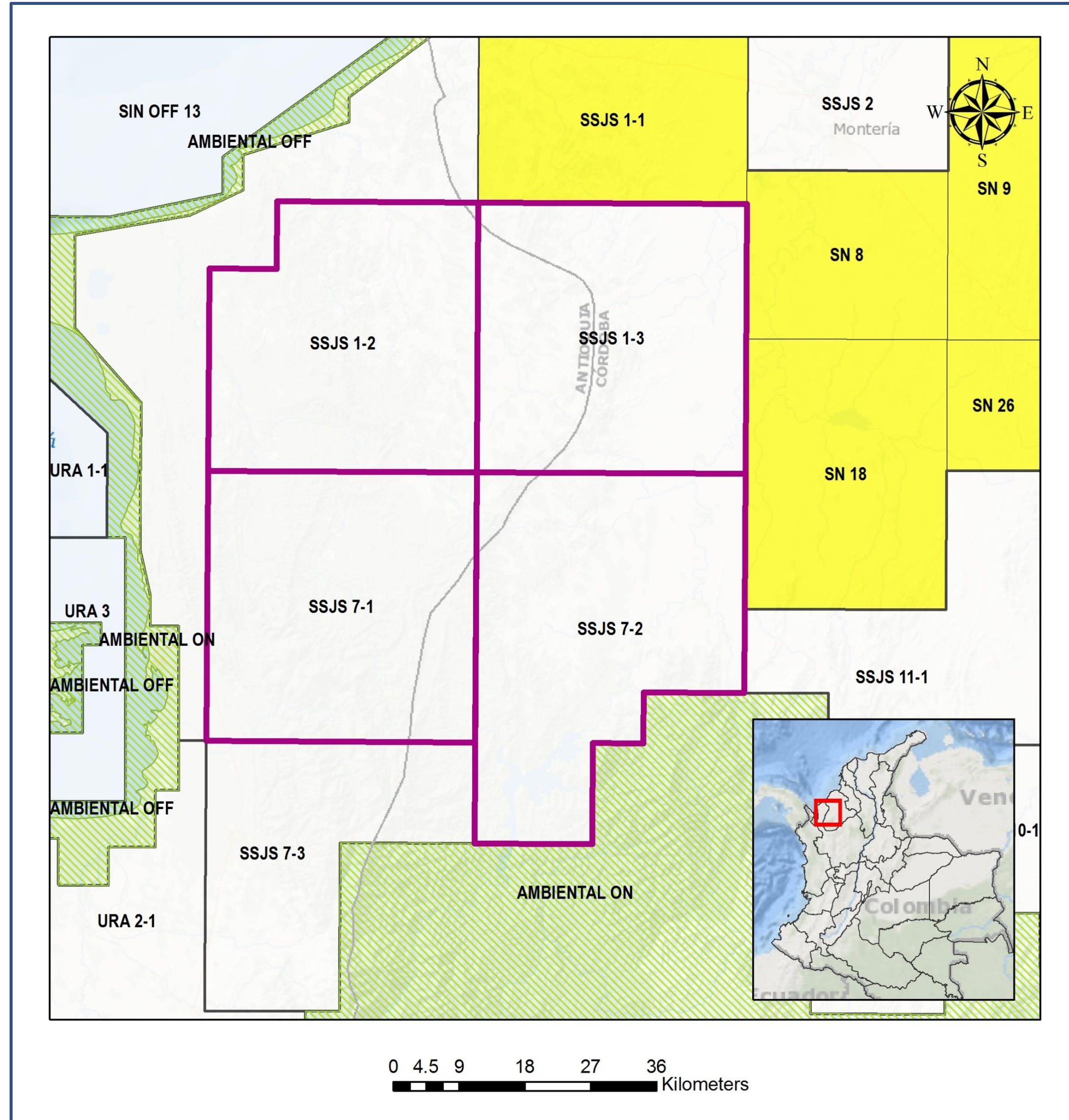


AREAS ADVERTISEMENT 2022

**Sinú – San Jacinto: SSJS 1-2, SSJS 1-3,
SSJS 7-1 & SSJS 7-2**

CONTENT

	Location
	History of Exploration
	Database
	Infrastructure
	Geological Framework
	Well Summary
	Seismic Interpretation
	Prospectivity
	Conclusions



Block Areas

- SSJS 1-2 (127.069 Ha).
- SSJS 1-3 (135.481Ha).
- SSJS 7-1 (135.656Ha).
- SSJS 7-2 (148.324 Ha).

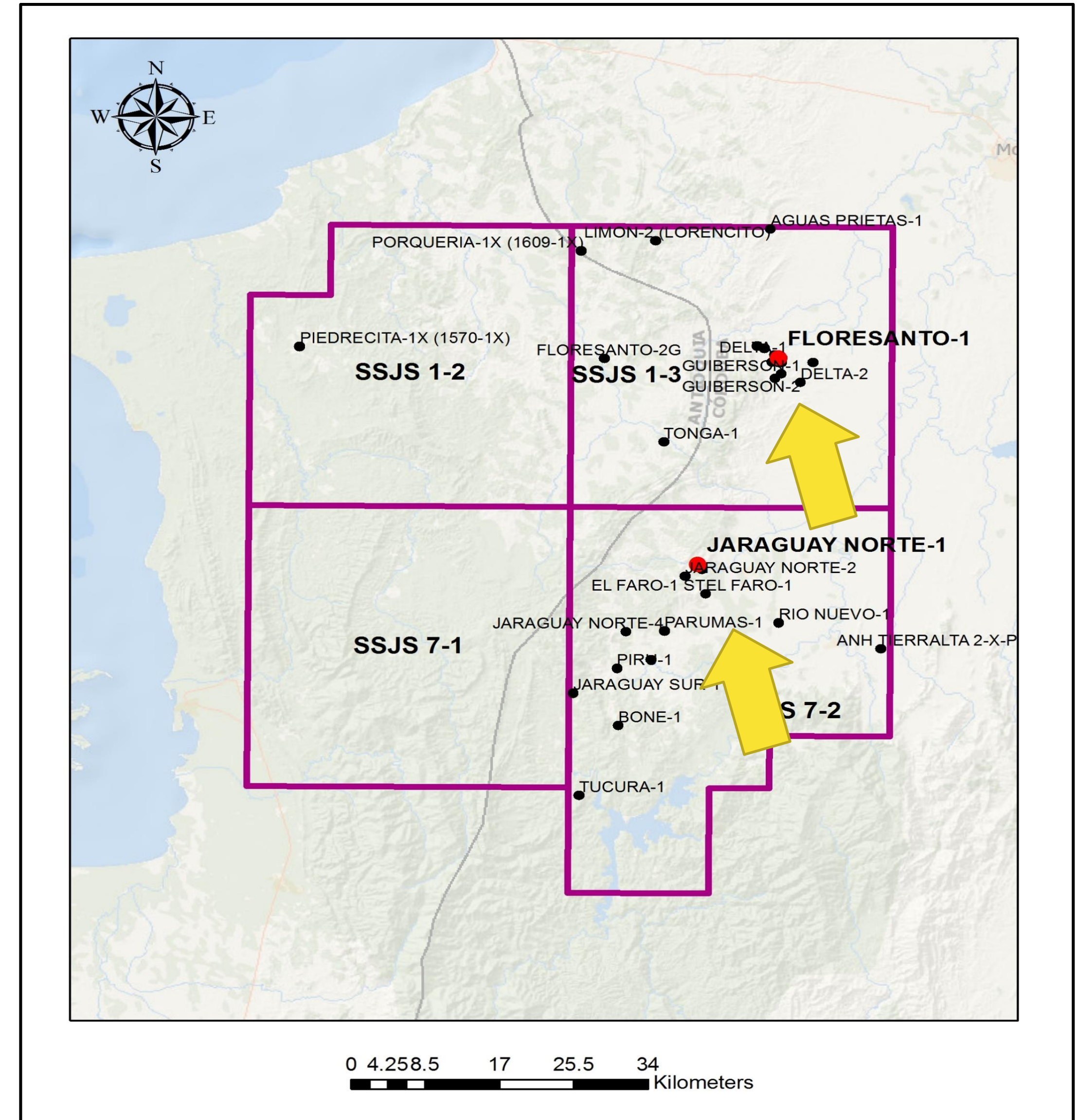
Departments

- Cordoba & Antioquia

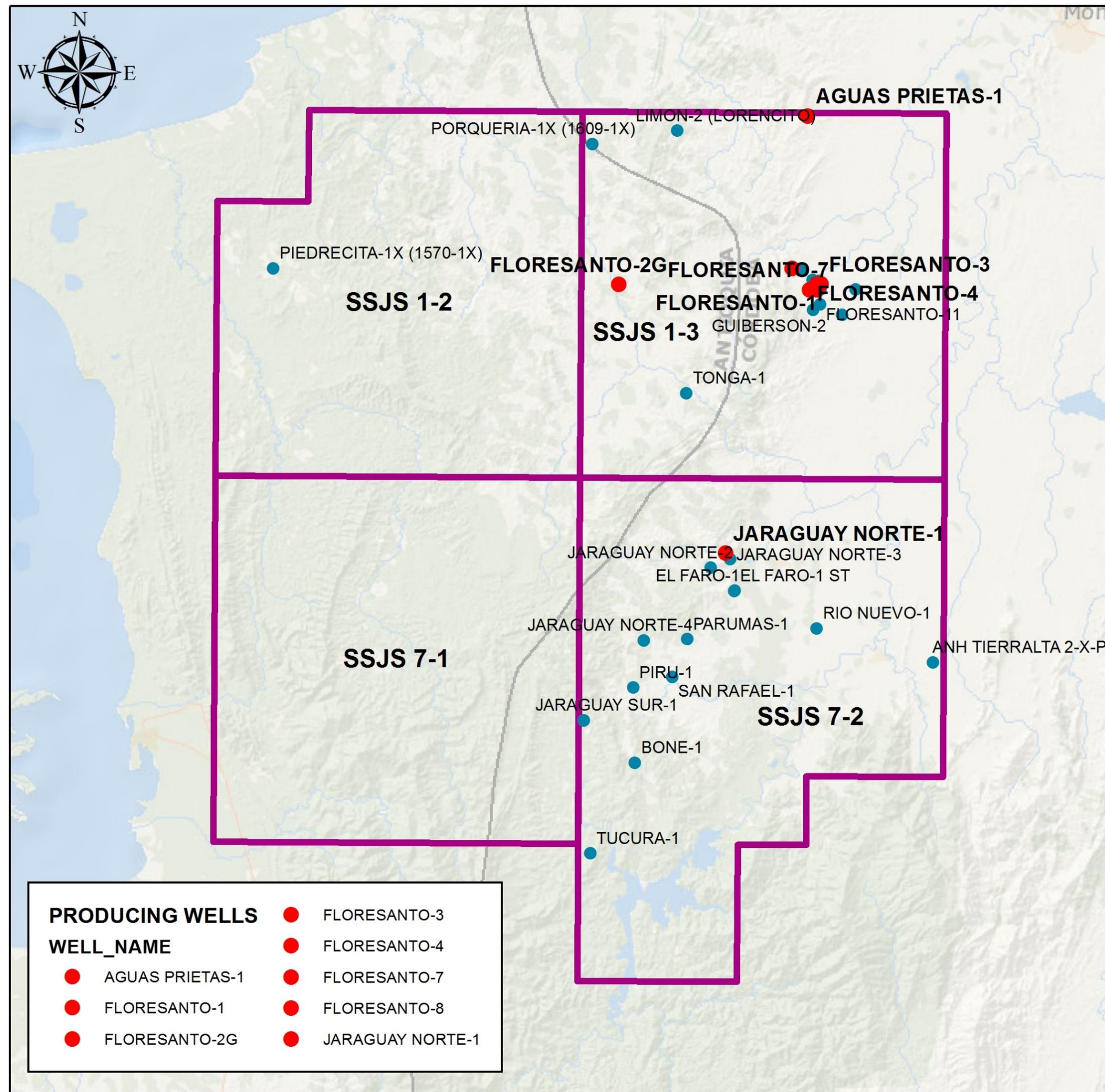
HISTORY OF EXPLORATION

- Despite of being under-explored, **this basin has a long exploration history** (since 1945)
- One well with commercial production **Floresanto – 1**: Depleted after two years with a total production of **28,730 BLS** of 51°API oil (nearby to the area)
- **Jaraguay N-1: 126 BOPD** of 48° API (close to the area)
- Successful production tests in another thirteen wells (Considered **as non-commercial at the time**)
- 191 wells have been drilled in the whole basin

Field	Year of first well drilled	Year of last well drilled	# Of Wells
Floresanto	1945	1946	16
Jaraguay Norte	1981	1983	5

