

Exploration Trends in South America

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Areas of Exploration in Latin America

Caribbean Basins

North Atlantic Basins

Intracratonic Basins

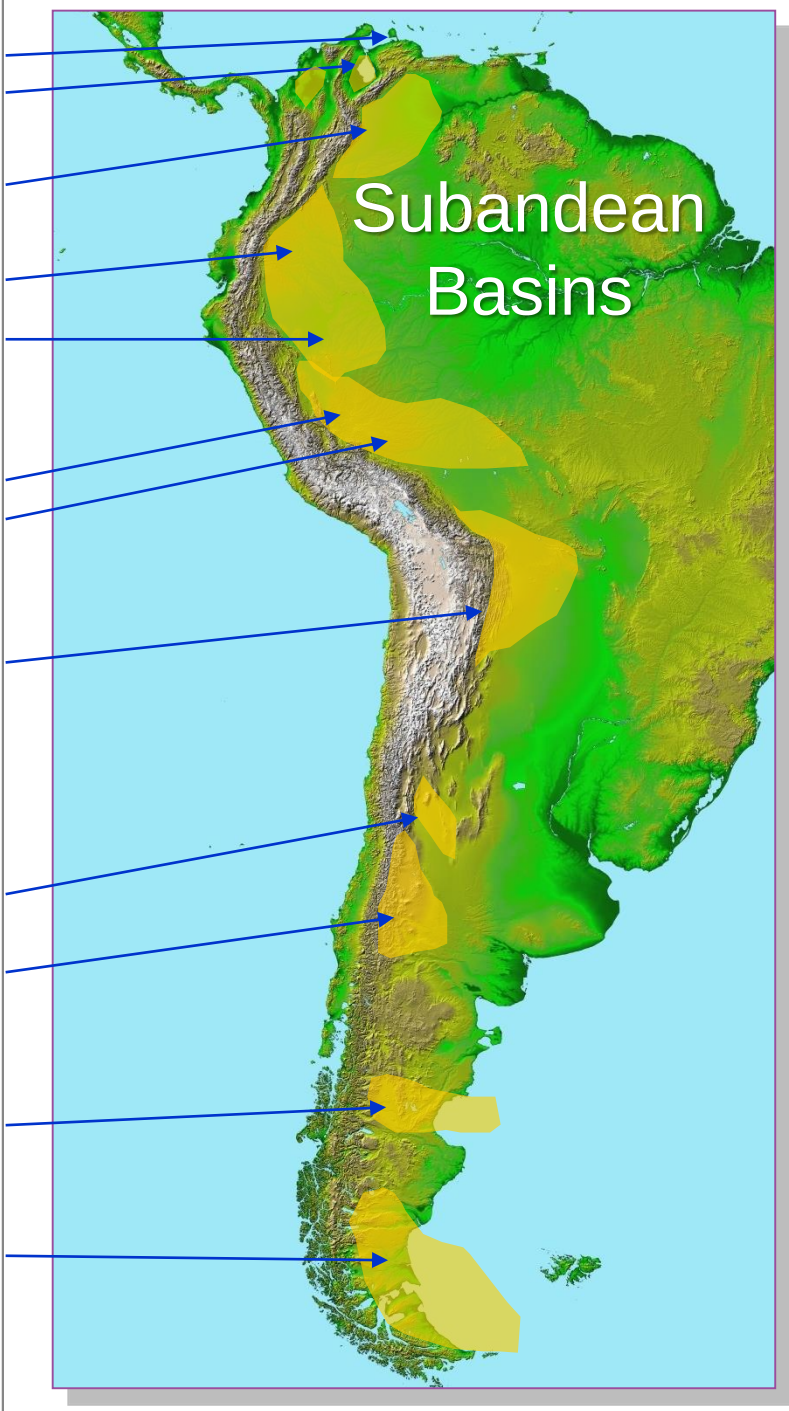
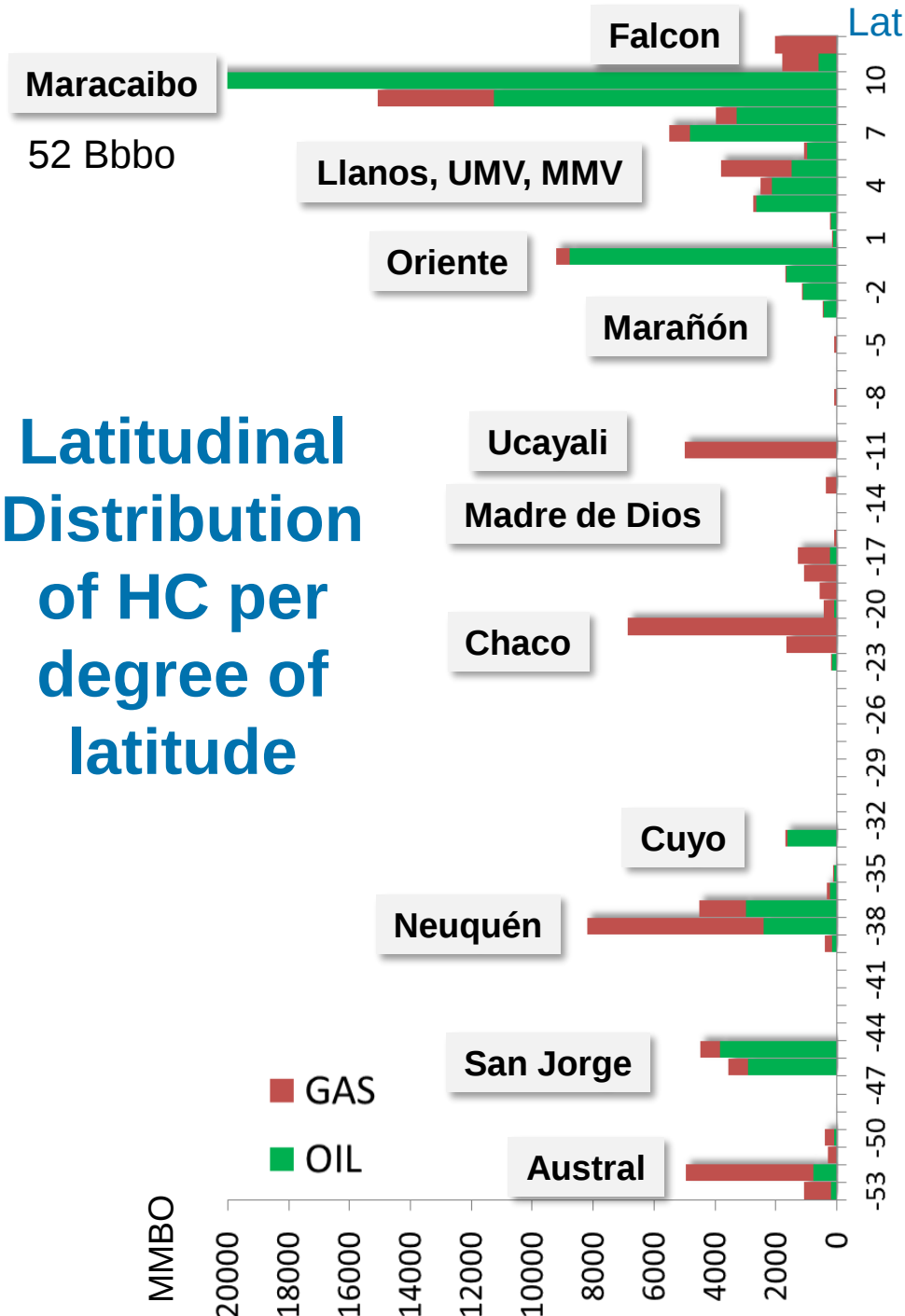
Subandean Basins

