According to well data, outcrops and 2D and 3D seismic information, a regional sequential stratigraphic analysis is developed for the Carboniferous Interval of the Southwest sector of the Tarija Basin.

The area of study lies between Santa Cruz de la Sierra to the North, the Charagua, Aguarague and Parabanon ranges to the West, the Pilcomayo River to the South and the Chaco Plains to the East. (Figure 1).

The Carboniferous depositional cycle lasts approximately 74 million years. Its deposits are influenced in part by glaciation.

The distribution of the sedimentary infilling is directly related to the advance or retreat of the glaciers and to the eustatic variations and the accommodation space generated.

The base of the Carboniferous is an important erosive unconformity generated on the Devonian age deposits corresponding to the Iquiri Fm. The top is an erosive unconformity showing a very important paleoclimatic change represented by Permian eolian sediments belonging to the Cangapi Fm.

Based on seismic interpretation two Megasequences have been defined. The limit between them is a regional erosive unconformity characterized by the development of important paleovalleys. These paleovalleys indicate the major advance of the glaciar systems during the Carboniferous.

It is assumed that this unconformity corresponds in age to the Mississippian Pennsylvanian limit.

The lower Megasequence, of Mississippian age, shows marine influence by the association of facies defined in outcrops, especially in its early stage. For the Upper Megasequence, of Pennsylvanian age, continental environments prevail.

Seismically interpreted, erosive limits allow the subdivision of these two Megasequences in two sequences of third-order respectively. (Figure 2).

Each one of the four defined sequences (SSQI, SSQ2, SSQA and SSQB) is formed by deposits corresponding to the development of the Lowstand system tract and the Transgressive system tract.

The basal section of each sequence comprises deposits of subaerial and subaqueous outwash and deltaic deposits, which are lithologically represented by diamictites, sandstones and shales eventually.
The top section of each sequence represents the infilling of these eroded paleovalleys plus the flood plain deposits. Lithologically these are represented by sandstones and shales. (Figure 3).

Due to reworking of the top sediments of each one of the sequences the preservation potential of the transgressive system tract is low. However, in the area of the study those corresponding to SSQI and SSQB are preserved, and can be regionally correlated. In accordance with our work they would correspond to the maximum flooding surface during the Carboniferous, (SSQI), and to the flooding of the depositional system on reaching the equilibrium profile,(SSQB).

The limits of each one of the sequences could be defined in outcrops and wells. Their geometry has been adjusted using seismic interpretation.

The integration of these data enables us to determine the paleogeography of each one of the Sequences.

Based on the result of this analysis the source for all the Carboniferous deposits could be seen to come from an Easterly or Southeasterly direction with the depocenter of the basin developed toward the North and Northwest of the study area. In general an increase in the shale content for each sequence can be observed as one moves in a North or Northwesterly direction. (Figure 4).

The different cycles studied here have been matched to the classic stratigraphic units of the Tarija Basin.

References


Figure 2 - DEPOSITIONAL SEQUENCES

SEISMIC LINE

N

1.4

1.9

2.4

S

Sq. B
Sq. A
Sq. 2
Sq. 1

Sq. B
Sq. A
Sq. 2
Sq. 1

[Map of YANTING]
Figure 4 - CROSS SECTIONS
ABSTRACT:

The objectives of this study were to evaluate the potential of reservoirs and to determine the occurrence and distribution of oil and gas. The study was conducted in the Cretaceous and Cenozoic formations, which are known to contain hydrocarbons. The seismic data was analyzed to identify the presence of faults and folds, which are important for the exploration of hydrocarbons. The results of the study suggest that the area has potential for oil and gas exploration.

OBJECTIVES:

To define the structural and stratigraphic features of the study area.

- To study the stratigraphic sequence and determine the facies variations.
- To identify the possible oil and gas sources.
- To determine the hydrocarbon potential.

SEISMIC BASE MAP

3D SEISMIC (1075km²)

2D SEISMIC (3385km²)

LOCATION MAP

BOLIVIA

RIO SECO BLOCK

ANTARES BLOCK

COLORINA BLOCK

PARAMAP BLOCK

CARBONIFEROUS DISTRIBUTION

STRATIGRAPHIC COLUMN

AGE

FORMATION/OFFSHORE

BOLIVIA

RIO SECO BLOCK

ANTARES BLOCK

COLORINA BLOCK

PARAMAP BLOCK

1600m
2nd ORDER SEQUENCES

- Two 2nd order sequences are defined in the Carboniferous interval as a result of the log seismic unconformity observed in the section.
- With regards to the coastal onlap curve this unconformity corresponds to the Mississippian - Pennsylvanian limit (un depositional period).
- Conglomerates and diamictites are prevalent in the basal sequence while sandstones are the main lithology in the upper sequences.
3rd ORDER SEQUENCES

3rd ORDER SEQUENCES EVOLUTION

- Start of the Glaciation Period
- During Carboniferous age, in Gondwana, the glaciation was a very important factor in sea level change and sediment supply.

- Glacial Period
  - Ice cap retained water.
  - Sea level started to fall.
  - Outwash fans grade into large braided rivers.

- Glacial retreat
- Sea level rises.

SEISMIC LINES

- Each 3rd order sequence is divided into two 3rd order sequences.
- The four sequences defined can be perfectly identified in the area of the Tarim basin where the study was performed.

SW

Well

NE

S

N
- Deposits correspond to the filling of paleovalleys generated during a sea-level fall.
- The upper part corresponds to red anoxia and to lower degree weathered-lower carbonates.

- Represent the most important sea level fall during the Carboniferous.
- Well defined by seismic.
- The lithology is predominantly sandstones.

- In the eastern sector, the lithologies in the wells are mainly sandstones while towards the neat the shale contents in reservoir.

- The beginning of the SQ1 is related to an important sea level fall.
- The geometry shows the development of a palaeokarst system.
- The top is represented in details by parallel reflectors with large area continuity (flowing open).
- It may be the maximum flooding during the Carboniferous.
PALEOGEOGRAPHIES

SEQUENCE B

- The studied facies are present in the northeastern part of the study area.

SEQUENCE A

- A facies geometry is defined through the study area, important signs of marine conditions.

SEQUENCE 2

- S
- N
- W
- E

0.3
0.3
0.3
0.3

A tectonic geometry is defined - structural discontinuities.

SEQUENCE 1

- Tectonic geometry.
- Seventh horizon is developed in the northern part.
- The facies analysis is based on core data.

CONCLUSIONS

- Four sequences in the Carboniferous interval were defined.
- All the deposits are glacially influenced.
- The best reservoirs correspond to the upper sequence.
- The regional seal corresponds to the marine shales facies (SG).
- We can predict a regional trend in the reservoirs and seal distribution for each sequence.