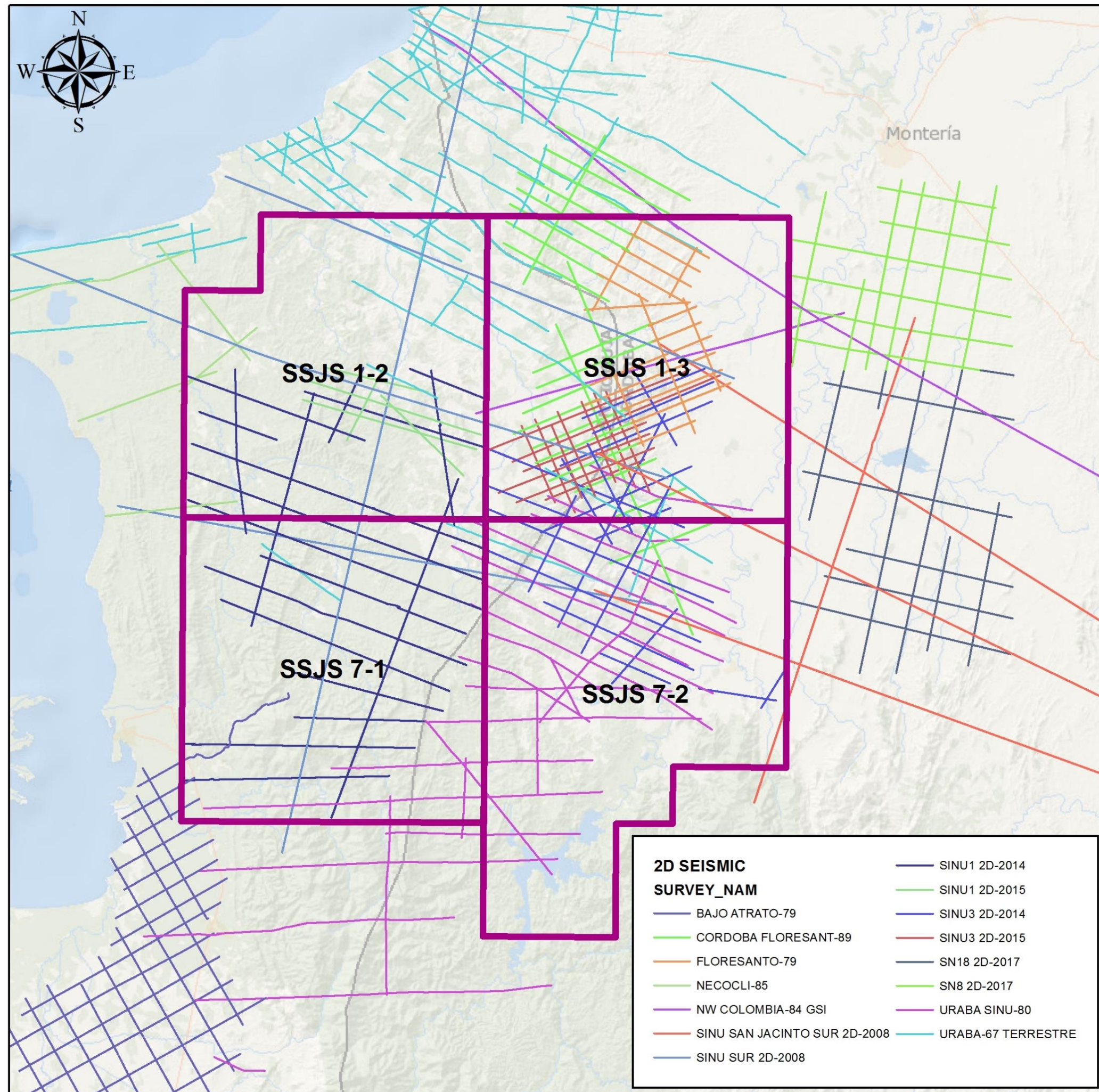


Well Data: SSJS 1-2, SSJS 1-3, SSJS 7-1, SSJS 7-2



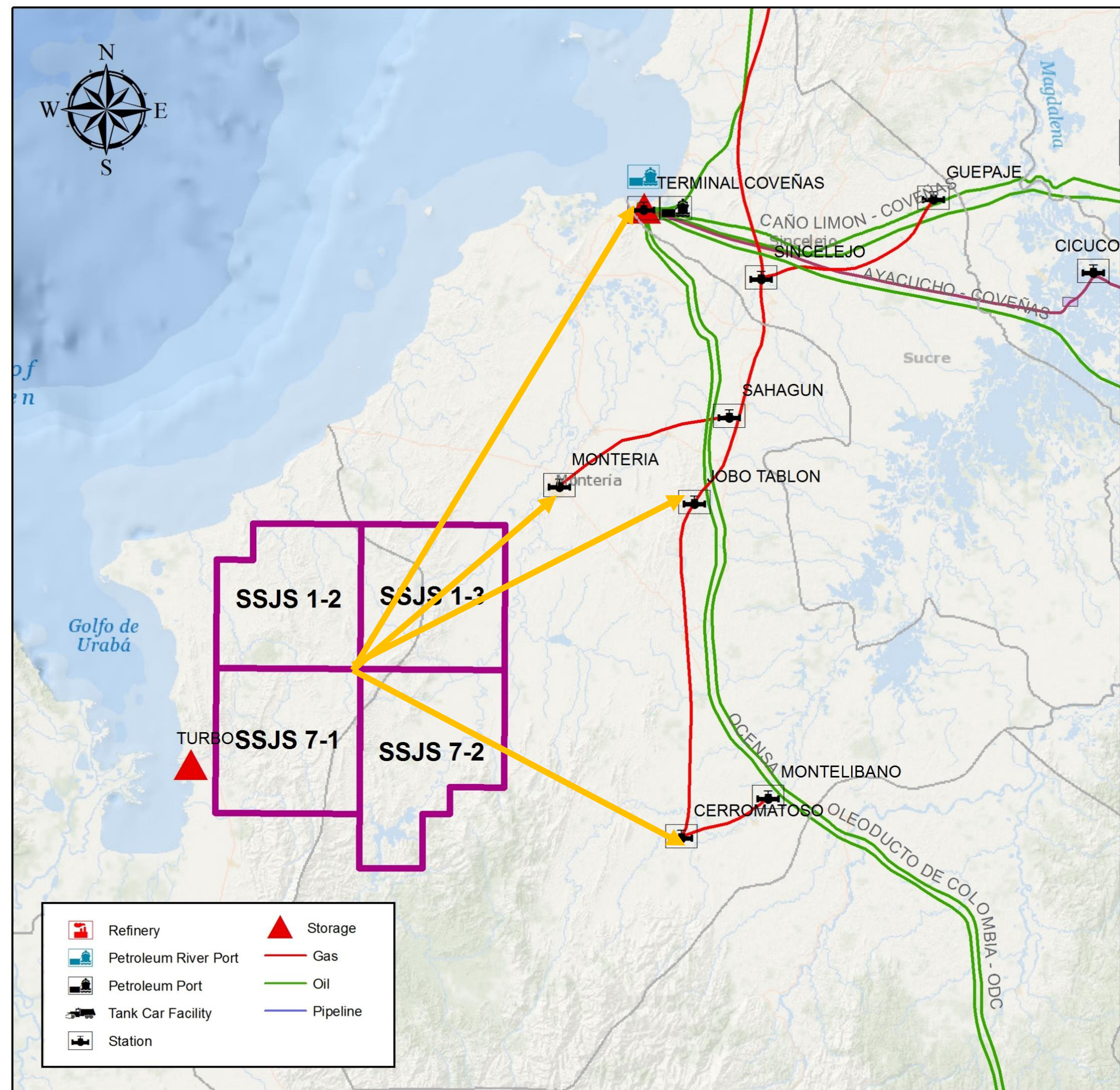
NAME	WELLS	TD (ft)	YEAR	NAME	WELLS	TD (ft)	YEAR
Aguas Prietas-1	1	0	1926	Morrocroy-1	1	4200	1982
Anh Tierralta2xp	1	8711	2013	Parumas-1	1	5148	1984
Bone-1	1	234	1980	Piedrecita-1x (1570-1x)	1	12262	1968
Delta	2	0	1957	Piru-1	1	247	1980
El Faro-1	2	0	1982	Porqueria-1x (1609-1x)	1	14512	1969
Floresanto	16	2542	1945-1951	Rio Nuevo-1	1	6800	1982
Guiberson	2	0	1951	San Rafael-1	1	8980	1981
Jaraguay Norte1	5	5102	1981-1983	Tonga-1	1	7910	2018
Jaraguay Sur-1	1	8002	1982	Tucura-1	1	247	1980
Limon-2 (Lorencito)		2214	1926				

40 WELLS



2D Seismic Surveys (14 Surveys)

- Bajo Atrato – 79
- Cordoba Floresant-89
- Floresanto-79
- Necocli-85
- NW Colombia-84-GSI
- Sinu San Jacinto Sur 2D-2008
- Sinu1 Sur 2D-2008
- Sinu1 2D-2014
- Sinu3 2D-2014
- Sinu3 2D-2015
- Sn18 2d-2017
- Sn8 2d-2017
- Uraba Sinu-80
- Uraba-67 Terrestre



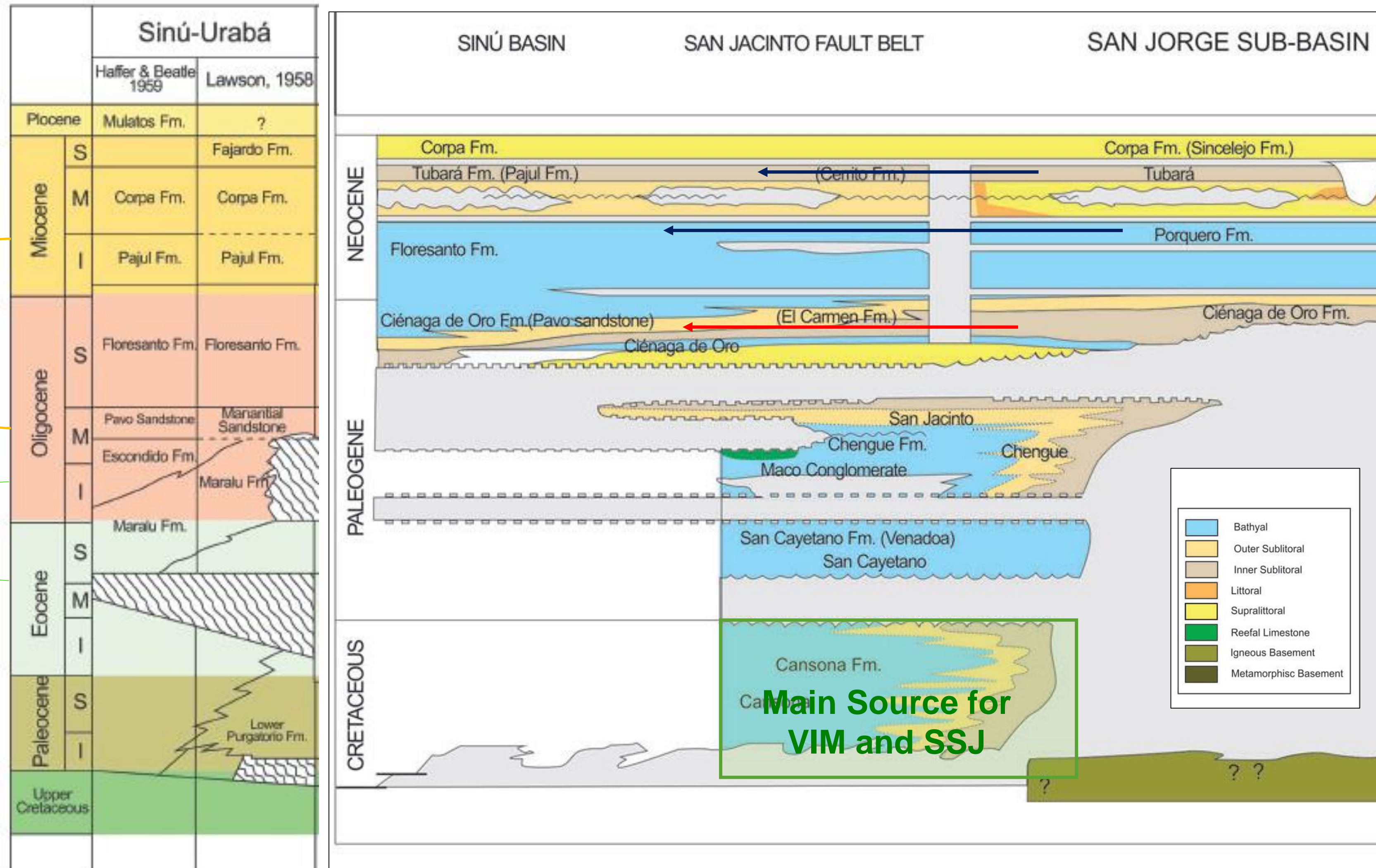
Main Infrastructure nearby

- **Oil Pipeline**
- Terminal Coveñas (137 Km)
- **Gas Pipeline**
- Monteria (69 Km)
- Jobo Tablón (95 Km)
- Cerromatoso (92 Km)

