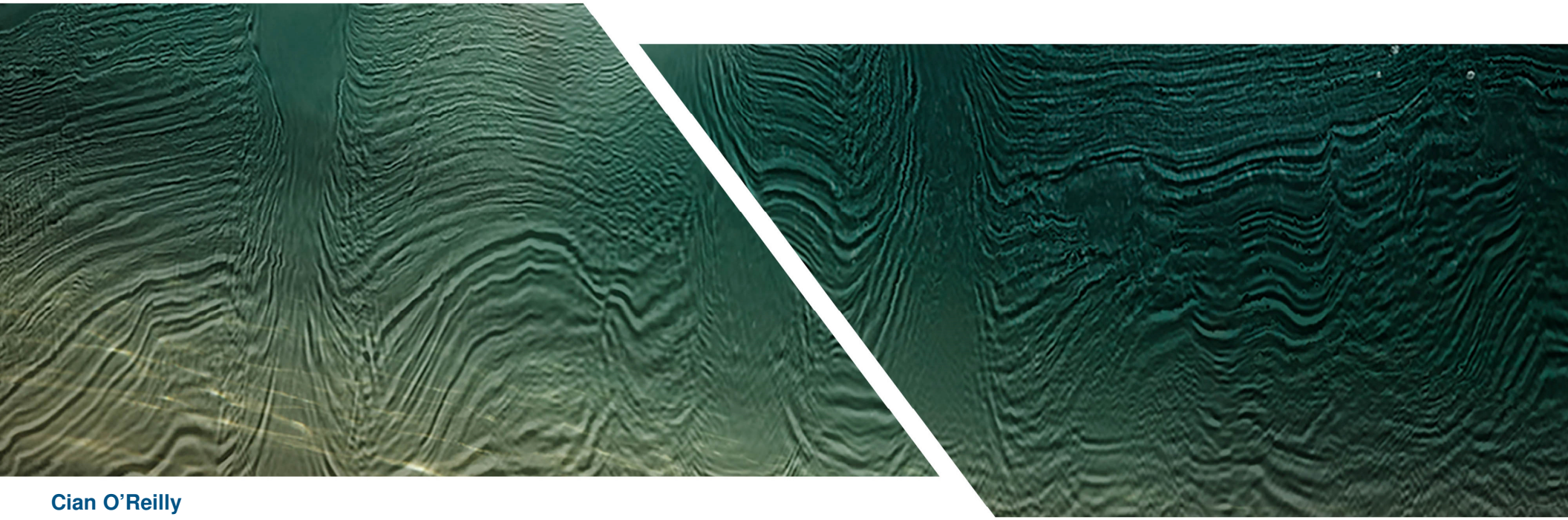
Exploration Update, Offshore Argentina

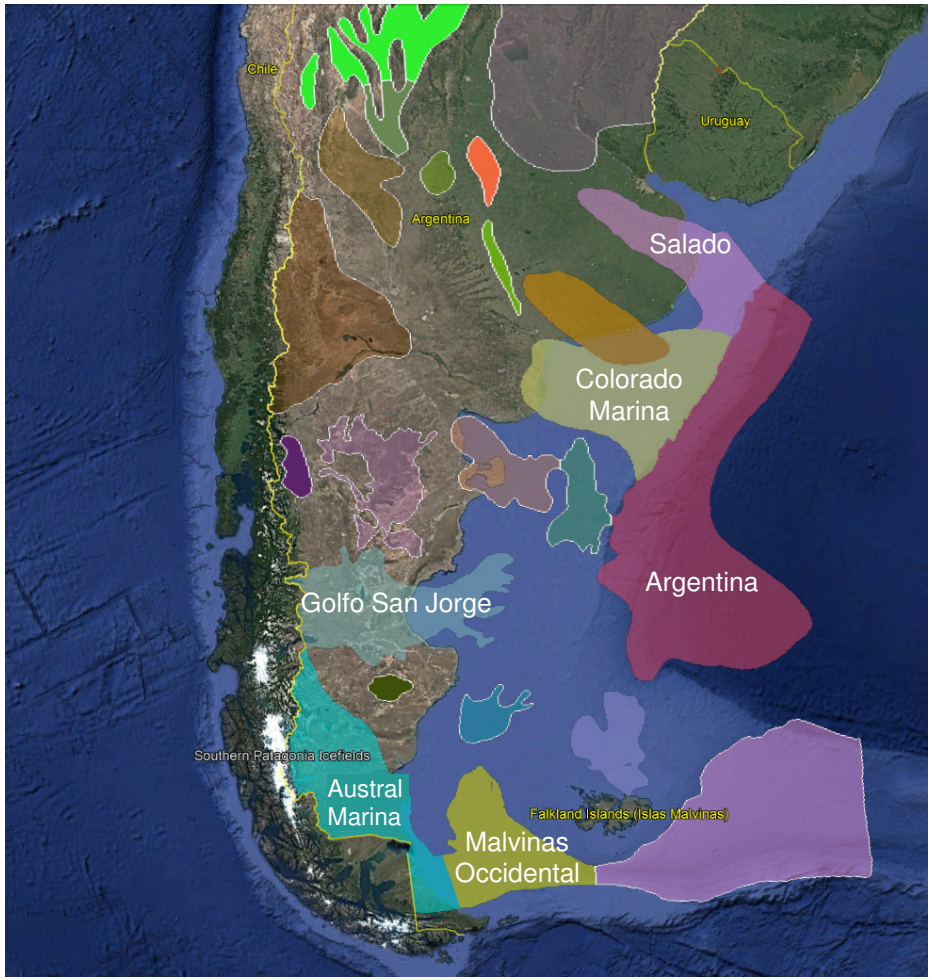


Cian O'Reilly

2019-05-20: 1400 - 1415

Agenda

- 2018: License round announced
- 2019: License round awards
- Geology and exploration of the offshore basins
  - Argentine Basin
  - Austral Marina Basin
  - Western Malvinas Basin
- TGS work plan: multibeam, geochemistry, 3D seismic
- Summary



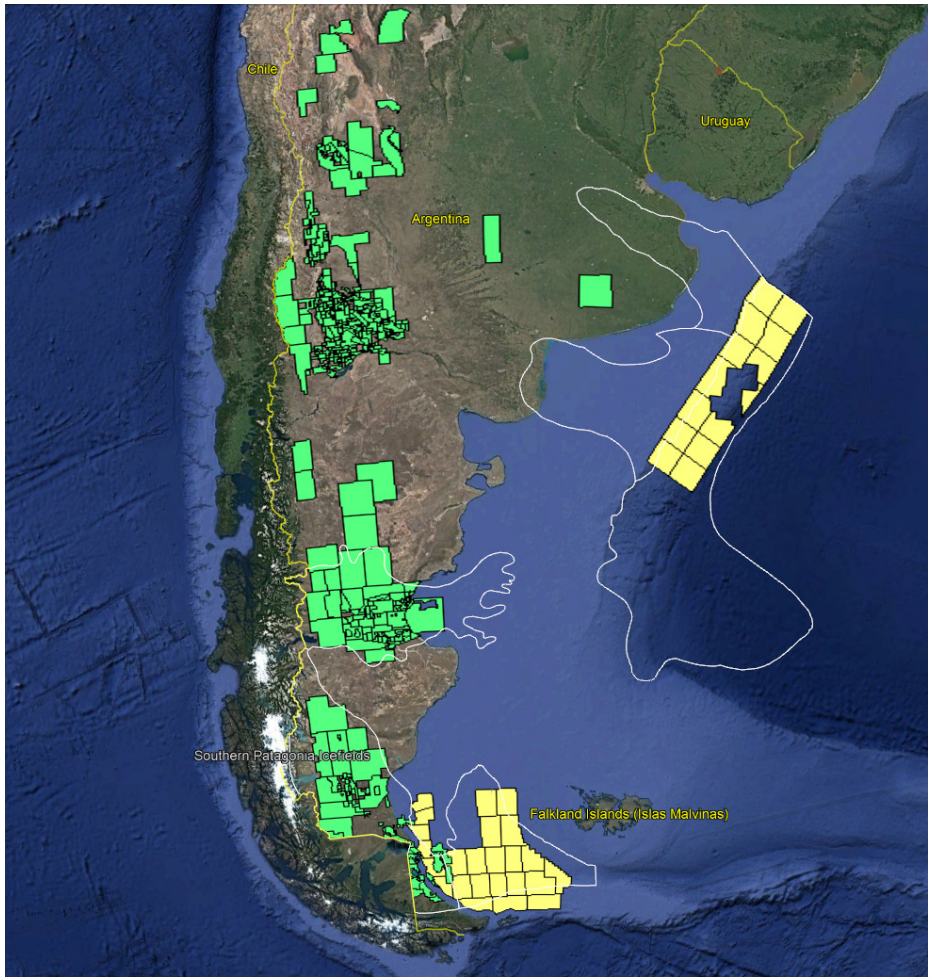
Offshore Licensing Round (October 2018)

- 2018: License round announced

- 38 blocks offered:
  - Northern Argentina Basin: CAN-01 ~ CAN-14
  - Austral Marina Basin: AUS-01 ~ AUS-06
  - Western Malvinas Basin: MLO-108, MLO-109, MLO-113 ~ MLO-128

