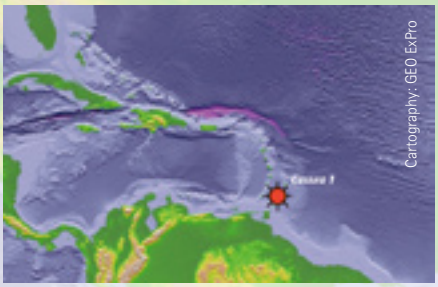
GEO EXPRO, TOGETHER WITH IHS, PRESENTS SOME OF THE MOST SIGNIFICANT DISCOVERIES MADE THROUGHOUT THE WORLD IN RECENT MONTHS.

Jane Whaley, Associate Editor. Robert Copson, Editor, Daily Alert, IHS



The Cassra discovery is on trend with a number of other finds in the Tobago Trough.

Extending the play

In early January, 2008, the Canadian independent oil company Petro-Canada confirmed a significant gas find in deep water (> 400m), about 25 km to the north of the island of Tobago in the Caribbean. This discovery, **Cassra 1**, is located 18.5km north-east of the **Iris** discovery and is on trend with a number of other significant discoveries in the Tobago Trough to the north of Trinidad and Tobago. In total this trend, sourced from Cretaceous La Luna equivalent rocks, is thought to contain an estimated 5Tcf (142 MMm^3; 900 MMboe) of proven gas reserves.

The well, in Block 22 in the West Tobago sub-basin, targeted the edge of a large seismic anomaly estimated to cover 68 sq km and reached a total depth of 1,712m below sea level. It found a gas water contact at the reservoir objective and on testing it flowed gas at a rate of 23 MMcfg/d (650 Mcmg/d). Petro-Canada announced that, based on the well results and using local field analogue recovery factors, they considered that the discovery could contain in the range of 0.6 to 1.3 Tcf (17-37 Bcm; 107-233 MMboe) of recoverable gas.

To appraise the discovery further, in late January Petro-Canada commenced drilling a second Cassra well a few kilometres to the south of the original well.

According to Petro-Canada, which is 90% owner as well as operator on Block 22, there are a number of other promising prospects within the acreage. It is believed that Petro-Canada has invested more than $80 million in the blocks offshore Trinidad and Tobago.

Defining a new province

After two promising discoveries in deep water off Ghana, oil companies working in the area were further encouraged by the success of the most recent new field wildcat. **Odum 1** was drilled on a new prospect in the Tano Basin, about 13 km east of the previous finds in the West Cape Three Points block, 51km from the Ghanaian coast in 955m of water. Kosmos Energy, operator of the block, announced that the well, which terminated at a depth of 3,387m, discovered a 60m gross oil column, including 22m net of oil-bearing, stacked reservoir sandstones. Testing suggests that this oil is high quality with an API of 29°. The reservoir is thought to have been deposited in a large fan or channel systems in Upper Cretaceous Campanian times, trapping hydrocarbons stratigraphically.

Kosmos, a privately held international oil exploration and production company which focuses on West Africa, first identified the play with its Mahogany 1 well, which was drilled in June 2007. This discovery, 63km from the coast in waters of 1,320m, was confirmed in August 2007 by Tullow Oil's Hyedua 1 well - pronounced 'shed-you-a' - in the adjacent Tano license, 5.3km south-west and down dip from Mahogany-1.

Hyedua-1 was drilled in 1,530m water depth to a TD of 4,002m and encountered 40m of net pay in a Cretaceous sandstone reservoir. The oil encountered is light (37° API) and has a favourable gas oil ratio. It appears that both these wells have drilled a single large structure with high quality reservoirs in Santonian turbidite sandstones. This was recently named as the Jubilee Field, and is thought to have potential in-place reserves of 1.3 Bbo (207 MMcm) of light (37° API) oil. The latest P50 reserve number given by Tullow is 480 MMbo.

Field development studies are underway to ensure speedy production, and a 3D/4D seismic survey was run over the area late in 2007. At least five further appraisal wells are planned on the field in order to increase the proven resource and to collect additional geological and engineering data to assist in development.

The Odum discovery can therefore be considered confirmation of a new, significant oil province in Ghana's western offshore basin.

Odum is the third promising discovery to be made in deep water off Ghana in the last year.