GEOLOGICAL FRAMEWORK

STRATIGRAPHIC SETTING

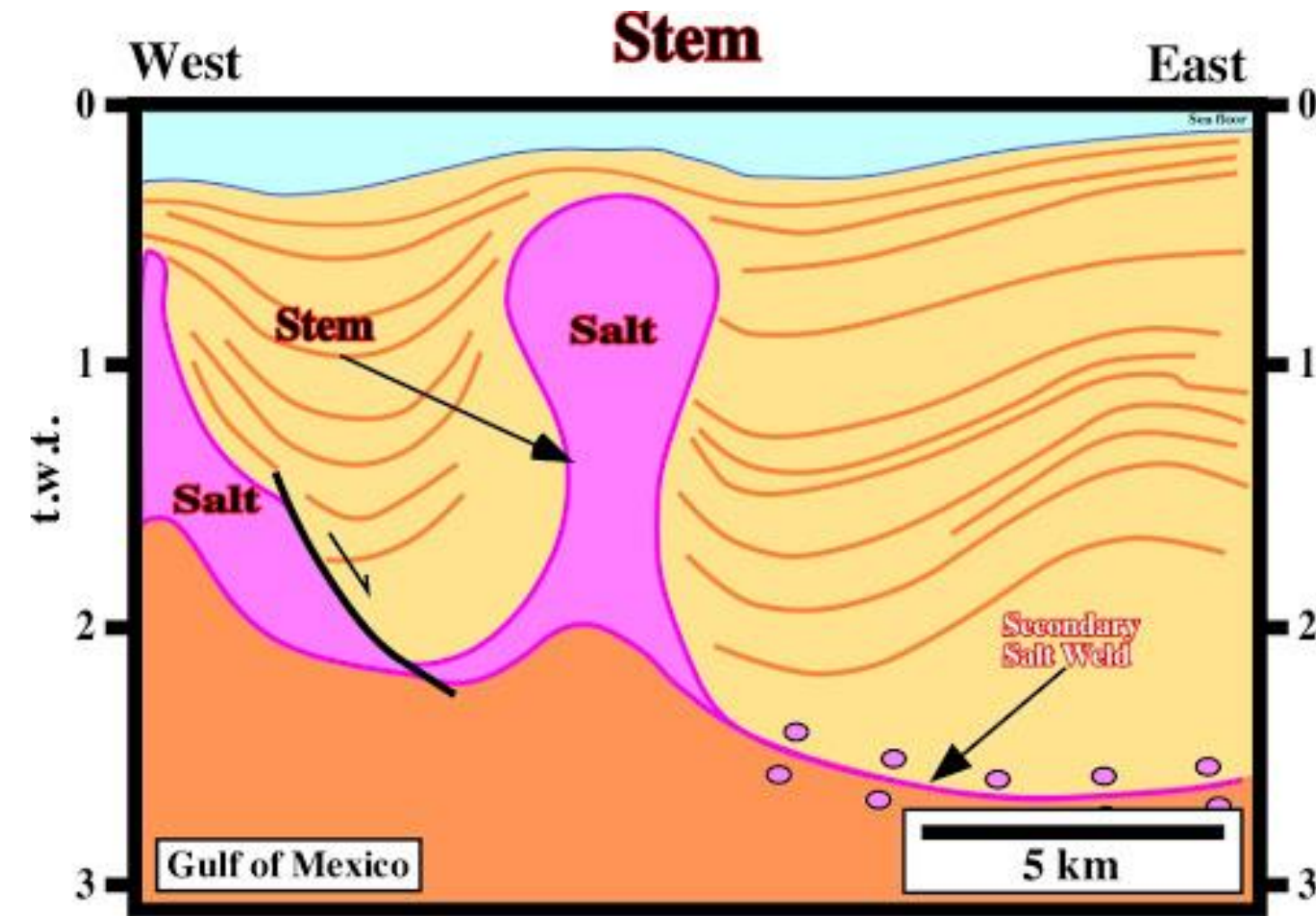
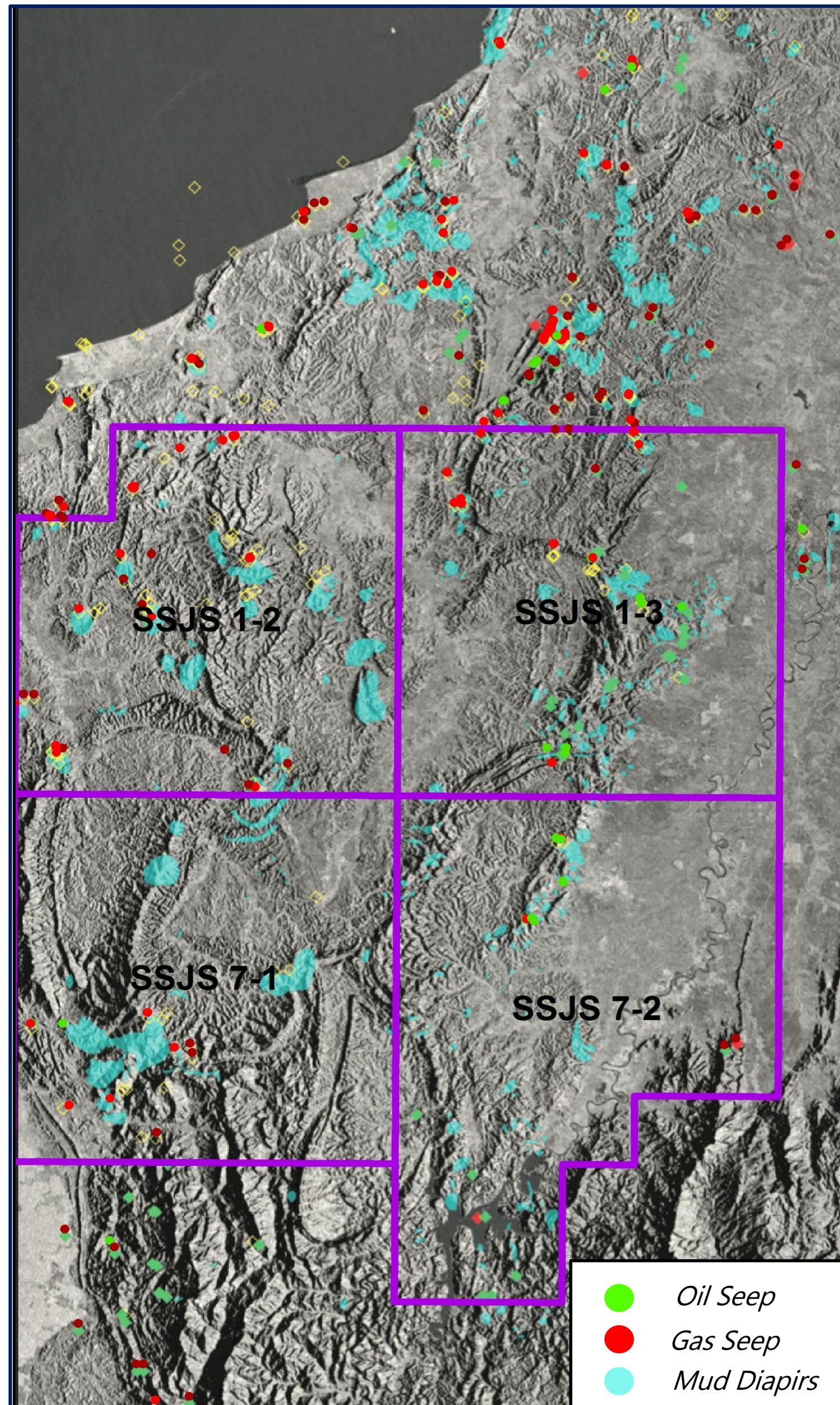
Reservoir
Considered as Source
in Jaraguay



From Lower Magdalena to SSJ

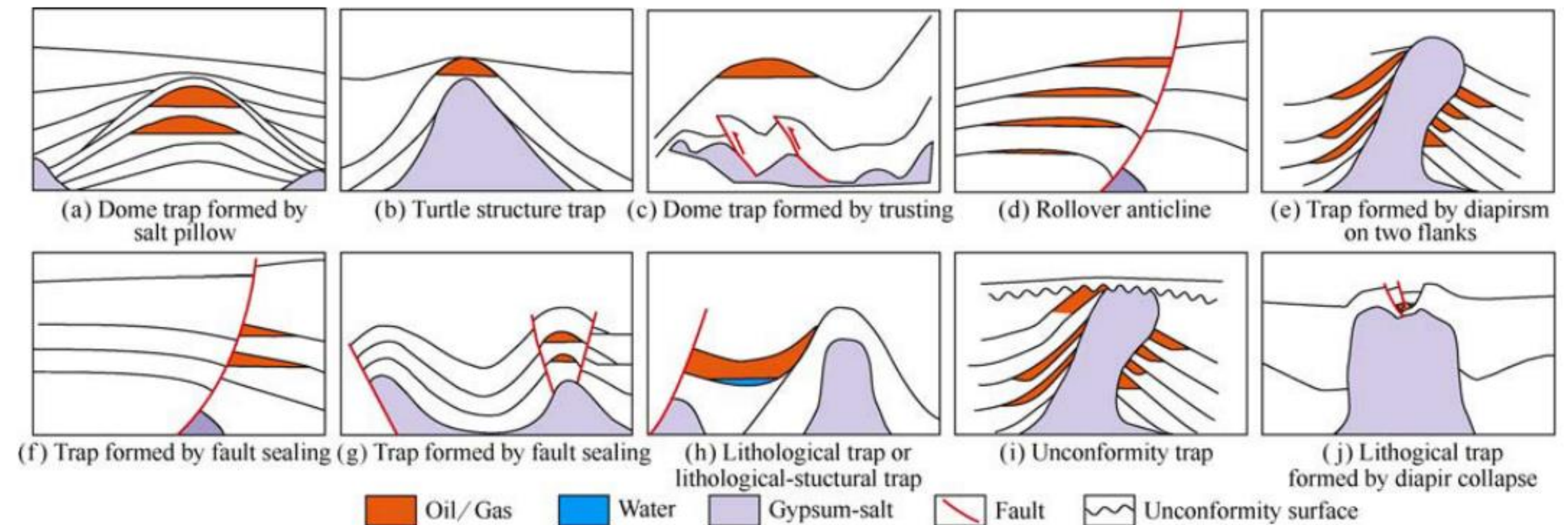
- Fluvial facies of **Tubará Fm.** remains relatively the same (Jaraguay tested production at sandstones of this level)
- Deepest facies to the ones related to the **Porquero Fm.** will be found in the **Floresanto Fm** in the Sinu Basin
- Sandstones of deeper facies to the ones related to the Cienaga De Oro Fm. are known as **Pavo sandstones** in the Sinu basin

MUD DIAPIRISM



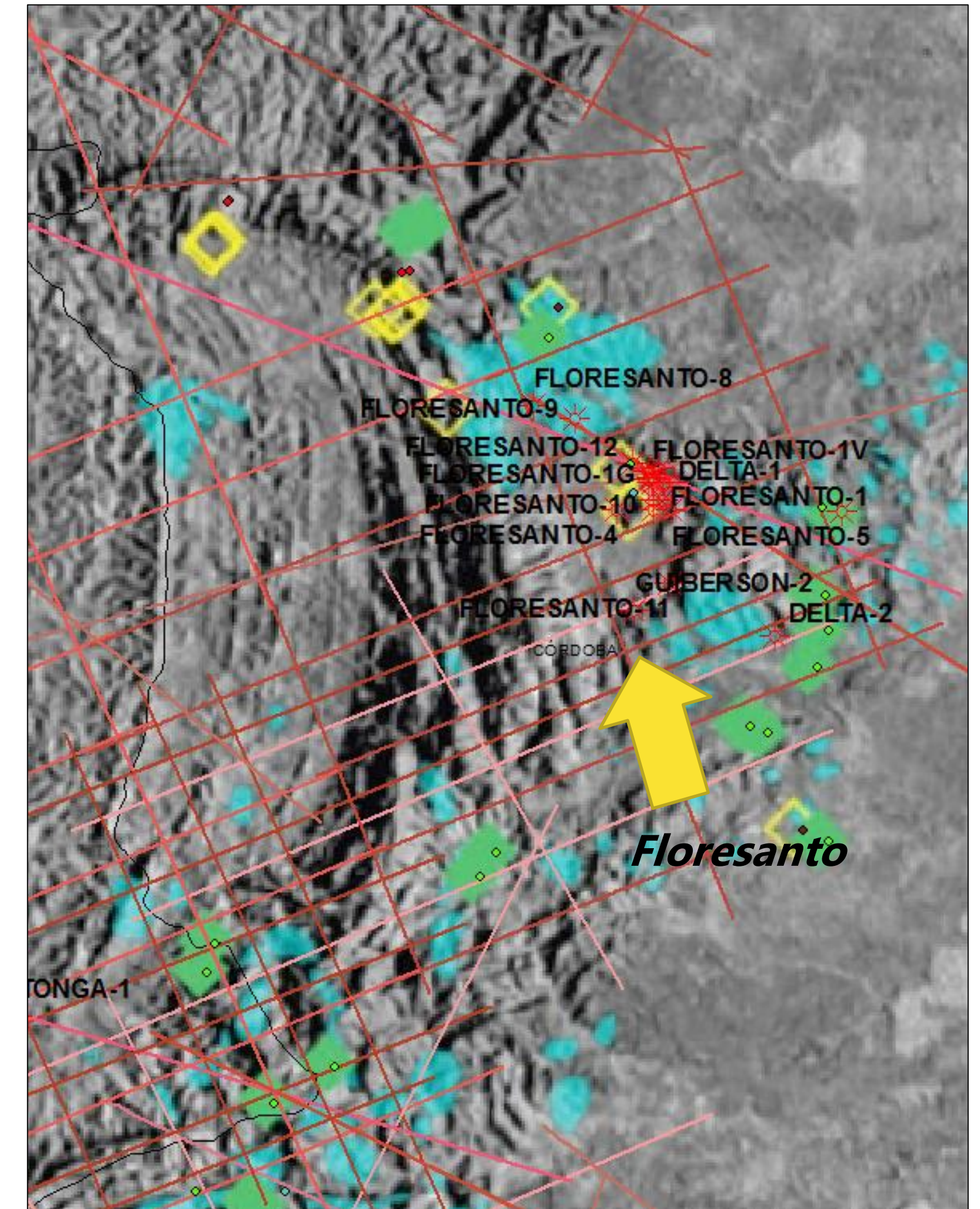
- **Mud diapirism** could be explained based on **salt diapirs schemes** due to its **similarity**
- **Ellipsoid structures** in surface are related to mud diapirs and syntectonic synclines
- **Syntectonic sediments** could be identified because of its difference in thickness
- **Weld faults** could have an importance into traps
- In SSJ mud diapirs have an strong relation with **oil and gas seeps distribution**