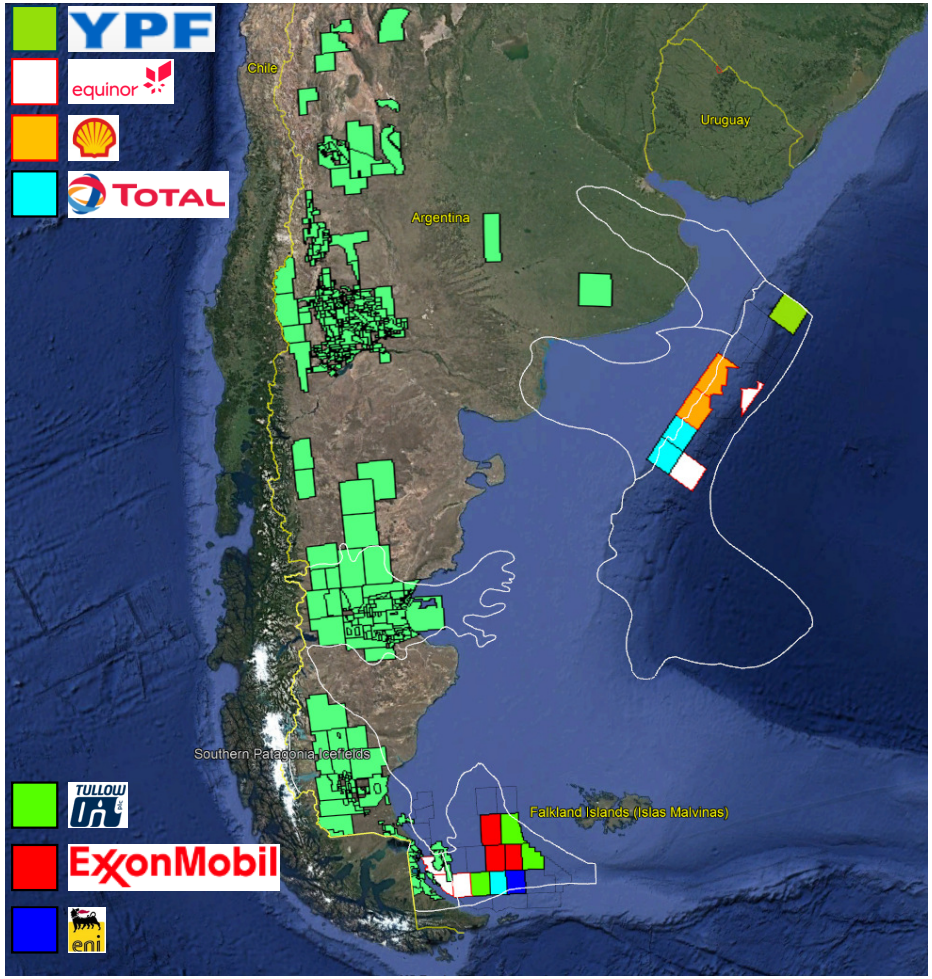
Attractive bidding terms designed to open up previously little explored territory

- Large block size
- Low upfront entry cost
- 8 year exploration period before return half block
- Seismic for Years 1 – 4. Must drill well after Y4



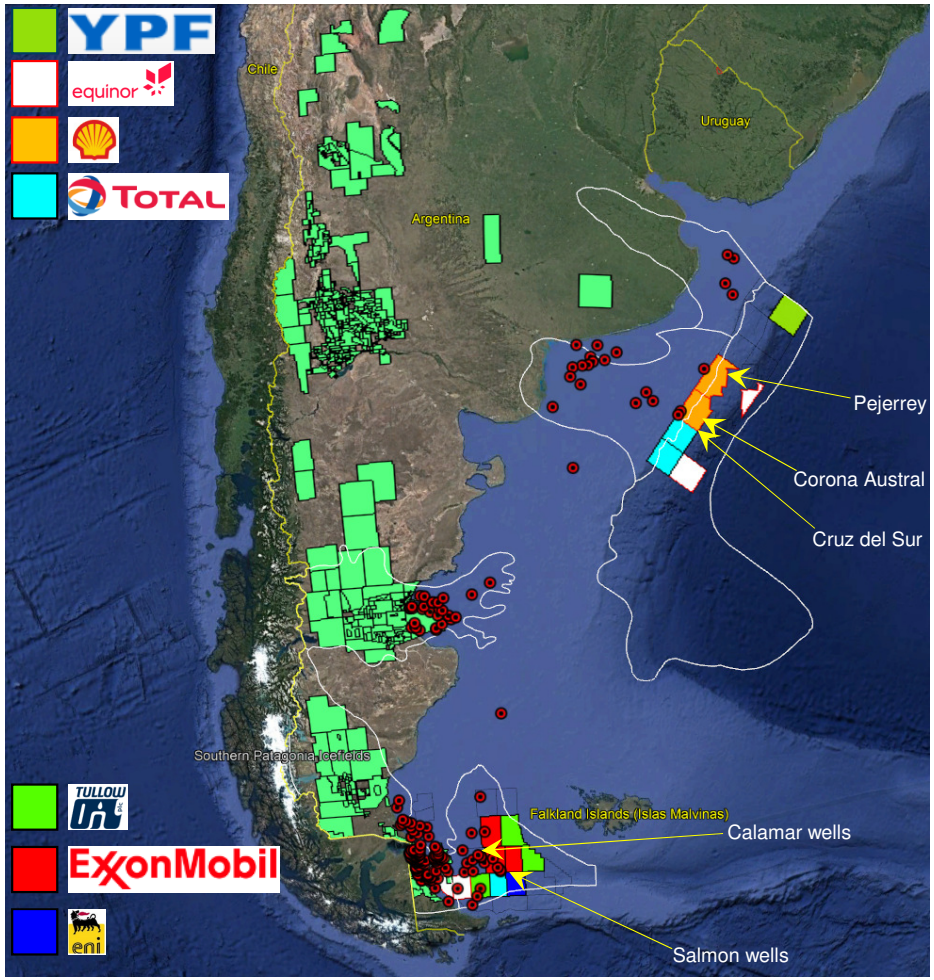
License round award: 2019-04-16

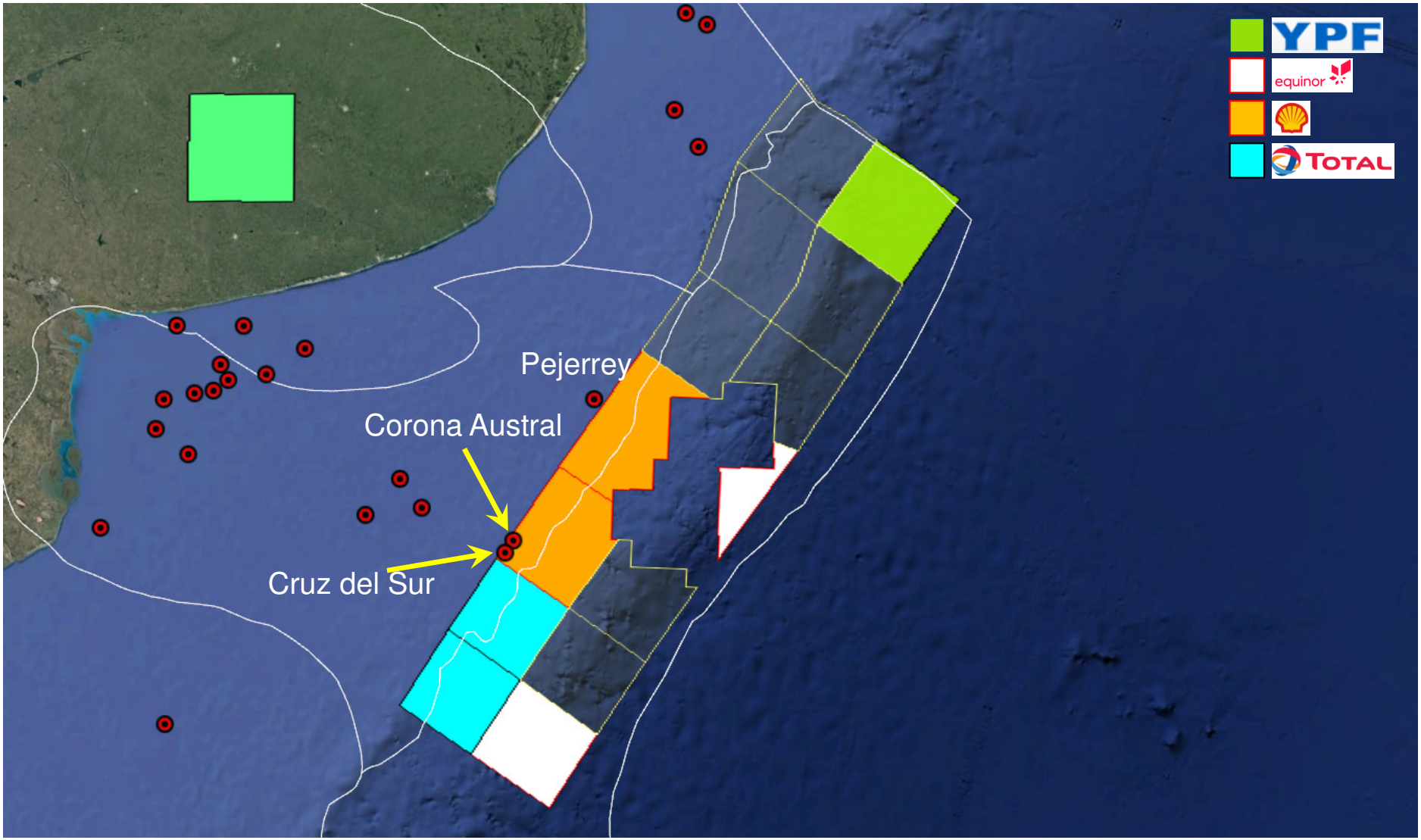
- 38 blocks on offer - 18 blocks licensed
- Winning bids totaled $718 million; on high side of expected amount.
- Equinor: most acreage and most diversified, with blocks in Argentine, Austral Marina and Malvinas
- Tullow and XOM competed for blocks in Malvinas: Tullow consortium won the more attractive blocks?
- Ratification of awards by mid-May
- Block signatures expected for Aug-2019



