Finding Petroleum

Overview of opportunities in South America, Mexico, Falklands

Premier Oil in Brazil

Opportunities in the Santos

Offshore Argentina and Uruguay

Why politics is key to understanding security

Finding Oil in Central & South America, October 29, 2018, London

Special report

Finding Oil in central and South America

October 29, 2018, London

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Finding Oil in central and South America

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South and Central America region accounts for 21 per cent of global oil reserves and 374 billion barrels of proven resources. Dividing up the world by region, that's more oil reserves than North America, Europe, Asia and Africa – only Middle East and North Africa (as one region) has more.

But bear in mind the majority of the proven oil reserves in South America are in Venezuela, which is 24 times larger than the next largest producer, Brazil. The next biggest are Mexico and Ecuador. But a large percentage of countries have working petroleum systems.

If we look at the estimates of 'yet to find' oil from the US Geological Survey, Brazil stands out with an estimated 20bn barrels of oil "yet to find". "The opening of pre-salt has been a game changer for Brazil," said Tim Davies, group exploration asset manager with Premier Oil, chairing the event.

Mexico has also seen many recent successes. There are four countries with 5-10bn barrels of 'yet to find' resource according to USCG - Mexico, Venezuela, Colombia and Bolivia. Peru and Argentina have 2-5 bn barrels yet to find.

Companies from outside the region need to understand what the companies and government within the county need, because if they have the internal capability to produce oil, they will do so.

The main answer is that some countries believe that they could produce more oil with external help, and this is leading to a push for "Energy Reform". For example, Mexico saw a 33 per cent reduction in production from 2008 to 2017. Venezuela increased production 14 per cent from 2015 to 2017, but its production is very flat, considering the resource wealth.

Brazil meanwhile has increased production 44 per cent since 2008, including the development of its pre-salt, which has added considerably to the country's wealth.

Mexico

In Mexico, the Energy Reforms has had quite a phenomenal impact, Dr Davies said. The country made a five year plan, starting early 2015, and regulatory bodies SENER (Secretaría de Energía de México) and CNH (Comisión Nacional de Hidrocarburos) delivered on it "effectively and quickly."

By October 2018, 107 contracts had been awarded, 76 in exploration and 31 in production. Of these, 31 are for shallow water, 28 deepwater and 48 onshore. Companies have made commitments to drill 132 wells. So the reform achieved its aim of stimulating new investment and getting drilling going again.

There has been 'rhetoric' from the new president of Mexico, Andrés Manuel López Obrador (known as 'AMLO'), that reforms have not yet added to production and therefore have not been effective. Although he seems not to realise that many years lie between issuing an exploration licence and first oil production. "We're doing the best we can," Dr Davies said.

Companies have paid $1.6bn in 'bonuses' to the government in order to win contracts – which is free cash for the government.

The average government 'take' from new oil production works out at 55 per cent, plus an additional 10 per cent government royalty. Some contracts have given the government a take "up in the 80s".

That companies feel it makes business sense to give so much of their revenues to the government indicates the volume of resources available, he said.

This is a report from the Finding Oil in Central & South America event, October 29, 2018, London

Event website

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Including videos from Premier Oil and Spectrum talks

Many oil majors are also "reloading their portfolios" in Brazil, where there have been $5bn in signature bonuses. It all adds to "quite a phenomenal investment in Latin America," he said.

Difficulties and risks

One of the risks of operating in the region is that governments decide to renationalise their resources, taking ownership away from companies. "To be honest it is the legal right of any sovereign state to nationalise their resources, as long as recompense is made to existing owners," he said.

The growth in populist politics is scary, with rhetoric replacing rational debate. Another inhibitor to development is the "poor communication of the energy industry's benefits to a sceptical public," he said.

The general public don't see foreign investment as a benefit to their country in Mexico and Brazil, where such large bonuses have been paid. People focus instead on the loss of control or loss of wealth.

Bureaucracy in Latin America can be hard. "I have to say I'm learning new things about bureaucracy. I have to submit notices to the government to submit notices. It is quite a spectacular level of bureaucracy I have never encountered before," he said.

There can be unrealistic "local content" requirements (requirements to hire a certain number of local workers), which creates an environment which can encourage fraud. It can be very difficult to find skilled local workers. Oil companies would like to help develop local content, but it isn't easy to work out how, he said.

Many companies accept fines for not meeting the local content commitments they have been asked to meet.

A further issue is that decision making in regulatory bodies can be "quite slow", particularly with environmental permitting, with challenges in both Brazil and Mexico. Another challenge is the heavily unionised workforces.

All of these risks can be mitigated and managed, apart from the risk of nationalisation. "But it takes a lot of time, a lot of investment, and discussions with those regulatory bodies," he said.

And the work can't be done from a foreign country, you have to be physically in the country.

Ultimately, "it is about relationships, as anywhere else in the world," he said.

All together, "I see Latin America as a huge opportunity, it has its challenges, it has its delays, but it is still somewhere we should all be thinking about investing."

Falklands

Dr Davies also shared some thoughts on operations in the Falkland Islands, where Premier Oil is operator of the Sea Lion project, together with Rockhopper Exploration.

The first challenge to oil and gas development is that there is no infrastructure, just a floating harbour and a hangar with a tent. "It is a huge development in a small country," he said.

"The government experience is limited. They are drawing a lot from UK government for provisions to put a hydrocarbon code in place."

The oil companies will be building an entirely new industry, and bringing many oil workers to the islands, which will have a large impact on the society. The locals have a desire to contribute but "we don't have enough locals of an age or skill set that can contribute" he said.

