[PS]The Lusitanian Basin (Portugal) and Its North American Counterparts - a Comparative Approach*

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Abstract

The Lusitanian Basin (LB) is a peri-Atlantic basin, related with the Triassic crustal stretching and Jurassic opening of the Northern Atlantic. On the eastern margin of the Atlantic, the LB is bordered by the Essaouira Basin (to the S) and the Galicia Basin (to the North), whereas on the western margin, just opposite to the LB, the Grand Banks, with the Jeanne D'Arc (JAB) and Flemish Pass (FPB) Basins are bordered by the Orphan and Wales Basins. Asymmetrical development between these non-volcanic opposite continental margins and its basins, involves aspects such as crustal and litospheric rupture, and consequently the tectono-sedimentary evolution of the related basins. This presentation deals with the comparison between the sedimentary filling and events of the Lusitanian Basin and the Grand Banks Basins.

The simple comparison between a litostratigraphic and events chart from the JAB/FPB and LB, points to a broadly parallel evolution:

- Rift 1) Carnian – Sinemurian Rift, with Pliensbaquian - Callovian Post-Rift;
- Rift 2) Oxfordian-Berriasian Rift, with Berriasian – Aptian Post-Rift;
- Rift 3) Upper Aptian – Albian Rift, with Cenomanian - Maastrichtian Post-Rift.

However, some differences are to be noticed: i) at the LB, both the 1st post-Rift unconformity (related to the drastic opening to marine Tethysean influences) and the 2nd Rift unconformity (related to increased uplift and basin subsidence) are slightly older at the Lusitanian basin; ii) the 3rd Rift unconformity (related to the Grand Banks – Iberian break-up) is also older at the Lusitanian Basin. These timing delays may be due to the specific geodynamic evolution of these asymmetric and opposite margins, as well as to the influence of other deeper offshore basins (e.g. Peniche and North Newfoundland).

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WEBSITE

C-NLOPB, Canada Newfoundland and Labrador Offshore Petroleum Board
http://www.cnlopb.ca

THE LUSITANIAN BASIN (PORTUGAL) AND ITS NORTH AMERICAN COUNTERPARTS - A COMPARATIVE APPROACH

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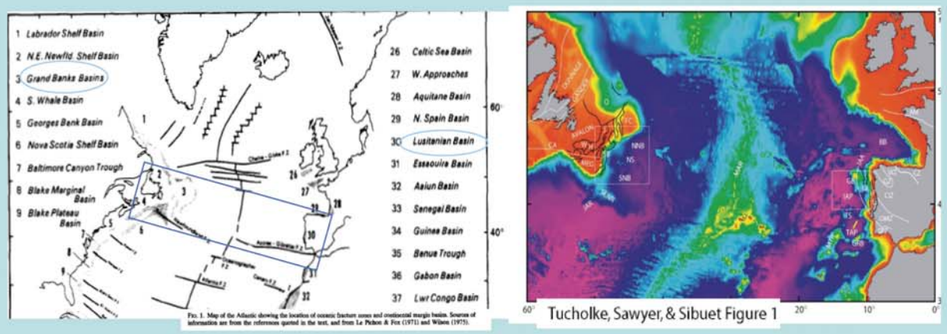
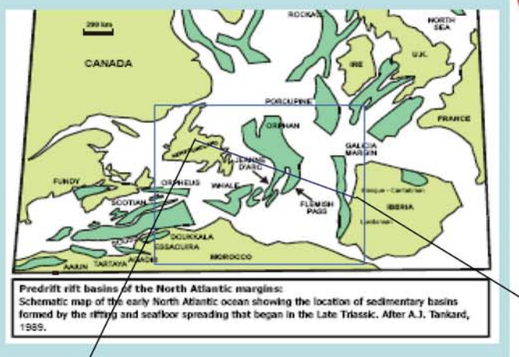
On the eastern margin of the Atlantic, the Lusitanian Basin (LB) is bordered by the Essaouira Basin (to the S) and the Galicia Basin (to the North), whereas on the western margin, just opposite to the LB, the Grand Banks, including the Jeanne D'Arc (JDA) and Flemish Pass (FP) Basins, are bordered by the NFL-Orphan Basin (NFL-O) to the N, and South Wales Basin (SW) to the S.