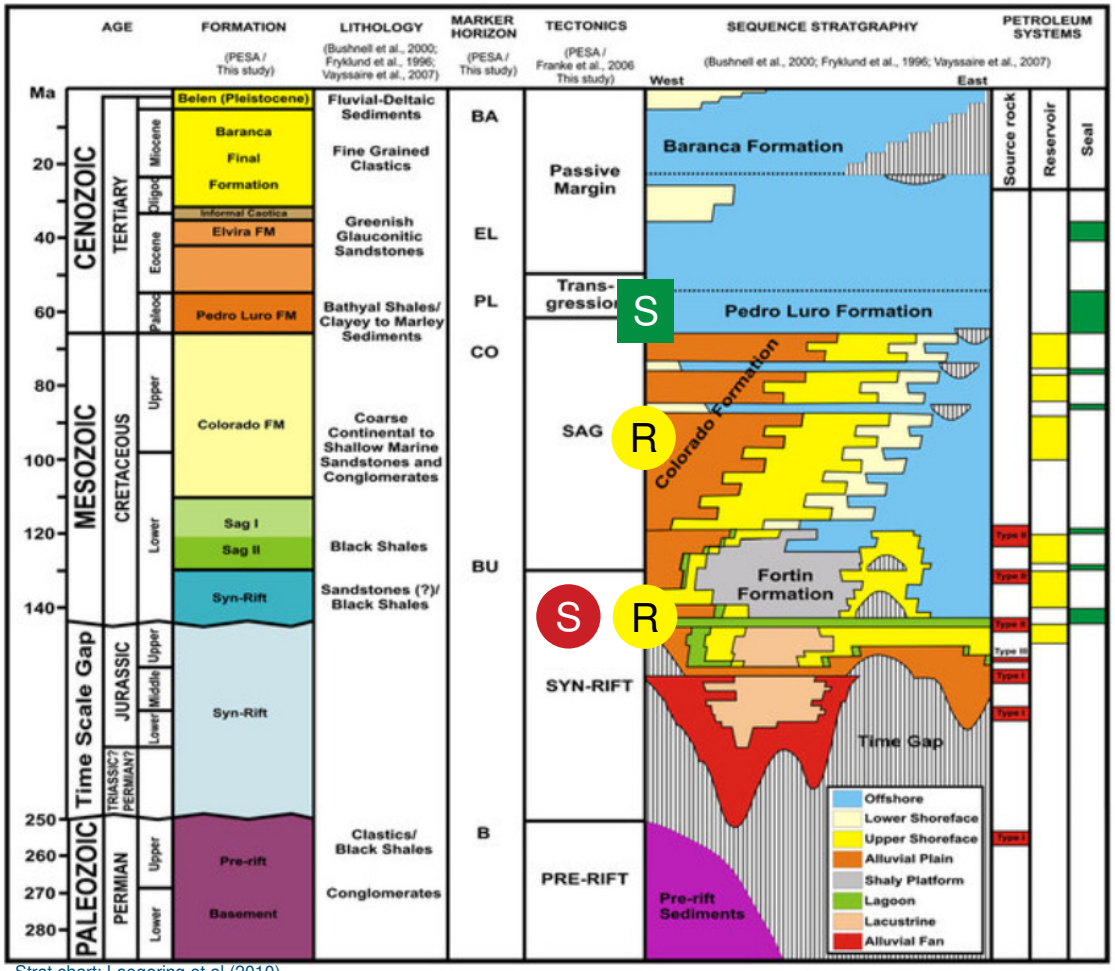
Exploration to date…

- Salado Marina: 4 wells, with minor oil in one
- Colorado Marina: 17 wells with oil shows in Lower Cretaceous. Structural targets tested. Charge?
- No wells drilled in the Argentine Basin: petroleum system proven by updip well Cruz del Sur x-1
- Onshore San Jorge highly productive oil province Offshore: no production
- Austral Marina: Main focus to date of offshore E&P
  - ➢ Total operates fields onshore & offshore since 1989
- Malvinas Occidental: 2 discoveries (Salmon and Calamar); main target Springhill FM.





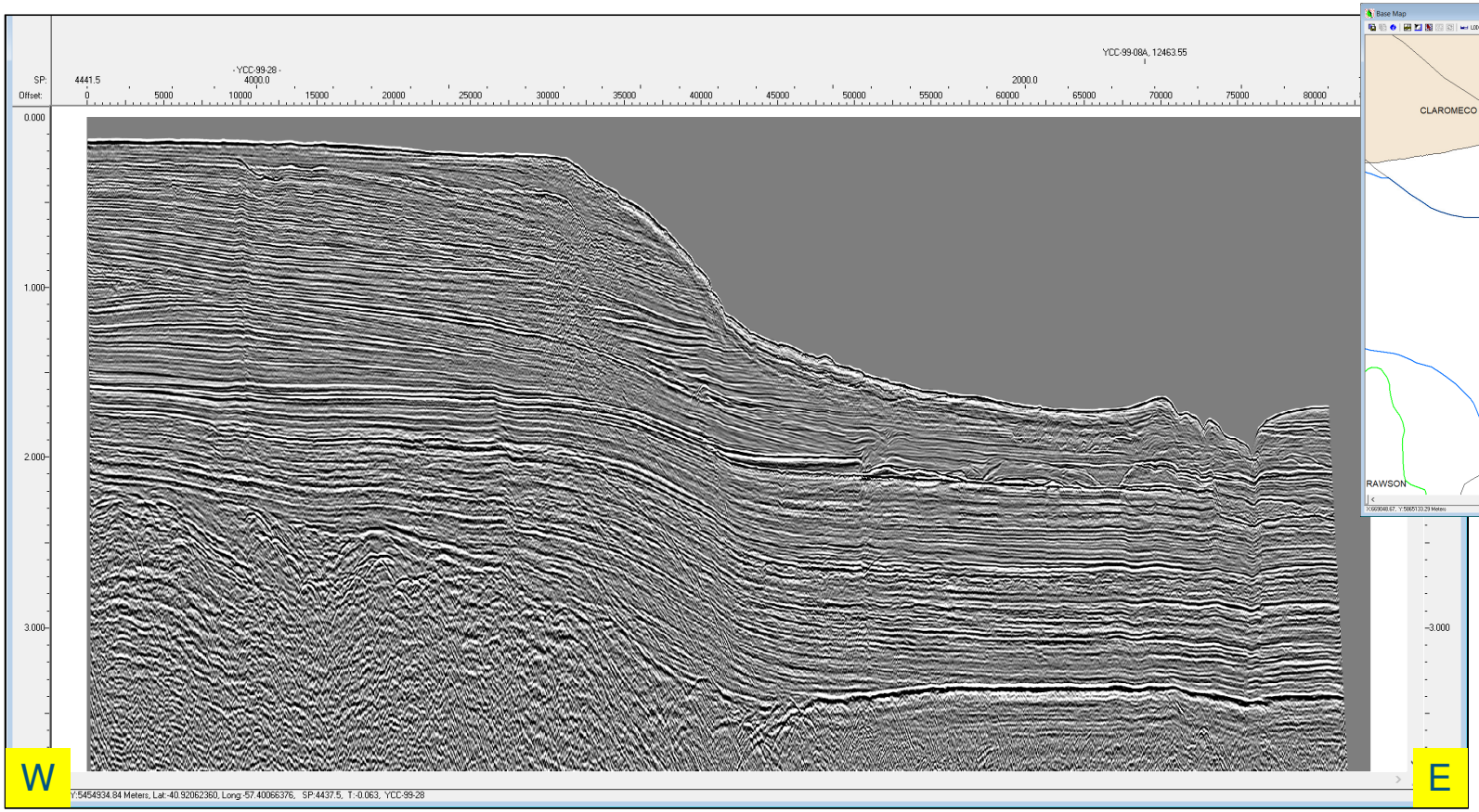
Colorado Marina & Argentina basins

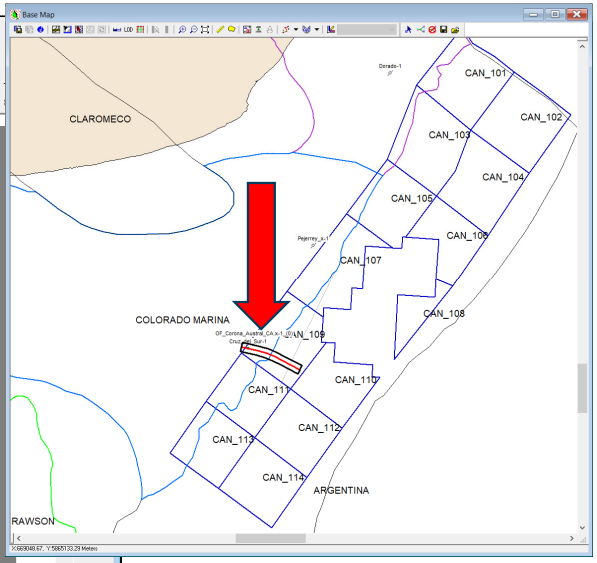


Strat chart: Loegering et al (2010)

- Up to 12 km marine & continental sediments
- Oil from well Cruz del Sur x-1 proves active petroleum system in syn-rift sequence
- Reservoir sands in post-, syn and pre-rift Mesozoic and Permian
- Regional seal: Pedro Luro FM (top Cret – Paleocene). Also intra-formational seals
- Structural traps proven explored by previous drilling. Un-tested structural traps, C-Ls, BFFs downdip in both basins (next slide…)
- Well failures: Syn-rift section thin to absent in Corona Austral x-1. No oil charge to the Corona Austral or Pejerrey structures. Source rock presence not proven.

