Accepted Manuscript

Comment on “Evolution and palaeoenvironment of the Bauru Basin (Upper Cretaceous, Brazil)” by Luiz Alberto Fernandes & Claudia Maria Magalhães Ribeiro

Giorgio Basilici, Patrick Führ Dal' Bó, Lucas Ernesto Fiorelli

PII: S0895-9811(16)30102-X

DOI: 10.1016/j.jsames.2016.06.015

Reference: SAMES 1582

To appear in: *Journal of South American Earth Sciences*

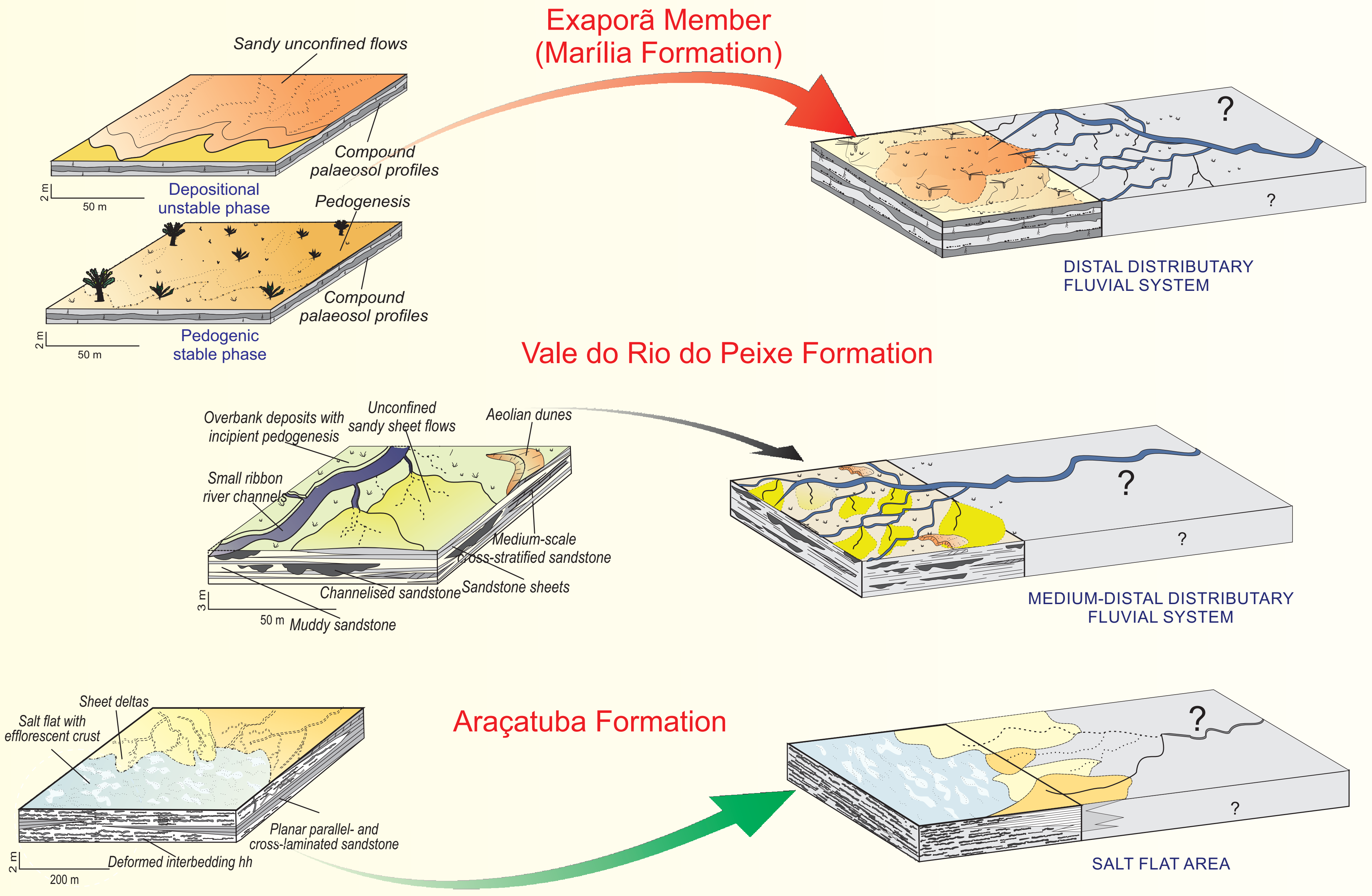
Received Date: 31 January 2016

Revised Date: 15 June 2016

Accepted Date: 30 June 2016

Please cite this article as: Basilici, G., Dal' Bó, P.F., Fiorelli, L.E., Comment on “Evolution and palaeoenvironment of the Bauru Basin (Upper Cretaceous, Brazil)” by Luiz Alberto Fernandes & Claudia Maria Magalhães Ribeiro, *Journal of South American Earth Sciences* (2016), doi: 10.1016/j.jsames.2016.06.015.

