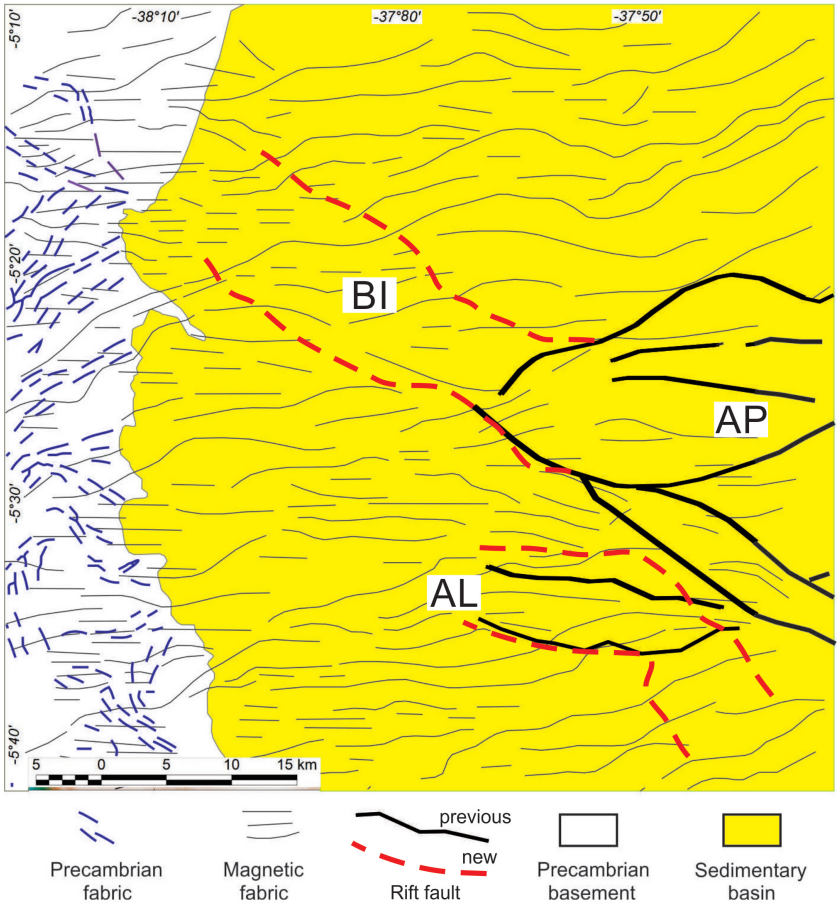

Fig. 5. Comparison between Precambrian structural fabric derived from remote sensing and NE-SW to E-W trending magnetic lineaments. Grabens: BI – Bica, AP – Apodi and AL – Algodões.

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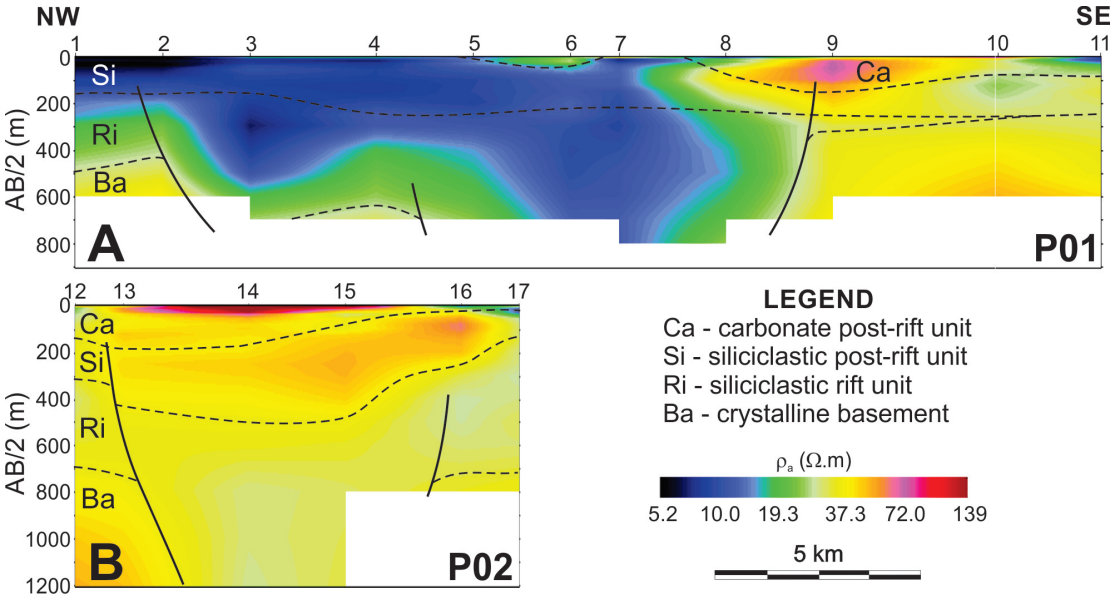

Fig. 6. Interpreted apparent resistivity cross sections of profiles P01 (top) and P02 (bottom). VES locations: 1 to 17.