The islands are isolated both geographically and geopolitically. The oil industry needs to function without any reliance on any South American country.

The oil companies plan a phased development, to reduce the shock to the islands. It will start with the core of the Sea Lion field, with 220m barrels of oil, and follow with phase 2A and B, with 375m barrels of additional oil. Then there are some gas projects. There is a proven exploration system which can be added as a phase 3 if the companies choose to.

5 wells were drilled in 2015 and 2016. A port facility has been built for supply boats and loading for materials and equipment. Personnel and equipment were all brought from Europe. "The online island supply base and passenger handling all worked effectively," he said.

"Engagement with Falkland Islands government will be key to making sure our footprint / impact isn't too large."

There is a phased oil export plan. Initially oil will be loaded from the field to a shuttle tanker, and then ship-to-ship transfer to a larger oil tanker Berkeley Sound, an inlet to the Falkland Islands. After 4 years, when security and stability of operations have been proven, the oil can be loaded directly onto a tanker.

Brazil and Premier Oil

Toby Garwood, exploration manager, Brazil and UK with Premier Oil, gave an overview of the exploration opportunities in Brazil from Premier's perspective, and the company's activities in the Ceara basin

Much of Brazilian opportunities are too crowded, too expensive, too deep, or too risky, but the Ceara basin is just right on all these issues, said Toby Garwood, exploration manager, Brazil and UK with Premier Oil.

Industry interest in Mexico seems to be much higher than in Brazil. "Wherever I go, whether externally or internally, I say to people I'm the Brazil exploration manager and they say, how is Mexico," he said.

"It occurs to me the oil industry appears to be moving around as a herd from one hotspot – Guyana, Santos pre-salt, Mexico. While the industry is very focussed on each of these trendy opportunities, I think there's very interesting stuff going on in Brazil."

Mr Garwood first worked in Brazil as an exploration manager in 1999, when he set up Enterprise Oil's office in Rio de Janeiro. This was the first development Petrobras had sold to a western company. After Shell acquired Enterprise Oil in 2002, he continued with Shell in the region. In 2013 he joined Premier as Western Hemisphere exploration manager covering Brazil and the Falklands,

Brazil has 16 offshore basins, all with very different geology, and a large range of water depths, from shelf to deep water.

You can't necessarily get to the best acreage though, "Petrobras covets some of the basins more than others," he said.

Premier Oil doesn't want to drill in waters deeper then 1500m, and only wants projects with proven petroleum systems, manageable logistics and reasonable license terms, allowing flexibility. It prefers basins with different development options, he said.

Tour of Brazil's basins

Mr Garwood provided an overview of all of the basins in Brazil, and how they look from Premier's perspective.

The Pelotas basin has no proven source rock, and is in deep to ultra-deep water, "so not for Premier," he said.

The Santos basin's pre-salt is "way too expensive and competitive for a company like Premier."

The Santos post salt "has actually been very disappointing – I spent a couple of years trying to work out what was going on. So that's not for us," he said.

The Campos basin is the opposite. There are disappointing exploration results in the pre-salt, but the post salt is looking good, but "Petrobras are hanging onto the best stuff," he said. "They are starting to divest equity in some development projects."

In the Cumuruxatiba Basin, there have been complex licensing issues, with many licenses awarded then retracted. "So not a part of the world Premier wants to be involved in."

The Sergipe and Alagoas Basin is a "very interesting basin, ignored for a long time," he said. "Over the last few years Petrobras have had 6 world class discoveries in there which I think surprised people." But it is deep to ultra-deep water, and "pretty expensive access."

"Petrobras has been trying to farm down some of their equity – I'm not sure how successful they've been. I imagine it was out of Premier's reach," he said.

In the Foz do Amazonas Basin, BP and Shell were drilling joint wells in 2002 to 2003. But it is a "pretty scary place to go drilling, geology largely unknown, and unproven source rocks – logistically very tough, and too expensive," he said.

In the equatorial margins, to the North, there is a proven petroleum system, and a lot of discoveries along the strike and along the conjugate margin. There is relatively simple "sweet spotting," he said.

There is nice seismic data, you have to identify the "classic feeder input systems." Acreage "is available in water depths that appeal to us," and the infrastructure is good. "This is an area I think is largely under the radar at the moment whilst all eyes are on Mexico."

Ceará Basin

But the Ceará Basin "ticks all the attributes Premier looks for." The 1.5bn barrel "Pecem" discovery, in the Ceará basin, is within one of Premier's license blocks, and it has been flow tested to show it has 30 degree API oil.

Toby Garwood, exploration manager, Brazil and UK with Premier Oil

The Petrobras Pitu discovery is on the same strike line, and the Liza and Zaedyus wells are to the North, offshore French Guiana. Following the fracture zone across to the other side of the Atlantic you have the Jubilee and TEN (Tweneboa, Enyenra, Ntomme) fields offshore Ghana. "These are all analogues that look very similar to Ceará."

"The geology looks pretty interesting at first glance, Atlantic margin architecture, and Aptian tilted rotated fault blocks, capped by lacustrine source rock."

There has been very limited exploration over 20 years.

Premier has equity in 3 blocks – 661, 717 and 665. These were all acquired in the 2013 license round. Petrobras was farming out this package of fields to try to raise more money to put into the Santos presalt.

665 is more out in deepwater, which the company is now less keen on, but the other two, 661 and 717, are largely in water depths the company likes, he said. There is a 1.5 billion barrel discovery, and numerous material scale undrilled discoveries in 717.

Premier is the operator of 717 and 665, and Spanish oil company CEPSA has 50 per cent equity. For 661, Total is the operator with 45 per cent, and Premier has 30 per cent.