Another interpretation of the Bauru Group



Comment on "Evolution and palaeoenvironment of the Bauru Basin (Upper Cretaceous, Brazil)" by Luiz Alberto Fernandes & Claudia Maria Magalhães Ribeiro

Giorgio Basilici[a,c,*], Patrick Führ Dal' Bó[b], Lucas Ernesto Fiorelli[c]

[a]Geoscience Institute, UNICAMP, Rua Pandiá Calogeras, 51, CEP 13083-870, Campinas, Brazil

[b]Geoscience Institute, UFRJ, Av. Athos da Silveira Ramos, 274, CEP: 21.941.916, Rio de Janeiro, Brazil

[c]Centro Regional de Investigaciones Científicas y Transferencia Tecnológica de La Rioja (CRILAR-CONICET), Entre Ríos y Mendoza s/n, CP 5301, Anillaco, La Rioja, Argentina

[*]Correspondent Author

ABSTRACT

Fernandes and Ribeiro (2015) described the evolutive history of the Bauru Basin in a clear and simple way, synthesising the research activity of the last 20 years. Sedimentological and stratigraphic data reflect the research activity of the senior author, whereas palaeontological information is a synthesis of data from literature. We do not believe that the evolutive history of the sedimentary succession of the Bauru Basin is as simple as described by the cited authors, but that other hypotheses, which are in strong contrast with the history considered in this article, exist. We exposed six main critical points in the model that Fernandes and Ribeiro (2015) presented. Each argument is presented and an alternative hypothesis is expressed. The criticisms are related to (1) the depositional interpretations of the Araçatuba Formation, (2) Vale do Rio do Peixe Formation and Echaporã Member, (3) the homogeneity and distribution of the Marília Formation, (4) the climate change in Bauru Group, (5) the inappropriate use of palaeosols and (6) some paleontological misconceptions.

The objective of this comment is to raise a discussion showing to the readers that the stratigraphy and depositional history of the Bauru Basin are far more complex than that presented by

Fernandes and Ribeiro (2015) and to show important alternative hypotheses not even mentioned by these authors.

Keywords: Bauru Basin, Upper Cretaceous, depositional palaeoenvironments, palaeosols, Brazil.

1. INTRODUCTION

The Bauru Basin is an intracratonic basin formed during the Upper Cretaceous in south eastern Brazil. Its stratigraphic and sedimentological framework is not simple. There are many reasons that make it difficult to understand: (1) the relative homogeneity of the lithology, formed overall of reddish brown sandstone, mostly structureless; (2) the huge dimension of the basin, which exceeds 350,000 km^2; (3) the absence of clear biostratigraphic or geochronological data; (4) the abundance of palaeosol profiles, which, on average, are c.60% of the thickness of the sedimentary succession of the Bauru Group (Basilici et al., 2009); (5) the lateral variations of sedimentological and palaeopedological features.

Fernandes and Ribeiro (2015) in "Evolution and palaeoenvironment of the Bauru Basin (Upper Cretaceous, Brazil)" synthesised the stratigraphic, sedimentological and palaeontological history of the sedimentary succession of the Bauru Basin. Stratigraphic and sedimentological synthesis comes from published data of the senior author and partly from literature, whereas palaeontological synthesis is extracted above all from literature data. This article summarises the last 20 years of studies on the stratigraphic organisation and depositional features of the Bauru Basin and its palaeontological content. It is, nevertheless, restricted to only one hypothesis of evolution of the Bauru Basin and shows this as a unique and conclusive history of this basin. On the contrary, other published hypotheses on the evolution of the Bauru Basin exist and they are in sharp contrast with that presented.

2. DISCUSSION

The critical aspects raised in this comment affect the Bauru Group.