Brazilian Atlantic Basins

South Atlantic Basins



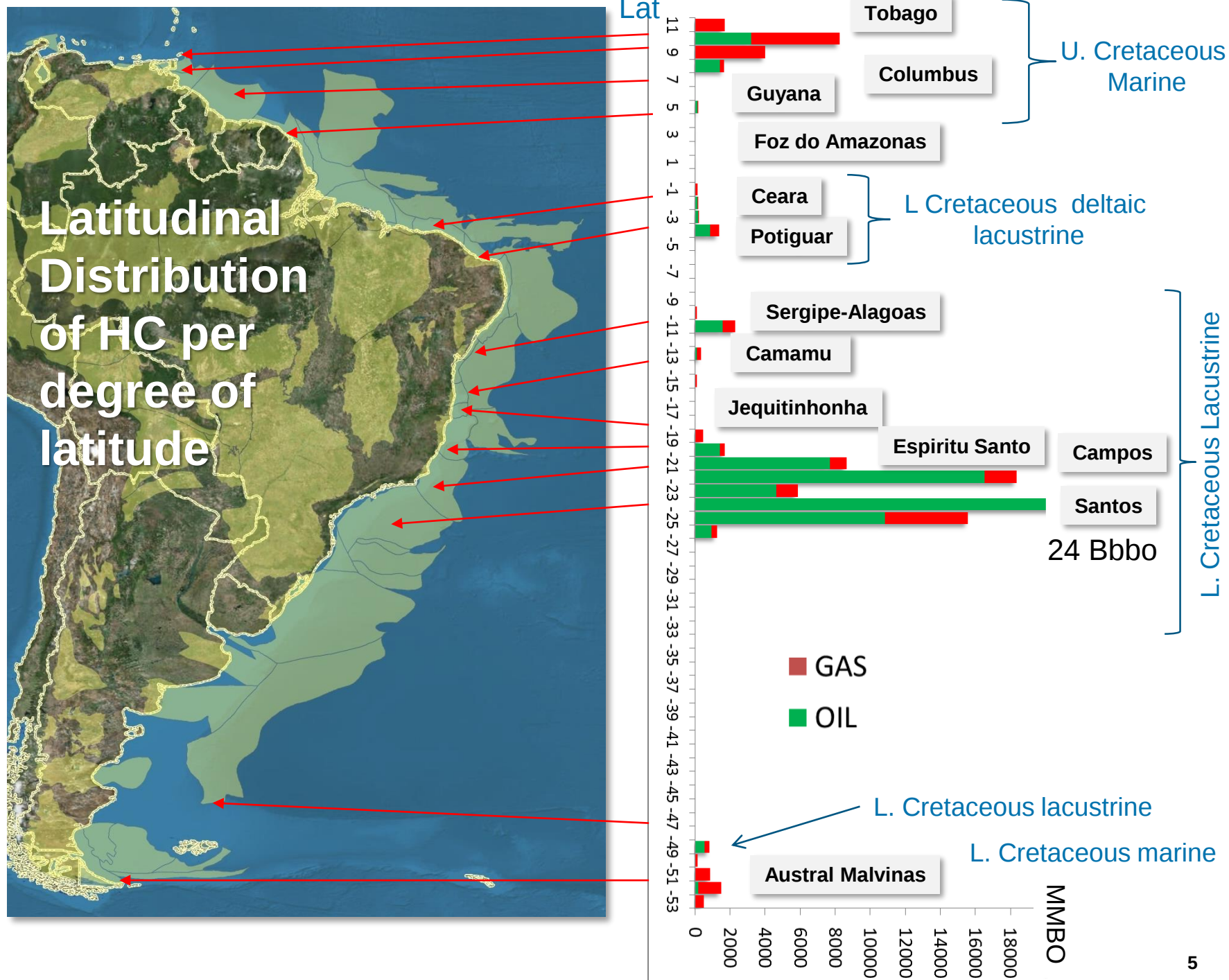
Latitudinal Distribution of HC per degree of latitude



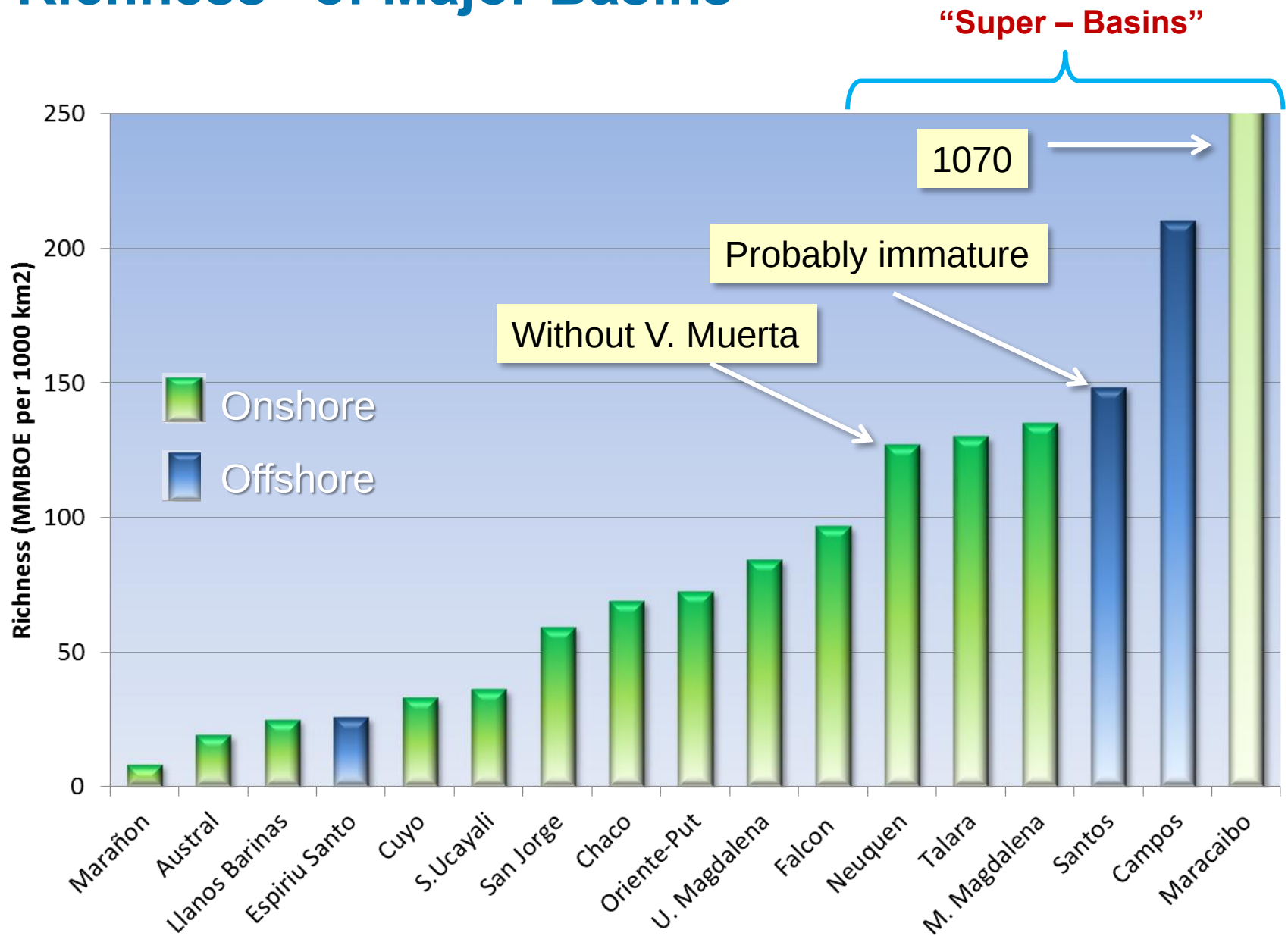
Age of main Source Rocks for the Subandean Basins



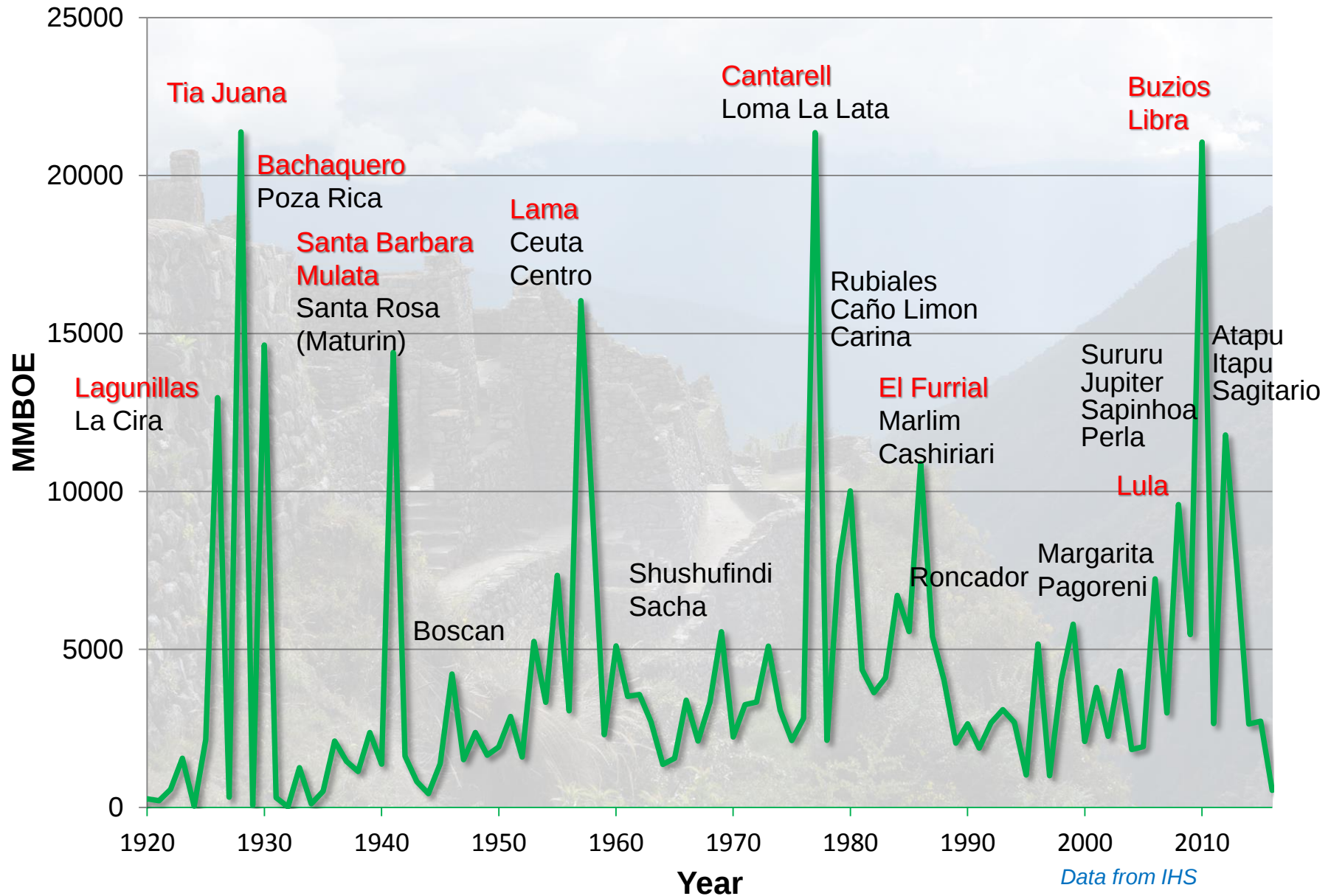
- Tertiary
- Cretaceous
- Tr-Jurassic
- Cb -Permian
- Devonian
- Silurian



