# Seismostratigraphic analysis of the central and south portion of Camamu Basin.

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## Abstract

**This work consist in a seismic interpretation of central and south portion of Camamu basin. Three second-order depositional sequences were mapped: pre-rift, syn-rift and post-rift. The pre-rift sequence was mapped in all Camamu basin area with approximately constant thickness. The syn-rift sequence has two third-order depositional sequences. Normal faults are present with N-S preferential direction. The post-rift sequence, contents three regional unconformities that delimits four depositional sequences.**


## Introduction

The basin is located between the Recôncavo and Almada basins. It is considered as one of the Brazilian east coast basin formed under the Gondwana breaking context.

The Recôncavo basin presents comproved hydrocarbon potential. Camamu has the Manati gas field, but is still considered as a new frontier basin, what means that is necessary more research and data in the area. The present work has the objective of seismic data interpretation of this region but is part of RECAMU project that intends to relate both basins. The amount of data includes well logs, 2D seismic, and 3D seismic (Figure 1).

## Method

An interpretation procedure to follow is important and it is necessary to avoid simple mistakes. Various data sets can be used for this purpose, including outcrop, core, well-log and seismic data. Each data set may be more suitable to a particular scale of observation, and may provide different insights toward the identification of stratal stacking patterns and key bounding surfaces. (Catuneanu *et al.*, 2011).

When it is necessary load the data, a previous data quality control is required (Souza et al. 2016). The right order of the steps guarantee that the loaded data, in this case, in IHS Kingdom and OpendTect softwares, don't present mistakes, as wrong coordinates. After the data loading, is necessary to filter, equalize the amplitudes and do the mistie correction between the seismic lines.

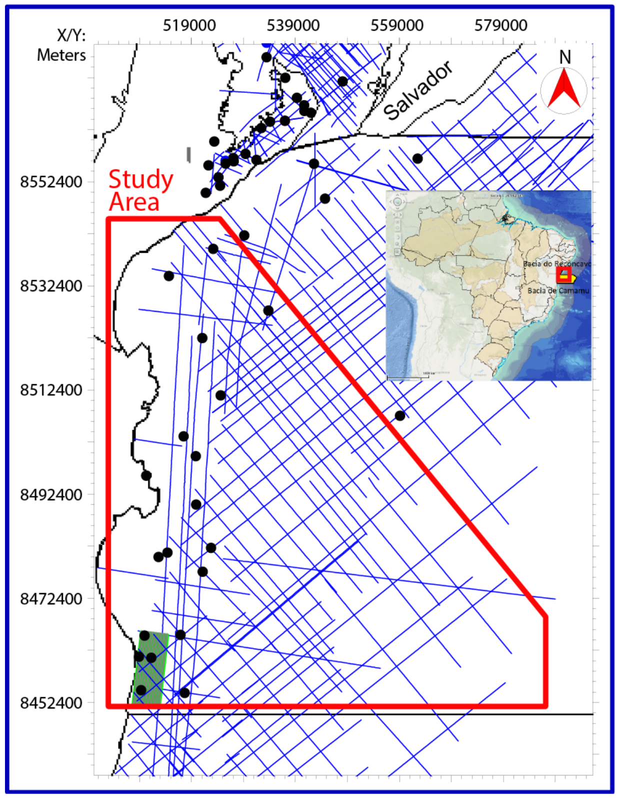


***Figure 1***: *Camamu Basin map and data base.*

The well logs ordinarily must be edited, because anomalous values are usual to appear. The VSPs and check-shots data were used together with the sonic log to improve the TD-chart and realize a better seismic-well tie (Figure 2).

Seismic stratigraphic analysis used the principles of sequence stratigraphy applied to rift basin, introduced by Prosser (1993) and adapted by Holz *et al.* (2014). The order of the steps used in the analysis, was:

- Marking of terminations: onlaps, truncations and downlaps;
- Interpretation of the gamma ray profiles in wells log data, delimiting stratigraphic;
- Tying seismic and well data, and verifying if the interpretations are agree;
- Delimitation of the depositional sequences.
- Seismic facies analysis;
- Generation of seismic maps.

