

PS The Thermal Effect of Basic Sill on Turbidites of Taciba Formation (Permian), Paraná Basin, Brazil*

L.D. Vieira¹, M.S. Silva², L.D. Mouro^{2,3}, and B.L. Waichel²

Search and Discovery Article #51428 (2017)**

Posted October 9, 2017

*Adapted from poster presentation given at AAPG Asia Pacific Region Geosciences Technology Workshop, Influence of Volcanism and Associated Magmatic Processes on Petroleum Systems, Oamaru, New Zealand, March 14-16, 2017

**Datapages © 2017 Serial rights given by author. For all other rights contact author directly.

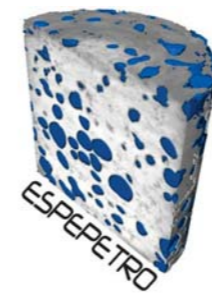
¹Programa de Formação de Recursos Humanos - PFRH-PB 240/UFSC, Grupo de Estratigrafia, Petrografia e Petrologia (ESPEPETRO) da Universidade Federal de Santa Catarina (lucasdebatin@gmail.com)

²Programa de Formação de Recursos Humanos - PFRH-PB 240/UFSC, Grupo de Estratigrafia, Petrografia e Petrologia (ESPEPETRO) da Universidade Federal de Santa Catarina

³Programa de Pós-Graduação em Geologia da Universidade Federal do Rio de Janeiro

Abstract

The pyrometamorphism is the result of high temperatures and very low pressures caused by the intrusion of hypabyssal bodies, combustion, and lightnings into sedimentary rocks, with or without interchange of material. It is well known that the Paraná Basin (Ordovician-Cretaceous) offers examples of this thermal effect, nevertheless most of the scientists have been studying bodies and their effect over oil maturation, with fewer works focused on effects over fossiliferous content. Here we report the thermal effect of a basic sill from the Serra Geral Formation (Early Cretaceous) on sedimentary rocks from the Taciba Formation (Permian) at the Claudemir Rertz outcrop, Itaiópolis, Santa Catarina, based on palynofacies, macrofossil content and X-ray microtomography sample reconstruction. This outcrop comprises a 4.5 meter fossiliferous turbidite (Te – division of Bouma sequence, laminated to homogenous mudstones, subdivided in 9 levels) covered by a sill (5 m thick).



The thermal effect of basic sill on turbidites of Taciba Formation (Permian), Paraná Basin, Brazil

VIEIRA, L.D.¹; SILVA, M.S.¹; MOURO, L.D.^{1,2}; WAICHEL, B.L.¹

¹ Programa de Formação de Recursos Humanos - PFRH-PB 240/UFSC, Grupo de Estratigrafia, Petrografia e Petrologia (ESPEPETRO) da Universidade Federal de Santa Catarina ; ² Programa de Pós-Graduação em Geologia da Universidade Federal do Rio de Janeiro; lucasdebatin@gmail.com; mateussouza200@gmail.com; lucas.delmouro@gmail.com; breno@cfh.ufsc.br

Introduction

The pyrometamorphism is the result of high temperatures and very low pressures caused by the intrusion of hypabyssal bodies, combustion and lightnings into sedimentary rocks, with or without interchange of material. It is well known that the Paraná Basin (Ordovician–Cretaceous) offers examples of this thermal effect, nevertheless most of the scientists have been studying bodies and their effect over oil maturation, with fewer works focused on effects over fossiliferous content. Here we report the thermal effect of a basic sill from the Serra Geral Formation (Early Cretaceous) on sedimentary rocks from Taciba Formation (Permian) at Claudemir Rertz outcrop, Itaiópolis, Santa Catarina, based on palynofacies, macrofossil content and X-ray microtomography sample reconstruction. This outcrop comprises a 4.5 meters fossiliferous turbidite (Te – division of Bouma sequence, laminated to homogenous mudstones, subdivided in 9 levels) covered by a sill (5 m thick).

Methodology

The palynofacies technique consists on the evaluation of kerogen components after removing the mineral matrix, and has been applied to support paleoenvironment interpretations for at least two decades in Brazil. Besides, palynofacies can be used to measure the thermal effect on kerogen components. The analysis criteria to measure the effects of the pyrometamorphism were the non-opaque phytoclast color variation and the difficult to identify their subdivision, which shows a decrease of the effect into the base of the turbidite.

Results & Discussion

These samples are essential formed by three kerogen group (Amorphous Organic Matter, Phytoclast and Palynomorphs), with high phytoclast concentration. On the base (0.5m) no effect has been observed, while at 1 meter only a subtle color variation occur. Through the subsequent levels (1.5–3m) a progressive effect has been noticed in both criterias, with values of burned non-opaque phytoclasts varying from 9.43% (1.5m–level 3) to 67.6% (3m–level 6). From levels 7 to 9 (3.5–4.5m) all the observed non-opaque phytoclast are burned. Furthermore X-ray microtomography samples reconstruction on turbidites of levels 2, 4 and 9, showed a variation of thermal effect on the porosity, with level 2 showing none porosity, level 4 with 0,55%, and level 9 without porosity and with greater hardness. These porosity variation on lower levels are possibly generated due to sample fragmentation during the analysis, with the sample of level 2 fragmenting before the X-ray tomography application and level 4 sample fragmenting after the analysis. All these variations may be associated with the late sill intrusion.