There were many wells drilled on the shelf

in the late 1970s and early 1980s. Petrobras made the Pecem discovery in 1993, and then Petrobras attention shifted to other basins, namely Campos, Santos and Sergipe Alagoas.

But from 2000 to 2006, there was a wave of activity in the Campos basin, so the focus went there. From 2006 to 2011, most interest was in the Santos presalt.

After the Pecem discovery in 2012, Petrobras made the 6 world class discoveries in the Sergipe and Alagoas Basin and disappeared from the Ceará region. So altogether, "in the last 20 years there's been very little activity in this basin."

Pecem

The Pecem discovery was made following an appraisal well drilled in 2012, jointly by BP and Petrobras. Petrobras only realised it was a discovery following a "re-exploration" well drilled in 2013.

This appraisal well was probably drilled under a private deal (subsequently revealed) with ANP (the Brazilian regulatory agency) where commitments may have been transferred from one basin and license to another, Mr Garwood said. ANP really wanted the Pecem discovery appraised.

Today, Premier Oil has rights to the block containing Pecem, and may consider developing it if it has success in block 717. "We don't believe it was optimally tested," he said.

The Pecem reservoir is thin-bedded, alluvial, deltaic type sands, "not the world's best reservoir". But "it is such an enormous structure – 15km x 8km. With a new generation of seismic I think we'll be able to sweet spot where the reservoir is better. With fluvial type systems, the reservoir quality can improve dramatically over short distances."

Ceará logistics

Many people assume that logistics in the Equatorial Margin will be very difficult, and it isn't, he said.

The distances to logistical infrastructure can be closer than with many North Sea fields – for example the Ceará basin is 100 miles from Fortaleza, the 5th largest city in Brazil, also the Ports of Belem and Sao Luis are in the region.

All the licensed areas sit on the edge of the shelf, so reasonably close to shore.

Also, as you move west to east along the North Brazilian coastline, there are more large cities, all with their own energy demands, workforces and supply bases.

Another issue to note is the overpressure in the reservoirs. In the Amazonas all wells drilled to date are over pressured, and in the Pará-Maranhão Basin some are over pressured. But in the Ceará basin there is no overpressure.

So altogether there is an underexplored region with "doable" logistics.

Oilfield development

Premier is considering a shallow water platform at the edge of the shelf connected to the wells, and a floating storage unit for liquids, and selling gas directly to other platform owners, or piping it to Fortaleza.

Premier originally had a two well commitment for block 717, but this was re-negotiated to one after the oil price collapsed. It plans to drill the well in 2020. It will also drill in block 661 in 2020 as well, saving money from drilling one well after the other.

There is 4300km2 of 3D seismic data available from PGS, acquired in 2016 and supplied as PSTM in 2017.

In terms of geology, the Pecem discovery has a 4 way dip closure at Aptian (120mya) level. There are also channel geometries cutting through the license block, with terminal fan lobes at the end.

"We believe Premier has the largest, most extensive database of the Ceará basin, maybe even more than Petrobras," he said. "We've done a lot of reprocessing that Petrobras does not have at the moment."

There is basic data available for 146 wells, porosity / permeability data for 30 wells, sidewall core / petrographic data for 20 wells, and deepwater petrophysics data on 7 deepwater wells.

Premier has done gross depositional environment (GDE) fairway mapping, rock studies, petrophysics and petroleum systems studies.

The tectonostratigraphy model is calibrated by all 146 wells, showing many turbidite reservoirs and proven reservoirs in the rift section.

For source rocks, well 42, on the edge of the shelf, a typical well, shows 5 source rock intervals.

Looking at oil expulsion maps for Trairi and Paracaru field, you can see maximum oil expulsion in block 661 and 717. The area which looks immature is the big Aptian four way closure.

There is a 10MW power cable to one of the fields, of which 6MW is spare. With spare infrastructure available, it is possible to minimise development cost on a marginal discovery.

Polarcus –Santos basin unlocked

Seismic company Polarcus is planning to expand its coverage in the Santos basin, offshore Brazil. Regional data sales manager David Contreras explained more

Seismic company Polarcus is planning to expand its coverage of the Santos basin, offshore Brazil. This will complement the company's existing multi-azimuth survey, which covers the BMS-50 block (and surroundings), containing the Sagitario discovery.

To illustrate how important the Santos is to Brazil, consider that production from the Santos presalt is up by 722 per cent over the 2012 to 2017 period – while Brazil's onshore oil production has declined by 30 per cent, said David Contreras, regional data sales manager, Africa, North & South America, with Polarcus.

Brazil has a big change in focus to offshore in general. 12 per cent of Brazil's wells are offshore, but they produce 54 per cent of its hydrocarbons, he said.

There has been $7bn signed in signature bonuses to access the pre-salt during the last two years, it is a highly competitive environment, he said.

As an illustration, the Carcará North block in the Santos pre-salt boasts estimates between 700m to 1.3bn barrels of oil equivalent. Earlier in 2018 a consortium of Equinor, Exxon and Galp paid a signature bonus of $910m for access. It was quite a contested bid round, and the first time Petrobras lost a bid (for the Uirapuru block).

Wells in the pre-salt Santos cost "between $100m and $120m", so "not prohibitive," he said. "The volumes and the value are huge. Some of these pre-salt developments, with the latest news we've seen, breakeven at $40."

Looking at Brazil overall, there have been big efforts to push away corruption, improve transparency and make foreign investment easier.

Brazil has also relaxed its "local content" rules (requiring companies to work with a certain number of local people). The increased freedom over who they employ enables companies to explore more efficiently, he said.