2.1. The Araçatuba Formation is a salt flat rather than a wetland area

Fernandes and Ribeiro (2015) attributed the Araçatuba Formation to a wetland (or paludal) area located at the central part of the Bauru Basin in a topographic depression. Lithofacies aspects of wetland deposits of this unit are not described in this article, but these may be found in Fernandes et al. (2003). Greenish gray, sheet mudstone and very fine-grained sandstone interbedding and lenticular very fine-grained sandstone constitute for Fernandes et al. (2003) internal and marginal wetland (or palustrine) systems, respectively. Wetland is a continental area characterised by water-saturated soil and/or water table above the surface for a frequency and duration sufficient to support hydrophytic vegetation (Patel et al., 2008). Wetland deposits in present desert regions are characterised by mudstone, with high content in organic matter and containing a dense net of thin roots, associated to herbaceous vegetation, and a rich amount of gastropods and ostracods (Pigati et al., 2014). The lithofacies description in Fernandes and Ribeiro (2015) and in Fernandes et al. (2003) does not correspond to wetland or palustrine deposits. On the contrary, lithofacies aspects of the Araçatuba Formation suggest that this unit was formed in a salt flat, or playa-lake covered by efflorescence saline crusts. Close to the city of Marília (see Fig. 1 of Fernandes and Ribeiro, 2015) the Araçatuba Formation is characterised by two lithofacies: deformed interbedding of sandstone and mudstone and planar parallel and cross-laminated sandstone. The first lithofacies (Fig. 1A) (*c.*75% of the measured section; see Fig. 3 of Basilici et al., 2016) is constituted of interbedding of well-sorted, fine- to very fine-grained weakly-cemented sandstone (olive grey - 5GY7/1) and mudstone (bright reddish brown - 2.5YR5/8) forming patches, few millimetres to 50 mm thick and few millimetres to 0.5 m in lateral extension, with jagged lateral edges and cuspate margins (Fig. 1Ai), characterised by protrusion at the boundaries between mudstone in the sandstone patches (Fig. 1Aii). Similar structures were described by Smoot and Castens-Seidell (1994) and Goodall et al. (2000) as produced by efflorescence crusts of evaporite minerals on the surface of a saline flat. Planar parallel and cross-laminated sandstone (Fig. 1B) form sheet beds that can be interpreted as sheet deltas (*sensu* Smoot and Lowenstein, 1991) at the margin of the flooded salt flat (Fig. 1C). To differentiate the Araçatuba Formation as salt flat (Fig. 1C) or wetland area is not purely a facies analysis exercise. This may have important consequences on palaeoecological interpretation, palaeoclimate and palaeohydrogeological reconstructions and depositional architecture definition. For more details on the lithofacies and depositional palaeoenvironment we suggest to refer to Basilici et al. (2016).

2.2. Another depositional interpretation for the Vale do Rio do Peixe Formation and Echaporã Member

Vale do Rio do Peixe Formation is overlain by Echaporã Member, which is the main and more extended member of the Marília Formation (see Fig. 2 and Tab. 1 of Fernandes and Ribeiro, 2015). For these authors these units are constituted of the same facies association and "correspond to deposits in sandy sheets and small dune fields with shallow temporary ponds". Such a generalisation does not correspond to field data. A detailed study in the areas close to Marília city, typical area of exposure of these units, showed different lithofacies organisation, which permits other depositional interpretations. Vale do Rio do Peixe Formation is characterised by channelised beds of fine-grained sandstone that cut sheet strata of interbedded very fine-grained sandstone and muddy sandstone (Fig. 2A). Locally cross-stratified beds, up to 1.2 m thick, characterised by planar and smooth erosive bottom and constituted of tangential foresets of alternating fine- and very fine-grained sandstone may be observed (see Fig. 8C of Basilici et al. (2016) and related description).

Channelised beds correspond to multistorey ribbon-shaped fixed channels, sheet beds were deposited by unconfined flows on a flood plain and cross stratifications correspond to small aeolian dunes (Fig. 2B). The Vale do Rio do Peixe Formation may be interpreted as a medium-distal portion of a distributary fluvial system (Nichols, 2005; Basilici et al., 2016).

The Echaporã Member is constituted of cyclic interbedding of conglomeratic sandstone sheets and sandstone palaeosols. Paleosols reach 95% of the thickness of the unit and are organised in compound profiles (Fig. 3A; see Figs. 10. 12 and 14 in Basilici et al., 2016), constituted mainly of Inceptisols (palaeosols characterised by a moderate development), secondarily by Vertisols, Entisols and Aridisols. Conglomeratic sandstone sheets were originated by unconfined subaqueous flows. Similar textural features and the stratigraphic overlay and continuity to palaeosol suggest that the parent material of the palaeosol was deposited by unconfined subaqueous flows. The Echaporã Member can be interpreted as a more distal portion of a fluvial distributary system (Nichols, 2005: Basilici et al., 2016) characterised by unconfined subaqueous flows, which occurred within a recurrence time sufficient to permit the almost complete pedogenesis of the deposits formed by unconfined flows (Fig. 3B). The depositional context of the Vale do Rio do Peixe and Echaporã Member units shows completely different characteristics in respect to those described by Fernandes and Ribeiro (2015) and drastically modifies some considerations on evolution and climate changes of the Bauru Group (see discussion below).