“Richness” of Major Basins

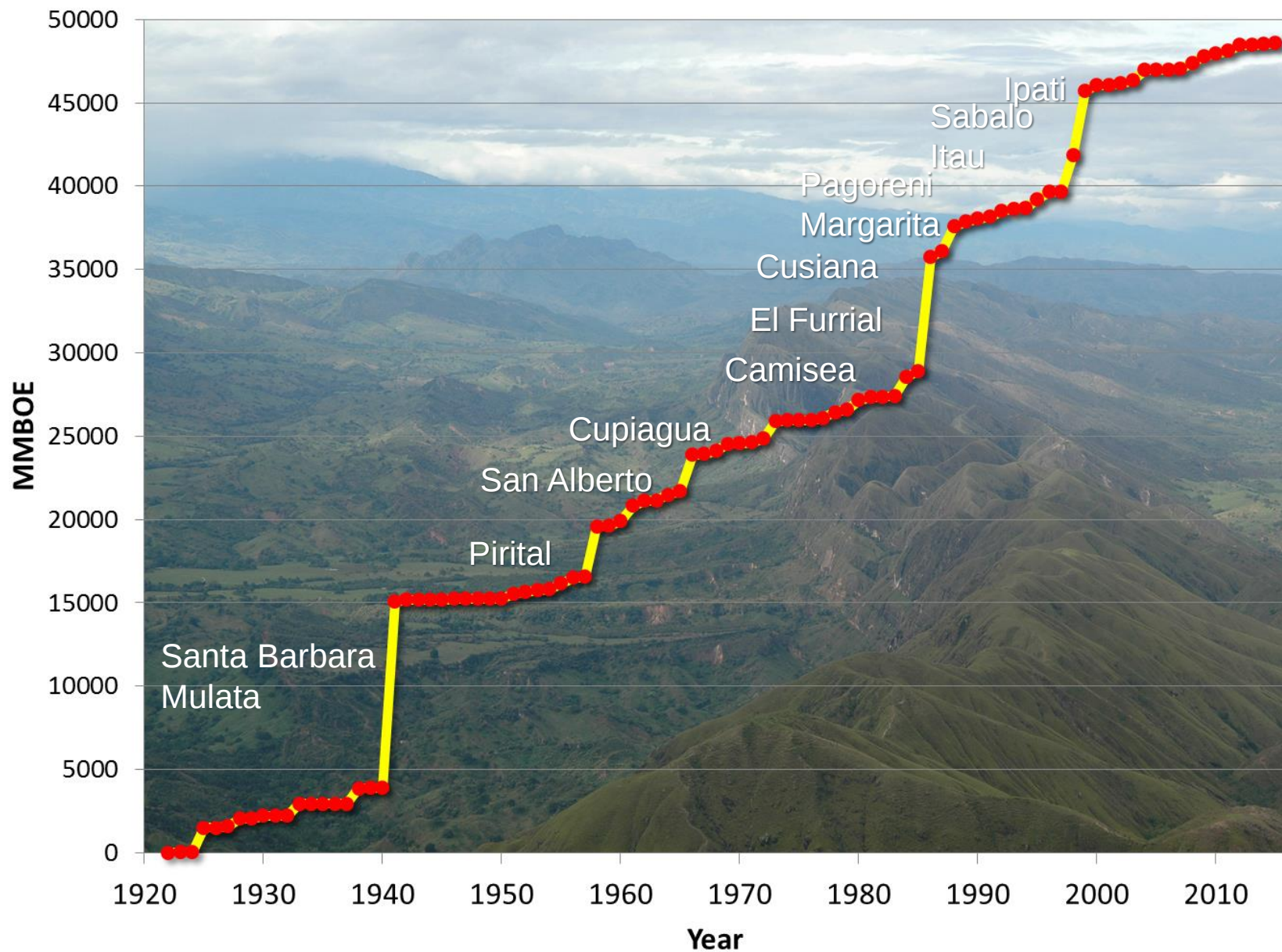


Latin American Discoveries – Last 100 years

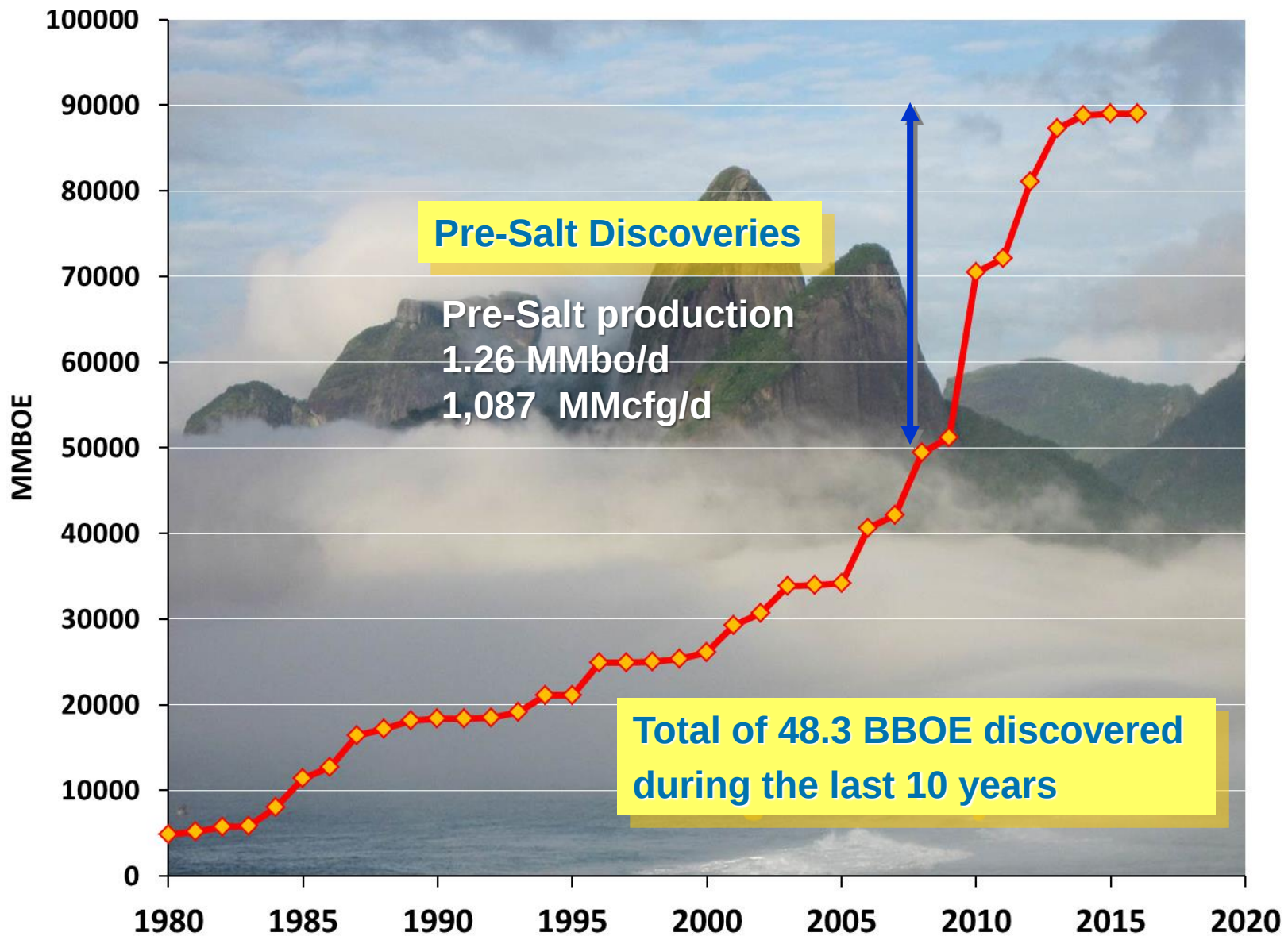


Orinoco Belt excluded

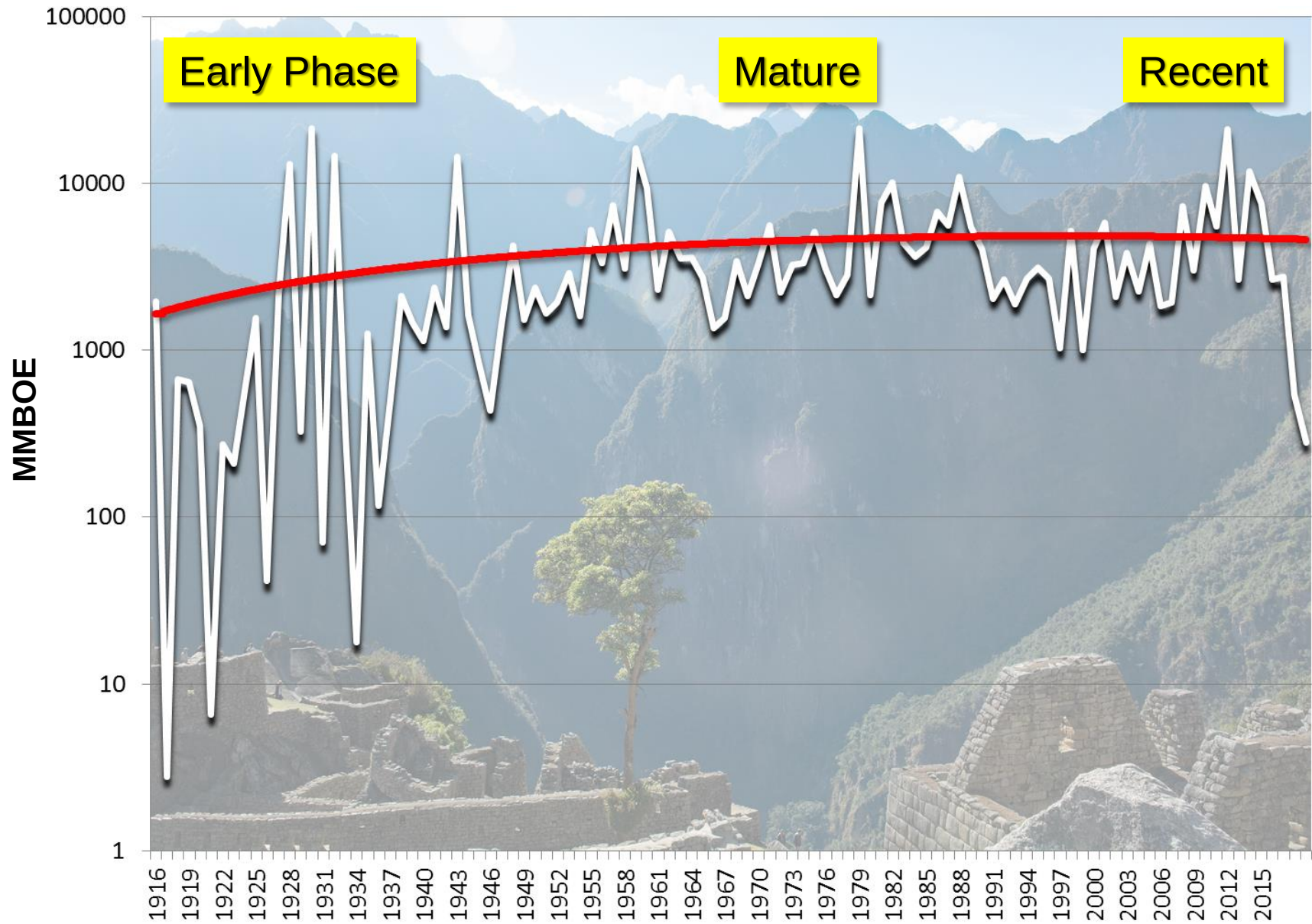