Hydrocarbons agency Agência Nacional do Petróleo, Gás Natural e Biocombustíveis (ANP) defined an ambitious schedule of bidding rounds. It made it easier for investors to trust the opportunity.

ANP now expects Brazil to be the fourth biggest producer in the world by 2027, after Saudi Arabia, USA and Russia, with production of over 5.5m bopd.

Data company Wood Mackenzie anticipates that up to 50 FPSOs could be operating by the mid-2020s.

In Brazil, Polarcus has acquired surveys in the Pará-Maranhão Basin margin for the Brazilian company QGEP.

Polarcus in the Santos

In the Santos pre-salt, Polarcus was awarded a contract to survey the BMS50 block and some open acreage, an area of 1600km2,

There are 2 wells within the survey area, the Sagitario discovery and another one in the post salt. The Sagitario discovery found a 127m column of light oil.

Explorers are very keen to understand the overburden (salt above the reservoirs), which impact the main geometry of the reservoirs. From a drilling perspective, the area is known for being over pressured and as such it is important to understand the complex compartmentalization of the reservoirs and presence of active faults which can make for hazardous drilling.

The survey also aims to look for further potential in pre-salt carbonates around the BM-S-50 block, and perhaps post-salt.

Polarcus acquired a multi-azimuth survey, where the area was shot with two "narrow azimuths" survey, with one vessel providing both source and streamers. It has chosen azimuths of 45 and 135 degrees, following studies by Petrobras showing these give the best results.

Previous surveys were made with just north-south or east-west Azimuths, which clients said were either great for interpreting salt, but not so great for the horizons or vice versa.

David Contreras, Regional data sales manager, Polarcus

It is possible to do higher resolution surveys, such as with seabed nodes, or with wide azimuth (with multiple source and recording vessels). Some wealthy oil majors have chosen this path. But these are more expensive than the multi-azimuth approach. Multi-azimuth gives "quite a high resolution imaging" below the salt, for lower cost, he said.

The surveys have been done with 12 x 8km streamers, with a 75m spacing.

The data processing work follows a traditional routine, looking for the top of salt, the base of salt, running some tomography, deghosting and full broadband processing.

Mr Contreras showed some of the resulting data, with quite a complex lateral velocity contrast, the high quality of the resulting pre-salt section and intriguing prospectivity within and outside the BM-S-50 block

Spectrum – opportunities offshore Argentina and Uruguay

Seismic company Spectrum Geo has proposed multiple play concepts all along Argentina's Atlantic margin and including Uruguay. Hannah Kearns, Geoscientist with Spectrum, explained more

The Argentina Offshore License Round 1 opened in November 2018, covering 14 blocks in Argentina North over the Rio Salado, Colorado and Argentina Basins, and 24 blocks in the Austral-Malvinas Basin. Spectrum acquired 52,000km of long offset 2D seismic data in 2017-18 to complement the round.

Argentina is underexplored, but has proven petroleum systems in shallow to moderate water depths, covering both pre-rift and syn-rift segments, she said.

The Permian basement is highly fractured and folded. Pre-Atlantic rifting, the margin formed a continuation of the Palaeozoic South African Cape Fold Belt, she said.

Later, Jurassic rifting created the nearshore Rio Salado and Colorado Basins. Early Cretaceous rifting then formed the South Atlantic Ocean and the deep water Argentina Basin, conjugate to Namibia's Orange Basin.

Oil-generating source rocks are proven in Permian, Jurassic and Cretaceous sediments in wells. The first offshore well was drilled in the 1950s, and the first offshore discovery was made in the 1970s. 8 wells on the northern Argentinian continental shelf contained hydrocarbon shows or fluid inclusions. However, subsequent exploration saw little commercial success due to inadequate seismic imaging, and Northern Argentina remains underexplored.

In the Jurassic Rio Salado and Colorado Basins on the shelf, evidence of gas and fluid escape is present directly above grabens formed during rifting, seen on seismic data, she said.

Beyond the shelf, the Ewing Terrace, comprised of clinoforms, extends the 1000m bathymetric contour to 500km offshore in places.

There are numerous potential structural and stratigraphic plays on the Ewing Terrace. Shallow reservoirs may be charged by post-rift faults, and fluid escape features directly above rift faults are linked to seabed pockmarks.

Hannah Kearns, Geoscientist with Spectrum

In Uruguay a deep water well was drilled at the base of slope by Total in 2016, "Raya-1".

However Raya-1 only penetrated through Cenozoic sediments (up to 66mya), not hitting the Cretaceous.

It proved that there are sandstones with good reservoir quality, but there was no charge at this level. However, deep water wells in the Namibian conjugate have proven an oil-generating Early Cretaceous (Aptian) source.

Spectrum has correlated this source over to the Argentina basin, and the interval is "pretty clear all the way down the margin," she said.

A regional strike line shows a thick sediment wedge developed from Rio Colorado basin floor fan deposits during the Cretaceous, compared with a dominantly Cenozoic sediment cover in Uruguay. Cretaceous channels directly overlie the Aptian source - one channel system is three times the areal extent of the prolific Sergipe slope-channel system.

The Austral-Malvinas Basins in the south evolved during the Late Jurassic/Early Cretaceous when South America separated from Antarctica.

During the Cenozoic, a fold and thrust belt formed to the south, a continuation of the Andes, and the Malvinas Basin is a foreland basin in front of this belt.

There has been previous exploration success in the Austral-Malvinas basins, ~7bn boe recoverable, she said.