2.3. Is the Marília Formation ubiquitous and represented by a homogeneous depositional system?

The Marília Formation crops out in three main areas: northern, north eastern and south eastern portions of the Bauru Basin (see Fig. 1 of Fernandes and Ribeiro, 2015). Overall, Fernandes and

Ribeiro (2015) interpreted this formation as deposited in alluvial fan systems (see Fig. 14C of Fernandes and Ribeiro, 2015). But is this unit homogeneous in all the localities? Does it represent the same depositional system?

The Marília Formation exposed in the north eastern portion (close to Uberaba city; see Fig. 1 of Fernandes and Ribeiro, 2015) is not the same unit which out crops in the other portions. Here, the Marília Formation is constituted of weakly cemented channelised sandstone and conglomeratic sandstone, and secondarily by finer flood plain deposits and thin and poorly developed palaeosols. This unit probably represents the deposition of the proximal/medial portion of a perennial multichannel braided fluvial system.

The other two areas of exposition of the Marília Formation (northern and south eastern portions) show apparently analogous lithologic features, but a careful analysis demonstrated great differences in lithologic, depositional and palaeopedogenic aspects. In the northern portion, the Marília Formation is formed of interbedding of well-developed palaeosol profiles (mainly Aridisols and Alfisols) (65% of the thickness) and conglomeratic sandstone (9% of the thickness), which represent ephemeral channel deposits, both formed on stabilised topographic surfaces in semiarid climate, and aeolian sand sheet deposits (26% of the thickness), deposited in more arid climate (Basilici et al. 2009 and their Fig. 14; Basilici and Dal' Bó, 2010).

In the south eastern portion, the Marília Formation is mainly constituted of compound profiles of moderately developed palaeosols (Inceptisols) interbedded with unconfined subaqueous flow deposits (Fig. 3A). Channelised deposits of conglomeratic sandstone are not present. Moderately developed palaeosol profiles suggest more frequent depositional processes than in the northern portion. The presence of unconfined deposits and the absence of channelised forms suggest a depositional environment characteristic of the more distal portion of a fluvial distributary system (Fig. 3B) (Basilici et al., 2016).

In conclusion, the three areas of exposition of the Marília Formation show different architectural organisation and interpretation of the depositional systems. Probably they cannot be included in the same stratigraphic-genetic unit and no elements exist to support their chronocorrelation. For these reasons, we disagree that the younger portion of the Bauru Basin sedimentary succession, the Marília Formation, can be included in a unique unit and interpreted using the same depositional environment.

2.4. An unclear climate variation at the transition Vale do Rio do Peixe Formation to Echaporã Member

Fernandes ad Ribeiro (2015) claimed that at the transition Vale do Rio do Peixe Formation to Echaporã Member a climate variation developed from a first phase of "desert conditions (desert system tract)" to a "second phase involving more water, although the climate was semiarid (fluvial-aeolian system tract)". They attributed this climate change to the presence of channels in the Marília Formation. We disagree with this interpretation for the following reasons. (1) Channel deposits are not distributed in all areas of the Marília Formation. As discussed above, the south eastern portion of this unit does not hold channel deposits. (2) If the argument to define the more humid climate of a region is the presence of deposits formed by water flows, then the Araçatuba and Vale do Rio do Peixe formations (which the authors consider belonging to the first desert phase) do not correspond to an arid climate because water-transported deposits are abundant in these units. The Araçatuba formation was formed in an environment with a water table near the topographic surface of a salt flat that was commonly subjected to floods. The Vale do Rio do Peixe Formation shows channel deposits and frequent unconfined subaqueous flows deposited on a flood plain. On the contrary, the transition from Vale do Rio do Peixe to Echaporã Member in south eastern and northern portions of the Bauru Group could more realistically represents a decrease in the precipitations. In the south eastern area, the absence of channel deposits and the relatively long recurrence time between one depositional event and another indicate a general retrogradation of the fluvial distributary system represented by the Vale do Rio do Peixe Formation that was probably caused by a decrease in the precipitations (Basilici et al., 2016). In the northern portion, the presence of aeolian sand sheet alternated with palaeosols and channel deposits means periodically more arid conditions (Basilici et al., 2009, 2012).

In any case, the absence of elements of chrono-correlation between the different portions of the Marília Formation does not permit to define a general climate change for the entire upper portion of the Bauru Basin.