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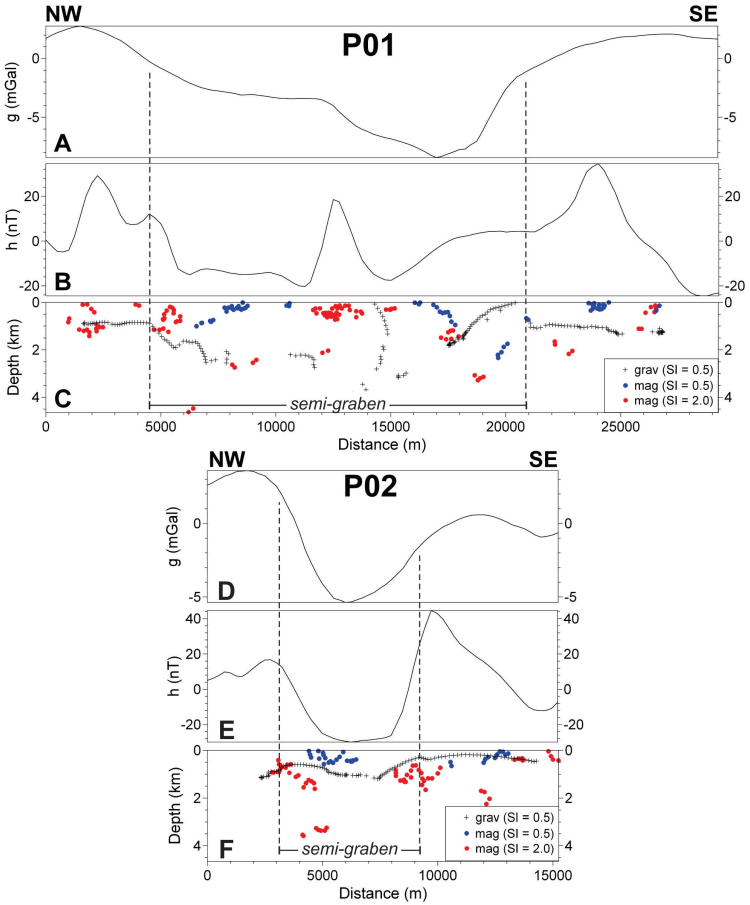

Fig. 7. Gravity (A, D) and magnetic (B, E) anomalies and Euler solutions (C, F) of profiles P01 (top) and P02 (bottom).

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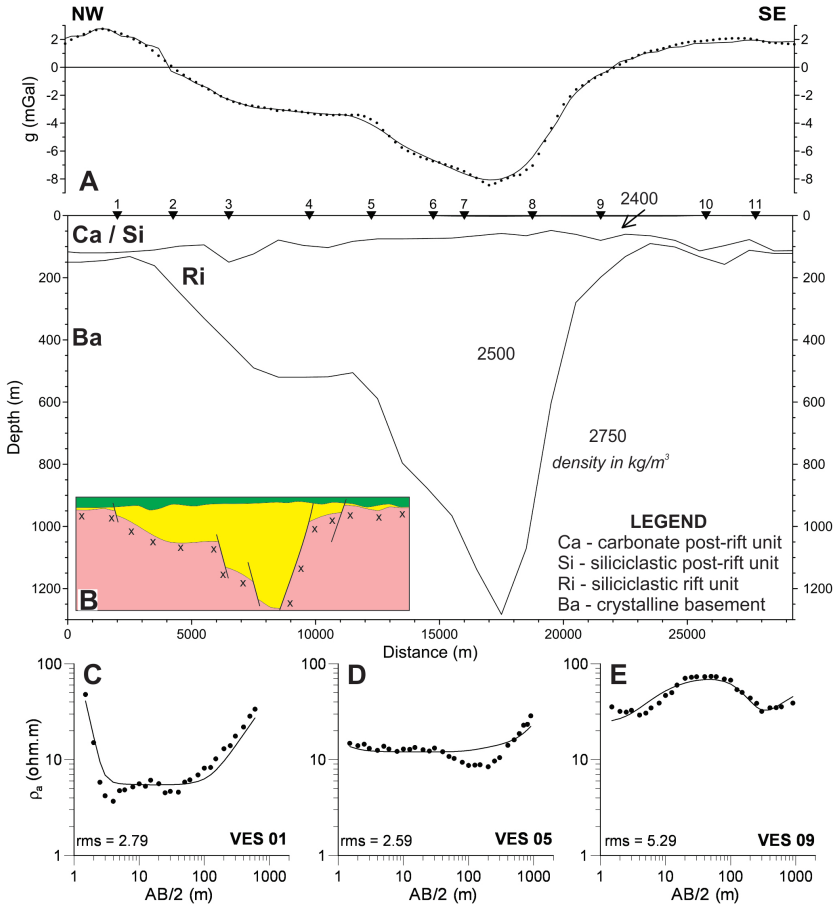

