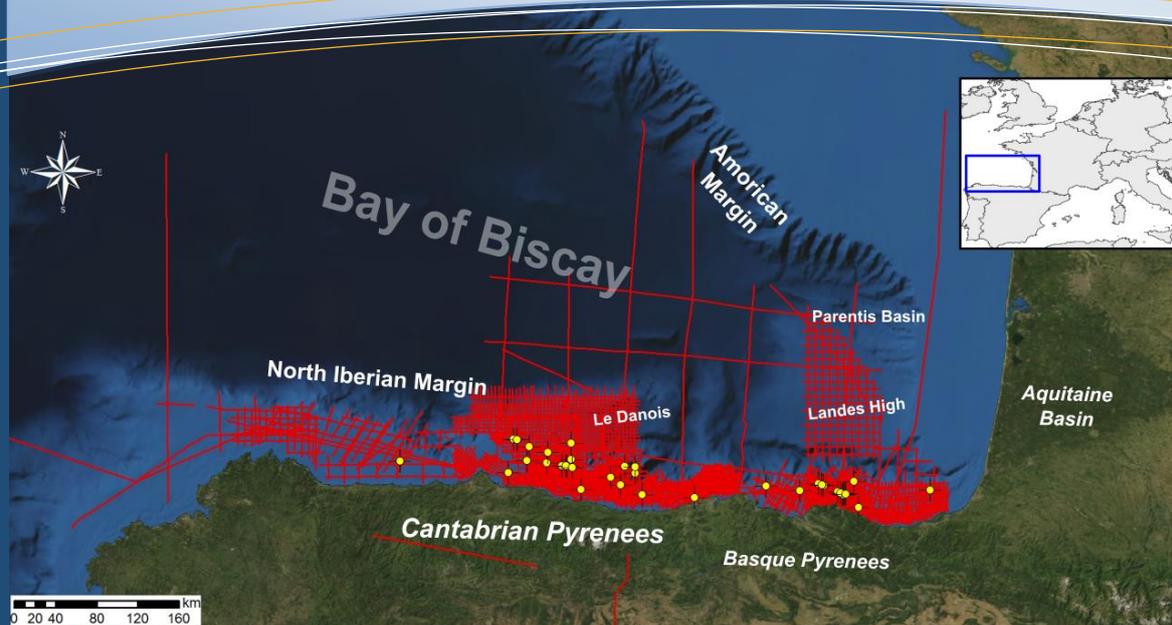


BAY OF BISCAY: GEOLOGICAL EVOLUTION AND PETROLEUM POTENTIALS



The Bay of Biscay is a triangular-shaped embayment located between the Iberian Peninsula and the western coast of France, representing an E-W-oriented subsidiary arm of the North Atlantic Ocean. The eastern and western sectors are bounded by two well-differentiated continental margins: the American Margin, northeastwards, and the North Iberian or Cantabrian Margin, southward. The Armorican Margin, is a Mesozoic extensional passive margin mainly characterized by southwest-directed listric extensional faults. By contrast, the North Iberian Margin is affected by compressional deformation related to the E-W-trending doubly-vergent Pyrenean orogen. It consists of a Late Cretaceous-Cenozoic thrust system juxtaposing the continental crust of the Iberian plate on top of the transitional-to-oceanic crust of the Bay of Biscay abyssal plain, westward, and on top of the thinned continental crust of the Landes Plateau, eastward. This thrust system reworked the former southern extensional passive margin of the Early Cretaceous Bay of Biscay basin and mainly consists of north-directed basement-involved thrusts and related folds.

The Bay of Biscay extensional basin results from the northward propagation of rifting and sea-floor spreading related with the opening of the North Atlantic Ocean during Late Jurassic-Cretaceous times. The North Iberian Margin remained stable until the beginning of the Cenozoic, during which the convergence between the Iberian and Eurasian plates lead to the development of the Pyrenean-Cantabrian orogeny with inversion and partial closure of the Bay of Biscay Mesozoic extensional basin. Most of the compressional deformation and shortening of this Alpine event concentrated along the Cantabrian margin involving also the retro-foreland of the Basque-Cantabria Pyrenees, progressively decreasing northward leaving the Armorican conjugate margin almost undeformed.

Convergence lasted approximately from upper Eocene to lower Miocene and stopped at an early stage, making Bay of Biscay a unique place having well-preserved structures related to the initial stages of contractional reworking and basin inversion of a previous passive margin.