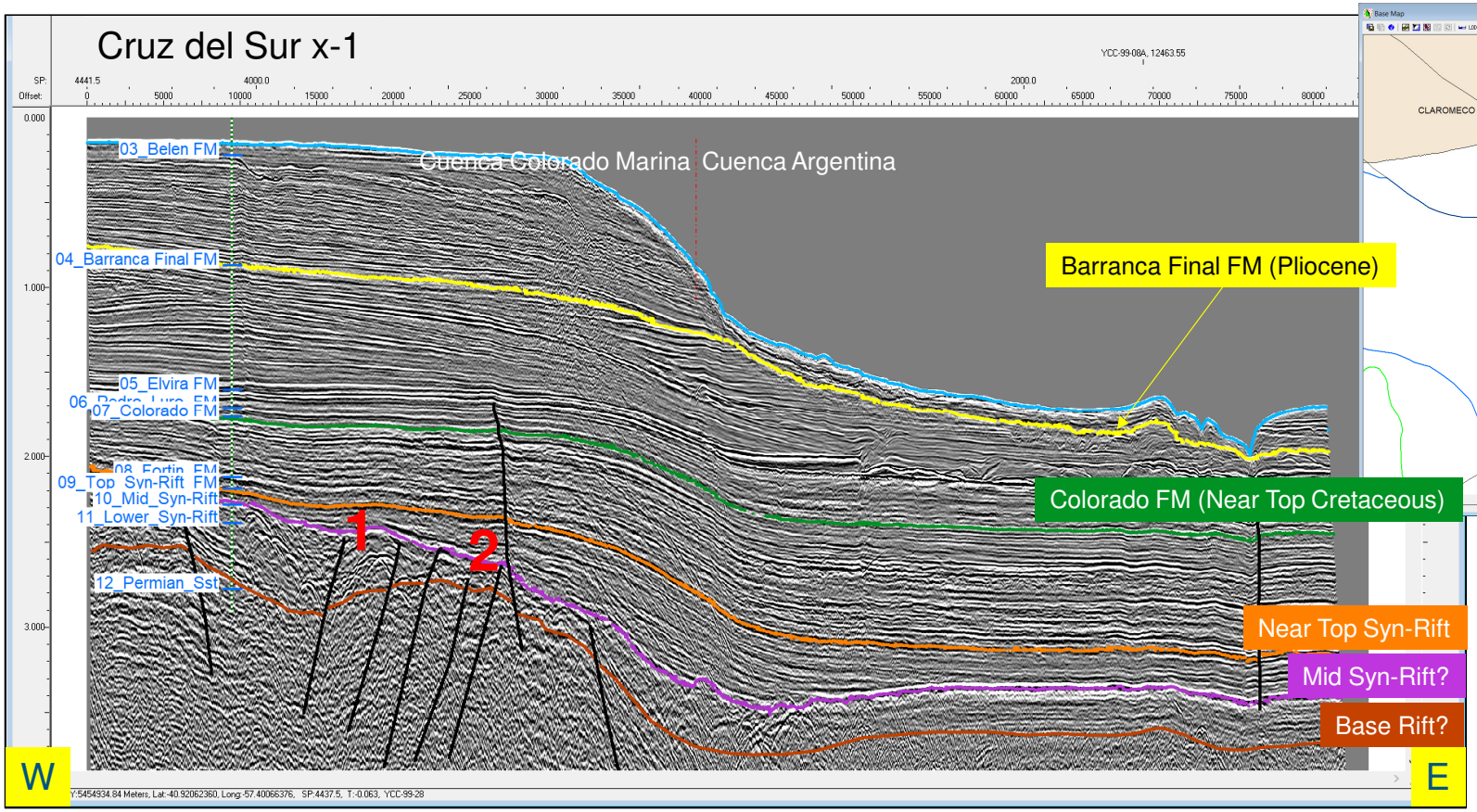
Colorado Marina & Argentina basins; Block CAN_109 (SHELL)

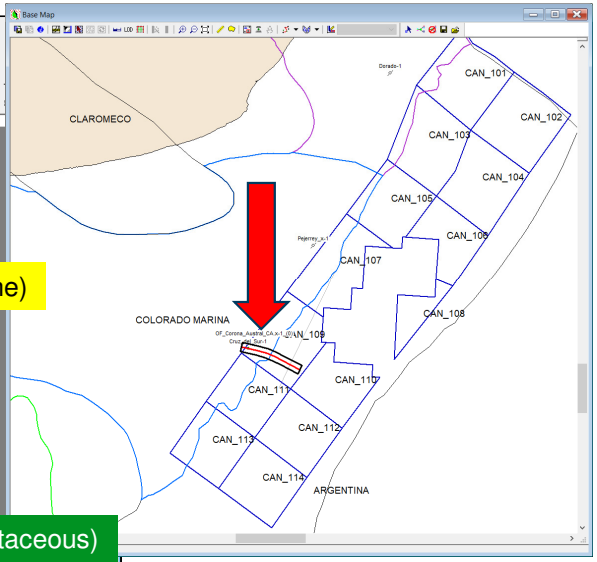




Block CAN_109
SHELL

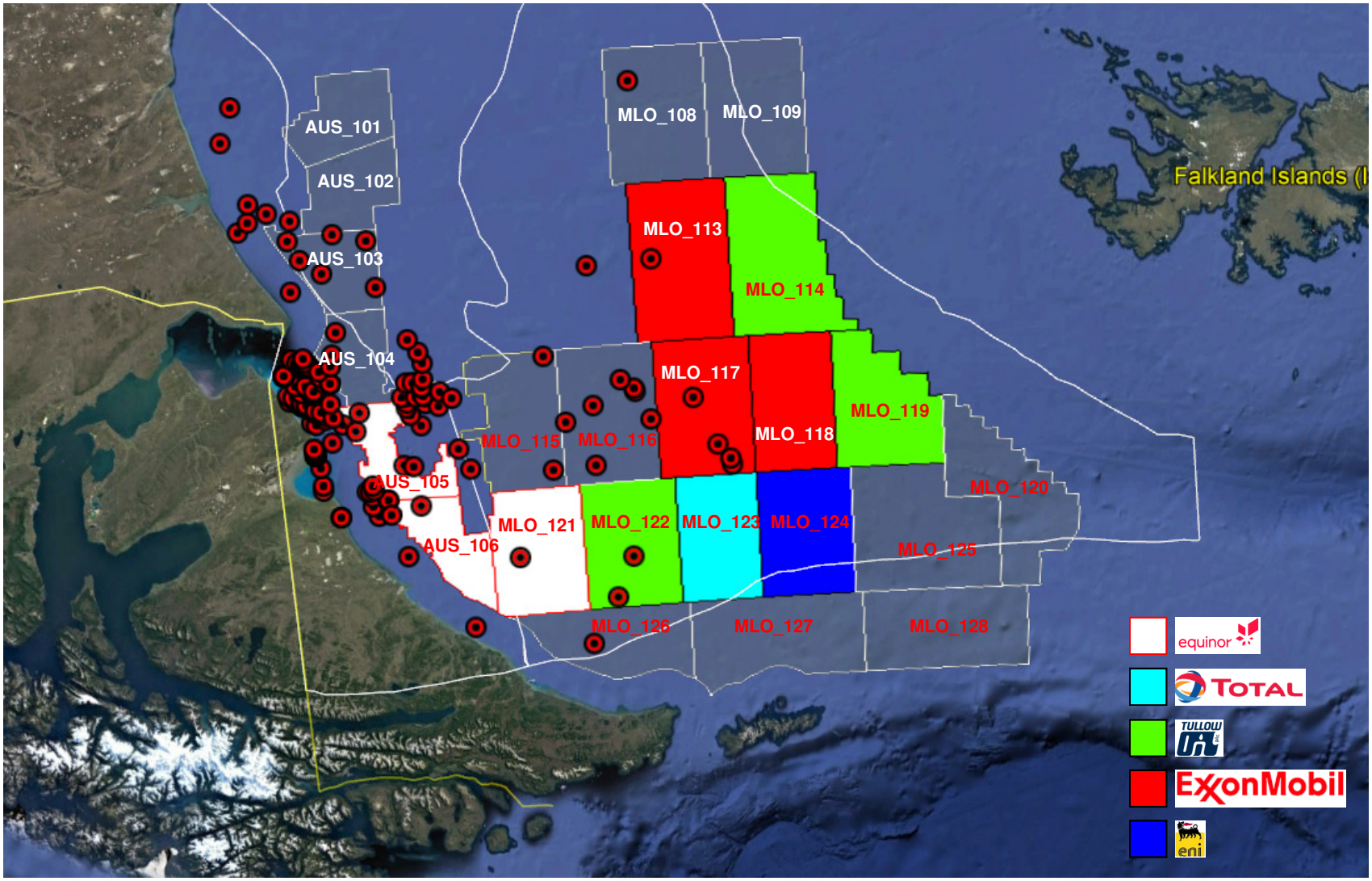
Colorado Marina & Argentina basins: Block CAN_109 (SHELL)