Fig. 8. Observed (dots) and calculated (solid line) gravity anomaly across the Profile P01 (A) and the final model response obtained from joint inversion method (B). Comparison of three VES data (dots) and mo

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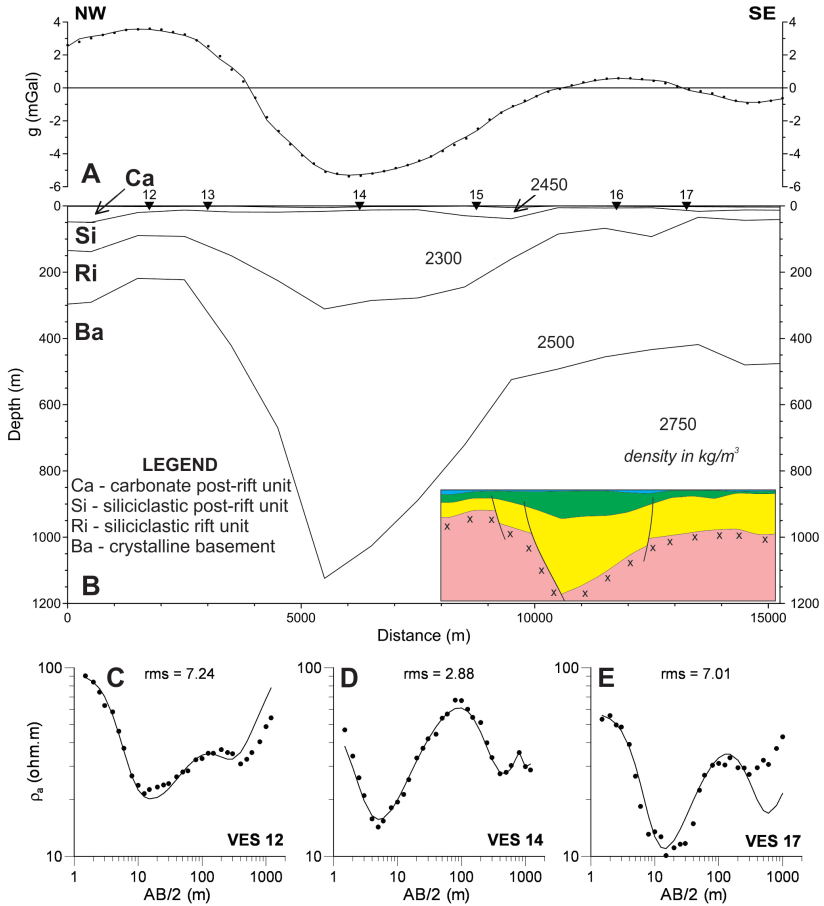

Fig. 9. Observed (dots) and calculated (solid line) gravity anomaly across the Profile P02 (A) and the final model response obtained from joint inversion method (B). Comparison of three VES data (dots) and mo