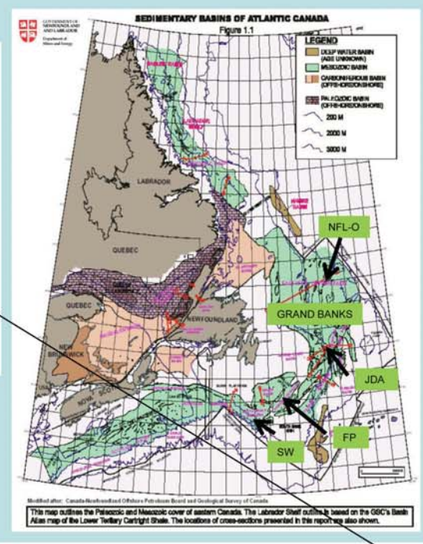
The Mesozoic evolution of the Lusitanian Basin reflects the overall evolution of the Northern Atlantic Rift, as well as the conjugate inter-action of N America, W Europe and N Africa, including the Tethys.

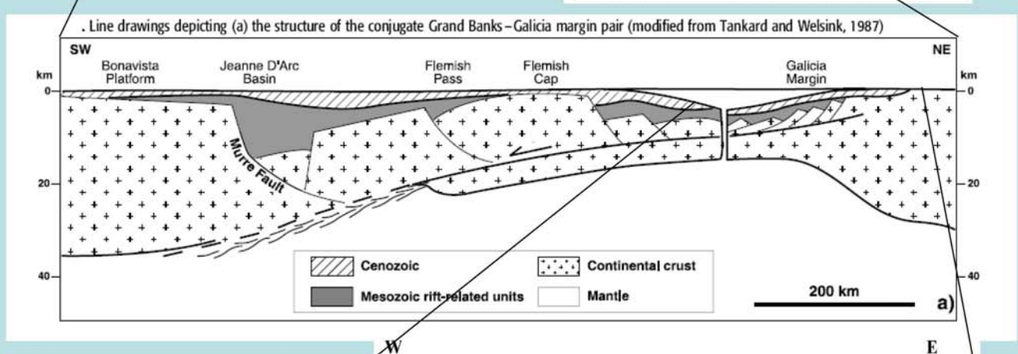


Tucholke, Sawyer, & Sibuet Figure 1



Predrift rift basins of the North Atlantic margins: Schematic map of the early North Atlantic ocean showing the location of sedimentary basins formed by the rifting and seafloor spreading that began in the Late Triassic. After A.J. Tankard, 1989.



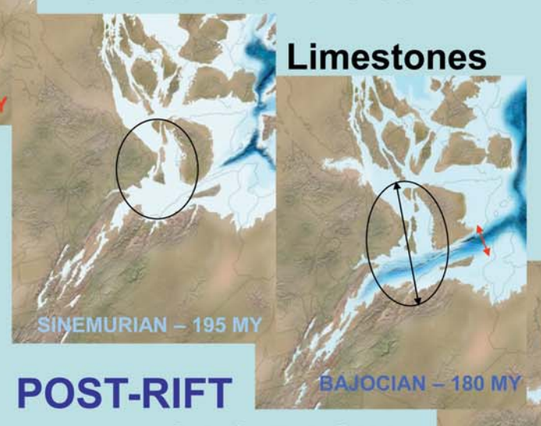


CONTINENTAL
Red beds & Salt

1st RIFT

TETHYSEAN MARINE
Marls & Black shales

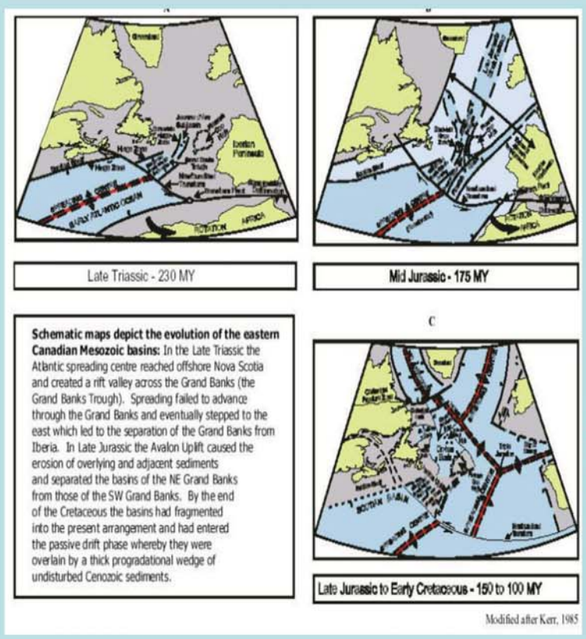
Limestones



POST-RIFT
SAG BASIN

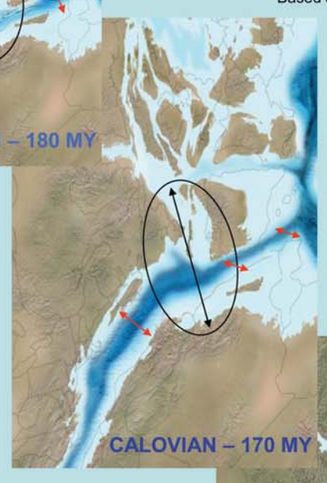
Considering palaeogeographic reconstructions, the 1st Rifting (U.Triasic to M. Jurassic) presents a Tethysean N-S extension, However, the 2nd Rifting (Upper Jurassic) shows an Atlantic-shifted geometry and the Drift (Cretaceous) presents a clearly Atlantic E-W extension.