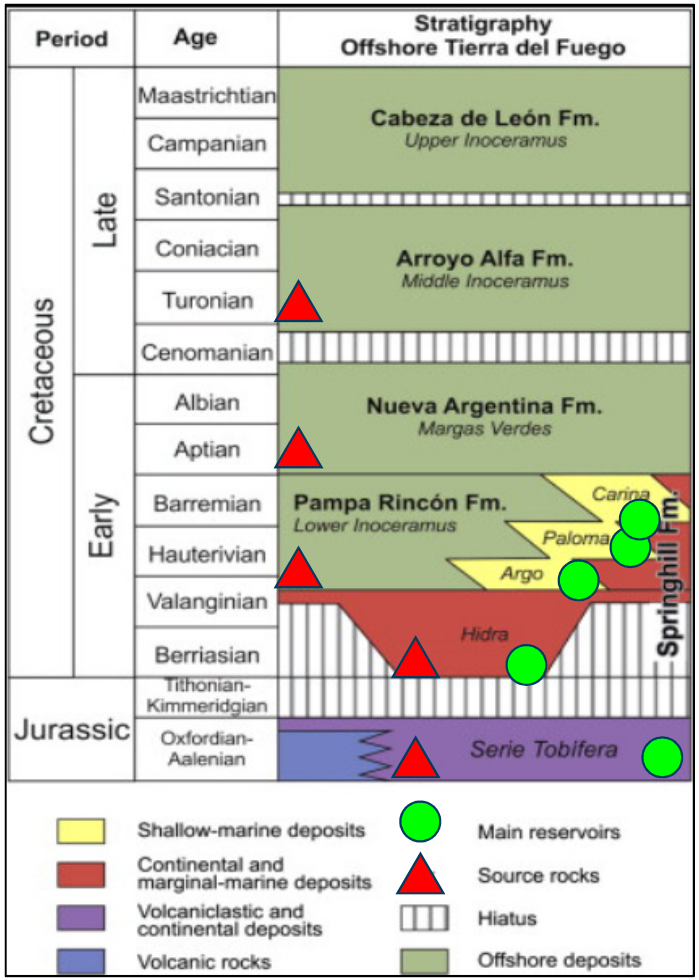


Block CAN_109 SHELL

Syn-rift oil in CdS x-1 suggests further structural prospects downdip (e.g. 1 and/or 2). Possible stratigraphic (channel / fan) prospects in upper Cretaceous & Tertiary would need amplitude support.



Cuenca Austral Marina (CMA)



Strat chart: Schwarz et al. (2011)

- Austral Marina the only productive offshore basin, with> 100 wells drilled. Production since 1989. All offshore production from Springhill Formation (some onshore Tobifera production)

- Lower Inoceramus – Springhill petroleum system.
- Tobifera shales proven source rock onshore
- Minor generative potential from later shales

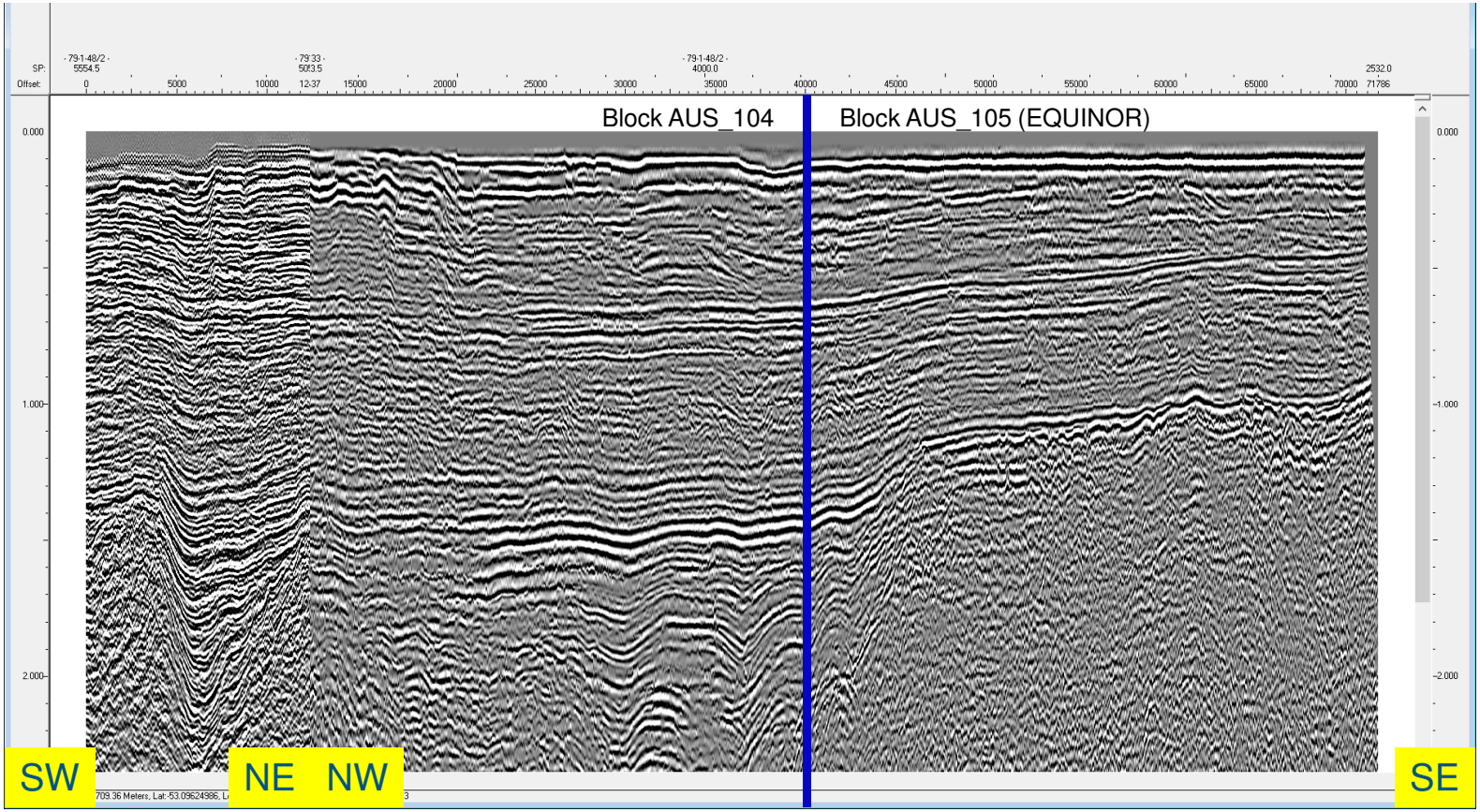
- Proven reservoir sands in the various Springhill FM units – some syn-rift Tobifera reservoir sands onshore

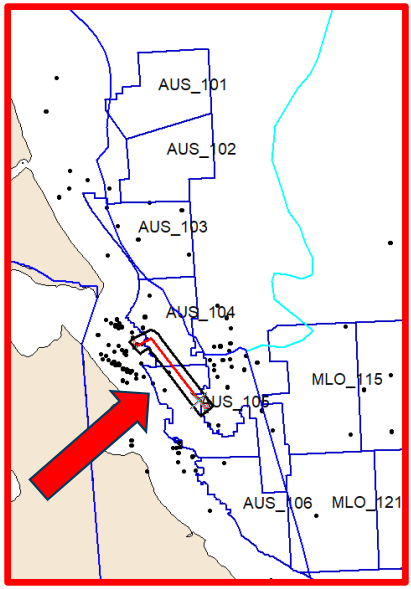
- Seal: Intra-formational seals

- Structural, stratigraphic and combination traps: explored by previous drilling and yet to be drilled