Discoveries in the Thrust Belt



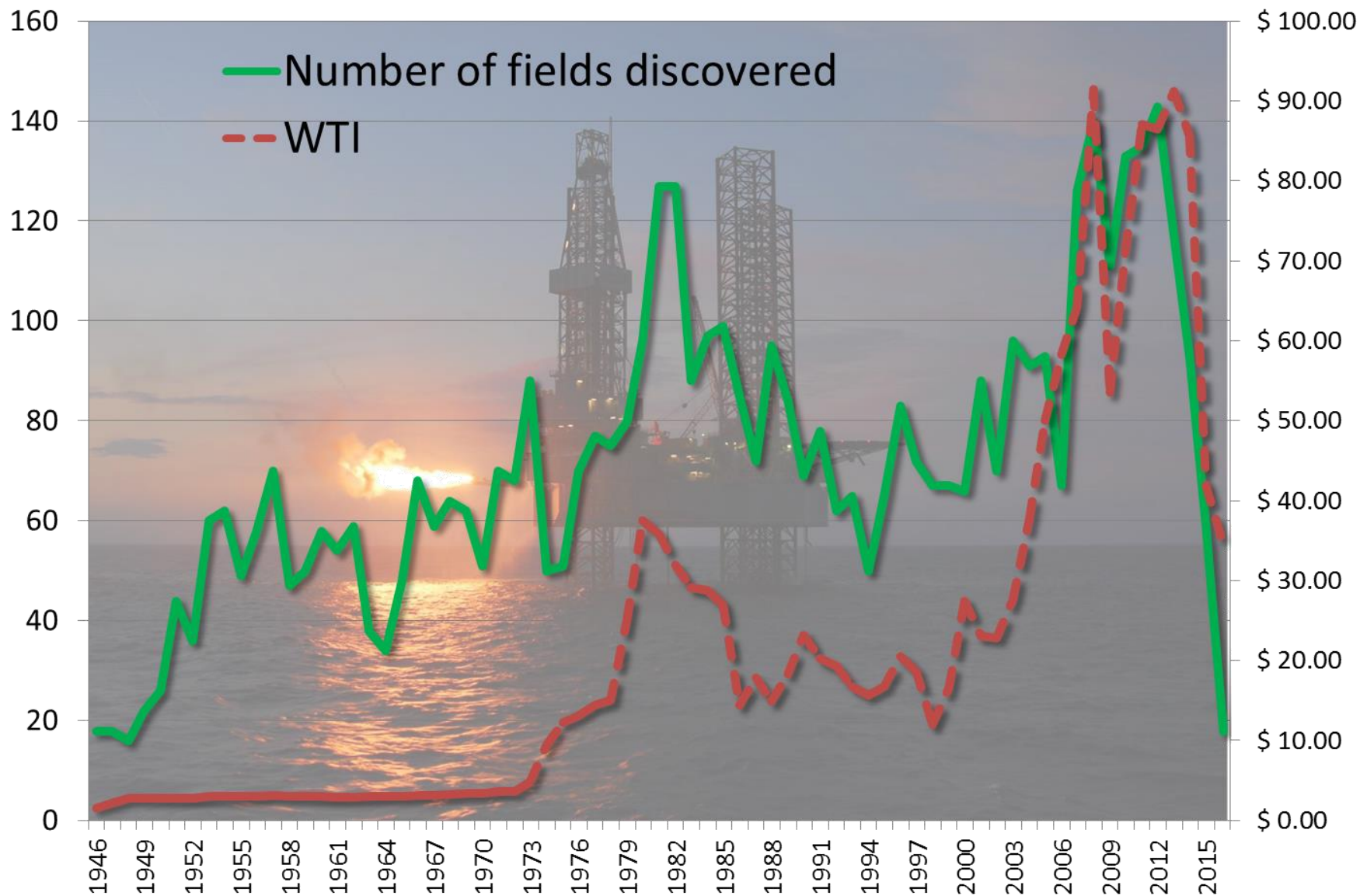
Creaming Curve Brazil Atlantic Basins



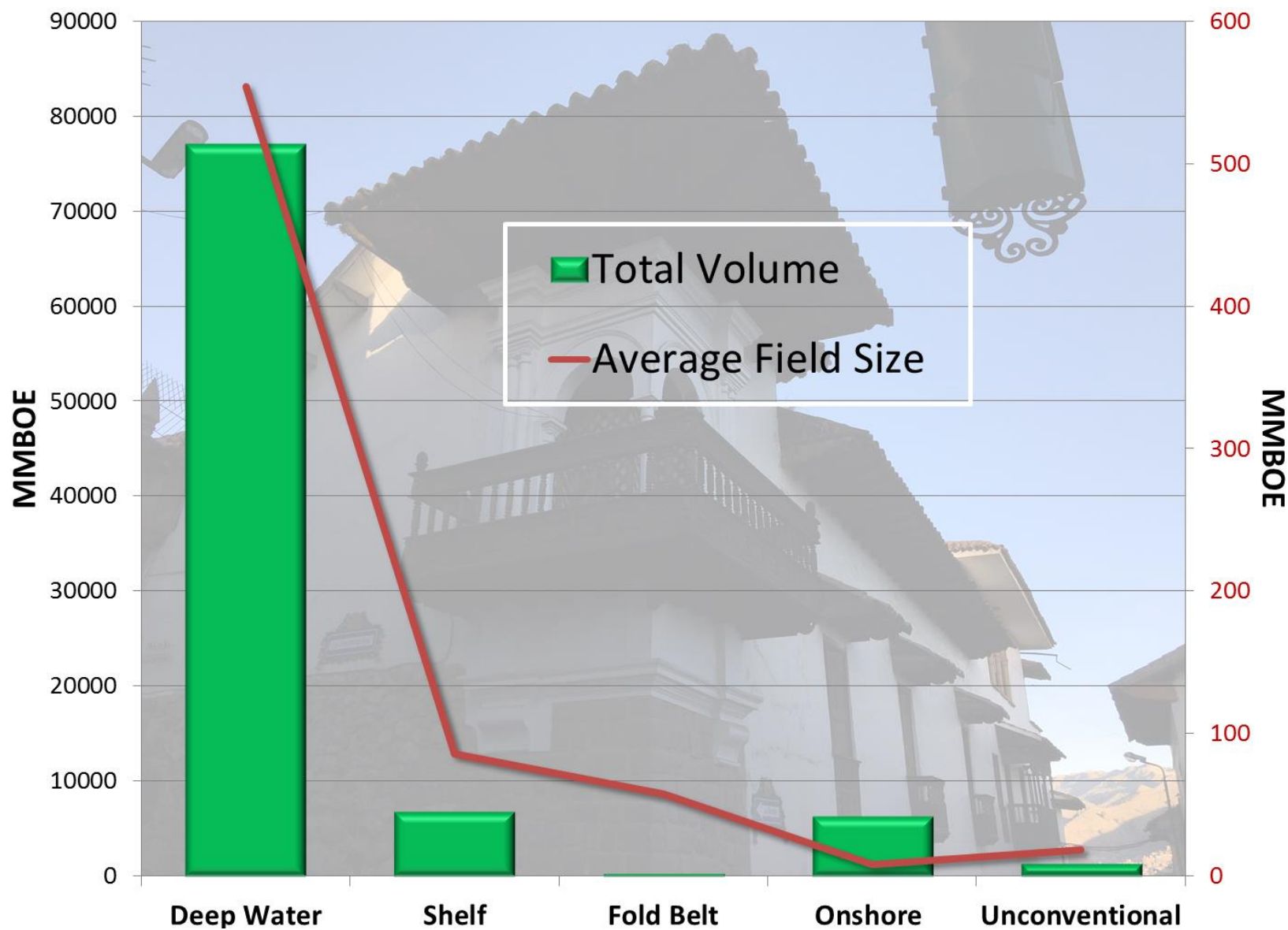
Latin American Discoveries – Last 100 years