In seismic data of this work, the marking of truncations presented a good reliability, mapping the unconformities. The log analysis are great to identify the SMR ("*Superfície de Máximo Rifteamento*", maximum rifting surface).

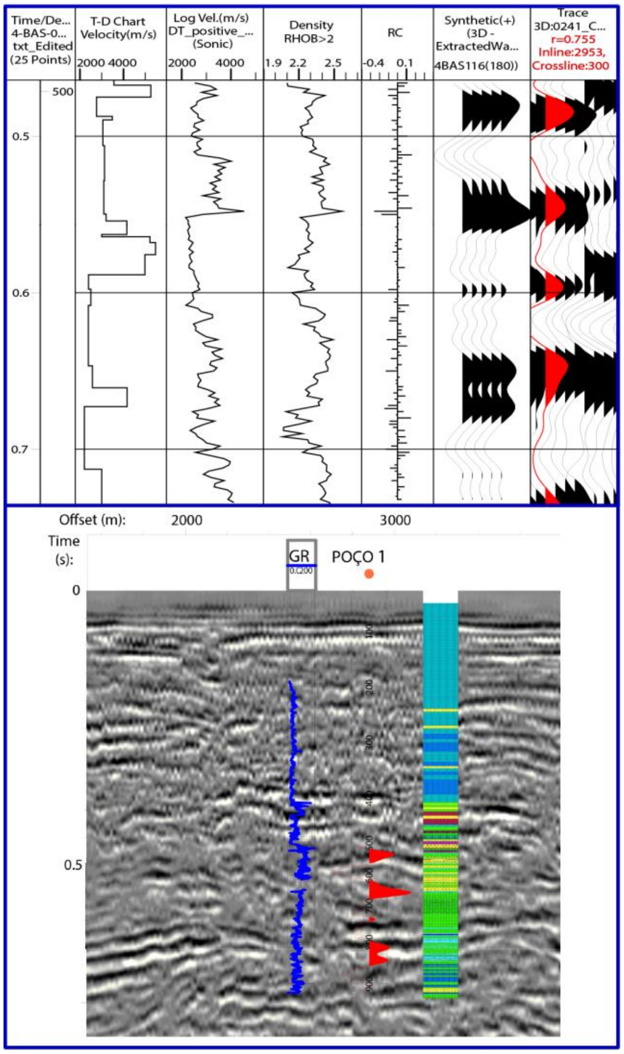

***Figure 2:** Example of seismic-well tie with 0.755 of correlation coefficient.*

### Seismostratigraphic analysis

The Sequence 1 is limited by the basement in the bottom and the DSR ("*Discordância Sin-Rifte*", syn-rift unconformity) on top. Usually has the seismic facies characteristic with reflectors of high amplitude, good continuity and low frequency. Lithostratigraphically, the DSR generally represents the contact with the Sergi Formation (Figure 3), showing a low and constant gamma ray interval. The seismic thickness of the Sequence 1 variates between 500 ms and 800 ms, and is mapped through all the basin study area. Its reliability is high in the proximal region because of the better reflectors continuity in the region, and the wells that are tied in this area. Several faults reach this sequence.

The Sequence 2 is limited by the DSR and the DPR ("*Discordância Pós-Rifte*", post-rift unconformity). The DPR mapped is very reliable and is throughout all the basin region. Seismic facies is not constant along the study area. Proximal area shows low frequency and amplitude, and a moderate continuity. In distal area the continuity becomes high. This sequence is intensively reached by normal faults (N-S direction) with dip slips very intense. The growth strata evidentiate the syn-tectonic deposition of this sequence, besides, alluvial fans can be associated to fault plane where the seismic facies is chaotic. Some unconformities were locally mapped. The unconformity D2 was extended regionally, it split the Supersequence 2 in sequences 2.1 and 2.2.