2.5. Inappropriate use of the palaeosols

In Fernandes and Ribeiro (2015) palaeosols seem to be restricted to calcretes, i.e., calcium carbonate concentrations, which are not palaeosols, but they constitute part of a palaeosol profile: Bk or Bkkm horizon. Calcretes are present in Bauru Group in some palaeosols, as Aridisols, and a few examples were found in Entisols or Inceptisols (Dal' Bó et al., 2009, 2010; Basilici and Dal' Bó, 2010; Basilici et al., 2012; Basilici et al., 2016), but many other palaeosols (Alfisols, Inceptisols, Entisols, Vertisols) do not show Bk or Bkkm horizons. In the end, calcretes are present in not more than 20-30% of the palaeosol profiles. Palaeosols, as described above, are abundant in Bauru Group and must be taken into consideration in the history and evolution of this basin.

2.6. Paleontological misconceptions

In the palaeontological review and discussion we noted three inaccuracies. (1) The inadequate treatment of the palaeosols does not take in account the important and well-known role for fossil preservation in these geological records (Retallack, 1984, 1997). (2) The statement “fossil record mainly consists of transported bones and other skeletal fragments” is not completely true. Many fossils (e.g. crocodyliforms, sauropoda) consist of well-preserved and/or complete-articulated remains (Pol et al., 2014; Iori et al. 2015). (3) The statement the “life in the Bauru flourished most in the areas with the greatest water availability" is a vague concept. The authors do not consider that crocoyilians faunas of Bauru were distributed and diversified according to the arid and semiarid climate with a marked seasonality of Cretaceous age (Carvalho et al., 2010; Pol et al., 2014; Leardi et al., 2015). Thus not necessarily was the fauna concentrated in "areas with the greatest water availability".

3. CONCLUSIONS

We disagree with the framework of the depositional evolution and paleontological review of the Bauru Basin that Fernandes and Ribeiro (2015) proposed. Overall, we consider it too simplistic for a basin so complex, large and barely studied. In this comment, we have underlined and discussed critical points that are in contrast to the framework presented by the authors. The points of criticisms are based on our original data, which have already been published (Basilici et al., 2016). We contested the following points: (1) the interpretation of Araçatuba Formation as palustrine or wetland area; (2) the interpretation of Vale do Rio do Peixe and Echaporã Member as aeolian sand sheet; (3) the palaeoenvironmental interpretation and depositional architecture of the Marília Formation; (4) an unclear climatic change from Vale do Rio do Peixe Formation to Marília Formation; (5) the almost complete absence of analysis of palaeosols; (6) some palaeontological misconceptions.

ACKNOWLEDGEMENTS

The authors would like to thank FAPESP (Project 2012/23209-0) and CNPq (Universal 4742272013-8) for having financed this study. We are grateful to Wiliam Nava, director of the

Marília Museum, whose discussion in the field has been fecund for our ideas. Claiton Scherer and an anonymous referee were determinant to improve the original manuscript.

REFERENCES

Basilici, G., Dal’ Bó, P.F.F., Ladeira, F.S.B., 2009. Climate-induced sediment-palaeosol cycles in a Late Cretaceous dry aeolian sand sheet: Marília Formation (North-West Bauru Basin, Brazil). Sedimentology, 56, 1876-1904.

Basilici, G., Dal' Bo, P.F.F., 2010. Anatomy and controlling factors of a Late Cretaceous aeolian san sheet: the Marília and the Adamantina formations, NW Bauru Basin, Brazil. Sedimentary Geology, 226, 71–93.

Basilici, G., Sgarbi, G.N., Dal’ Bó, P.F.F., 2012. A Sub-Bacia Bauru: um sistema continental entre deserto e cerrado. In: Hasui, Y., Almeida, F., Carneiro, C.D.R., Bartorelli, A. (Eds.), Geologia do Brasil. São Paulo, Beca, 523-543.

Basilici, G., Dal' Bo, P.F., Oliveira, E.F., 2016. Distribution of palaeosols and deposits in the temporal evolution of a semiarid fluvial distributary system (Bauru Group, Upper Cretaceous, SE Brazil). Sedimentary Geology, http://dx.doi.org/10.1016/j.sedgeo.2016.04.014.

Carvalho, I.S., Gasparini, Z.B., Salgado, L., Vasconcellos, F.M., Marinho, T.S., 2010. Climate's role in the distribution of the Cretaceous terrestrial Crocodyliformes throughout Gondwana. Palaeogeography, Palaeoclimatology, Palaeoecology, 297, 252–262.

Dal’ Bó, P.F.F., Basilici, G., Angelica, R.S., Ladeira, F.S.B., 2009. Paleoclimatic interpretations from pedogenic calcretes in a Maastrichtian semi-arid eolian sand-sheet palaeoenvironment: Marília Formation (Bauru Basin, southeastern Brazil). Cretaceous Research, 30, 659-675.

Dal' Bó, P.F.F., Basilici, G., Angélica, R.S., 2010. Factors of paleosol formation in a Late Cretaceous eolian sand sheet paleoenvironment, Marília Formation, Southeastern Brazil Palaeogeography, Palaeoclimatology, Palaeoecology, 292, 349–365.