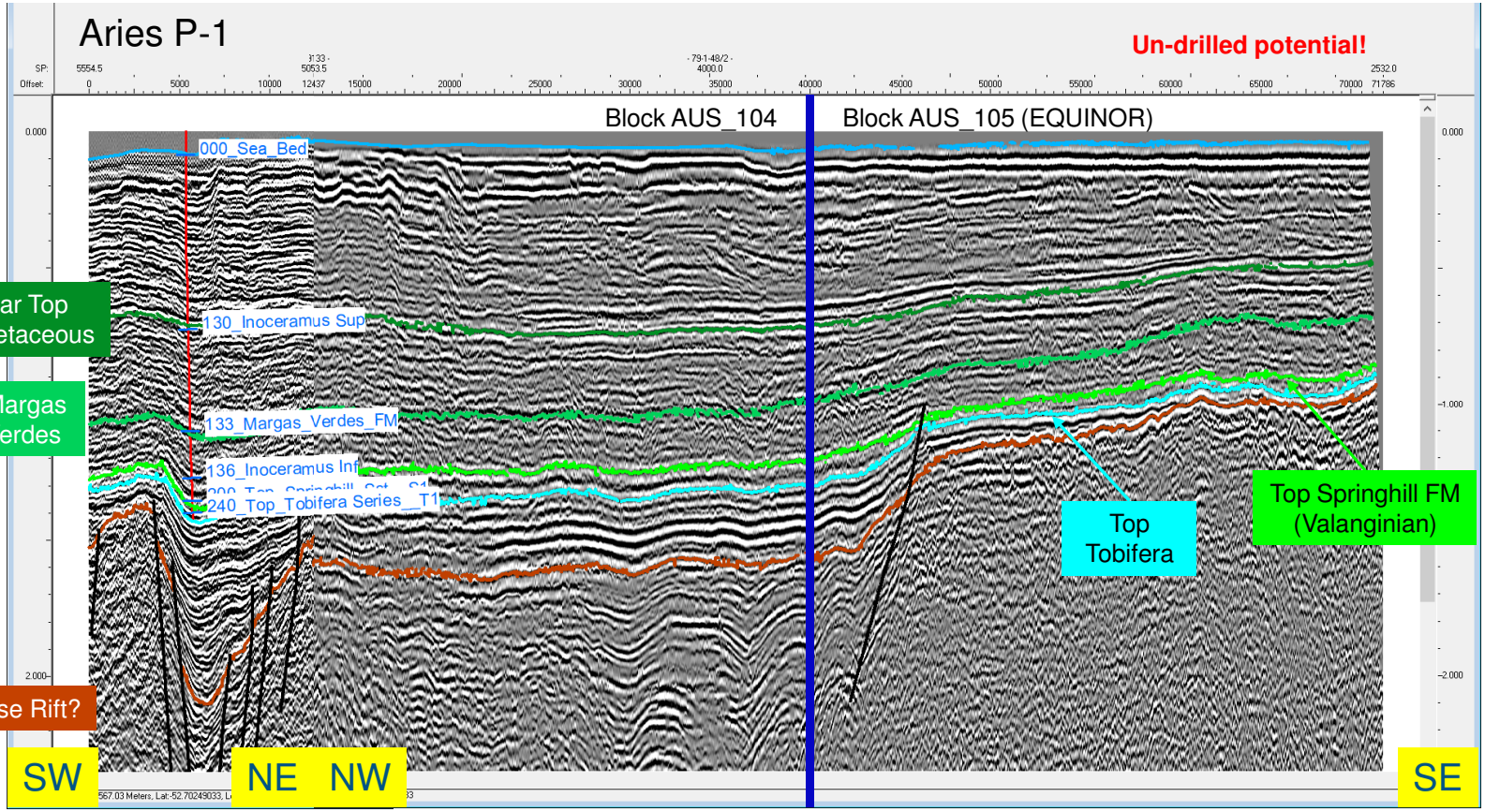
Austral Marina Basin – Block AUS_105

Block AUS_105
EQUINOR





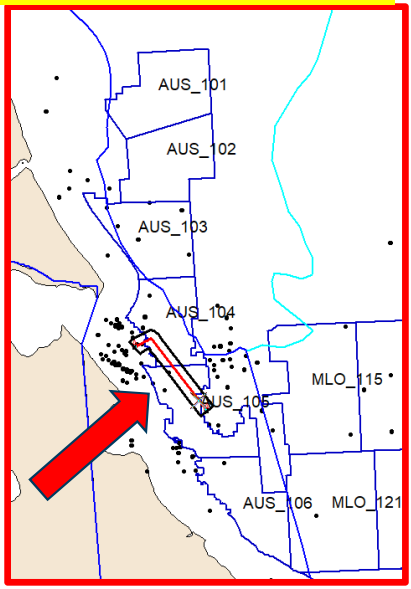
Austral Marina Basin – Block AUS_105

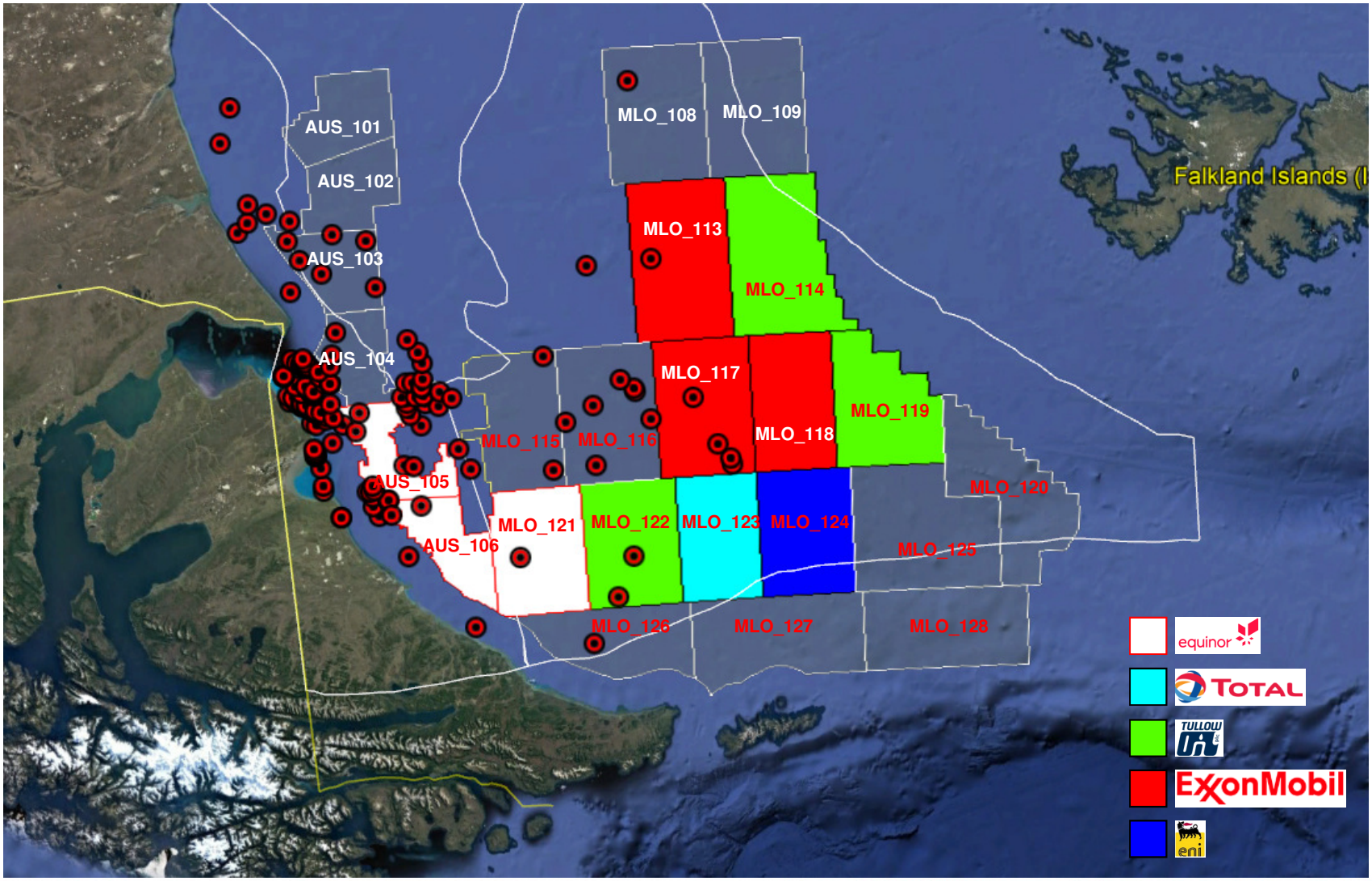


Block AUS_105 EQUINOR

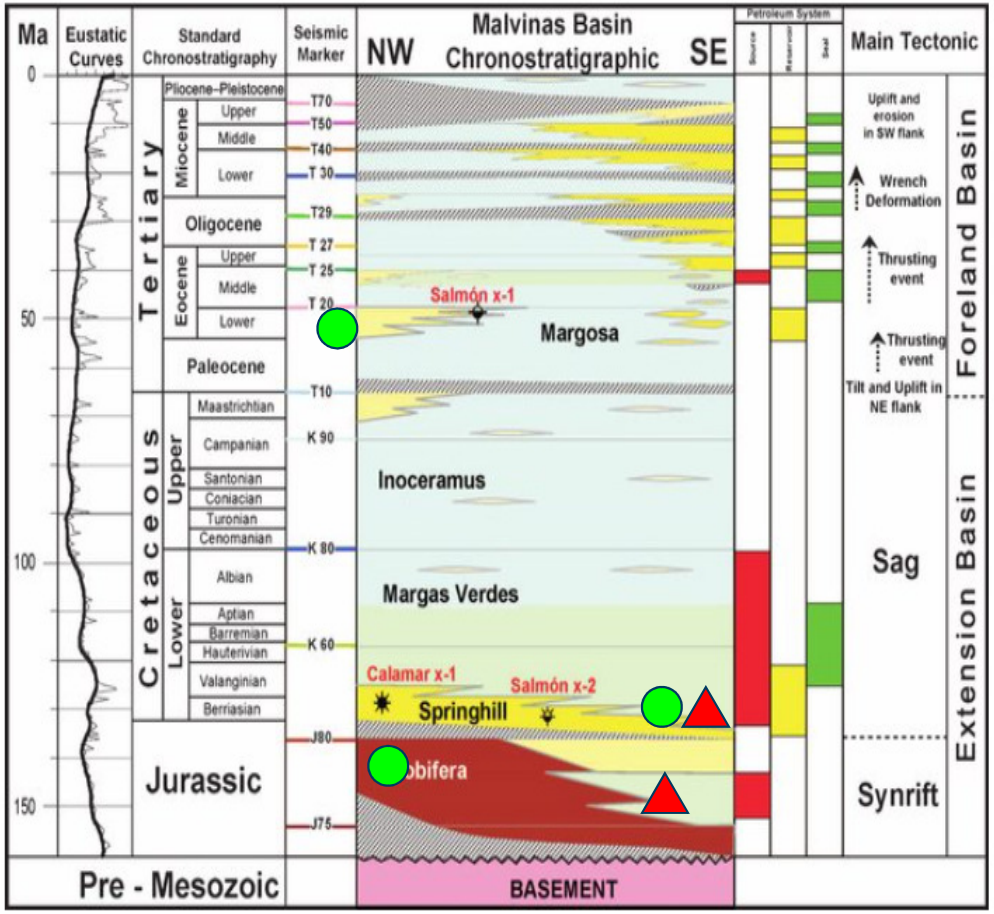
Aries P-1 gas discovery in Springhill Formation sands at 1500m TVDSS.

Obvious structural target in Block 105 is the Springhill drape at circa 960m TVDSS over the basement high shown. Other more subtle leads also exist.





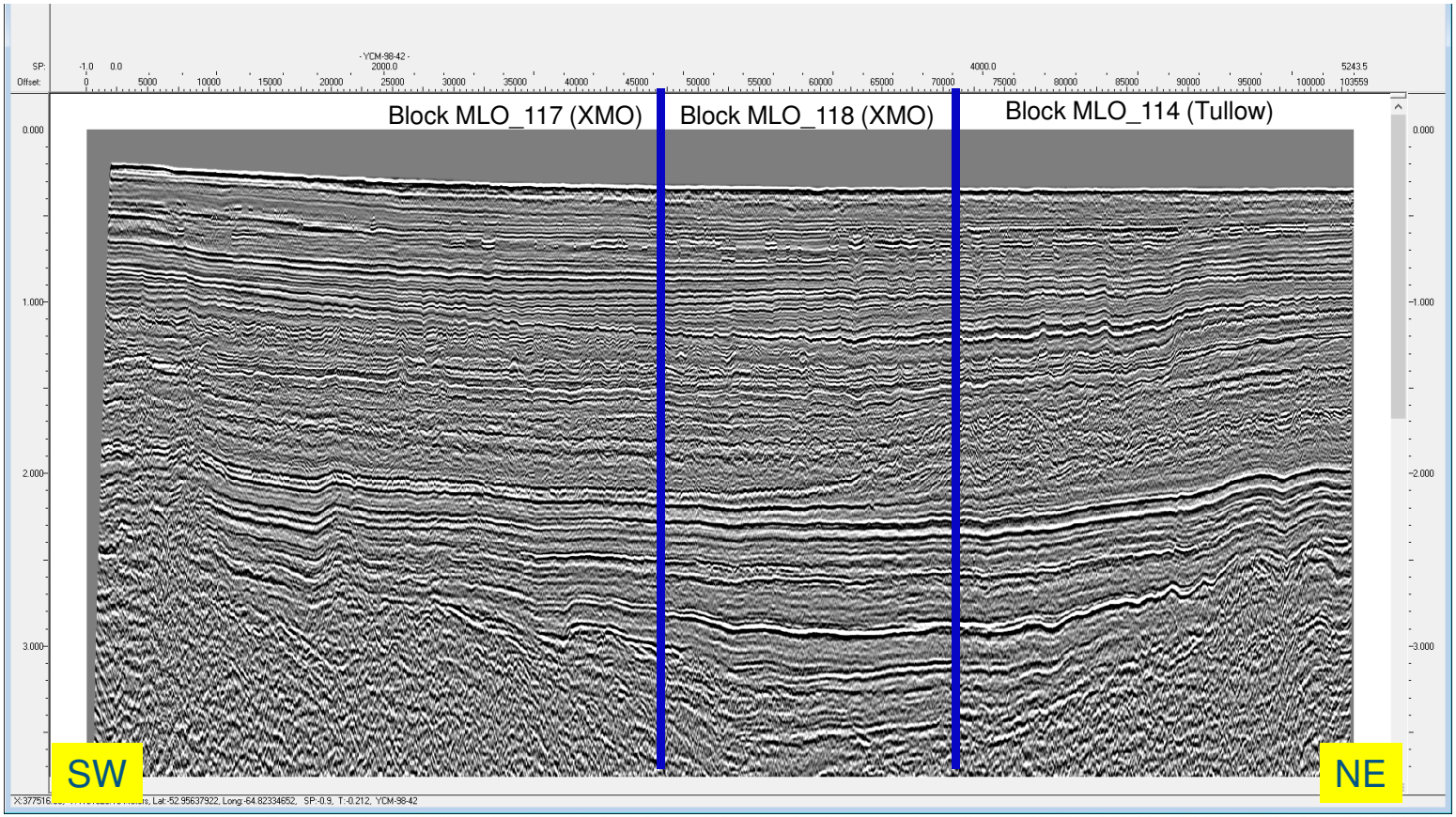
Cuenca Malvinas Occidental

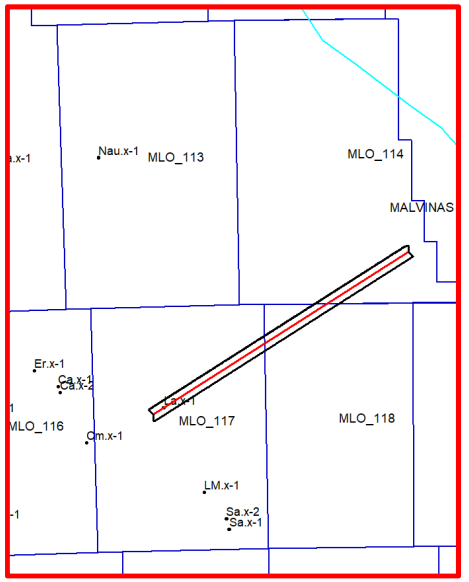


Strat chart: Vayssaire (2012)