http://jan.ucc.nau.edu/~rcb7/nam.html
Ron Blakey, Northern Arizon University
Based on References updated in 2004



Schematic maps depict the evolution of the eastern Canadian Mesozoic basins: In the Late Triassic the Atlantic spreading centre reached offshore Nova Scotia and created a rift valley across the Grand Banks (the Grand Banks Trough). Spreading failed to advance through the Grand Banks and eventually stepped to the east which led to the separation of the Grand Banks from Iberia. In Late Jurassic the Avalon Uplift caused the erosion of overlying and adjacent sediments and separated the basins of the NE Grand Banks from those of the SW Grand Banks. By the end of the Cretaceous the basins had fragmented into the present arrangement and had entered the passive drift phase whereby they were overlain by a thick progradational wedge of undisturbed Cenozoic sediments.

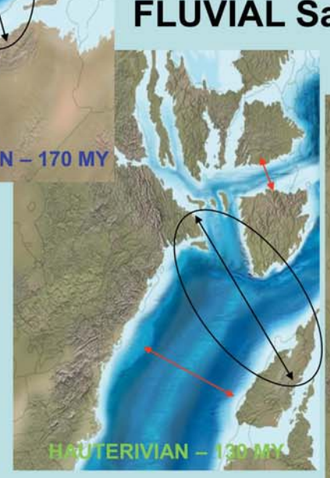
Modified after Kerr, 1985



FLUVIAL Sandstones

2nd RIFT

ATLANTIC MARINE



DRIFT

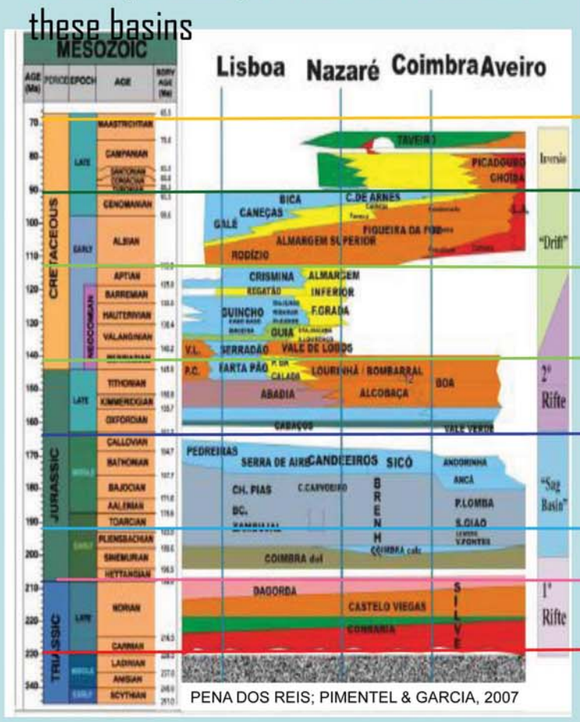
POST-RIFT

Older (e.g.Kerr,1985) reconstructions only take into account the Atlantic opening, considering it active since the Upper Triasic.

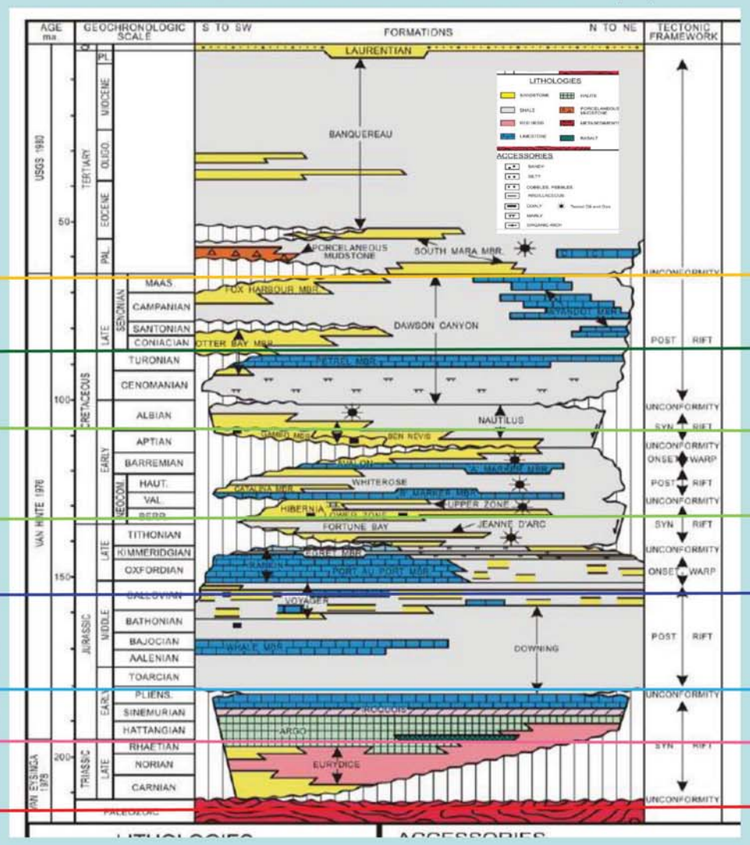
The LB is related with the Triassic crustal stretching of Pangaea and Jurassic-Cretaceous opening of the N Atlantic, and therefore considered as a peri-Atlantic Basin. However, an earlier peri-Tethysean opening, as well as a latter peri-Mediterranean closure, must be taken into account.