Fernandes, L.A., Giannini. P.C.F. and Góes, A.M., 2003. Araçatuba Formation: palustrine deposits from the initial sedimentation phase of the Bauru Basin. Anais da Academia Brasileira de Ciências 75, 173-187.

Fernandes, L.A., Ribeiro, C.M.M., 2015. Evolution and palaeoenvironment of the Bauru Basin (Upper Cretaceous, Brazil). Journal of South America Earth Science, 561, 71-90.

Goodall, T. M., North C. P. and Glennie K. W., 2000. Surface and subsurface sedimentary structures produced by salt crusts. Sedimentology, 47, 99-118.

Iori, F.V., Carvalho, I.S.; Marinho, T.S., 2015. Postcranial skeleton of *Caipirasuchus* (Crocodyliformes, Notosuchia, Sphagesauridae) from the Upper Cretaceous (Turonian-Santonian) of the Bauru Basin, Brazil. Cretaceous Research, 60, 109–120.

Leardi, J.M., Fiorelli, L.E., Gasparini, Z., 2015. Re-description and re-evaluation of the taxonomical status of Microsuchus schilleri (Crocodyliformes: Mesoeucrocodylia) from the Upper Cretaceous of Neuquén, Argentina. Cretaceous Research, 52, 153–166.

Nichols, G. J., 2005. Sedimentary evolution of the Lower Clair Group, Devonian, West of Shetland: climate and sediment supply controls on fluvial, aeolian and lacustrine deposition. In: Doré, A. G., Vining, B. A. (Eds), Petroleum Geology: North-West Europe and Global Perspectives, Proceedings of the 6th Petroleum Geology Conference, 957–967.

Patel, S. V., Golakiy A B. A., Savalia, S.G., Gajera, H.P., 2008. A Glossary of Soil Sciences. International Book Distributing Co. Lucknow, (INDIA), 407 pp.

Pigati, J.S., Rech Jason A., Quade J., Bright J., 2014. Desert wetlands in the geologic record. Earth-Science Reviews, 132, 67–81.

Pol, D., Nascimento, P.M., Carvalho, A.B., Riccomini, C., Pires-Domingues, R.A., Zaher, H., 2014. A new notosuchian from the Late Cretaceous Brazil and the phylogeny of advanced notosuchians. PLoS ONE 9, e93105.

Retallack, G., 1984. Completeness of the rock and fossil record: some estimates using fossil soils. Paleobiology, 10, 59–78.

Retallack, G., 1997. Dinosaurs and dirt. Dinofest International, 345–359.

Smoot, J. P. and Lowenstein, T. K., 1991. Depositional environments of non marine evaporites. In Melvin, J. L. ed. Evaporites Petroleum and Mineral Resources. Amsterdam Elsevier, pp. 189-347.

Smoot, J.P. and Castens-Seidell, B. (1994) Sedimentary features produced by efflorescent crusts, Saline Valley and Death Valley, California. In: Sedimentology and Geochemistry of Modern Ancient Saline Lakes (Eds R.W. Renaut and W.M. Last), Spec. Publ. SEPM, 50, 73-90.

CAPTIONS

Figure 1. Araçatuba Formation. (A) Deformed interbedding of sandstone and mudstone Note (i) the jagged termination of the laminae or thin strata and (ii) the protrusion at the boundaries between sandstone (olive grey - 5GY7/1) and mudstone (bright reddish brown - 2.5YR5/8) interbedding. This structure is formed by superficial growth of thin salt efflorescence crusts on a salt flat. Object of scale is 26 mm in diameter. (B) Planar parallel-laminated sandstone (lower part) is formed in unidirectional upper flow subaqueous regime and is interpreted as sheet delta deposits at the margins of the flooded salt flat. These structures are overlaid by trough cross-laminations (upper portion) with local opposite dip of the foresets (see arrow) and they are interpreted as combined-flow ripples produced by wave reworking of the sand. The section is parallel to the foreset dip. Coin: 20 mm. (C) The Araçatuba Formation is interpreted as a salt flat. Interbedding of sandstone and mudstone, deformed by efflorescent salt crust growth, constitute most of the depositional unit. During the floods, at the margin of the salt flat, unconfined flows formed sheet deltas.

Figure 2. Vale do Rio do Peixe Formation. (A) Muddy sandstone (ms) and sandstone sheets (ss) constitute most of the lithofacies of this unit. Sandstone sheets are interpreted as unconfined

flows. Channelised sandstone (chs) represents the filling of multistorey ribbon-shaped channel. (B) This unit deposited in medial or distal portion of a fluvial distributary system. Small and fixed ribbon-channel deposits cut dominant interbedding of sandstone sheet and muddy sandstone beds, formed by unconfined flows. Occasionally, aeolian cross-stratifications can be observed.