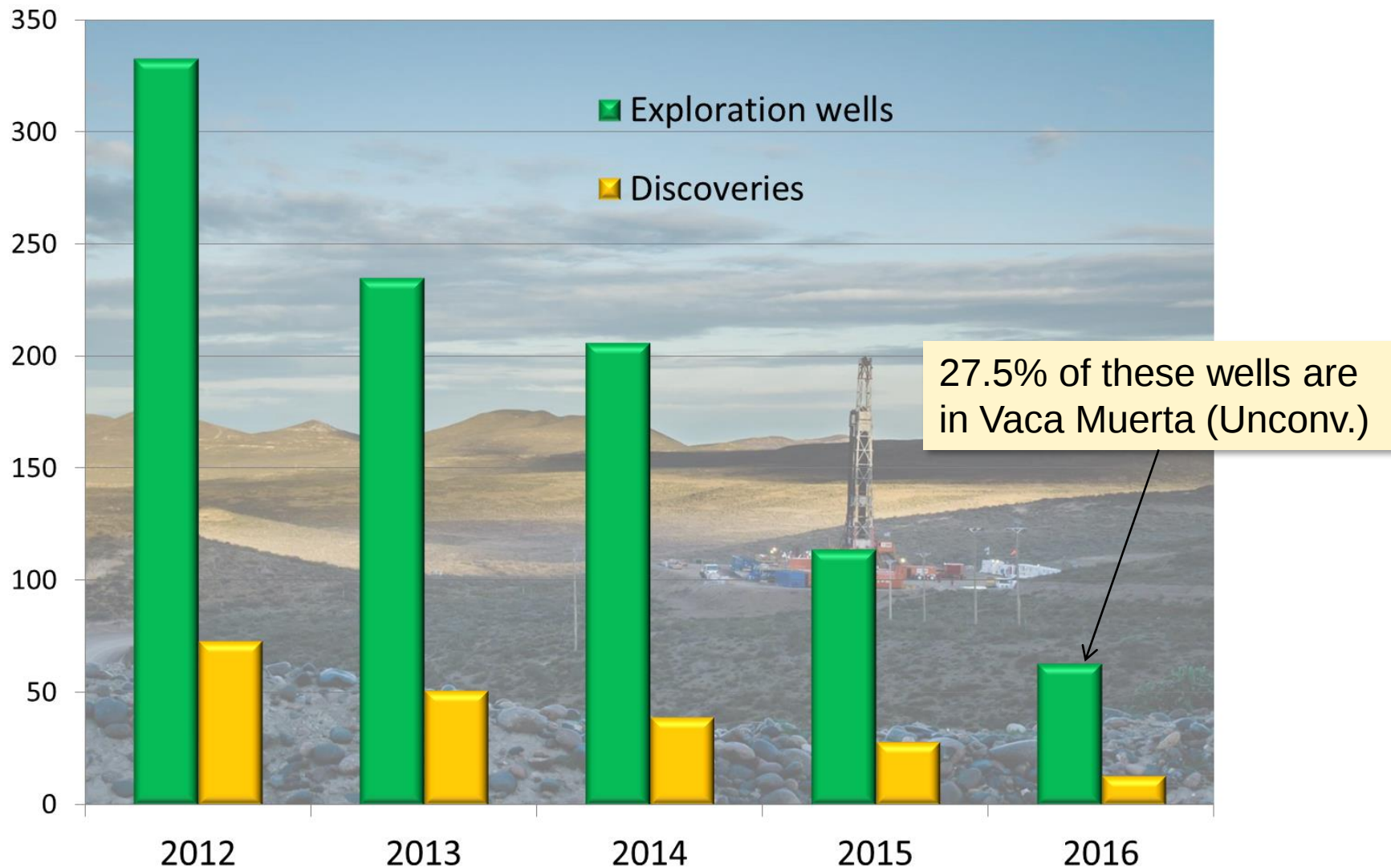
Number of Discoveries vs. WTI price



Discoveries during the last 10 years

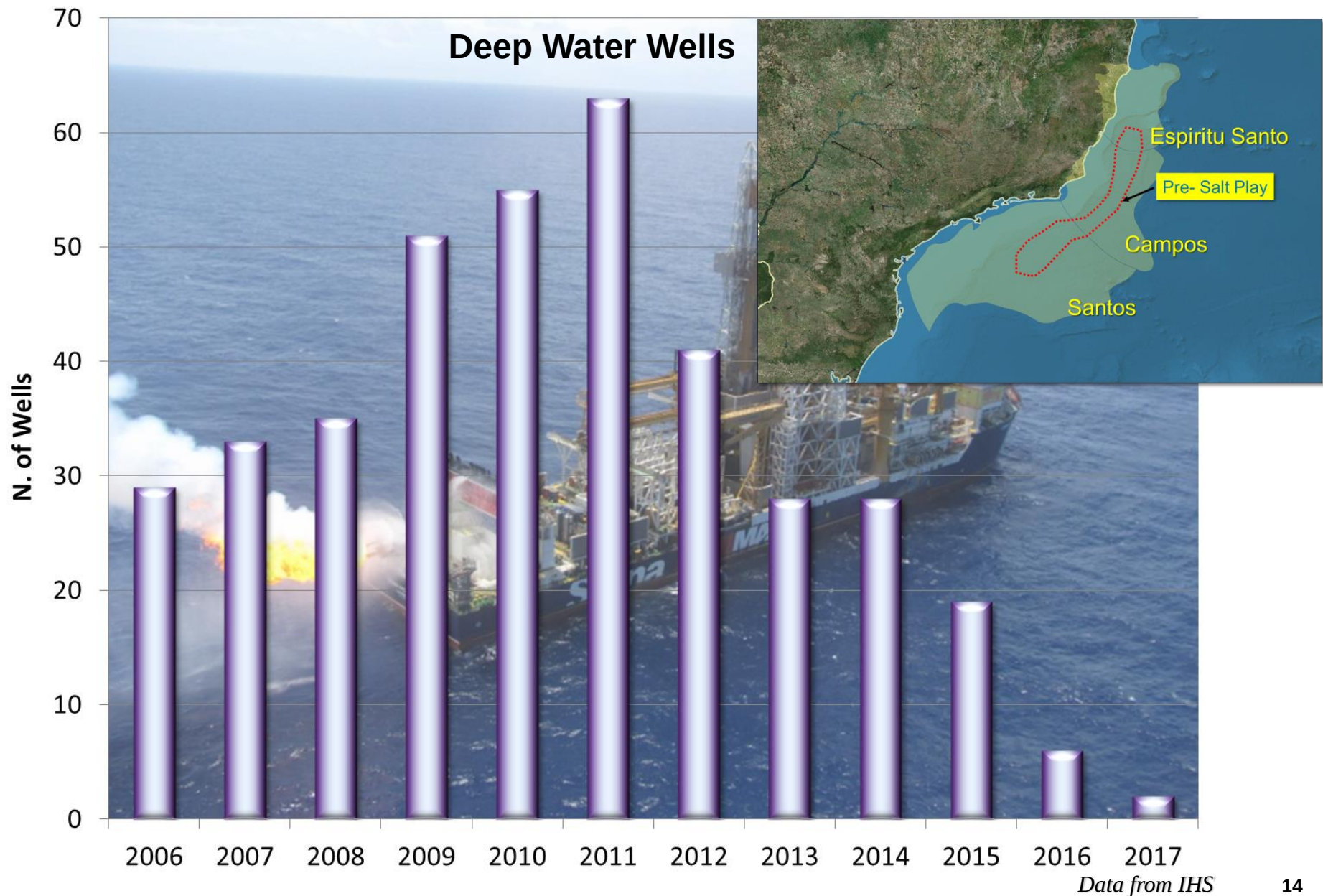


Recent Exploratory Activity in Latin America



Data from IHS

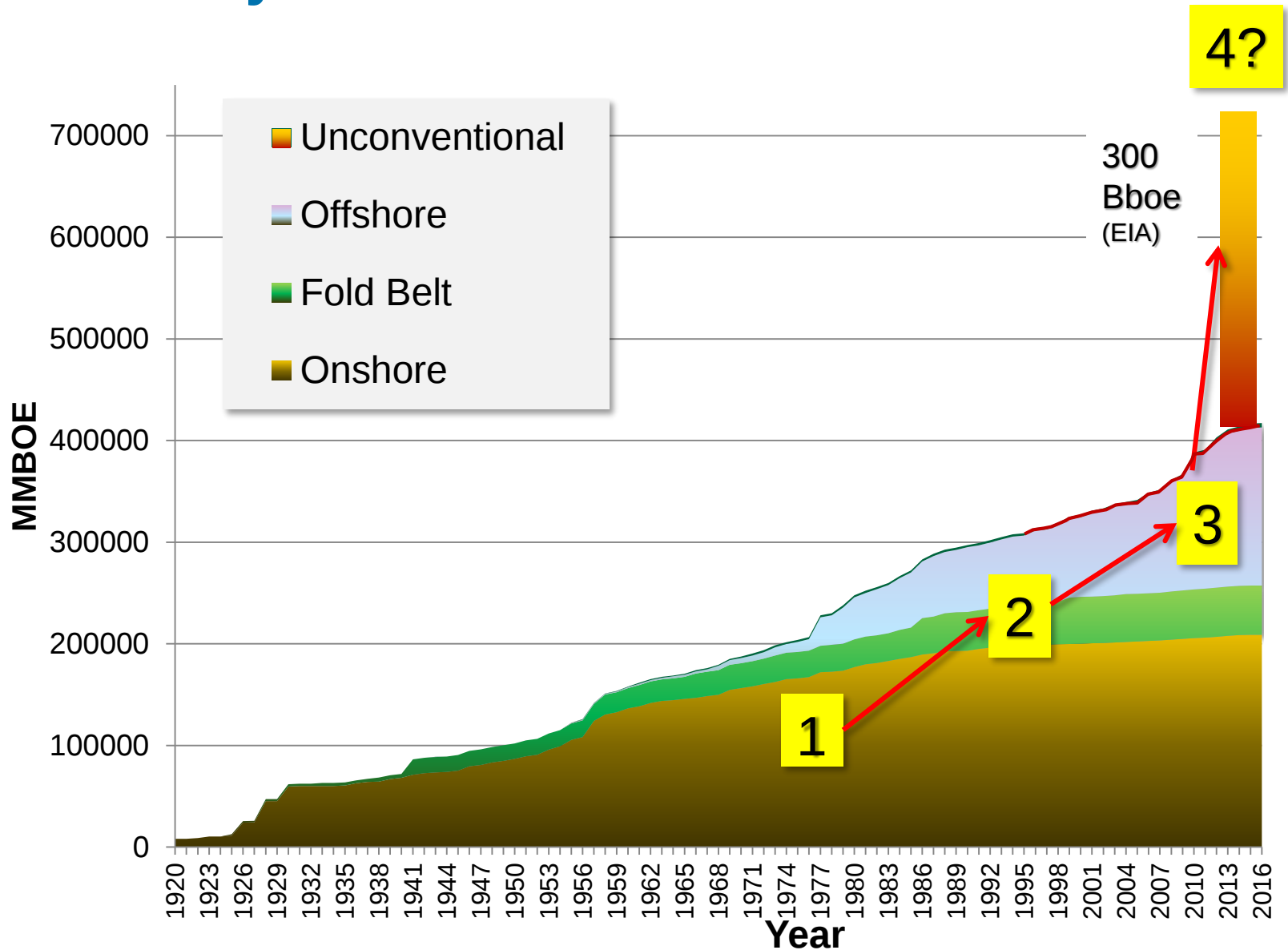