Traps associated to diapirism

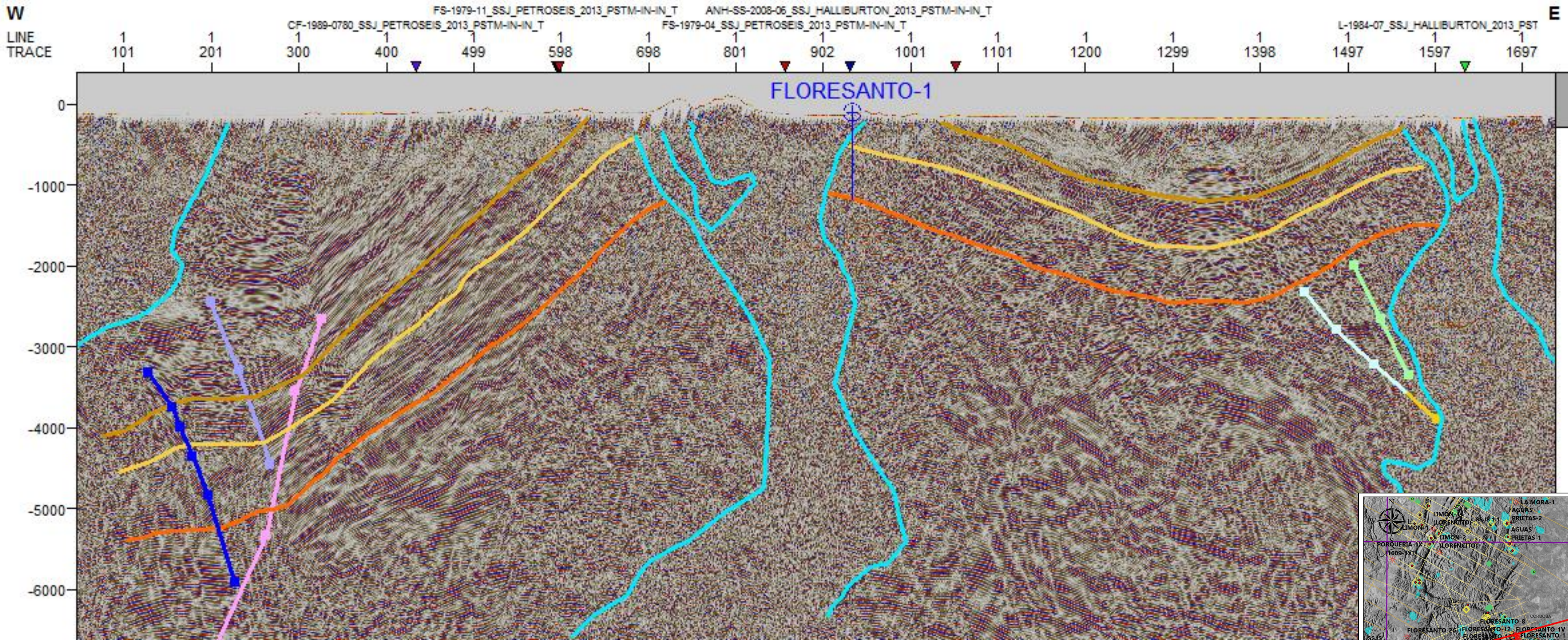


WELL SUMMARY & ANALOGUE FIELDS

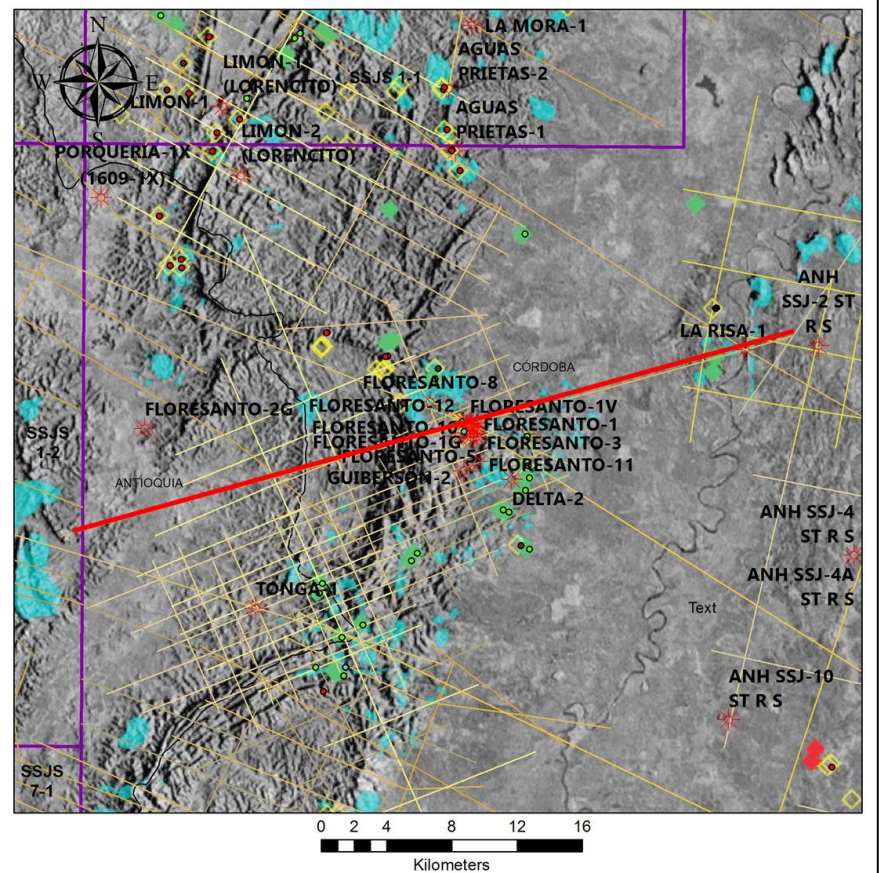
- Twelve (12) wells were drilled from May of **1945** to August of **1947**.
- Most of them were drilled by **Socony-Mobil** and classified as producer wells. However, formal production was only declared in the wells **Floresanto 1** and **Floresanto 6**
- Ten (10) of the twelve (12) wells were shallow (an average of 1,541') and the other two (2): **Floresanto 1** and **Floresanto 10**, reached total depths of 6,936' and 10,876', respectively.
- **Floresanto 1**: Oil production from of the **Floresanto - Pajuil Fm.** (694-614') started in december of 1944. At August of 1945, **28,730 bbls** were produced. (51° API)
- **Floresanto 6**: During tests the well produced 42 bbls in 12 hours (API 50°)



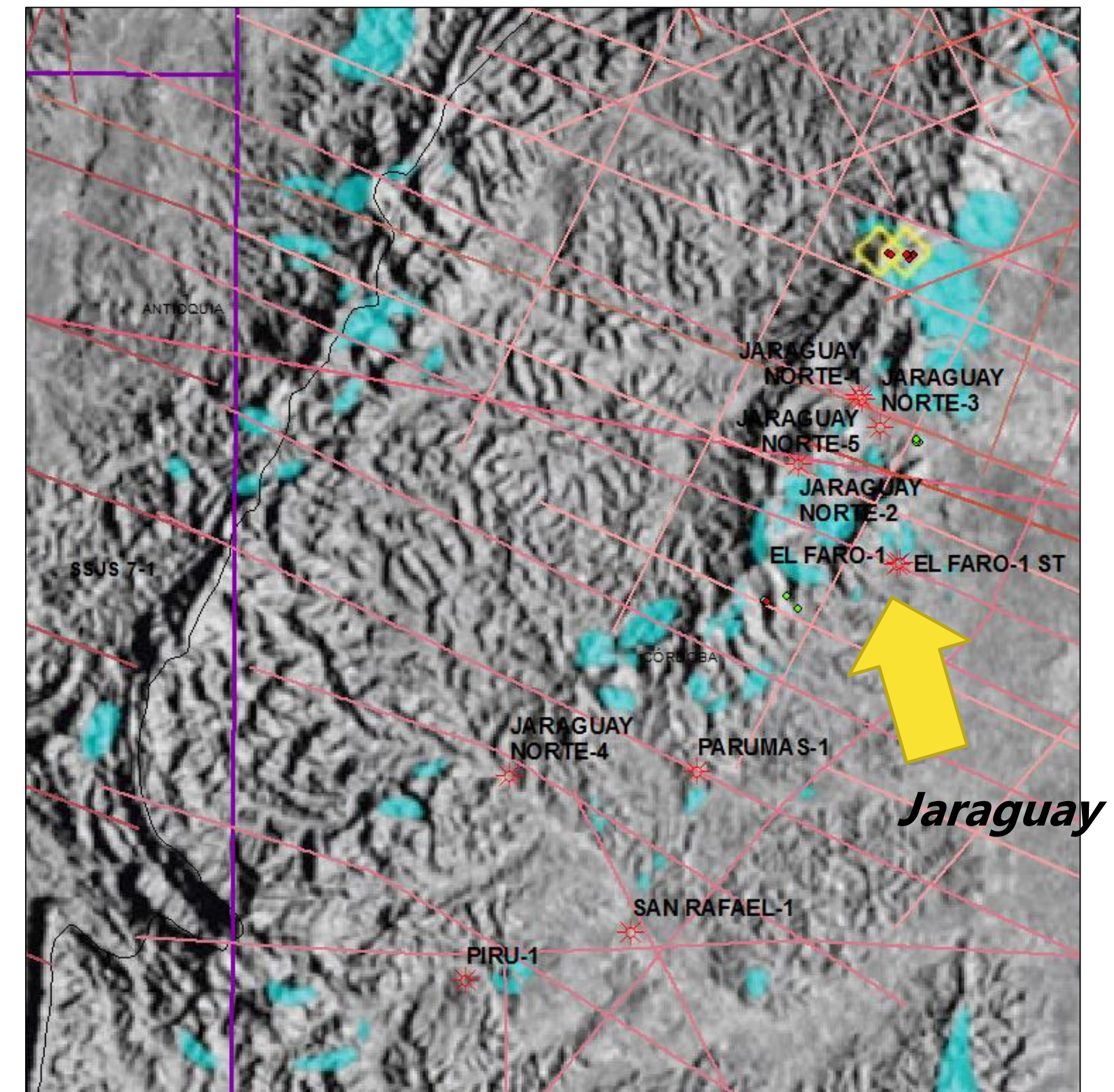
Floresanto: Dip Seismic Line



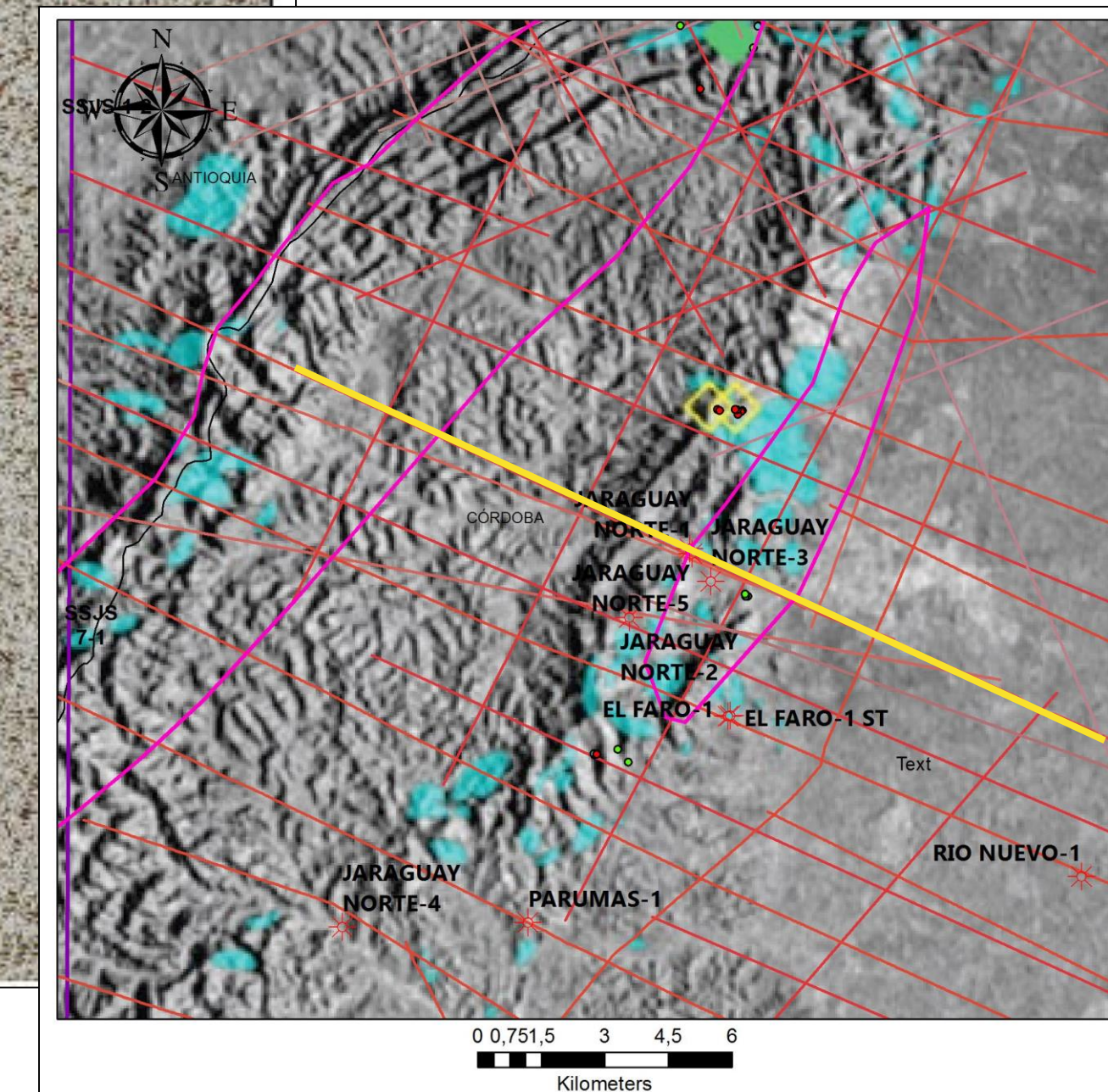
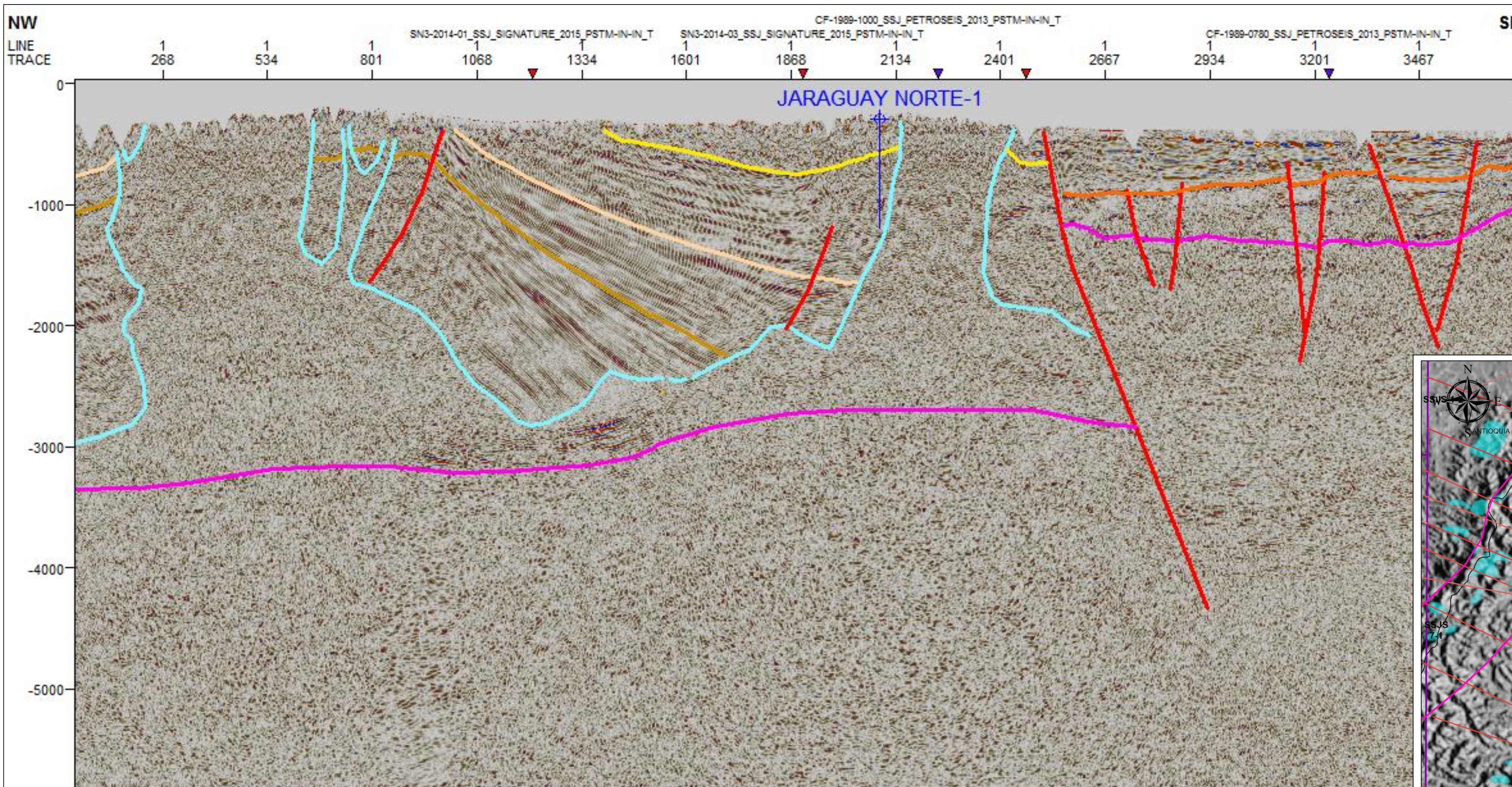
Seismic Dip Line L-1984-09-SSJ