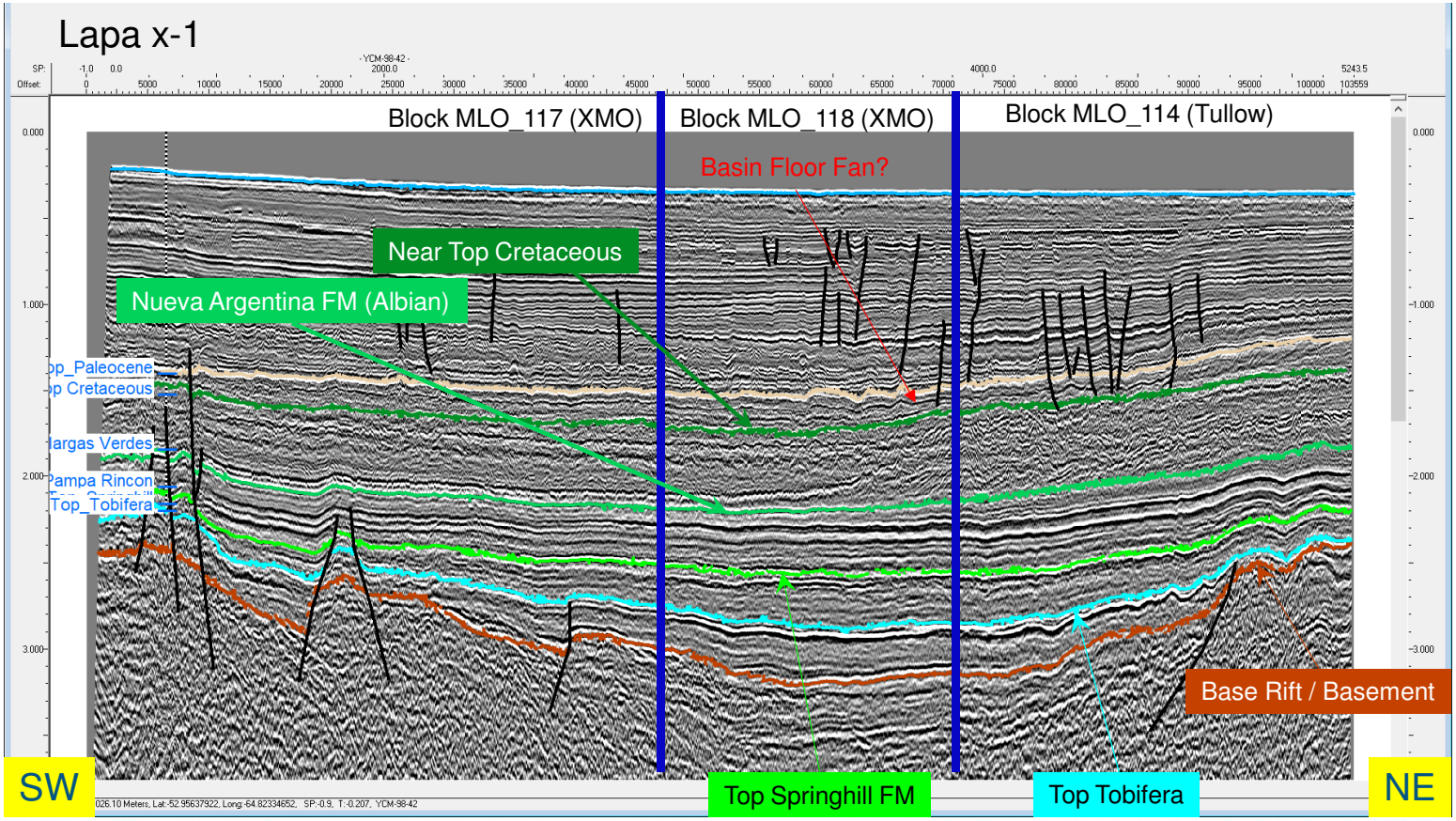
- No active production in Western Malvinas Basin
- Oil, condensate and gas in Salmon wells and Calamar x-1 proves active petroleum system in syn-rift sequence
- Proven (▲) source rocks occur within the Lower Inoceramus / Springhill Formation and (onshore) within the syn-rift Tobifera shales
- Potential in Margas Verdes & younger shales
- Potential reservoir sands throughout. Proven reservoir sands (●) in fluvial-alluvial Springhill FM (and Eocene turbidite sands)
- Seal: Intra-formational seals
- Structural and combination traps: explored by previous drilling and yet to be drilled
- Well failures: Insufficient charge, failure to charge