The seismic thickness is very variable because the tectonic was very intense at deposition moment and the DPR erosion. Some wells evidentiate the DPR in contact with the Sequence 1, and there are regions (Figure 4) that the seismic thickness is close to 1800 ms.

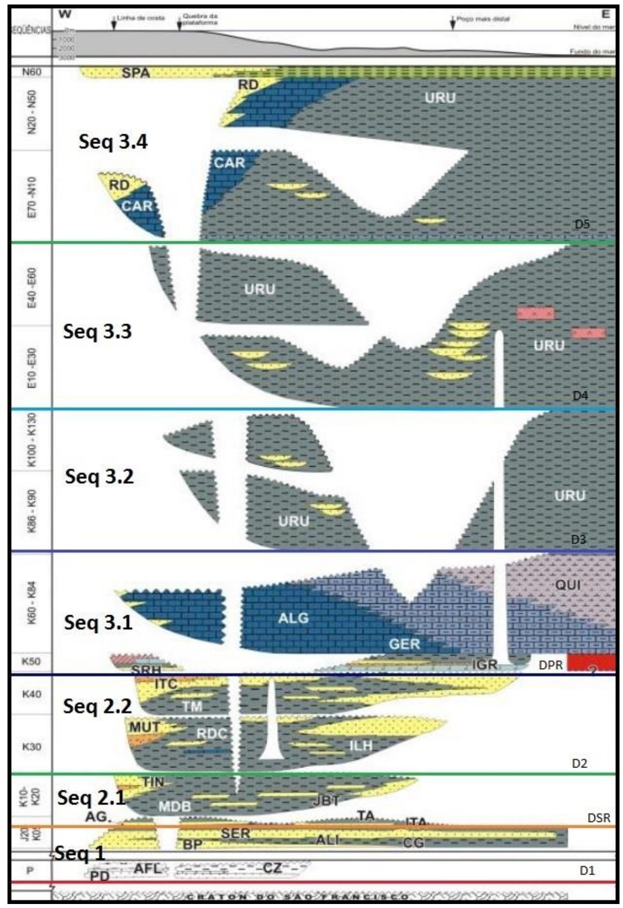

***Figure 3:** Stratigraphic chart with the unconformities mapped in the seismic lines of central and South Camamu Basin. Modified from Caixeta et al., 2007.*

The Sequence 3 is limited underneath by the DPR. Three internal unconformities split this sequence in four depositional sequences of third order. Its seismic facies has low amplitude, good continuity and high frequency (Sequence 3.1). The sequences 3.2, 3.3 and 3.4 have moderate amplitude, moderate continuity and high frequency. Just a few faults reach this sequence, and its sedimentation is already in the classic sequence stratigraphy context, since the tectonic is no longer the main space creation factor. The wells shows part of the Sequence 3.1 as being carbonates and the other sequences are mostly siliciclastic. The thickness tends to grow in the distal parts of the basin.