- Jaraguay area is located at the south of the Sinú basin
- At the Jaraguay area, rocks from the Oligocene (Maralú Fm = Lower CDO) to the Pliocene (Corpa Fm.) have been drilled
- Well targets were the equivalents of the Lower Porquero Fm (Floresanto Fm) and Cienaga de Oro Fm (Pavo Fm).
- Total depths of the Jaraguay Norte wells were reached between 2,500 and 5,000'. The well Jaraguay Sur-1 reached 8,002'
- Oil found in production tests and seeps in the area are considered as light oil (>40° API)
- Pavo sandstones are considered as the best reservoir in the area
- **Jaraguay Norte – 1:** During production tests in the Floresanto Fm. **3,5 bls** of 48°API oil were obtained at the interval 1,834' – 2,338', **6,3 bls** of 47°API at the interval 1,148' – 1,364'. The well produced at its peak **126 BOPD**
- **Jaraguay Norte – 3:** During tests only one gallon of oil were recovered

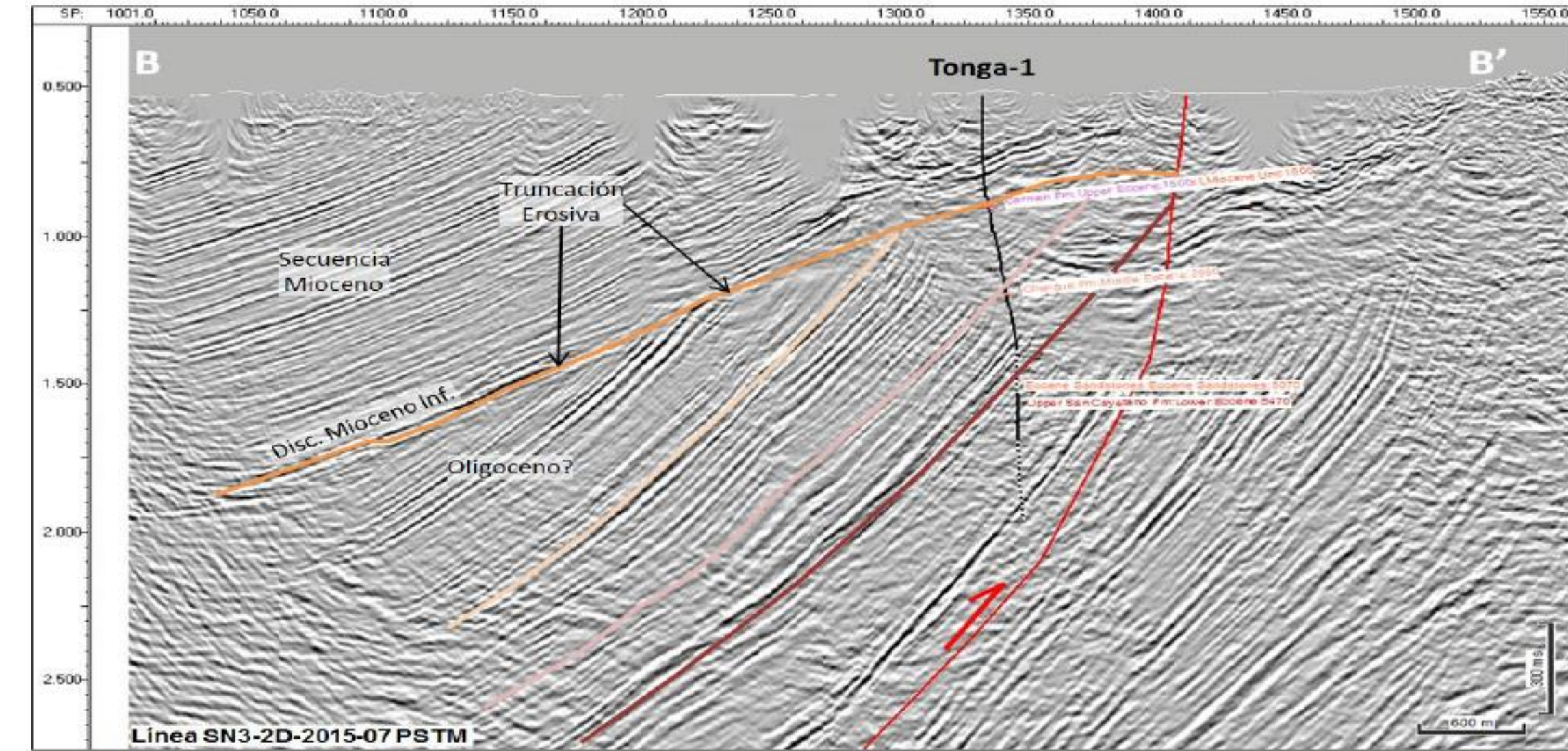


Jaraguay Norte: Dip Seismic Line



Tonga – 1

- The well Tonga – 1 was drilled by Gran Tierra Energy in **2018** with a TD of 8000’.
- The well tried to find presence of hydrocarbons in **Eocene sandstones** (Chengue Fm) and characterize units below Miocene discordance
- Despite of finding the reservoir, the shows were not economically viable.
- The well was plugged up and abandoned

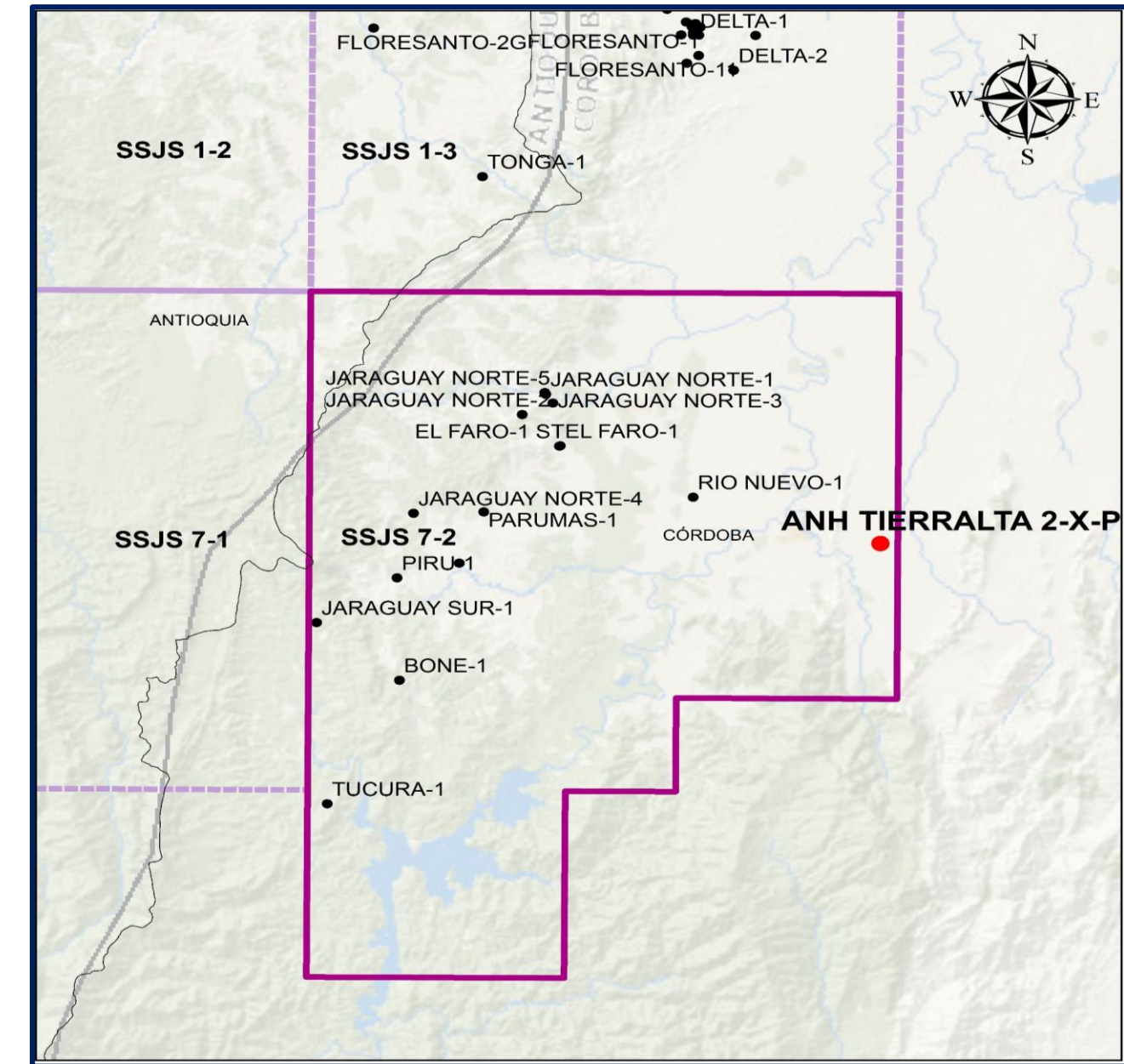


FORMACIÓN	TOPES PROGNOSIS			TOPES TENTATIVOS POR MUESTRAS			DIFERENCIA ESTRUCT. (pies)	
	MD (pies)	(TVD) (pies)	TVDss (pies)	MD (pies)	(TVD) (pies)	TVDss (pies)	Mayor (H) TVD'ss	Menor (L) TVD'ss
MIOCENE (PAJUIL/FLORESANTO)	Surface	Surf	345	Surface	Surface	345	--	--
MIOCENO BASAL	941	941	-596	--	--	--	--	--
DISCORDANCIA MIOCENO INFERIOR	1521	1511	-1166	1500	1490	-1145	-21	--
EOCENO TARDÍO (CARMEN)	1521	1511	-1166	1500	1490	-1145	-21	--
EOCENO MEDIO(CHENGUE)	2213	2178	-1833	2980	2920	-2575	--	742
EOCENO INFERIOR (SAN CAYETANO SUPERIOR)	5070	4983	-4638	5470	5385	-5040	--	402
TD	6587	6500	-6155	8000	7910	-7565	--	--

