Takutu Basin

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Geologic Setting

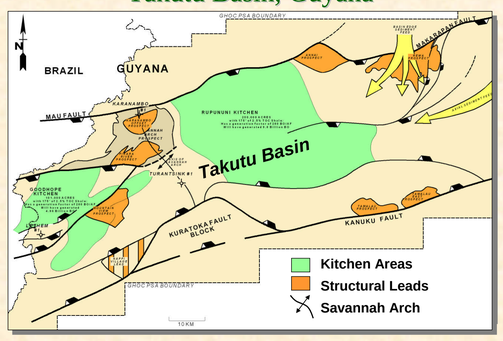
Takutu Basin. Guyana and Brazil:
A Jurassic Lacustrine Rift Basin

The Takutu basin is an ENE-trending Jurassic-Early Cretaceous continental rift basin about 40 km wide and 280 km long that cuts the Guyana shield in southwest Guyana and northern Brazil. Prior exploration documented a stratigraphic section dominated by mudstone but including Jurassic lacustrine source shale, siltstone, evaporites, and basalt. Numerous anticlinal and tilted fault block structures, including a noncommercial oil discovery, suggested an attractive exploration play existed.

In late 1988 Hunt Oil Co. began operations in the basin. A three-year exploration program included field geology, photogeologic mapping, several methods of surface geochemical prospecting, reprocessing, and acquisition of SAR, aeromagnetics, and 1,331 km of new seismic. Exploration efforts ultimately focused on the large central basin Savannah Arch. The exploration well Turantsink 1 drilled an anticline near the south end, which was interpreted as a drape feature above a thick lacustrine fan delta complex. However, the deep structure proved rooted in a thickened salt section near the Jurassic basin paleocenter.

Minor oil shows were observed at several horizons, but the predicted sandstone reservoirs were not present. This part of the basin had been affected by a Tertiary hydrothermal event that drove the thick source shales into overmaturity and destroyed porosity in all potential reservoir units. This plus unfortunate timing of late Tertiary structural reactivation severely downgrade the petroleum potential of the basin.

Major Basin Elements & Leads
Takutu Basin, Guyana

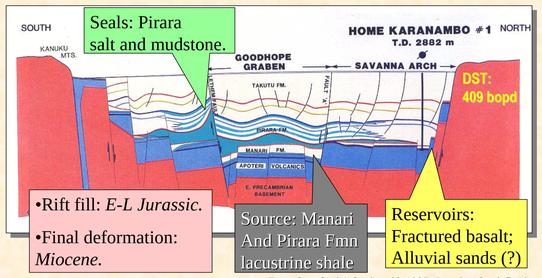


Stratigraphy of Takutu Basin

Age	Formation	Stratigraphic Column	Lithology	Reservoir	Source	Seal
OLIGOCENE - RECENT	N.SAVANNA & RIVERS		SAND and SHALE			
Eocene (?)	NAPPI		LATERITE			
UPPER CRETACEOUS	TUCANO		SANDSTONE			
EARLY CRETACEOUS MIDDLE - LATE JURASSIC	TAKUTU to 3500m		RED - BROWN MUDSTONE, FINE SANDSTONE (LACUSTRINE)			
MIDDLE JURASSIC EARLY JURASSIC	PIRARA to 1400m		HALITE, GRAY SHALE, MINOR LIMESTONE and BASIN MARGIN CLASTICS (LACUSTRINE)			
EARLY JURASSIC	MANARI to 750m		GRAY - BROWN SHALE and CARBONATE			
EARLY JURASSIC-LATE TRIASSIC	APOTERI to 1200m		GRAY BASALT			
PRECAMBRIAN (ARCHEAN)			GRANITE, GNEISS, METAVOLCANIC			

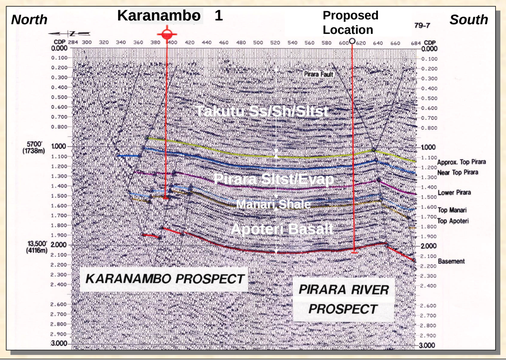
Structural Cross-Section
Takutu Basin, Guyana

With Petroleum System Elements

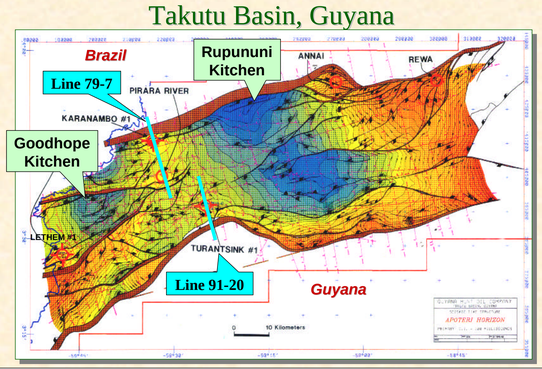


From Crawford & Szelewski, 1985, Jour Pet Geol, fig. 6.