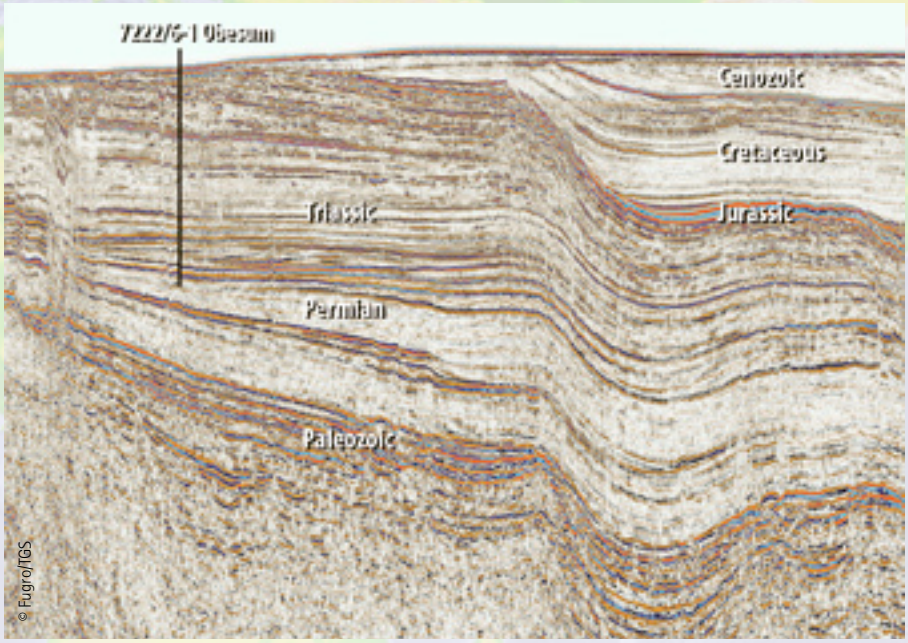
New Barents Sea Discovery

In early March this year StatoilHydro announced that their well 7222/6-1S in the south-western Barents Sea had found hydrocarbons. The well, approximately 175 kilometres north-west of the northern Norwegian town of Hammerfest, was plugged and abandoned at 2,825 m in the Lower Triassic.

StatoilHydro had been targeting a Triassic prospect, known as Obesum, and the results from the well show that the reservoir contains both oil and gas in mid Triassic sandstones. No well tests were carried out but extensive data acquisition and sampling was undertaken. The company, which is the operator and has 100 percent interest in licence 228, announced that it is too early to estimate the size of the finds. Further data processing is required, but they consider the discovery promising and will drill another well in the licence in 2008.

Photo: Halfdan Carstens

The gas from Snøhvit is liquefied at Melkøya just outside Hammerfest in northern Norway and sent to markets in Europe and the US.



Seismic line running from Obesum into the Hammerfest Basin further south. The sedimentary package through the well consists of Triassic and Paleozoic sedimentary rocks. Courtesy of Fugro/TGS.

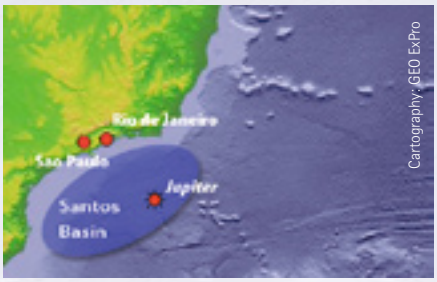
The Norwegian Petroleum Directorate puts total undiscovered resources in the Barents Sea at 6.2 Bboe (990 MMm^3), with an uncertainty range between 2.8 and 10.7 Bboe. Oil in place is about 1.25 Bboe.

Since 1980 there have been a number of discoveries in the Barents Sea, but only one has been large enough to start production. The Snøhvit field, put on production last year, has a 124m gas column overlying a 14 m thick oil leg in Lower and Middle Jurassic formations. The Goliat discovery, made in 2000, found oil and gas in sandstones of the Realgrunnen Group (Middle Jurassic-Upper Triassic). Both these fields are about 100km to the south of the Obesum discovery.

Boosting Brazilian reserves

A huge gas-condensate field, to be called Jupiter, has been found offshore Brazil, 290km south of Rio de Janeiro, according to Petrobras, Brazil's state-controlled oil company. The discovery is just 37km (23 miles) from the giant Tupi Field, discovered in 2006, which is estimated to contain between five and eight billion barrels of light oil with an API of 28° and the gas:oil ratio of approximately 15-20%. The Tupi reservoir is a new carbonate facies previously unknown in Brazil and it has been suggested that it may be analogous to the Toca carbonate trend in the Congo Basin.