Figure 3. Echaporã Member. (A) This unit is composed of cyclic sequences of conglomeratic sandstone sheets and compound palaeosol profiles (Inceptisols). (B) This unit is interpreted as distal portion of fluvial distributary system characterised by alternating periods of deposition by unconfined flows followed by moderate pedogenesis of the deposits.

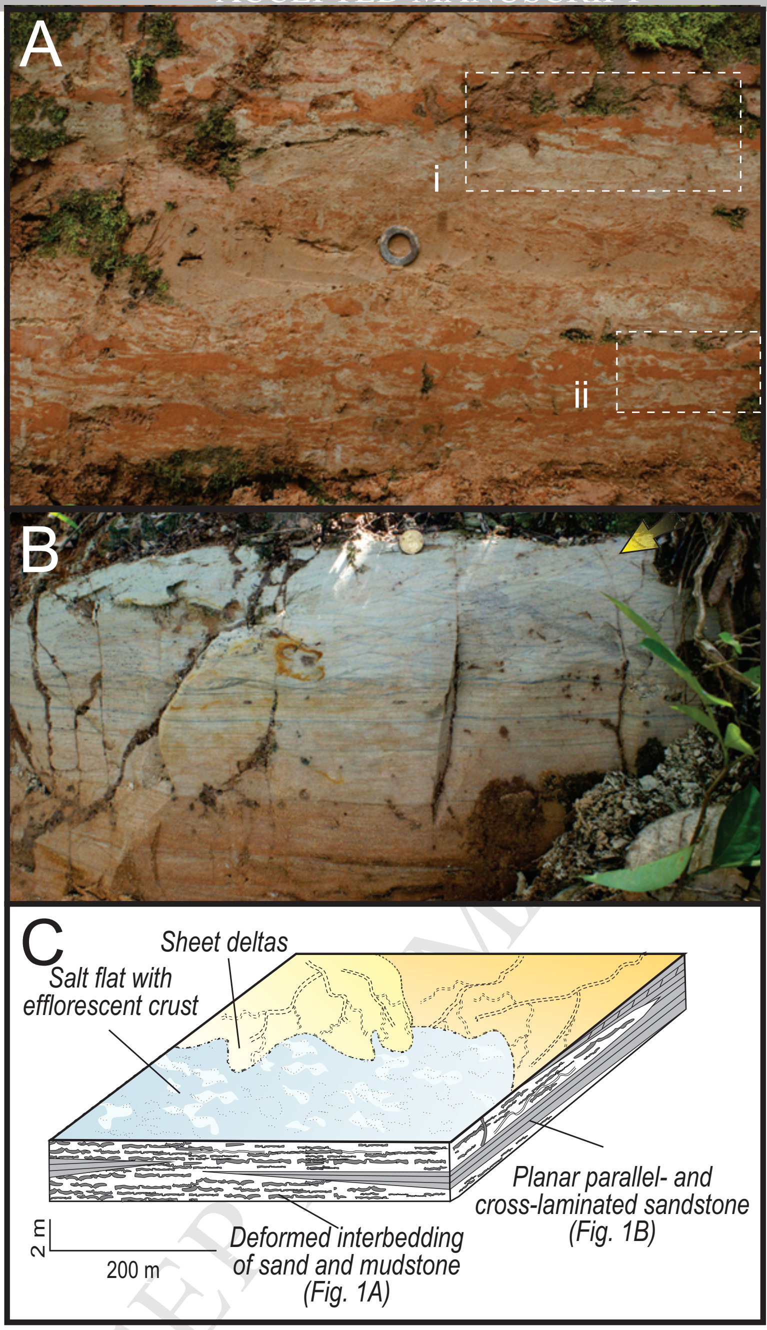

A
i
ii
B
C
Sheet deltas
Salt flat with
efflorescent crust
Planar parallel- and
cross-laminated sandstone
(Fig. 1B)
Deformed interbedding
of sand and mudstone
(Fig. 1A)
2 m
200 m