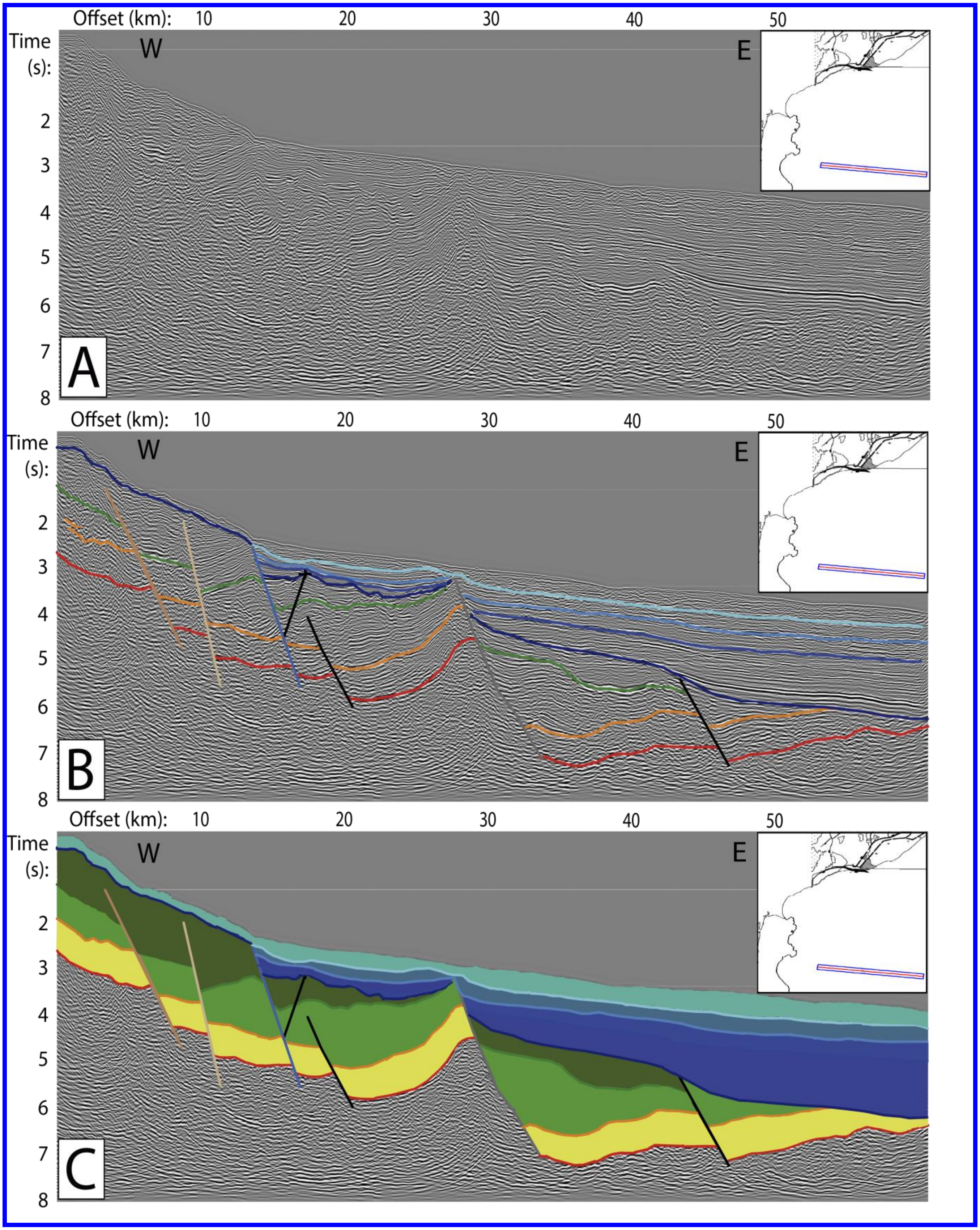


***Figure 4:*** *Representative dip seismic section of the South of Camamu Basin: (A) not interpreted; (B) interpreted; (C) with the interpreted stratigraphic model.*

The Figure 5 shows the top of the basement map as a product of the seismic interpretation. Is important to remember that the scale is in time (TWT) and not necessarily will represent correctly how deeper is one area than another. The map evidentiate the faults direction N-S and the general tendency of the study area.