The discovery well, which completed in mid-January 2008, is a new field wildcat in the south-eastern part of the Santos Basin, a large offshore basin lying along the coast of the states of São Paulo and Rio de Janeiro. It is in ultradeep water of between 2,000m and 2,500m. Like the Tupi field, the well targeted the Aptian Guaratiba carbonate formation below the widespread salt, which until recent technological developments in seismic imaging was very difficult to image. The well was drilled to a total depth of 5,252m and encountered 120m of reservoir, having drilled through about 2,000m of salt.



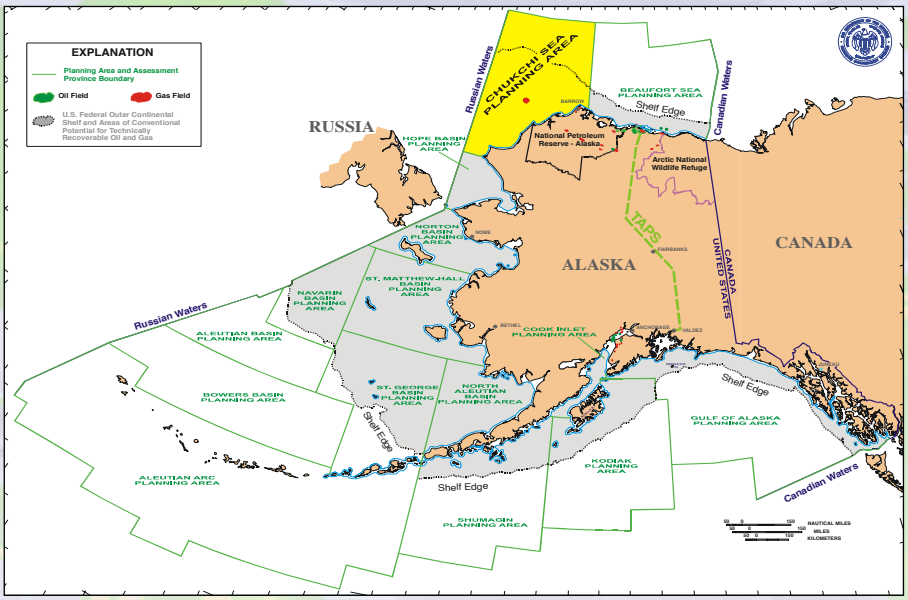
Recent large discoveries Tupi and Jupiter are indications of the potential of the sub-salt trend in the Santos Basin

Petrobras believe that the Jupiter Field could be as large as Tupi, although further work needs to be done to delineate it, and a number of appraisal wells are planned in the near future.

Brazil is hoping that these discoveries are just the 'tip of the iceberg' for the sub-salt play, which appears to extend south-westwards from the Espirito Santo Basin through the Campos Basin to the Santos Basin. It has been estimated that potential new reserves from this trend could be as high as 56 Bboe, which could boost Brazil's oil reserves from the 17th biggest in the world to among the top 10.

Huge Bids for Old Prospects

Shell and ConocoPhillips are the big spenders in the $2.6 billion Sale 193 Chukchi Sea, Alaska with the highest bids over previously drilled prospects. This highly prospective area is a continuation of the prolific Alaska North Slope petroleum system where Prudhoe Bay and other super giant fields have been discovered.



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Location of Chukchi Sea planning area and assessment province.

Thomas Smith, Associate Editor

What a surprise for the Minerals Management Service (MMS) that had estimated it would make $67 million off the Chukchi Sea Sale when all the top 10 bids each exceeded that amount.

Shell was by far the largest bidder winning 275 tracts for over $2.1 billion, and all 10 of the highest bids were theirs, while ConocoPhillips won 98 tracts for the sum total of $506 million. The largest bids went for the Burger prospect, previously drilled by Shell in 1989-90. Five other operators also won tracts in this sale.