51 exploration wells have been drilled in the Austral Basin, and 20 in the Malvinas Basin. Late Jurassic to Early Cretaceous anoxic shales are the main proven regional source rocks.

Most previous exploration success has focused on Early Cretaceous channels and deep marine sandstones of the Springhill Formation. To the east, the "Darwin East" condensate discovery in 2012 occurred in thick Aptian (120mya) sandstones.

The fold and thrust belt remains underexplored – only one well has been drilled (Malvinas-1). This well only drilled Cenozoic sediments, and didn't reach the more prospective Cretaceous interval.

The lack of exploration here is probably due to poor imaging of the fold and thrust belt on legacy seismic data – an issue that has been much improved in Spectrum's 2017-18 dataset, she said.

Anticlines and fault-bound structures in Cretaceous sandstones may be highly prospective. Seismic evidence of gas and fluid escape is seen in overlying sediments.

Numerous faults segment the Springhill Formation in the foreland basin. Within the fold and thrust belt, large folds above gravity slides give potential for Eocene or Cretaceous charge.

A characteristic of Argentina's basins is that they are underexplored, cover large areas and have proven or low risk petroleum systems.

These occur in both shallow and moderate water depths. The new Offshore Licensing Round recently announced is the perfect catalyst to unleash a wave of exciting exploration.

Spectrum anticipates the geology seen on the new seismic datasets will be highly prospective, bringing commercial success back to the margin, she said.

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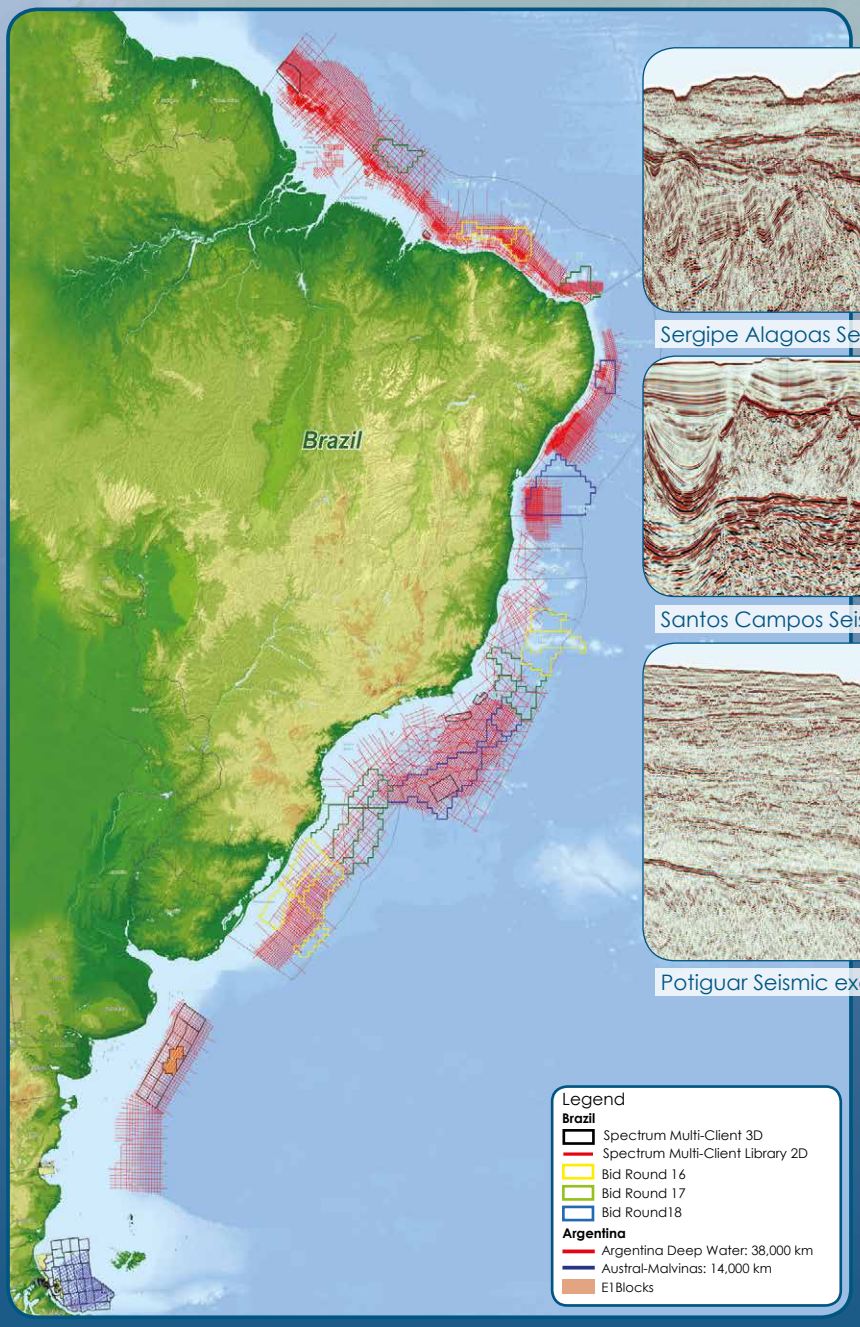
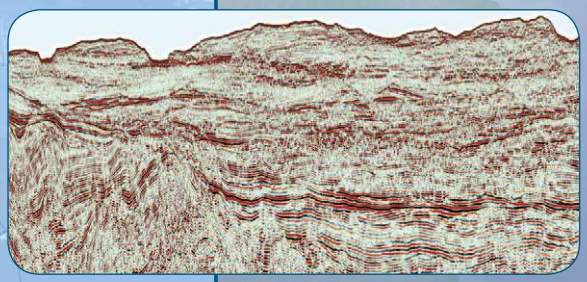
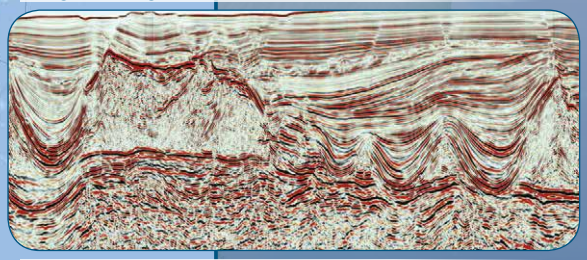
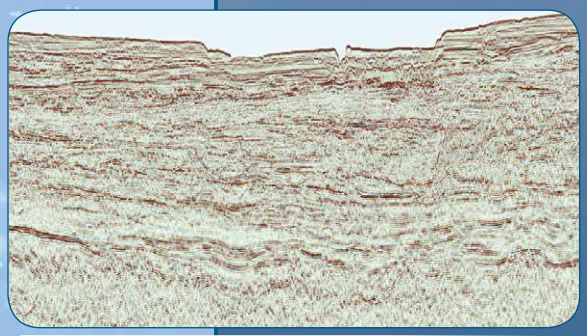