Conclusion

Comparing the data from palynofacies, X-ray microtomography and considering that the macrofossil content is almost all formed by prints of calcarean sponge spicules, which have their calcium carbonate burned by the late heat, we infer that fossil and primary porosity preservation of Taciba Formation has been negative affected by the sill, with thermal effectiveness of 3.5 meters beneath the intrusion. Sill geochemistry analysis showed a compositional variation on silica and titanium oxide, varying from 51.02 and 3.19 (high-Ti basalt) on the base, respectively, to 60.23 and 0.65 on the top (low-Ti andesite), which can probably indicates two different intrusions, associated with the higher thermal effect observed on this outcrop compared with others on the region.

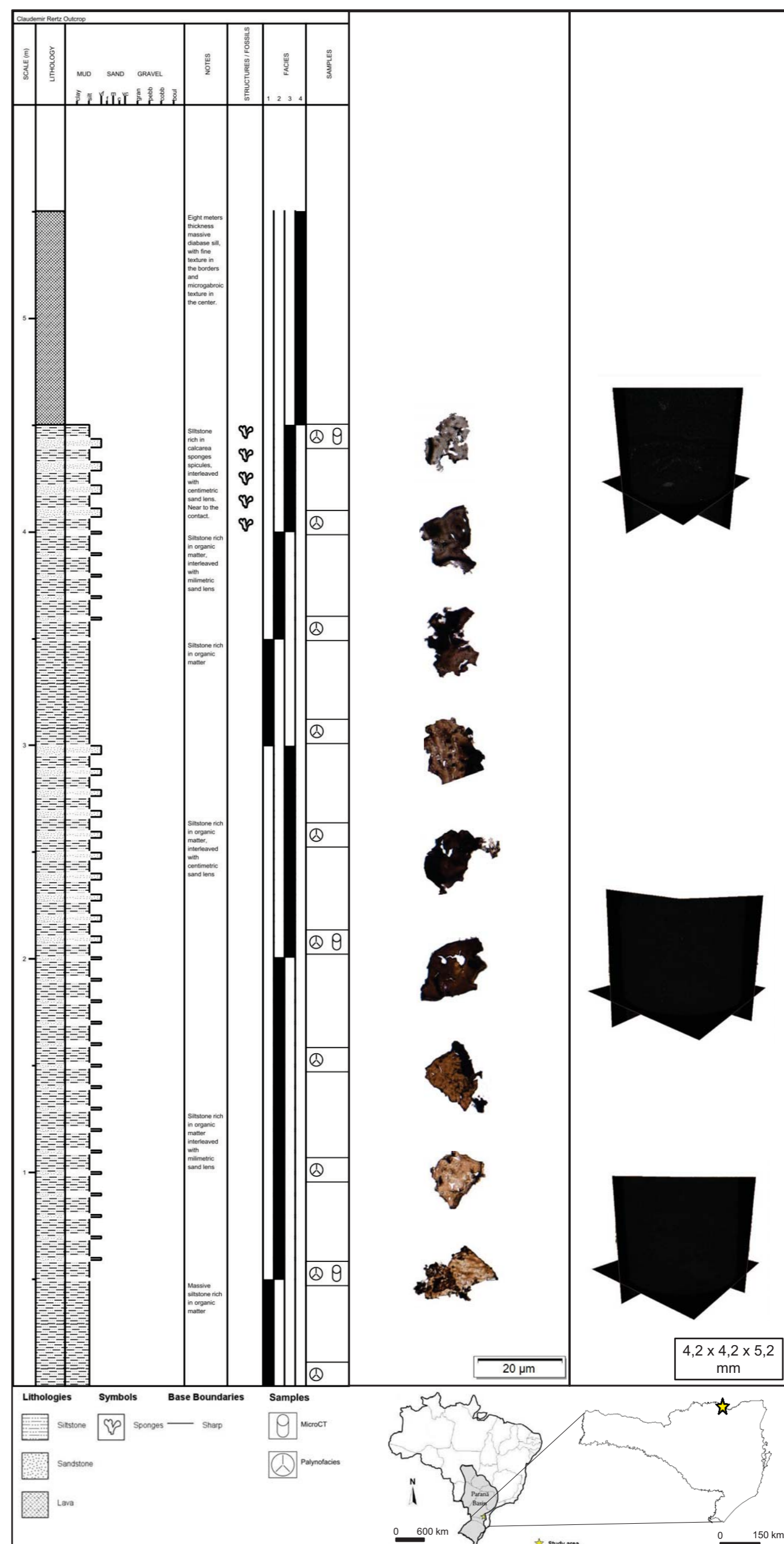


Figure 1 – Claudemir Rertz Outcrop log, with each level analyzed phytoclast and microtomographic reconstruction.

Acknowledgements

This work had the financial support of Programa de Formação em Recursos Humanos em Geologia da Petrobras (PFRH-PB 240). We also appreciate the Chevron sponsorship to student registration, in special to the presenter of this work.