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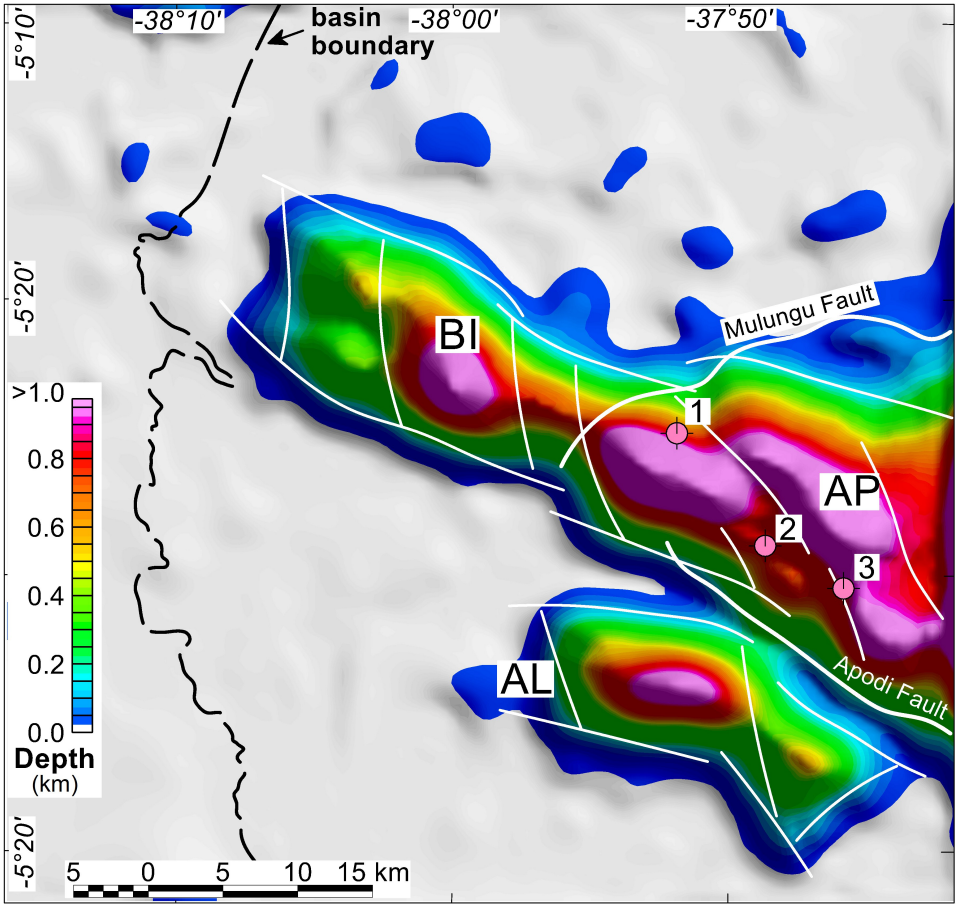

Fig. 10. Basement contour map of the SW border of the Potiguar Rift derived from 3D-gravity modelling with major fault segments (thin white traces). Thick white traces: rift limits from previous studies. Grabe

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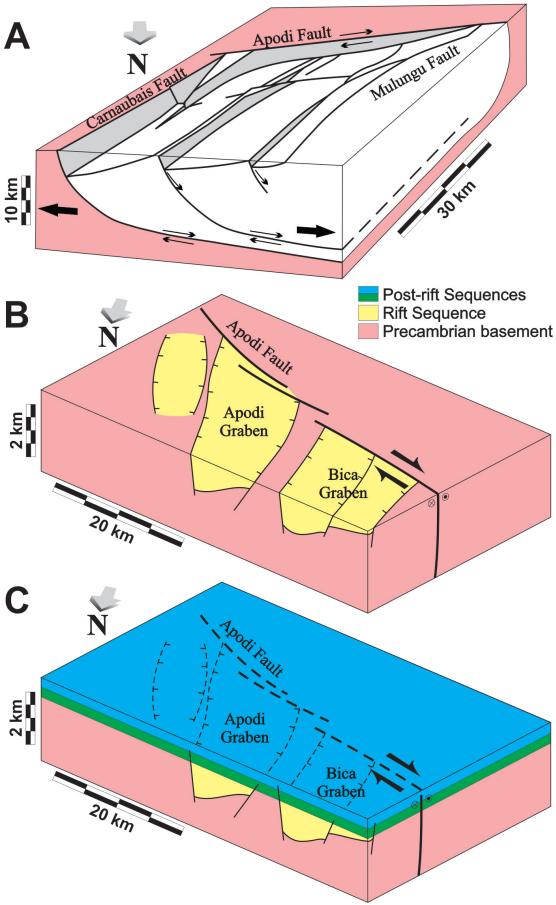

Fig. 11. Cartoon illustrating (A) the main framework of the Potiguar Basin proposed by Matos (1992) (modified from Rodrigues et al., 2014); (B) the geometry and kinematics of the Apodi faults and the N-S-trend

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