Recent Trends Brazil Atlantic Basins



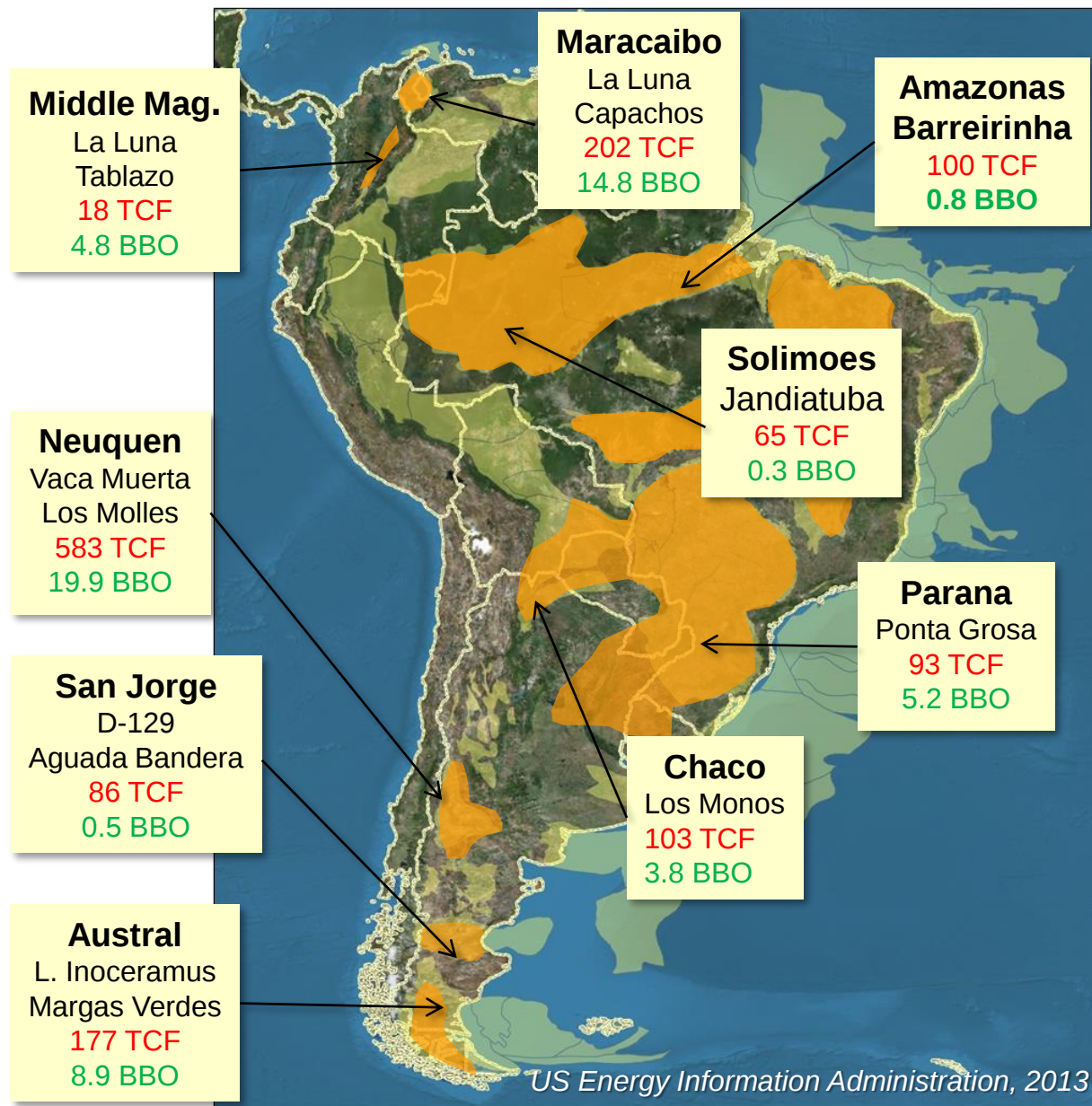
Trends Northern South America



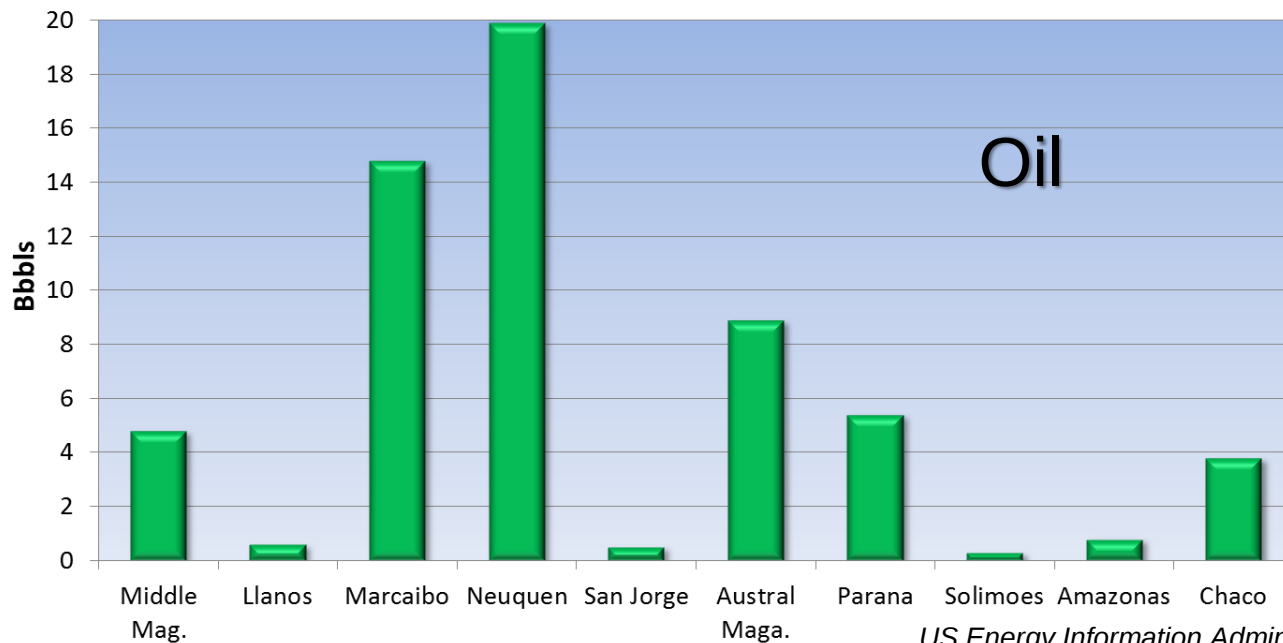
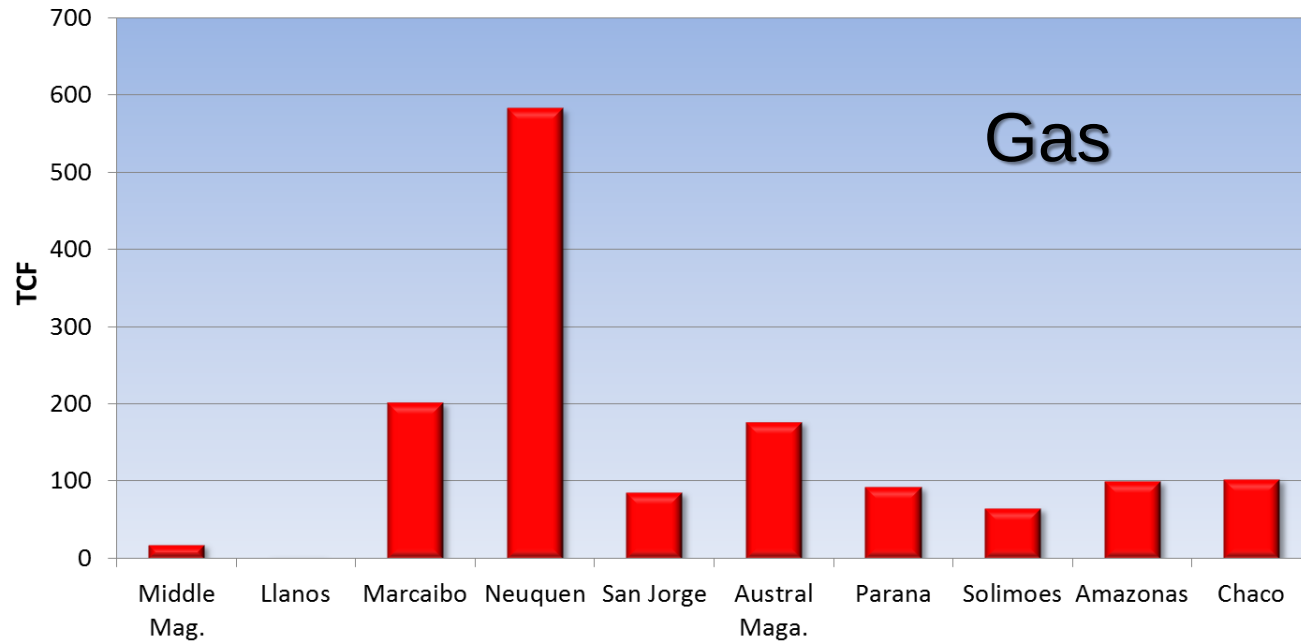
Cumulative Resources discovered during the last 100 years