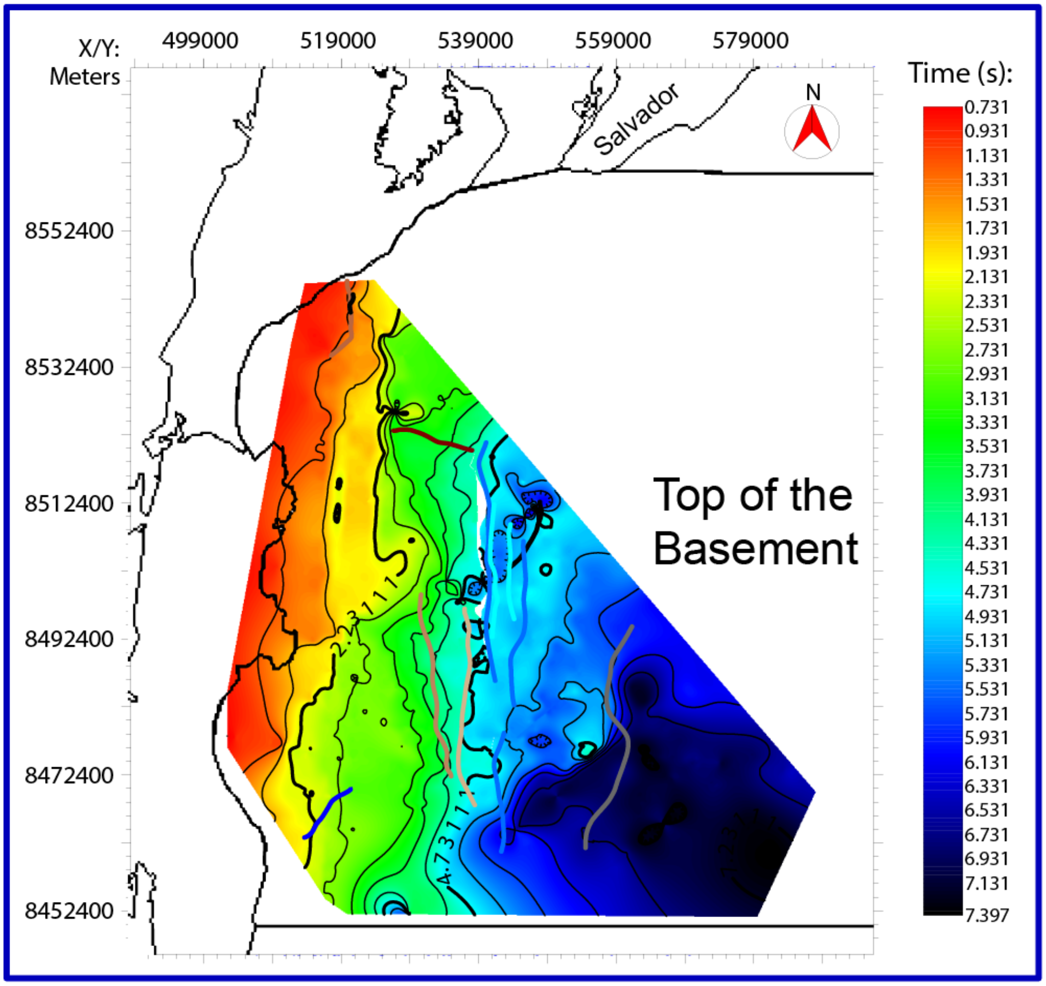


***Figure 5:*** *Seismic time map of top of the basement. Note the preferred direction N-S of the basement surface and the interpreted main faults.*

## Conclusions

The first interpreted sequence was deposited before the rifting of the basin, so it represents the pre-rift deposit. Its gamma ray pattern showed few lithologic variation and it is corroborated seismically by the homogeneous seismic facies along the area. The Sequence 2 represents the syn-rift phase of the basin. Its deposition is predominantly sand/shale with sandy debrites, turbidity bodies and alluvial fan conglomerates close to the faults. Has at least two third-order depositional sequences. The tectonic development stages, TTIR, TTDR and TTDR, (Holz et al., 2014) could not be entirely mapped, just in some areas where there was well data available. The Sequence 3 represents the post-rift phase of the basin and has at least four third-order depositional sequences.

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