Sergipe Alagoas Seismic example



Santos Campos Seismic example



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Spectrum

Control Risks Group – politics key to understanding security

To understand security in South America, it is important to understand a balance of contributing elements including the political situation and social risk factors, said Nick Panes, senior partner with specialist risk consultancy Control Risks Group

Security in South America needs to be placed in its proper and appropriate context. In many cases the risks may have been exaggerated, said Nick Panes, senior partner with specialist risk consultancy Control Risks Group.

To understand security in South America, it is helpful to first understand a broad spectrum of risks including the political and social situation.

Security risks can be mitigated if they can be understood and evaluated, he said. Then they can then be quantified and considered as part of any commercial decision.

Control Risks group has been operating in Latin America for 45 years, and Mr Panes has been involved for 20 years, including 6 years living in Mexico, where he lived through the Enrique Peña Nieto administration (2012-2018), including discussion and approval of the Energy Reform and roll-out, "a fascinating period of time".

Across Latin America, "for the oil and gas industry, I would say, with some exceptions, these are interesting times," he said.

Political environment

The political environment in Latin America has become very complicated over the past year. "This has been a fantastic year for a political scientist," he said.

In May 2018 we had elections in Colombia with Iván Duque coming to power. In July 2018 we saw Andrés Manuel López Obrador winning elections in Mexico. In October Brazil elected Jair Bolsonaro, its next president. "That's a fairly interesting spectrum of candidates," he said. "The leftist tide we saw in the 2000s has firmly moved on."

"One could argue that ideology has become less important to the Latin American electorate. Issues around violence, security, corruption, transparency have become materially more relevant to those electorates."

"We have seen a slightly unexpected and diverse group of candidates – being successful in their various campaigns."

"Broadly speaking, with the exception of Venezuela, we have democratic institutions which by and large have been held up. Most of these elections have been handled and undertaken in a relatively free manner, which gives a level of assurance in certain democratic institutions."

"However, we get some fairly interesting characters positioning themselves as 'change candidates'."

In Mexico, "AMLO", Andrés Manuel López Obrador, will take power in December 2018. "He sits in theory on the leftist end of the spectrum, and came in on a wave of discontent with established parties. He campaigned on economic equality, poverty reduction, transparency and anti-corruption.

"The levels of perceived corruption were high enough that some people were prepared to take a risk on AMLO just to see if they would be better off than they are today" he said.
His rhetoric at beginning of campaign was fairly flamboyant."

"For people who had seen the benefits of the Energy Reform, there was an element of concern as to what he may represent. Whilst perhaps not moving at the speed everybody wanted, the Energy Reform has delivered a series of interesting opportunities for investment and oil and gas companies."

Nick Panes, senior partner with specialist risk consultancy Control Risks Group

"Whilst AMLO's agenda remains towards the left, and his rhetoric populist in nature-there's a sense of underlying pragmatism," he said. "To ensure economic growth, he will have to engage in more moderate, mainstream, pragmatic policies."

It was perhaps surprising how AMLO managed to win majorities in both houses of Congress. Congress has traditionally been a fragmented affair in Mexico. It illustrates the level of dissatisfaction with how things were.

The majority "will be useful for pushing his policy agenda."

In order to overturn the energy reform, he would have needed to get a "supermajority" in one or both houses of 66 per cent, but he did not get this; however subtle shifts in political allegiances could allow him to engineer that supermajority which would make constitutional reform a possibility.

In terms of the oil and gas sector, this administration may make life for oil companies more difficult, such as postponing bidding rounds. This is perhaps a likely outcome, with less opportunities coming online.

AMLO will also try to restore state oil company PEMEX's position as the dominant player. It will be useful to see who the new leader of PEMEX is.

There may be moves to build a refinery but would require $6bn to $10bn, which would be difficult under the current fiscal situation.

Venezuela

Venezuela is considered "high risk" by Control Risks Group, and little improvement is expected, more likely a growing security risk.

There are some oil services companies there and they are likely to remain, but operating in an "extraordinarily difficult market".

There won't be elections for 5 years, and not much appetite or ability for anyone to take on Venezuela president Nicolás Maduro, he said.

The difficult political and economic situation will keep the security situation complicated. And the border region with Colombia is likely to become more difficult, with increasing numbers of people trying to leave.