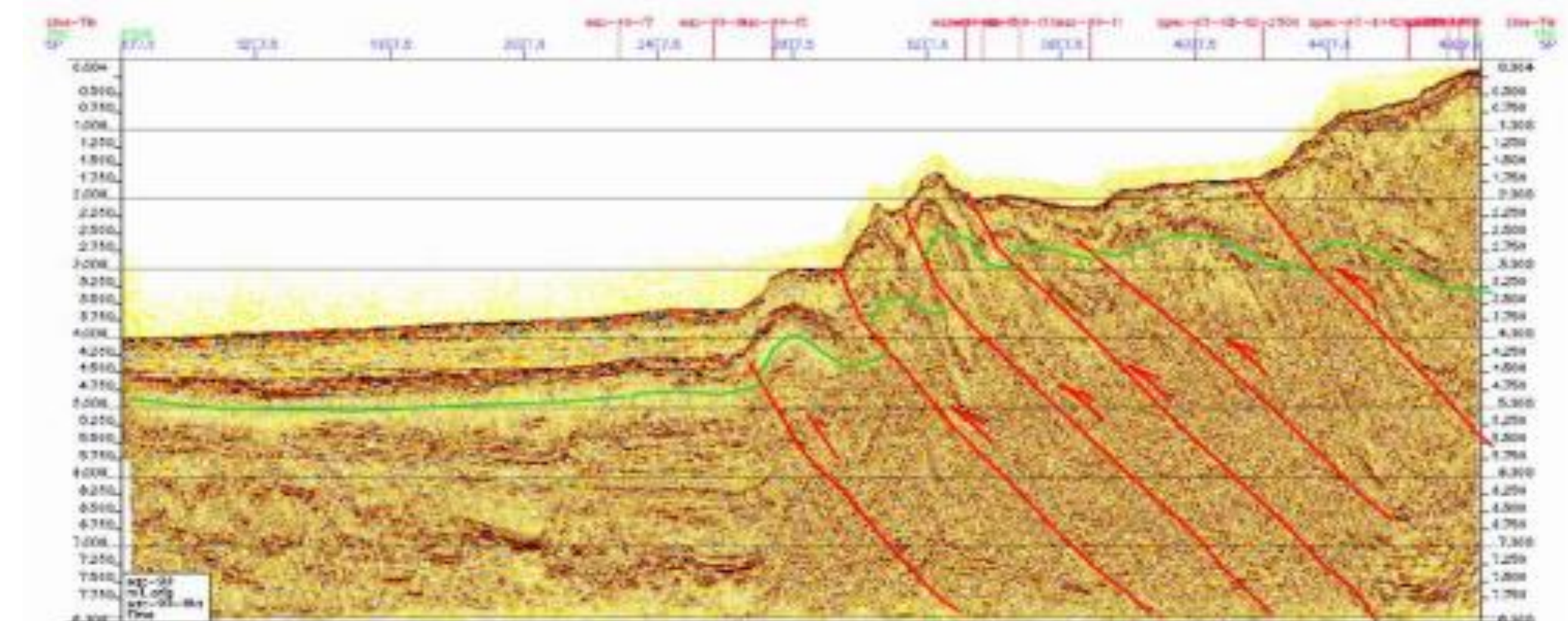
GAS SHOWS		ppm										RATIO'S CALCULATIONS			
Interval (ft)	Lithology	Tot. %	B.G.G	Net %	C ₁	C ₂	C ₃	iC ₄	nC ₄	iC ₅	nC ₅	Wh	Bh	Ch	Type
FORMACIÓN PAJUIL/ FLORESANTO (MIOCENO)															
335 – 344	SST	0.21	0.04	0.17	2131	-	-	-	-	-	-	-	-	-	-
482 – 485	COAL	0.17	0.05	0.12	1709	-	-	-	-	-	-	-	-	-	-
665 – 670	SST	0.17	0.05	0.12	1685	-	-	-	-	-	-	-	-	-	-
707-712	COAL	0.36	0.04	0.32	3613	1	-	-	-	-	-	-	-	-	-
841' – 844'	COAL	0.19	0.15	0.04	1919	-	-	-	-	-	-	-	-	-	-
895' – 900'	SD	0.83	0.68	0.04	8385	-	-	-	-	-	-	-	-	-	-
900' – 1130'	-	-	0.08	-	4451	1	-	-	-	-	-	-	-	-	-
1392' – 1397'	SLTST	1.47	0.08	1.39	14789	45	6	1	1	-	-	-	-	-	-
FORMACIÓN CARMEN (EOCENO TARDÍO) - DISCORDANCIA (MIOCENO INFERIOR)															
1500 - 2980	-	-	0.04	-	4100	-	-	-	-	-	-	-	-	-	-
FORMACIÓN CHENGUE (EOCENO MEDIO)															
2980 - 3350	-	-	0.08	-	5621	20	9	9	2	7	1	-	-	-	-
3370 - 3510	-	-	0.92	-	9194	24	8	1	1	4	1	-	-	-	-
3520 – 3770	SLTST /SD	-	1.66	---	16588	38	8	5	1	2	1	-	-	-	-
3770 – 3940	SLTST/SD	-	0.5	---	5290	14	2	3	-	-	-	-	-	-	-
4001' – 4010	SST	2.0	0.5	1.5	20130	59	18	13	3	6	1	-	-	-	-
4067 – 4073	SST	2.4	0.5	1.9	24139	77	26	22	4	9	2	-	-	-	-
4210 – 4520	SLTST	-	0.96	-	9572	25	6	6	1	3	1	-	-	-	-
4530 – 4760	SST/SLTS T	-	0.86	-	8599	25	7	6	1	3	1	-	-	-	-
4760 – 5160	SLTST	-	0.97	-	9692	29	9	9	1	4	1	-	-	-	-
5293 - 5320	SST	2.43	0.44	1.99	24116	69	27	20	4	10	2	-	-	-	-
FORMACION SAN CAYETANO SUPERIOR (EOCENO INFERIOR)															
5704 - 5709	SST	1.6	0.6	1.0	16024	48	16	12	2	7	2	-	-	-	-
5776 - 5820	SST-SD	1.99	0.68	1.31	19816	55	19	15	3	7	4	-	-	-	-
5842 - 6020	SLTST	-	1.43	-	14195	42	14	11	2	6	1	-	-	-	-
6130 - 6220	SLTST	-	0.82	-	8110	25	9	8	2	5	1	-	-	-	-

ANH-Tierra Alta 2-X-P

- The well ANH-Tierra Alta 2-X-P was drilled in **2013** with a TD of 8711’.
- The main objective was to reach the Cansona and San Cayetano formations.
- No visible and significant manifestation of oil was observed in the sandy levels of the formations drilled in this well
- Sediments found in the well do not match with the units reported in literature
- Light oil were found in stains (API>35°)



FORMACIÓN	TOPES			
	PROGNOSIS GEOLÓGICA		MUESTRAS	
	Profundidad medida (ft)	Profundidad Vertical Verdadera (ft)	Profundidad medida (ft)	Profundidad Vertical Verdadera (ft)
DEPOSITOS ALUVIALES	superficie	superficie	superficie	0
SECUENCIA 1			280	280
R1	950	950	970	970
SECUENCIA 2			970	970
SECUENCIA 3			1.181	1.181
R2	1.540	1.540	1.180	1.180
R3	2.895	2.895	2.950	2.948
SECUENCIA 4			3.112	3.110
SECUENCIA 5			5.330	5.325
R4	6.400	6.400	6.620	6.612
SECUENCIA 6			6.620	6.612
TD	8.711	8.711	8.711	8.698

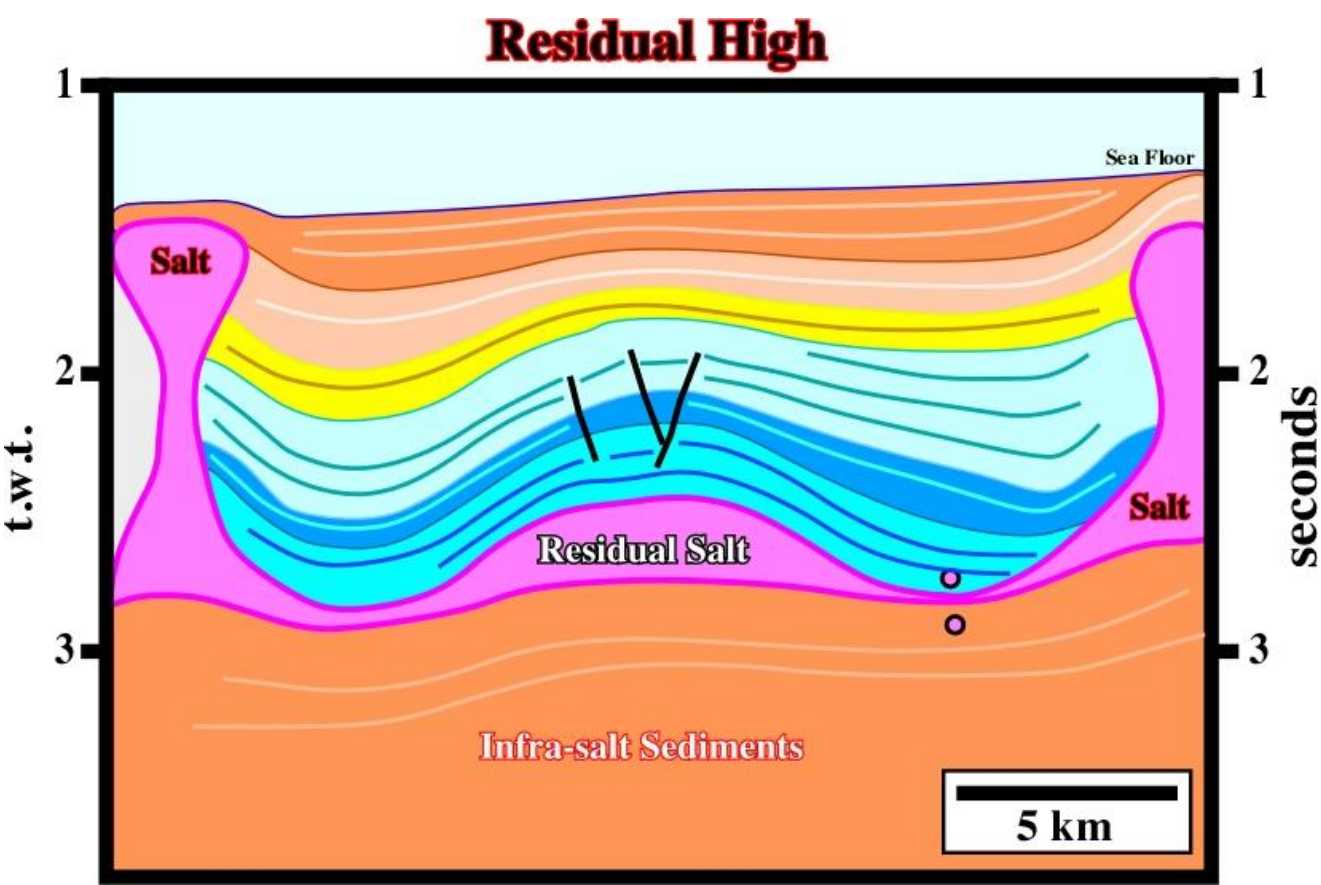


SEISMIC INTERPRETATION

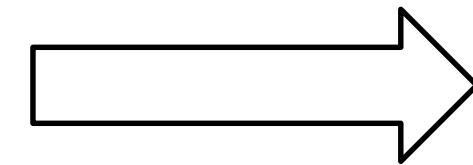
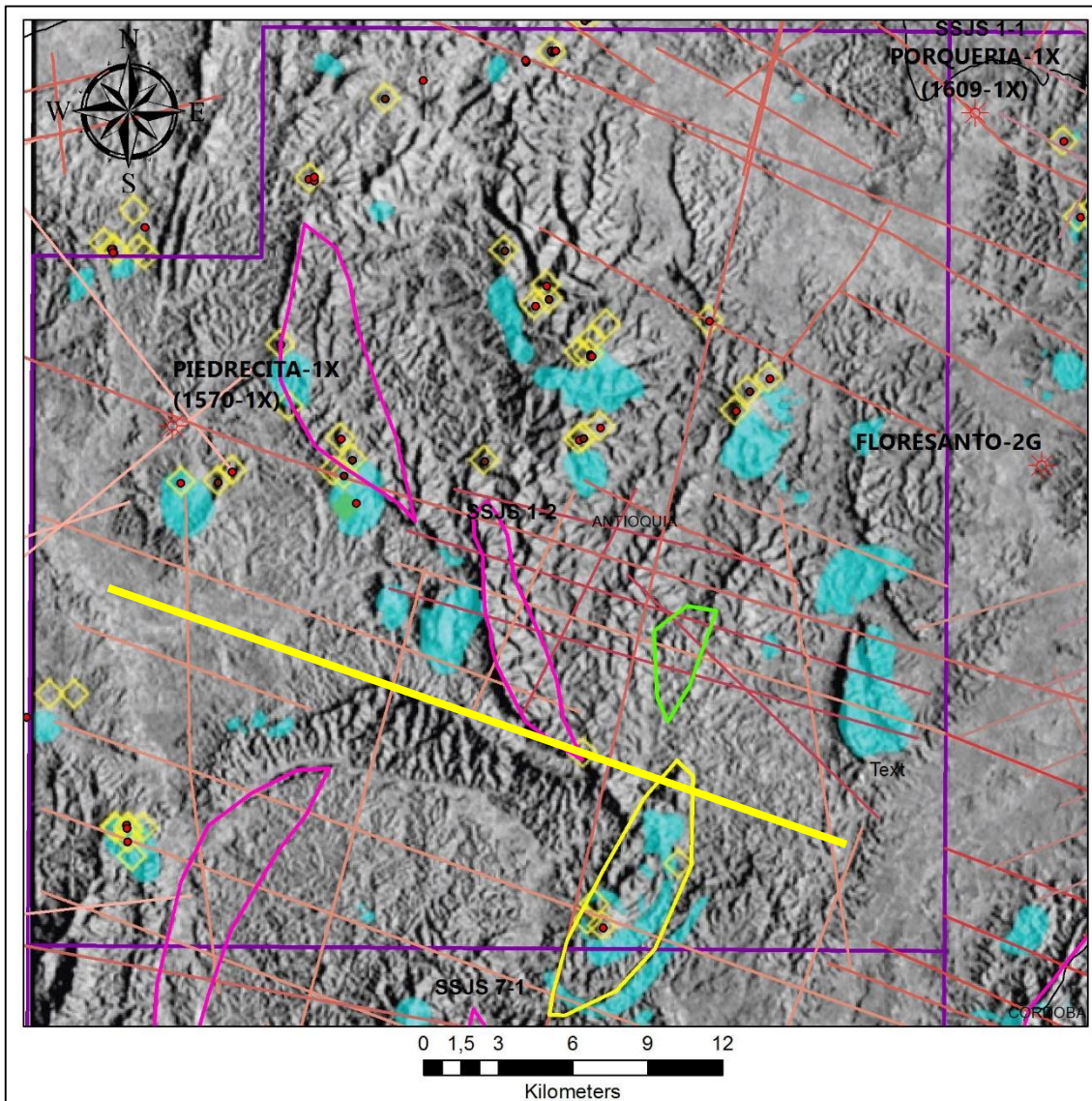
Three Different Types of Traps