In this area 48 exploration wells have been drilled but none of these wells was drilled outside the continental shelf. Most of the seismic available was shot on the continental shelf and only few regional lines extend to the deep water parts of the margin.

This study represents a full review of the geology and exploration potentials of the Bay of Biscay. The analysis was performed integrating the interpretation of more than 14500 km of seismic lines the results of the main wells drilled in the area, the review of detailed studies on outcrop and in the basin, the development of 1D basin models for some key wells and an exhaustive and critical evaluation of the stratigraphic and tectonic frameworks. The integration of all available data and information confirm that there is the possibility of the presence of pre-, syn- and post-rift complete HC systems.

The main conclusions of the study focus on the description of the play types identified in the basin. The main exploration targets are in Jurassic and Cretaceous levels. Three source rocks, represented by shale deposits of Carboniferous and Jurassic age, can be present. The seal are made of clays and marls interval of Mesozoic and Cenozoic age.

Possible traps for preservation of hydrocarbons were formed during the rifting in Upper Jurassic-Lower Cretaceous and during the compressional phase in the Tertiary. Play distributions, paleogeographic maps, basin locations, main structural features and location of all the data acquired during the previous exploration activities are included into an ArcGIS project supplied as enclosure to this report.

The study has been conducted by GEPlan Consulting s.r.l. based in Ferrara, Italy, who is an oil and gas consulting firm that can provide innovative and integrated services for new joint ventures and for exploration, appraisal and development projects. It has specialistic skills in the characterization of carbonate and fractured reservoirs and Italian and Circum-Mediterranean Oil and Gas Prospectivity. This study is part of larger collection of basin studies. These reports describe the geological characteristics of the basin and its evolution through time and they cover the most important aspects related to the hydrocarbon exploration and prospectivity, identifying and characterising the proved and possible plays in the area.

for more information
contact:

GEPLAN CONSULTING

Via L. Ariosto, 58 –
44121 Ferrara – ITALY

ph +39-0532 207770,
fax +39 0532 1920204;
e-mail: info@geplan.it;
website: www.geplan.it

BAY OF BISCAY: GEOLOGICAL EVOLUTION AND PETROLEUM POTENTIALS

REPORT CONTENTS

EXECUTIVE SUMMARY

1 INTRODUCTION

- 1.1 Objectives of the report
- 1.2 Definition of the area and country boundaries
- 1.3 Bathymetry
- 1.4 Dataset and approach
- 1.5 Structure of the report & contents

2 EXPLORATION HISTORY & HYDROCARBON POTENTIALS

- 2.1 Previous Exploration
- 2.2 Current exploration permits and new available data
- 2.3 Main discoveries

3 GEOLOGICAL FRAMEWORK

- 3.1 Opening of the North Atlantic Ocean
- 3.2 Development of the Pyrenean- Cantabrian orogeny

4 STRATIGRAPHIC EVOLUTION

- 4.1 North Iberia margin
- 4.2 Le Danois Basin
- 4.3 Landes High

5 STRUCTURAL FRAMEWORK

- 5.1 Introduction
- 5.2 Tectonic setting
- 5.3 Tectonic Evolution
- 5.4 Present and recent stress regimes

6 SEISMIC INTERPRETATION

- 6.1 Well tie
- 6.2 Selected horizons
- 6.3 Velocity modeling
- 6.4 Maps on Time & Depth/Structural interpretation

7 GEOCHEMISTRY

- 7.1 Geochemistry and Source Rocks
- 7.2 Geothermal gradients
- 7.3 Timing and Migration

8 PETROLEUM SYSTEMS

- 8.1 Source Rocks
- 8.2 Reservoirs
- 8.3 Seals
- 8.4 Structures
- 8.5 Basin Modeling

9 PLAY TYPES

- 9.1 General description
- 9.2 Plays Distribution

10 CONCLUSIONS

11 REFERENCES

Enclosures:

- GIS project;
- Enclosure 1: Stratigraphy
- Enclosure 2: Cross sections
- Enclosure 3: Dataset and Geological Dataset
- Enclosure 4: Play distribution and characteristics

for more information
contact:

GEPLAN CONSULTING

Via L. Ariosto, 58 –
44121 Ferrara – ITALY

ph +39-0532 207770,
fax +39 0532 1920204 ;
e-mail: info@geplan.it;
website: www.geplan.it