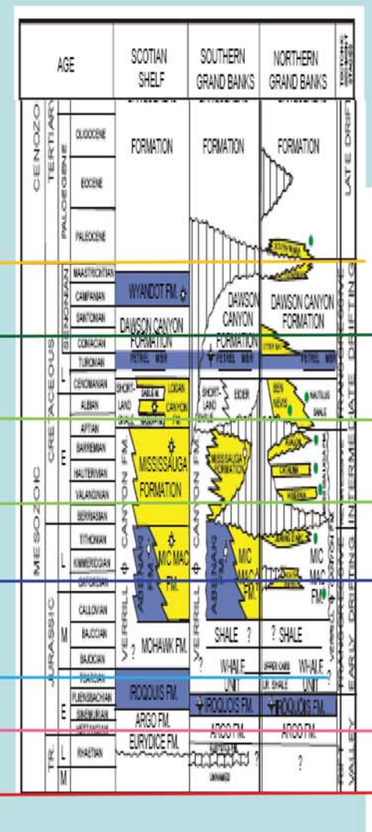
Comparing published litostratigraphic columns, it's clear the contemporaneity of the main events at these basins

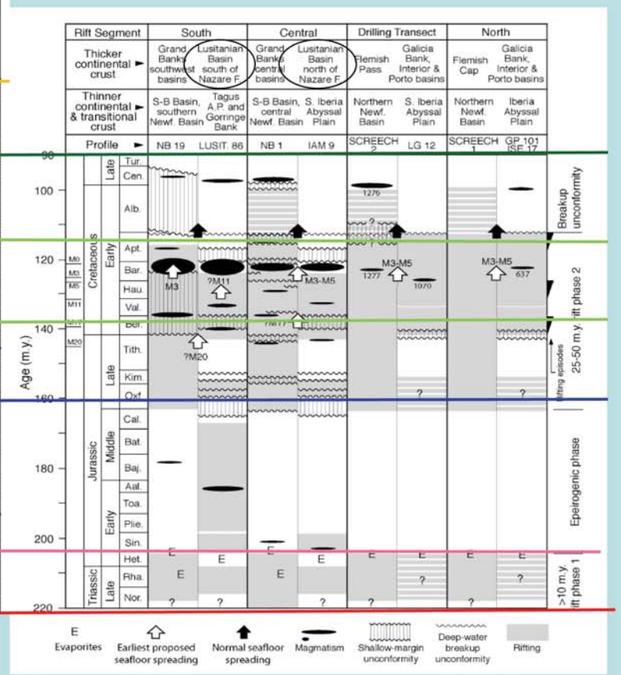
SINCLAIR, 1994 & Canada NewFoundland Offshore Petroleum Company



PENA DOS REIS; PIMENTEL & GARCIA, 2007







The main evolutionary stages and unconformity surfaces are well represented in all these N American and SW European Basins, although correlation is not always synchronous in Age, due to asymmetric E-W and also diachronic N-S paleogeographic / geodynamic issues.

CONCLUSIONS

THE LUSITANIAN BASIN (PORTUGAL) IS A WESTERN IBERIAN BASIN FACING THE NORTH ATLANTIC AND RELATED WITH OTHER NORTH-AMERICAN PERI-ATLANTIC BASINS.
HOWEVER, A TETHYSEAN EVOLUTION, RELATED WITH OTHER WESTERN PERI-TETHYSEAN BASINS (e.g ESSAOUIRA-AGADIR BASIN) MUST BE SOUGHT, ESPECIALLY REGARDING THE 1st RIFTING PHASE AND SUBSEQUENT MARINE INVASION (UPPER TRIASSIC TO MIDDLE JURASSIC).