Exploration History

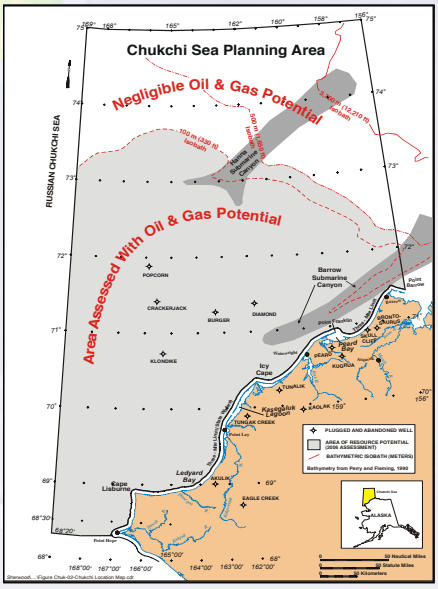
In 1988 and 1991, four lease sales (2 sales each of those years) were held in different parts of the Chukchi shelf with Shell as the primary industry investor. Of the 42 prospects the MMS had identified on the shelf, 85% of the previous bids went to just five prospects all of which were then drilled. All leases had 10- year terms that expired prior to this lease sale. Many leases had been dropped before expiration dates to allow companies to take write-offs for leasing and exploration expenses.

Over 160,000 km of high quality seismic data, as well as gravity, magnetic, thermal and geochemical data were collected in preparation for the 1988 and 1991 lease offerings. Five wells were drilled between 1989 and 1991; the Burger, Klondike, Crackerjack, and Popcorn encountered recoverable hydrocarbons, while the Diamond well was the only one to possibly miss.

Shell's Burger well encountered the largest accumulation and this time received the highest bids. In 2001, a re-appraisal by James Craig and Kirk Sherwood, geologists with Minerals Management Service (MMS), Alaska Division, estimated the trap closure to cover 765 km² as the well encountered gas shows in a 33m thick Cretaceous sandstone at 1,695 m. Condensate and gas were recovered from formation sampling devices, however the well was never flow tested. The most likely estimated resource is 14 Tcf (0.4 Tm³; 2.5 Bboe) gas and 724 MMb (115 MMm³) of condensate, however, Craig and Sherwood admit the volumetric estimates for the pool are highly speculative based on just one well.

New Optimism

"The Chukchi Sea is believed by many to be one of the most promising undeveloped hydrocarbon basins in the United States," says Curtis Smith, Shell's spokesman in Alaska. "Our entry into the Chukchi, combined with our lease holdings in the Beaufort Sea, further solidifies our position in Alaska, which has the potential to become a new



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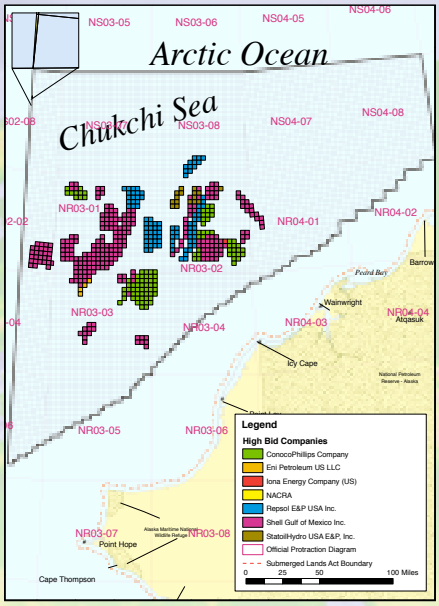
The Chukchi Sea lease area off the north west coast of Alaska where 5 offshore wells have been drilled and is considered by the Minerals Management Service (MMS) to have high oil and gas potential.



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Successful companies in the recent Chukchi lease sale.

heartland for Shell."

Shell is responsible for 4 of the 5 wells drilled in the Chukchi offshore area and has been gathering seismic data for nearly two decades. They have been evaluating the subsurface geology for the last 4 years that included reprocessing an extensive 2-D seismic data set and have two seasons of new proprietary 3-D seismic. This effort has allowed Shell to complete a state of the art geologic tectonic plate reconstruction of the Arctic and compile an extensive regional study to "underpin the confidence in opportunities in the area."

"We have done our homework here, using current technology and current climate conditions to evaluate possible development scenarios, pending exploration success," says Curtis. "We plan to use extend reach drilling that enables a smaller footprint and fewer platforms with fewer supply vessels. We have developed ice-reinforced development plans pioneered from our work at other Arctic sites like Sakhalin (a far eastern Russian island)."

