

## Morphological Analysis of Stromatolites from Salt Lake (Rio de Janeiro) Juliana Oliveira Bartolomeu (IC), Alexandre Campana Vidal (PQ)

### Abstract

The description of petrophysical and morphological properties of carbonate rocks has been improved by the use of image analysis technique in two and three dimensions. Computer routines are available for the analysis of photographed samples and tomography emerges as a major breakthrough for the 3D analysis. This study aimed to characterize petrophysical properties of the stromatolites from Salt Lake (Rio de Janeiro) through petrography and image analysis. The results showed three distinct growth pattern.

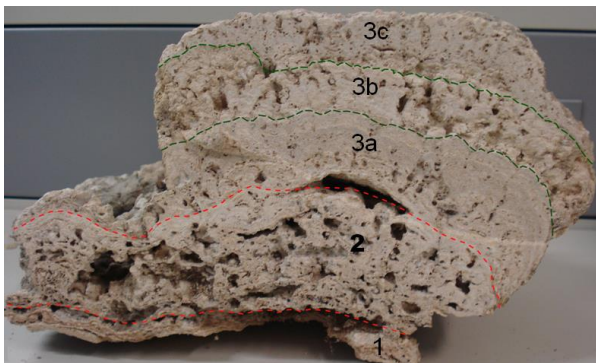
*Key words: stromatolites, tomography, image analysis.*

### Introduction

Computer routines and tomography are two techniques currently used to describe reservoir rocks. It offers advantages for being a non-destructive, fast and high-resolution method. They can provide porosity, pore connectivity, permeability, and pore size distribution. The stromatolites from Salt Lake were chosen as study case due to their significance in terms of comparison with reservoir rocks.

### Results and Discussion

The petrographic analysis showed a segmentation pattern of the samples, resulting in three distinct regions with some sub-divisions (Figure 1).



**Image 1.** Sample divided into regions and sub-regions

On the bottom of the stromatolites, the first region has low porosity, laminar profile ("flat" type), high degree of inheritance and parallel accretion. The top shows a non-laminar profile affected by bioturbation. The second region has high porosity, thrombotic texture, chaotic fabric, and less laminar profile. Some samples have "cup shaped" columns (Srivastava, 2002). Finally, the third region has low porosity, pseudo columnar laminar profile, moderate degree of inheritance and parallel accretion.

The image analysis in two dimensions provided absolute porosity and pore connectivity. Once binarized, the images were processed using Matlab. The porosities found were 15%, 25% and 12% in regions 1 to 3, respectively. The pore connectivity obtained was low in groups 1 and 3 and high in group 2.

Computed tomography was useful in analyzing the shape and pore size distribution (PSD). In region 1, irregularly shaped pores and regular PSD were observed. In region 2, there was irregular PSD and huge pores showing complex shape. The region 3 shows irregular PSD and irregular shape of pores.

### Conclusions

The study showed a certain diversity between the samples, but a common pattern among them: three distinct regions with specific characteristics. It is believed that these changes in the rock formation are due to environmental factors such as climate variations and changes in aerobic conditions (Coimbra, 2000).

### Acknowledgement

I would like to thank my advisor Prof. Alexandre Campana Vidal, my friend João Paulo da Ponte Souza for his help with the computer routines, and Pibic/CNPq for the financial support.

<sup>1</sup> Srivastava, N.K. 2002. *Lagoa Salgada, RJ - Estromatólitos recentes*. Sítios Geológicos e Paleontológicos do Brasil. 1. ed. Brasília: DNPM/CPRM - Comissão Brasileira de Sítios Geológicos e Paleobiológicos (SIGEP), 2002. v. 01: 203-209.

<sup>2</sup> Coimbra, M. M.; Silva, C. G.; Barbosa, C.F.; Mueller, K. A., 2000. *Radiocarbon measurements of stromatolite heads and crusts at the Salgada Lagoon, Rio de Janeiro State, Brazil*: Nuclear Instruments & Methods in Physics Research Section B—Beam Interactions with Materials and Atoms, v. 172, p. 592–596