FIGURE 1

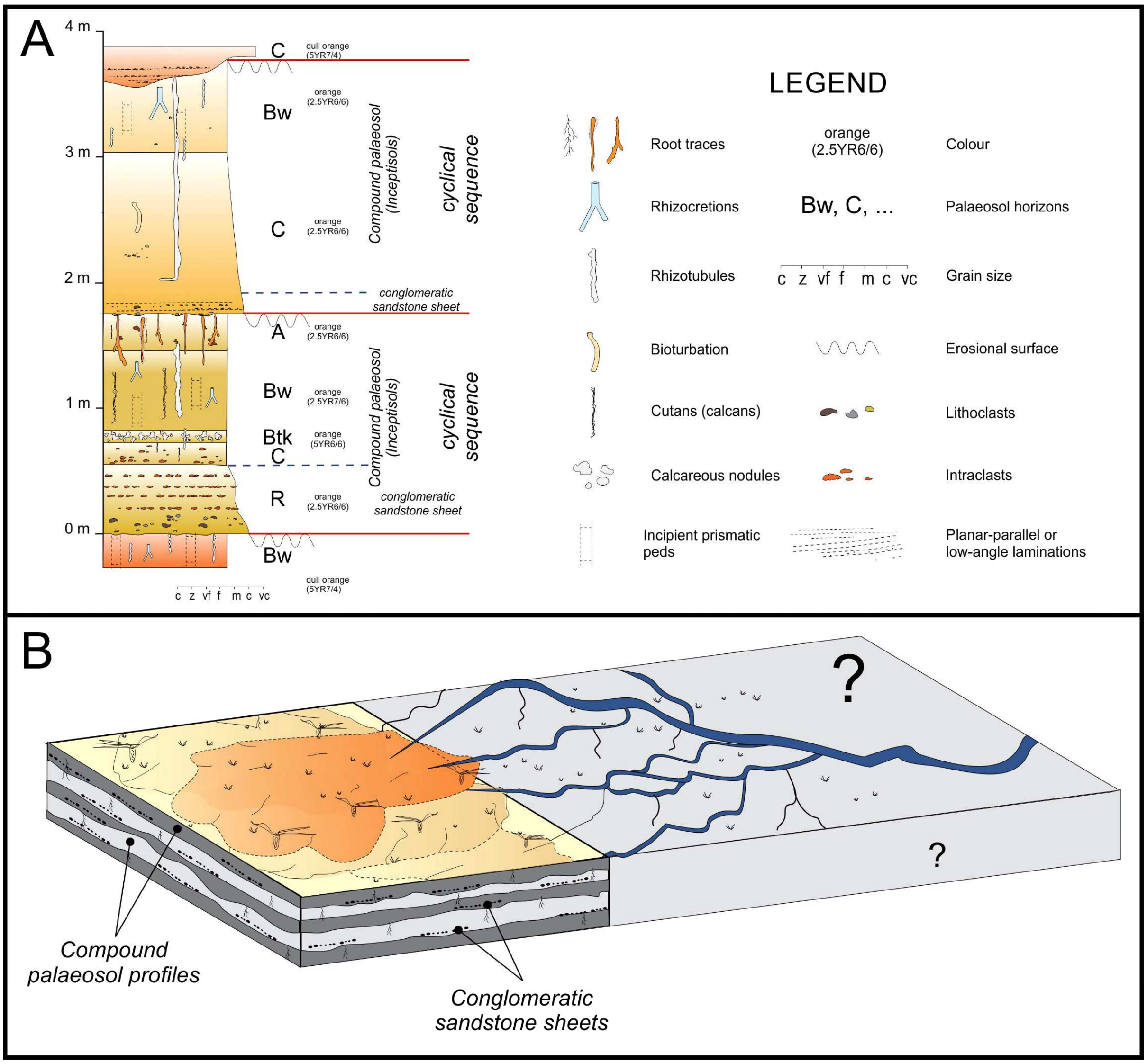

A
4 m
3 m
2 m
1 m
0 m
C
dull orange (5YR7/4)
Bw
orange (2.5YR6/6)
C
orange (2.5YR6/6)
Compound palaeosol (Inceptisols)
cyclical sequence
conglomeratic sandstone sheet
A
orange (2.5YR6/6)
Bw
orange (2.5YR7/6)
Btk
orange (5YR6/6)
C
R
orange (2.5YR6/6)
conglomeratic sandstone sheet
Bw
dull orange (5YR7/4)
c z vf f m c vc
LEGEND
Root traces
orange (2.5YR6/6)
Colour
Rhizocretions
Bw, C, ...
Palaeosol horizons
Rhizotubules
c z vf f m c vc
Grain size
Bioturbation
Erosional surface
Cutans (calcans)
Lithoclasts
Calcareous nodules
Intraclasts
Incipient prismatic peds
Planar-parallel or low-angle laminations
B
?
?
Compound palaeosol profiles
Conglomeratic sandstone sheets

FIGURE 3

Highlights

The Bauru Basin history is not as simple, clear, and linear as the authors presented.

Other depositional interpretations of the Bauru Group are possible.

Climate interpretations are not reliable if compared with available data.

Palaeosols constitute c.60% of the Bauru Group, but their analysis is absent.