ConocoPhillips spokesperson Erec Isaacson, VP Exploration and Land for ConocoPhillips in Alaska, seemed pretty excited after the sale as high bidder on 98 tracks and with their optimistic outlook there, they should be. "The Chukchi is an extension of the same prolific petroleum system that produced the Kuparuk, Alpine, and Prudhoe Bay fields, says Erec Isaacson. "Both the Klondike and Burger discoveries are analogs to the established plays at Kuparuk and Alpine."

For Norwegian oil company giant, StatoilHydro this is their first move into Alaska winning 16 tracts and bidding almost $14 million. Their leases are located on prospects outside the areas that have been drilled. "Alaska is a new and exciting play for StatoilHydro," says Kjersti Torgersen, head of communication for StatoilHydro North America. "We believe the area is both oil and gas prone," she adds.

Huge Potential-Complex Geology

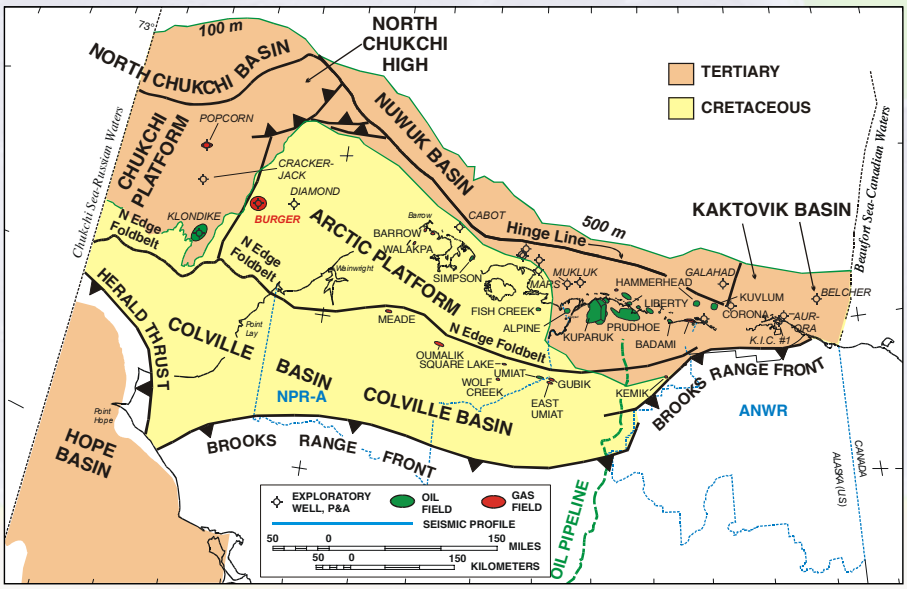
MMS mapping of the area show 5 distinct basins with deformation ranging from simple listric faulting to a fold and thrust belt. They have an inventory of 856 mapped prospects (from conventional 2-D seismic data) that include anticlines, fault traps, and stratigraphic wedge-outs. Eleven of these prospects exceed 607 km², larger than the major oil fields of the Alaska North Slope.

Most of the source rocks present in northern Alaska were penetrated by the 5 exploration wells drilled here. The Klondike well penetrated the most complete section encountering fair to excellent oil-prone units 314 m thick. Kirk Sherwood of MMS estimates that one of these source beds (Triassic Shublic equivalents) could have created nearly 3 Tbo (0.5 Tm³). Across the entire northern Alaska petroleum province, this same system could have generated over 8 Tbo (1.3 Tm³). The US Geological Survey estimates a recoverable hydrocarbon endowment of 71.3 Bboe of which about 40% or 28.8 Bboe have already been discovered.

In 2006, the MMS assessed 29 exploration plays in the Chukchi Sea OCS area. They arrived at an expected or mean value for technically-recoverable, undiscovered hydrocarbon energy of 29 Bboe (4.6 Bm³) ranging up to 77 Bboe (12 Bm³). Free oil and condensate estimates range from 15 Bb (2.4 Bm³) to 40 Bb (6.4 Bm³).

After the previous sales, evaluation of the Chukchi Sea was certainly curtailed by the industry downturn that occurred in the early 1990's. We currently have much higher oil and gas prices, tried and proven Arctic production technologies, and a very optimistic view among the bidders. While it is too early to project about new seismic programs and wells, this area is certain to receive a much more aggressive evaluation this time around.

In the next issue of GEO ExPro we will look at the Russian part of the Chukchi Sea.



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Brookian sequence depositional systems and tectonic setting, Arctic Alaska and Arctic offshore.