- 1) Traps on Flanks
- 2) Anticlines with Normal Faults by Collapse
- 3) Unconformities

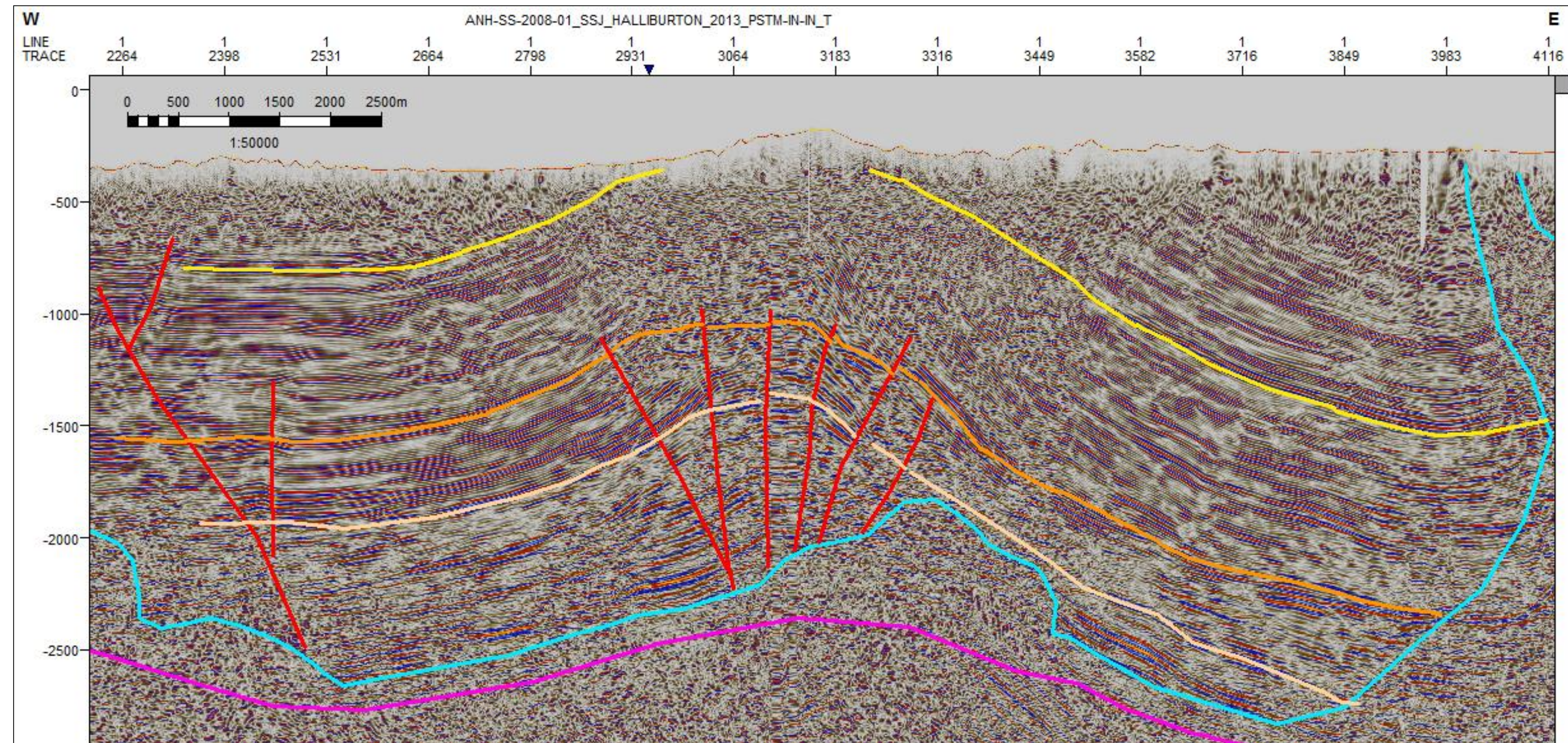
SEISMIC INTERPRETATION SSJ 1-2: Anticline with normal faults by collapse



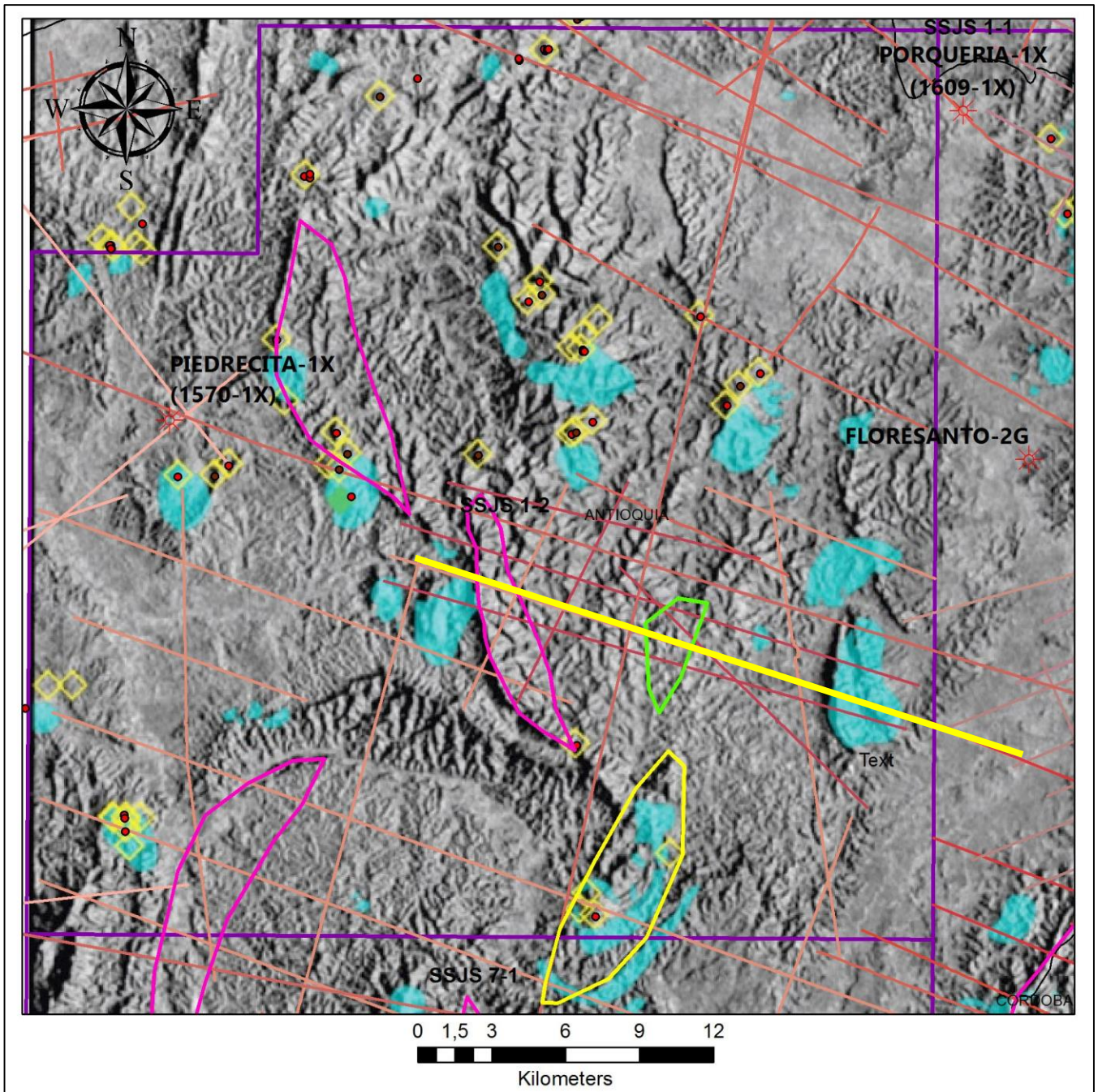
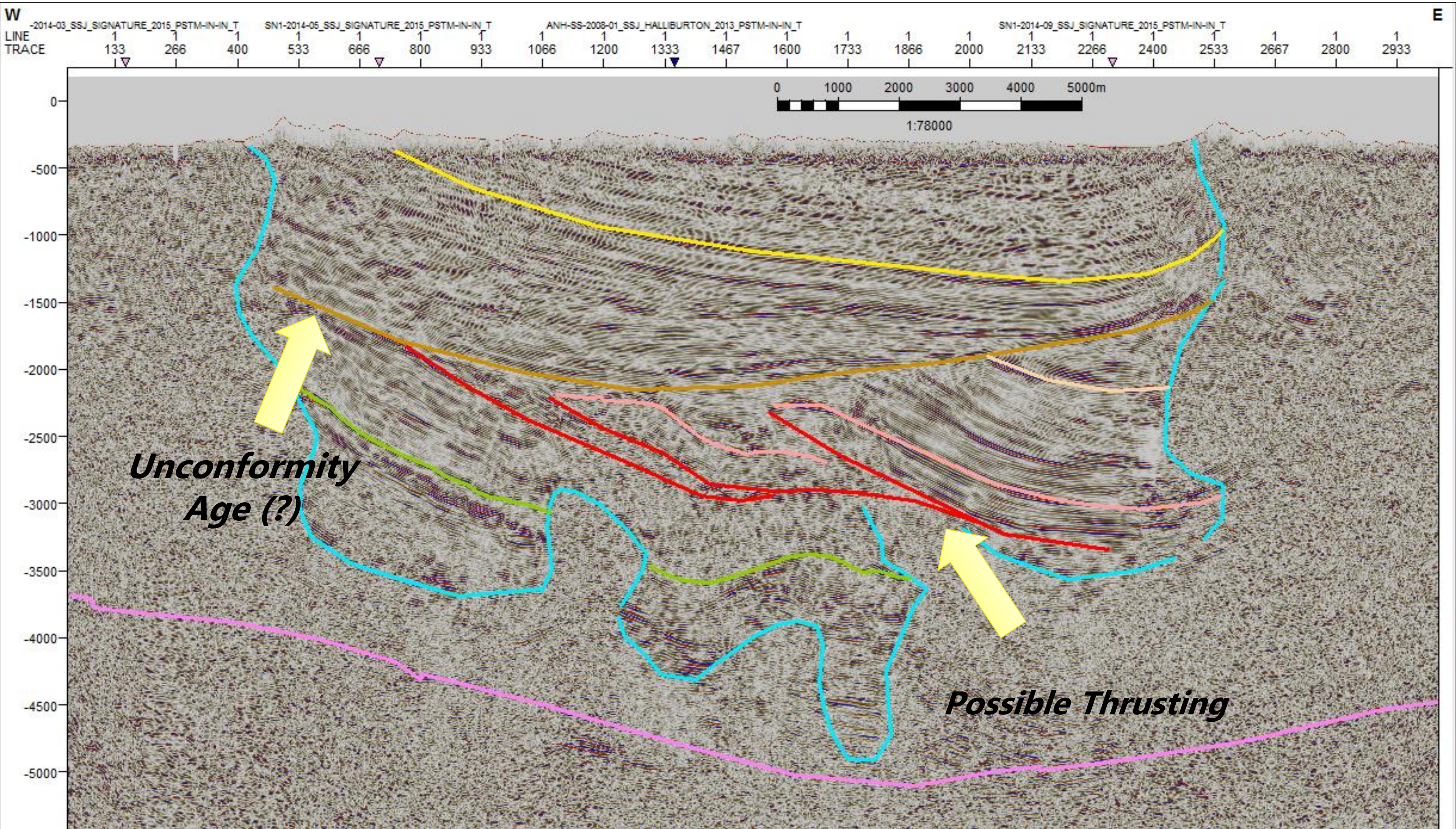
Taken from (Seffel, 1968)