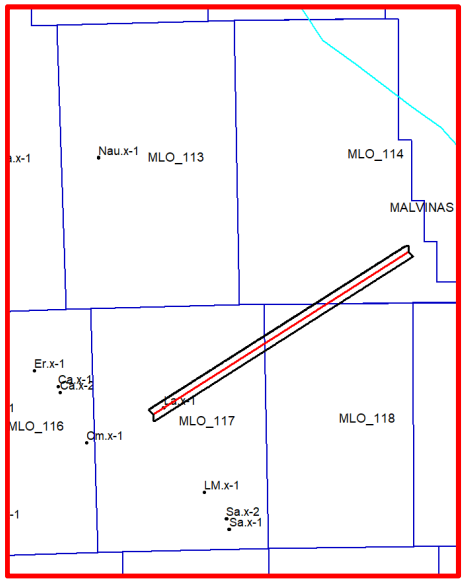
Cuenca Malvinas Occidental –XMO & Tullow blocks





Cuenca Malvinas Occidental –XMO & Tullow blocks



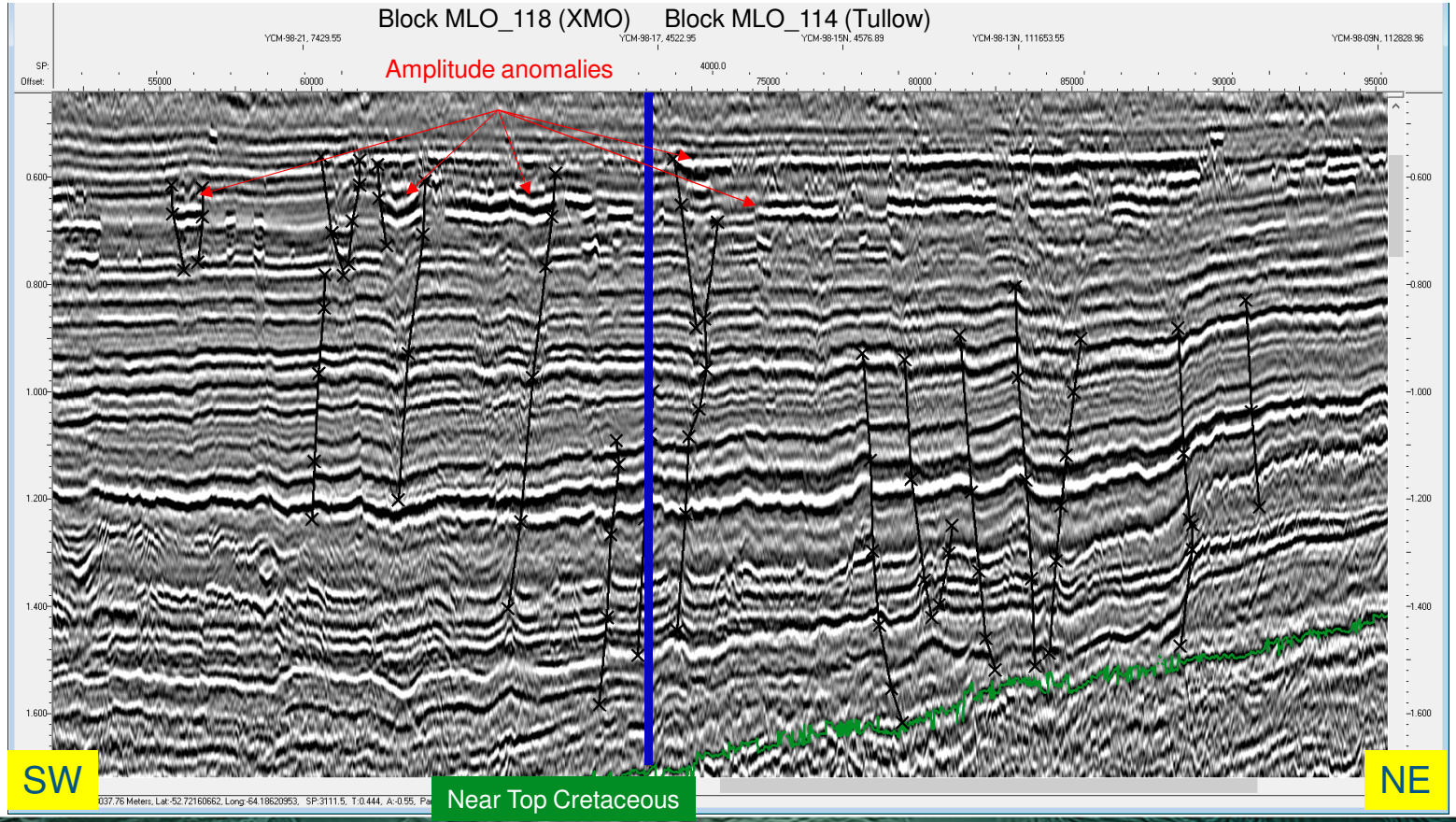


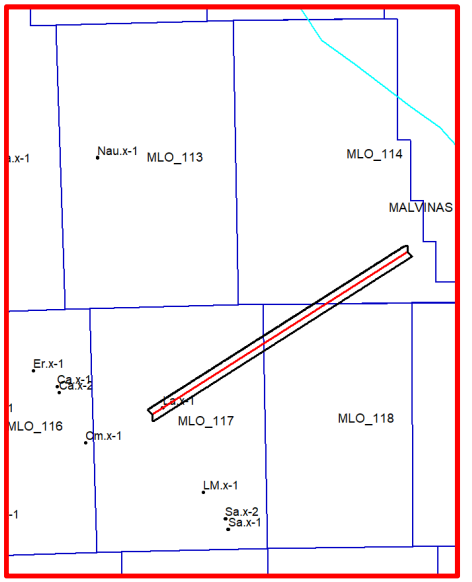
Lapa x-1 drilled by ESSO in 1982
Well drilled on a fault-bounded high.
1º objective: Springhill FM sandstones
Other targets:
To test for Paleocene ssts.
Evaluate shale source rock potential
Well was P&A dry.

Features of interest
4WDCs underneath the large fan complex to NE are structurally similar to the Lapa prospect

Association of minor (polygonal?) faults and amplitude anomalies in 0 ~ 1 secs

Cuenca Malvinas Occidental –XMO & Tullow blocks





- Association between polygonal faults and amplitude anomalies in 0 ~ 1 secs.
- Proof of active petroleum system; sourced either from Mid Cretaceous shales or Tobifera?

Summary

- Northern Argentine Basin is un-explored. Proven syn-rift petroleum system up-dip in the Colorado Marina Basin, potentially additional systems down-dip?
- Austral Marina Basin has proven syn-rift and sag-phase petroleum systems. Blocks AUS-105 and AUS-106 are relatively little explored by comparison with the more inboard producing areas.
- Malvinas Basin has same proven syn-rift and sag-phase petroleum systems, with mix of structural, stratigraphic and combination traps. Perception that the basin is undercharged.
- Geochemistry program will map seep areas; identifying the active petroleum systems and potential prospect/lead areas.
- High resolution 3D seismic to accurately trap geometries and identify hydrocarbon presence

Thank you

Cian O'Reilly

713-860-2100

cian.oreilly@tgs.com