Unconventional Potential Latin America



Technically Recoverable Unconventional Resources

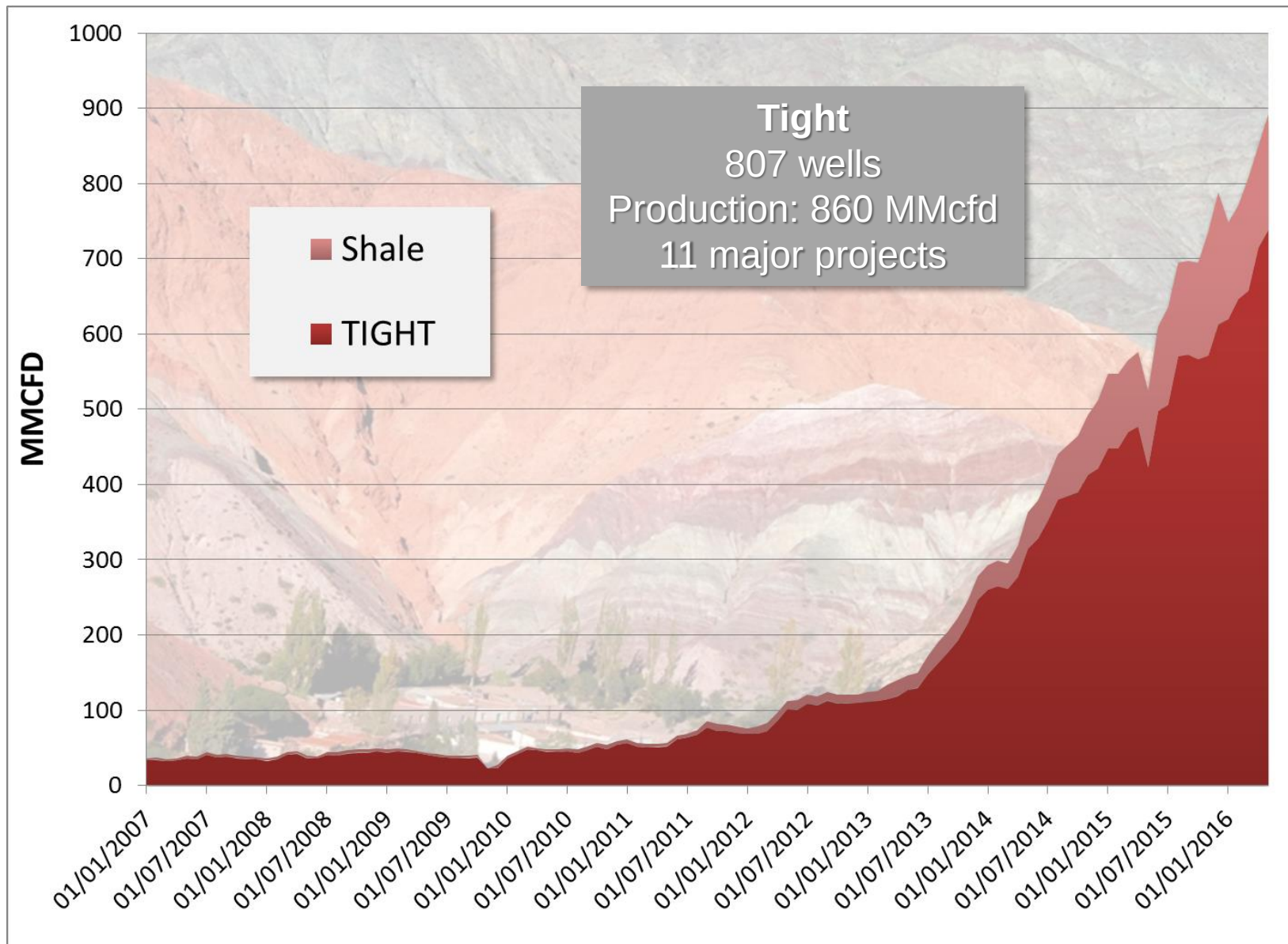


Unconventional Potential Neuquén Basin

- Tight Gas
- Vaca Muerta

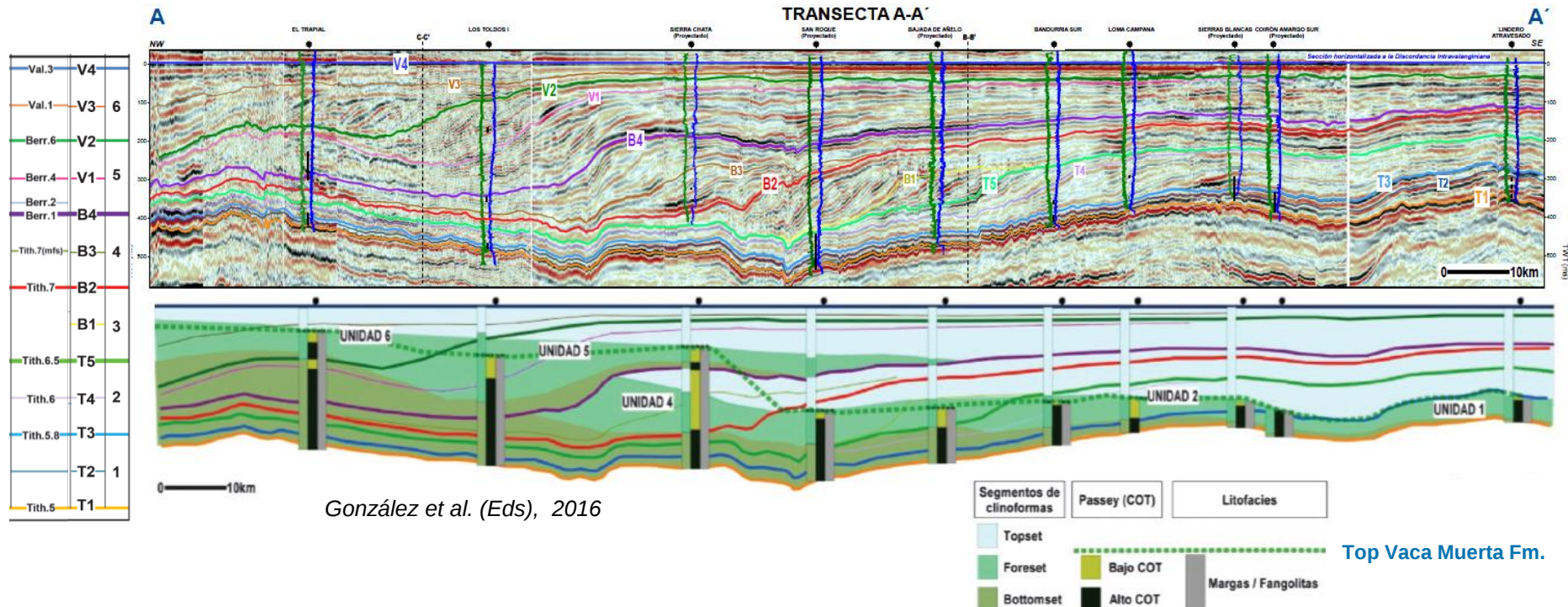
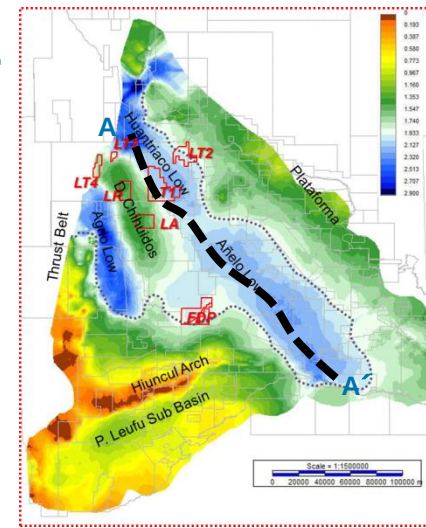


Tight and Shale Gas Production

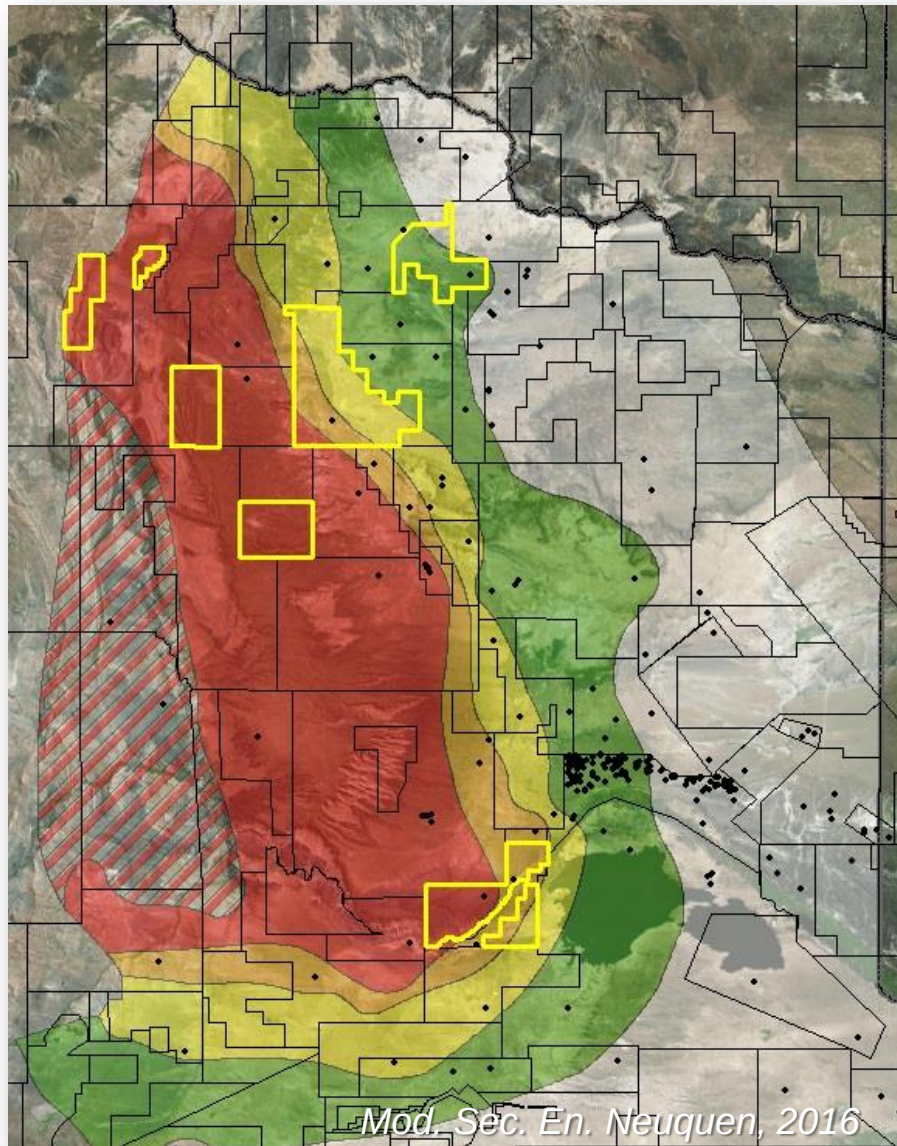


Neuquén Basin – Vaca Muerta

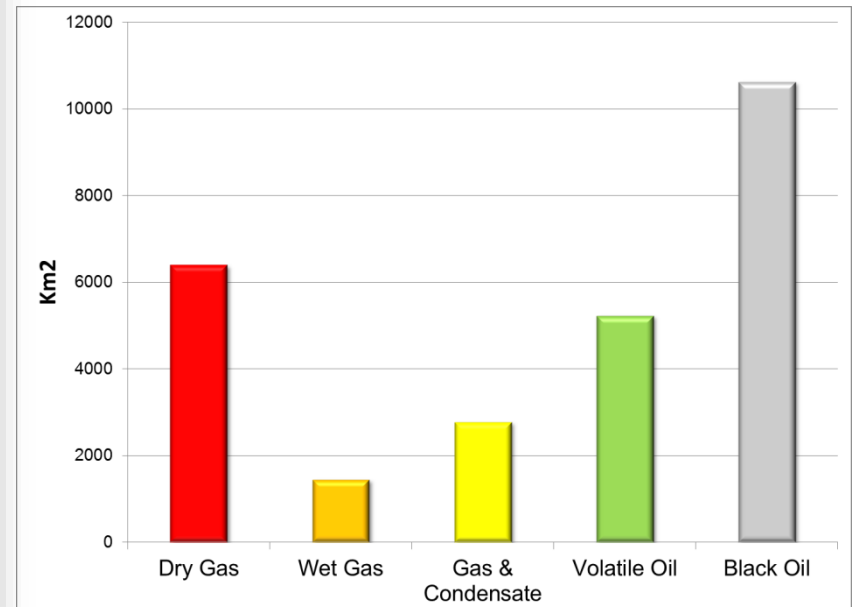
- Organic rich shales and marls
- Late Jurassic-Early Cretaceous (Tihonian-Berriasian)
- Deposited in a restricted marine platform



Vaca Muerta Maturity Zones Map



- Dry Gas Window
- Wet Gas Window
- Gas & Condensate
- Volatile Oil Window
- Black Oil Window



Vaca Muerta Productivity

- Best oil well = 1000 bbls/d
- Best gas well = 15.4 mmcf/d
- Current Oil Production = 37,000 bbls/d
- Current Gas Production = 182 MMcf/d

According to IHS Markit, the Vaca Muerta Play could produce **560,000 bpd of oil** and **6 bcf** of gas by 2040 (more than the current total production of Argentina)

Vaca Muerta Aspects

Below Ground Factors

- Size of Potential Reserves ↑
- Productivity ↑
- Well optimization →



Above Ground Factors

- Fiscal Regime – Prices ↑
- Land Access / operability ↑
- Workforce ↑
- Service Sector →
- Distribution network →
- Market ↑



Conclusions

- The collapse of the oil price has dramatically affected the exploration activity and hence the number of new discoveries during the last two years.
- Current “hot areas” are mostly located in the offshore: Pre-salt, Transform Margin, NW Colombia.
- Potential for heavy oil in stratigraphic traps in the Llanos Basin, but affected by low oil price. Important potential remains in the Thrust Belts.
- The unconventional resources could become the next source of value (“Fourth Wave”). However it still needs to be established if the Vaca Muerta potential can be replicated elsewhere in South America