Line 79-7 Along Savannah Arch



Time Structure Map, Apoteri Basalt
Takutu Basin, Guyana



R. E. Webster 4/20/2004

Paleogeography & Climate

Different Perspectives

Early Jurassic Paleogeography

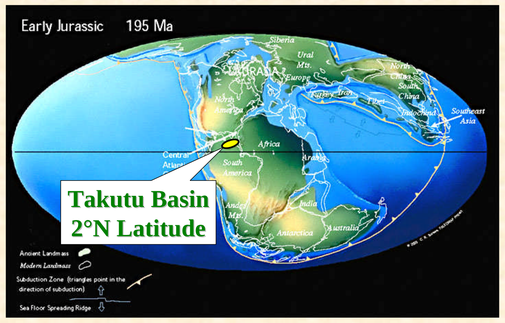
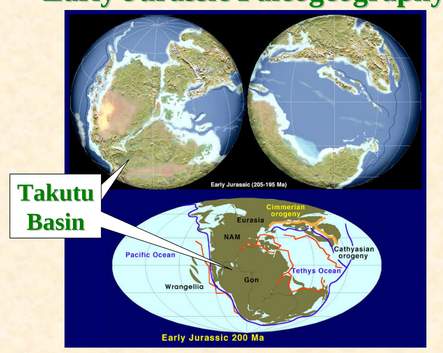


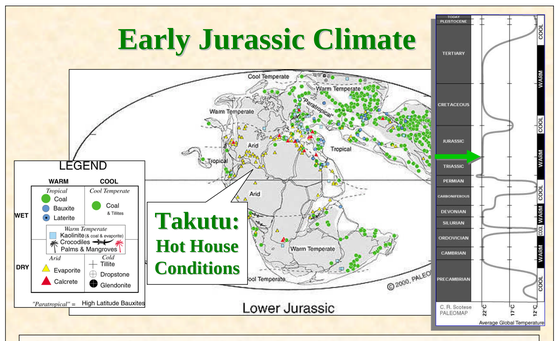
Image from Christopher Scotese, The Paleomap Project, http://www.scotese.com/jurassic.htm

Early Jurassic Paleogeography



Images from Dr. Ron Blakey, Northern Arizona University, http://jan.ucc.nau.edu/~rcb7/Jur.jpg

Early Jurassic Climate



The interior of Pangea, including the Takutu Basin area, was very hot and arid during source rock deposition in Early to Mid Jurassic time.

Image from Christopher Scotese, The Paleomap Project, http://www.scotese.com/ejurclim.htm

Early Jurassic (Toarcian, 190 Ma)

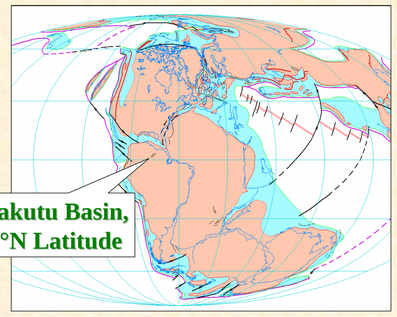
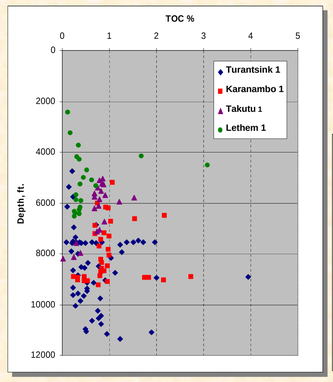


Image from Robertson Research, Phanerozoic Paleogeographic Reconstructions and Major Source Rocks of the World.

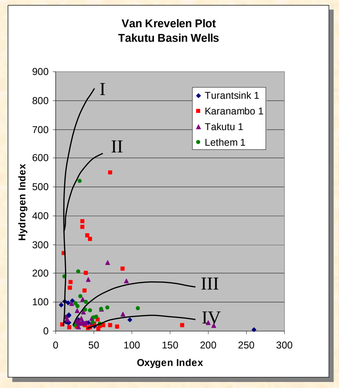
Source Bed Geochemistry

TOC% vs Depth
Tacutu Basin



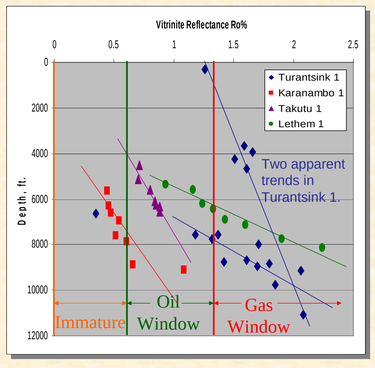
Reduced TOC levels in Turantsink 1 and Lethem 1 are due, at least in part, to over-maturation (gas window) of Pirara and Manari formation lacustrine shale source rocks.

Van Krevelen Diagram
Takutu Basin



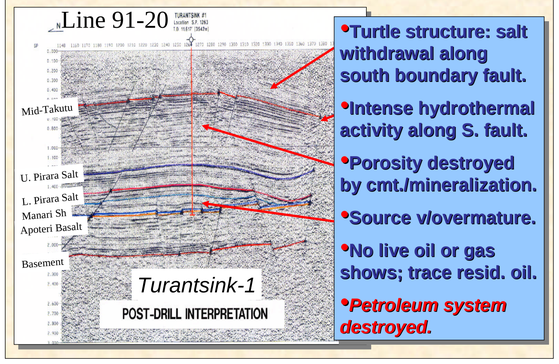
•Type I/II kerogen is evident in early mature to mature Karanambo and Lethem samples.
•Low HI numbers in Turantsink 1 are due to overmaturity of the source interval.

Maturation Profiles
Takutu Basin



Overmaturity & degradation of rich oil-prone lacustrine shale was caused by intense Miocene hydrothermal activity along south graben boundary faults.

Drilling Results, Turantsink-1



•Turtle structure: salt withdrawal along south boundary fault.
•Intense hydrothermal activity along S. fault.
•Porosity destroyed by cmt./mineralization.
•Source v/overmature.
•No live oil or gas shows; trace resid. oil.
•***Petroleum system destroyed.***