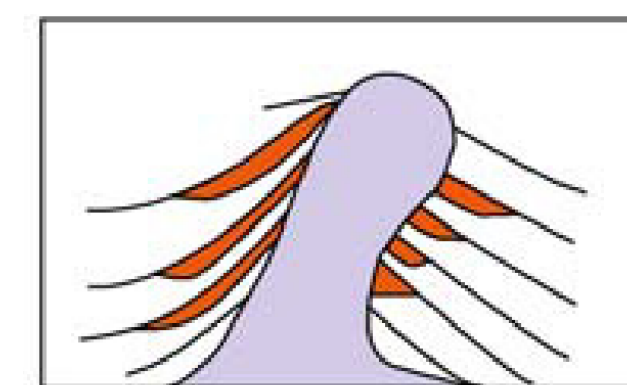
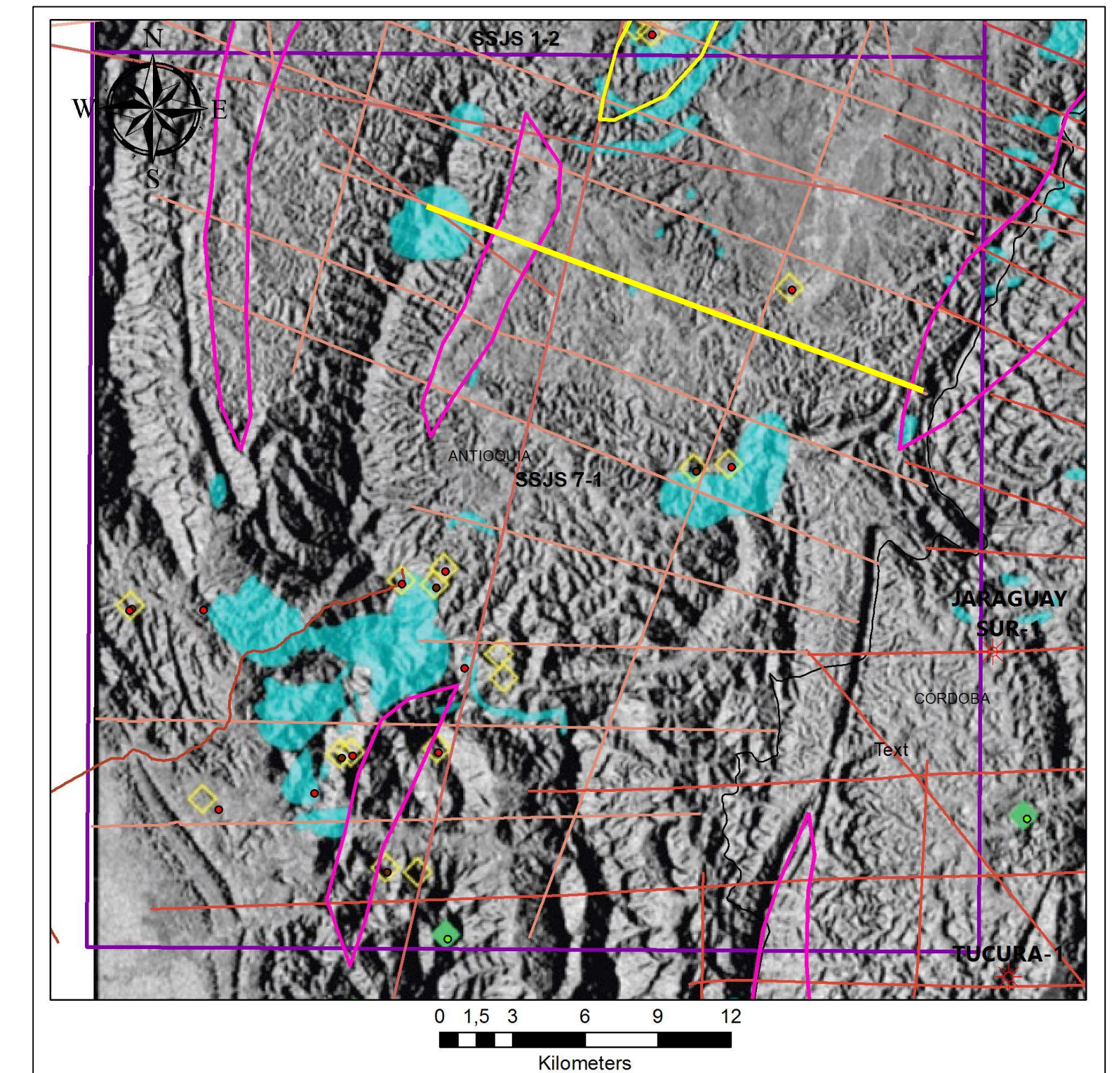
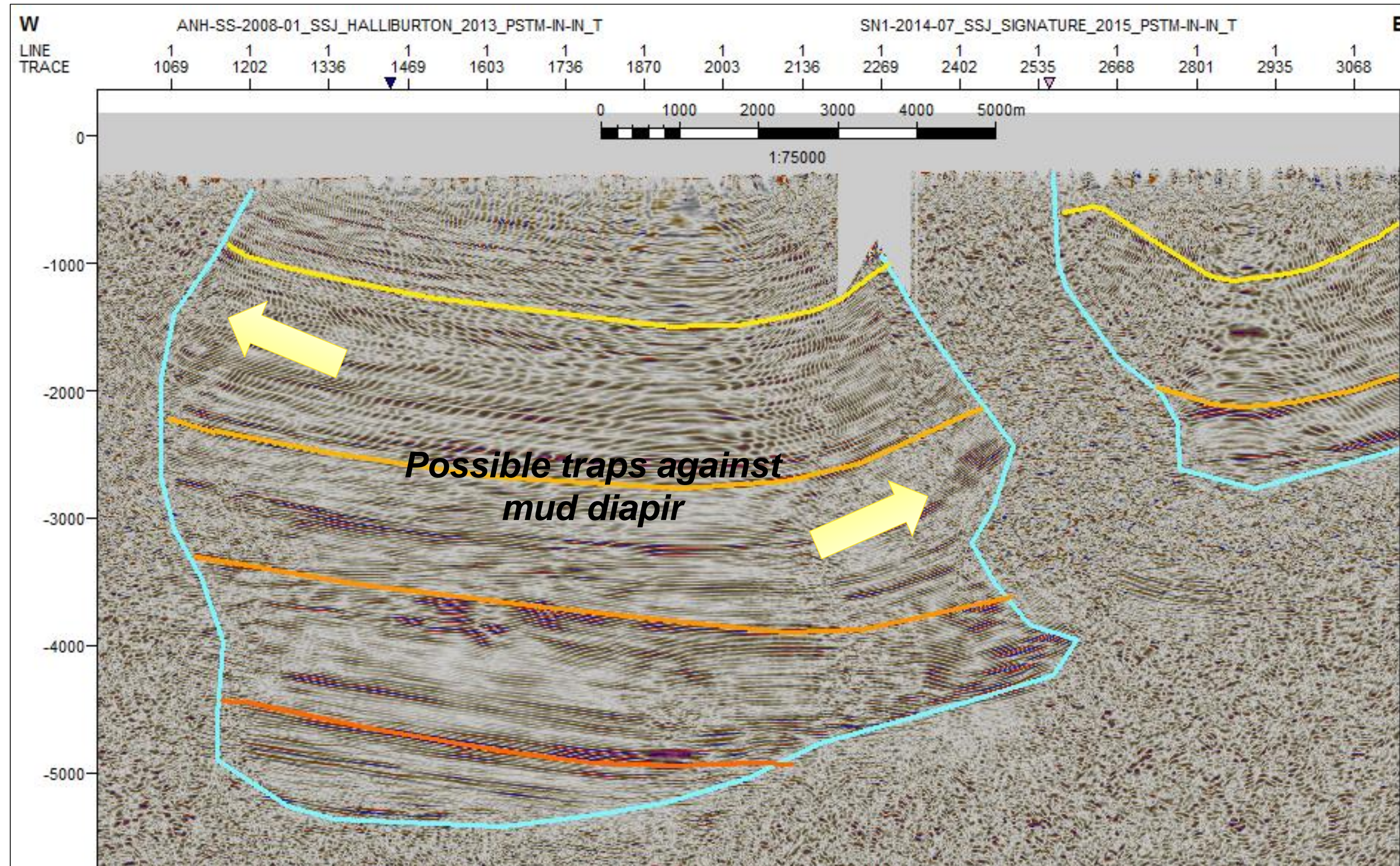
Residual High: Antiforms formed as an early stage of "Turtle Back" structures



SEISMIC INTERPRETATION SSJ 1-2: Unconformities



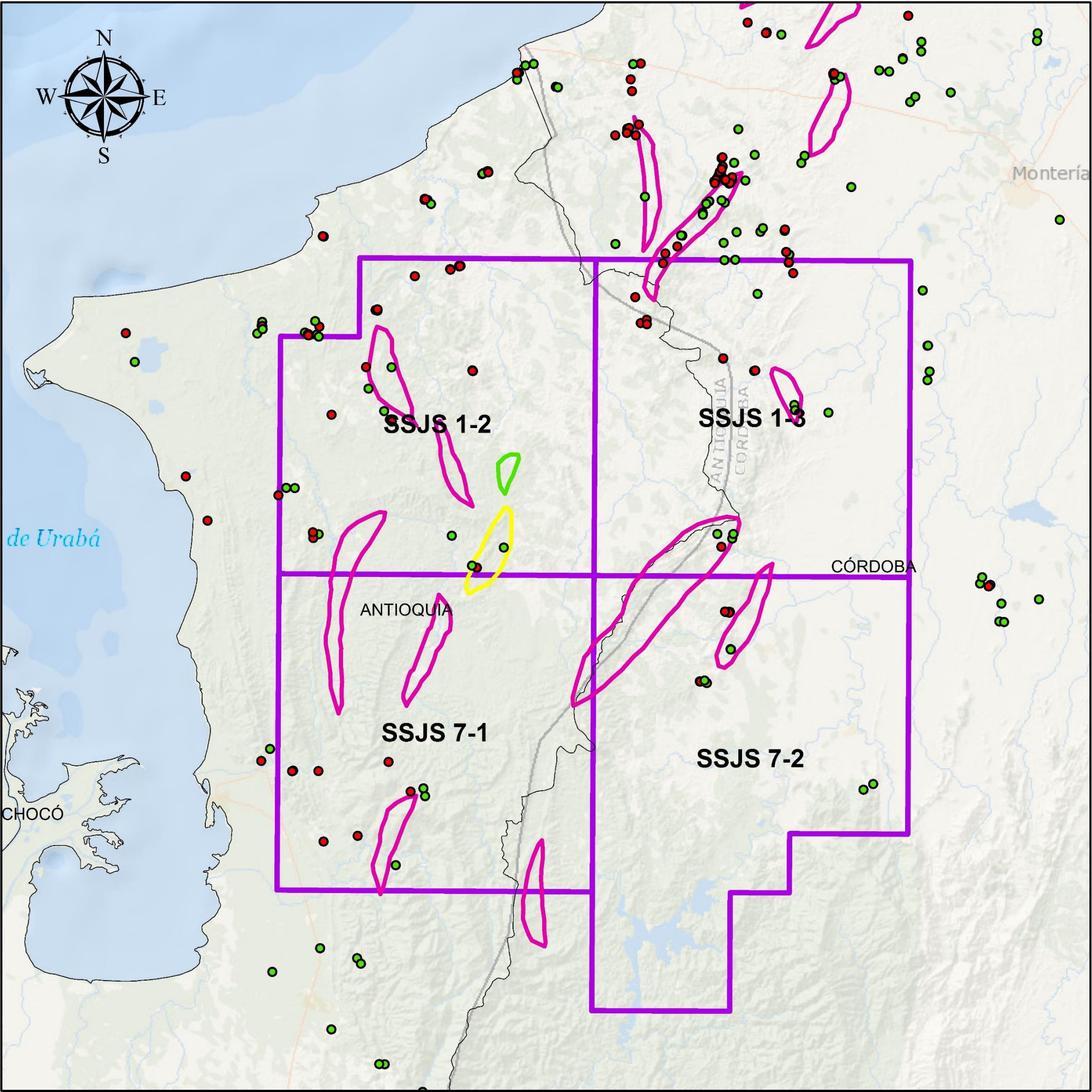
SEISMIC INTERPRETATION SSJ 7-1: Traps on flanks



(e) Trap formed by diapirism on two flanks

RECOVERABLE PROSPECTIVE RESOURCES

VOLUMETRICS: TOTAL



Oil (Deterministic)

- **13 leads in total**
- **OOIP: 1,282.51 MMBls**

Recovery factor 50%
Chance of success 30%

- **Prospective Resources**

High Estimate	192.37 MMBls
Best Estimate	96.18 MMBls
Low Estimate	19.2 MMBls

CONCLUSIONS

- The area **despite of being unexplored** has a **very long history of exploration**, including wells of the **Floresanto field** drilled from 1945 to 1947 by Socony Mobil and wells of the **Jaraguay Norte field** drilled in 1981 by Petrocol.
- **7 wells** and **3,101 Km** of 2D seismic have been acquired in the mega area including of the Sinú South area.
- Maralu (Eocene) and **Cansona (Upper K) Formations** are considered as the source rock in the area and the **Pavo sandstones, Floresanto** and **Pajuil Formations** are considered as the reservoirs
- The synclines and main structures in the area are dominated by the dynamic of mud diapirs with a source possibly at Oligocene Sediments
- Two fields have shown production in the area: Floresanto (**28,730 bls/51°API**) and Jaraguay Norte (**126 BOPD bls/48°API in Jaraguay Norte -1**) with **12** and **5** wells drilled respectively
- The seismic imaging could be improved using **wave-based migration** techniques such as RTM (**Reverse Time Migration**)
- **Three different sort of traps** have been identified: 1) traps at **mud diapir flanks**, 2) **anticlines with normal faults by collapse** and 3) traps **related to unconformities**, being the first one the most common
- Inside the areas offered by the ANH, **13 leads have been mapped** using surface geology and seismic interpretation with a **best estimate of recoverable prospective resources of 96,18 MMBls**.

Thanks

www.anh.gov.co