Colombia

When Iván Duque Márquez took over as president in August 2018, he stated clearly that he wanted a framework and conditions for economic growth in Colombia, particularly improving exploration and production activities in oil and gas, and encouraging companies to see it as an oil and gas destination. "The overarching political and economic environment is positive."

However the social component in Colombia is very complicated, with a difficult peace process with FARC (The Revolutionary Armed Forces of Colombia) pushing for change. It is a "social dynamic that is likely to remain complex."

Brazil

Brazil is the big story, with the next president Jair Bolsonaro also positioning himself as a "change candidate". Although that's not necessarily an accurate portrayal of himself, considering he has a long history in government, Mr Panes said.

Until 18 months ago he espoused a more nationalist stance. Then he met Paulo Guedes, a free-market economist from the University of Chicago, and had a "neo liberal moment", turning him into an outspoken proponent of free markets and economic liberalism.

He has harnessed the popular dissatisfaction with the existing political establishment, which has propelled him to an extraordinary victory, he said.

His first big challenge is pension reform, which is "critical for Brazil's fiscal position."

Brazil's politics is highly fragmented, with 30 parties represented in the lower house. Mr Bolsonaro secured just over 10 per cent of the lower house, with the little known Social Liberal Party. The fragmentation means that everything will need to be negotiated with other parties. His economic advisor may be suggesting economic reforms, but he will need to negotiate hard to get them through.

He has stated plans to privatise 149 state owned oil companies in the first year, which seems "somewhat bullish" as that would be one every 2 days. The privatisation plan will also include the non-core assets of Petrobras.

Most election debates have been largely about security, transparency and corruption, not on energy reform. These are the topics "which have registered the greatest popular appeal," he said.

Argentina

Mr Panes lived in Argentina in the 1990s. "If you compare this administration to the previous one, it at least has some coherence to its policies and frameworks," he said. But "the ability to push them through has been somewhat difficult."

Argentina's president Mauricio Macri had sought to establish certain political capital before making certain decisions, which has given him less time to fulfil other parts of his mandate.

"If this administration, Macri and his central bank, can create an element of macro-economic stability, we would expect Argentina to become an interesting, high potential market."

For the oil and gas industry, Latin America will continue to offer "highly prospective markets", although the risk will vary materially whether you are looking at onshore or offshore. But it is always important to remember that social issues need to be understood.

The latest RiskMap from Control Risk Group, showing its assessment of risks around the world, is online at **https://www.controlrisks.com/riskmap**

Finding Oil in Central & South America, London, October 29, 2018, Attendees

David Roberts, Consultant, 3-DMR

Geoffrey Boyd, Field Development Consultant, Antium Frontfield

Muktadir Ur Rahman, Director, Apex Consulting Ltd

David Craik, Consultant, Atlaslocal

Simon Berkeley, Director, Berkeley Associates

David Sendra, Associate Consultant, BlackRockQI

Joe M Boztas, Director/Interpreter, Boz Seismic Services

Chris Matchette-Downes, MD & Owner, CaribX and MDOIL Limited

Jo Firth, Senior Geophysicist, CGG

John Glass, MD, Cloverfield Consulting Ltd

Arndt Peterhaensel, Geological Adviser

Diwin Amarasinghe, Geophysical Specialist,

Roger Doery, Consultant

Peter Farrington, Consultant Geophysicist

Simon Adamsdale, Director, Control Risks

Nick Panes, Control Risks Group

Richard Walker, Consultant Geophysicist, Cornhill Economics Ltd

Ian Newth, Director, Count Geophysics

Stephen Norman, Business Development Manager, DNV GL

Iain Scott, Business Development, Exceed Energy

Karl Jeffery, Editor, Finding Petroleum

Avinga Pallangyo, Events Manager, Finding Petroleum

Richard McIntyre, Sales Manager, Finding Petroleum

Nick Norton, Senior Energy Advisor, Foreign Office

Jeremy Berry, BD Director, GCA

Nick Cameron, Geological Advisor, GeoInsight Limited

Jim House, Director, GeoSeis Ltd

Toya Latham, Analyst, GlobalData

Abbey Hunt, Geoscientist, Impact Oil and Gas

Edward Prescott, Chief Geophysicist, Impact Oil and Gas

Ahmed Elghorori, Independent Geoscientist

Neil Simons, Consultant

Mark Robinson, Consultant

Nick Steel, Consultant

Manouchehr Takin, Independent consultant

Mike Hibbert, Independent consultant

Katerina Krylova, Business Development Manager, Interica

Neville Brookes, Principal Commercial Geoscientist, Lloyd's Register

Colin Clarke, Geophysicist, Lloyd's Register

Rupert Simcox, Data Analyst, Lynx Information Systems

Paul Spencer, Senior Production & Seismic Data Manager, Lynx Information Systems Ltd

Andrew Foulds, Director, Petrafiz Ltd

Mohit Khanna, Head of Subsurface, Petrofac

Mike Rego, Independent Consultant,

Henry Dodwell, Consultant, PetroVannin

David Contreras, Gegional Geoscience Manager, Polarcus

Tim Davies, Global Portfolio & NV Manager, Premier Oil

Toby Garwood, Exploration Manager - Africa/Mid East/Americas, Premier Oil

Colin More, Prospect Geoscience

Kes Heffer, Director, Reservoir Dynamics Ltd

Patrick Taylor, Director, RISC (UK) Limited

Stephen Corbin, Technical Director, RPS Energy

Esther Escobar, Petroleum Economist, RPS Group Plc

David Jackson, Principal Geologist, Shearwater Geoservices

Debbie Collier, Risk Manager, Shell

Glyn Roberts, Director, Spec Partners Ltd

Hannah Kearns, Geoscientist, Spectrum

Karyna Rodriguez, Director of Geoscience, Spectrum

Andy Harris, SpectrumGeo

Chris Wheaton, Director, Stifel

Diveena Danabalan, Upstream Energy Analyst- Oil and Gas, The EIC

John Weston, Tecnical Director, Tridevi Energy & Resources

Julie Branston, Region Manager, EUR & Russia, WesternGeco

Alastair Bee, Westwood Global Energy

What did you enjoy most about the event?

Networking and the Control Risks talk.

Some nice examples of pre-salt imaging from Brazil.
Ian Newth (Count Geophysics)

The excellent presentations.
David M Roberts (3-DMR)

The last speaker - good quality, no fuss presentation - just right for his topic. Premier spoke well too.

Great presentations, with a good final presentation on security and political risks, very insightful.

Illustrated examples of data enhancement using multi-azimuth acquisition.

Networking & political overview.
(MDOIL LIMITED)

Premier talk on Brazil.
Roger Doery (Consultant)

Networking, but also the depth of knowledge by most speakers, particularly on the last topic of regional politics and security.

Interesting update on Brazil exploration and excellent overview of the political and security risks across the region.
Richard Walker (Cornhill Economics)

The last presentation was by far the most interesting and engaging, which was excellent (10), as proven by the number of questions!

Good quality presentations.

Great networking event and the topics are relevant and current.
Andrew Foulds (Petrafiz Ltd)

Varied presentations.

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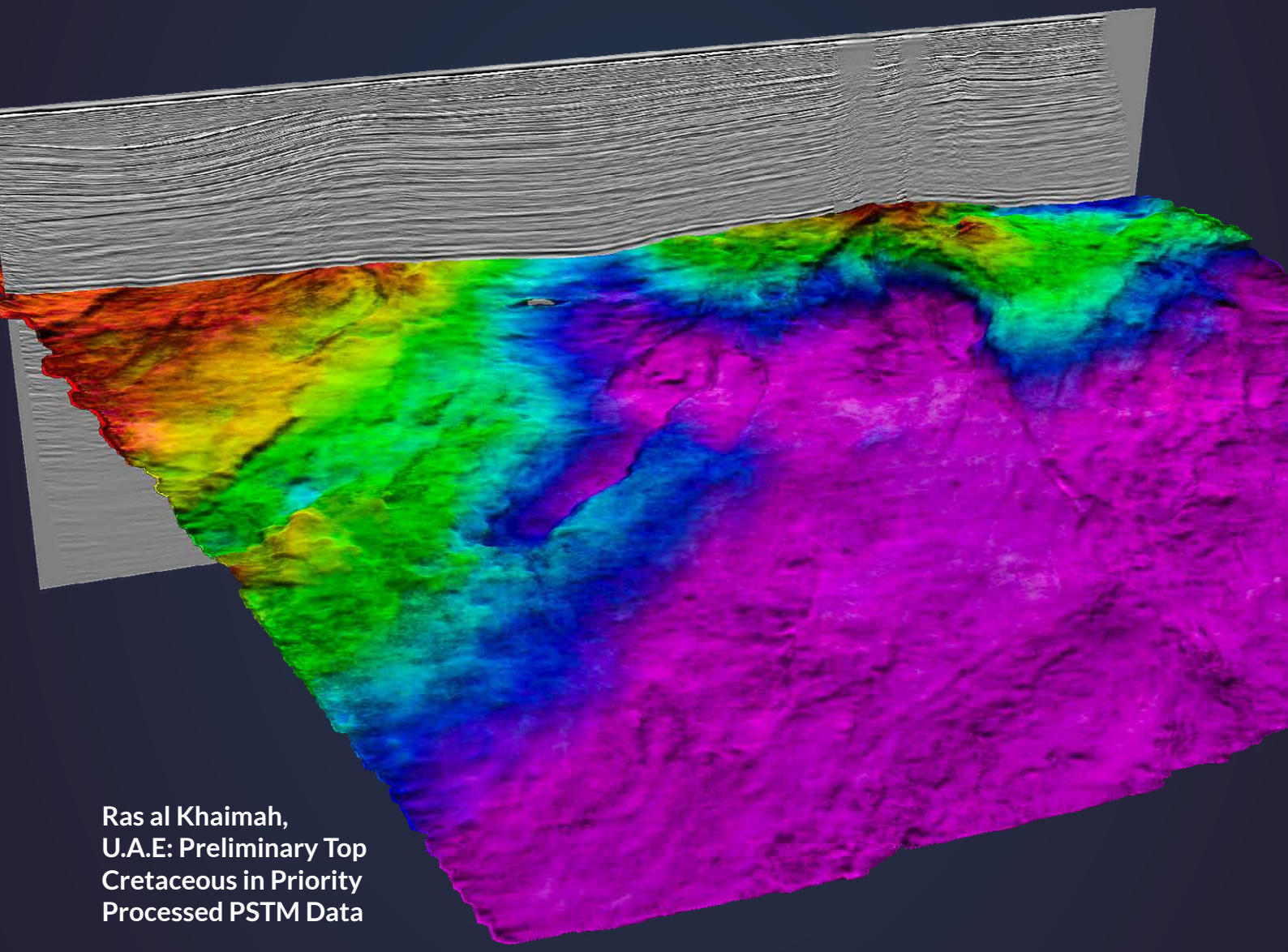

Ras al Khaimah,
U.A.E: Preliminary Top
Cretaceous in Priority
Processed PSTM Data

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