

New Gravity and Magnetic Anomaly Maps of Colombia

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Geologist MSc - Potential Fields Specialist



El futuro
es de todos

Minenergía



Work team:

Víctor Graterol, Ing Minas Geophysicist MSc – Data processor
Roniber Pinzón R., Geographer, Geologist MSc – Data processor & GIS
Juan Fco Arminio, Geologist MSc – Geology
Miguel A. Beltrán, Geologist – Data processor
Jorge Rubiano, Jr Geologist – Geology support



SCOPE AND IMPORTANCE OF THE PROJECT

Potential field maps and their supporting databases are scientific products of great use in planning oil and mining exploration and in academic research on the geotectonics.

In the field of hydrocarbons, they strongly contribute to the correct definition of the shape, structure and depth of our sedimentary basins.

COLOMBIA AIRBORNE, GROUND AND SATELLITE GRAVITY AND MAGNETISM INFORMATION SOURCES

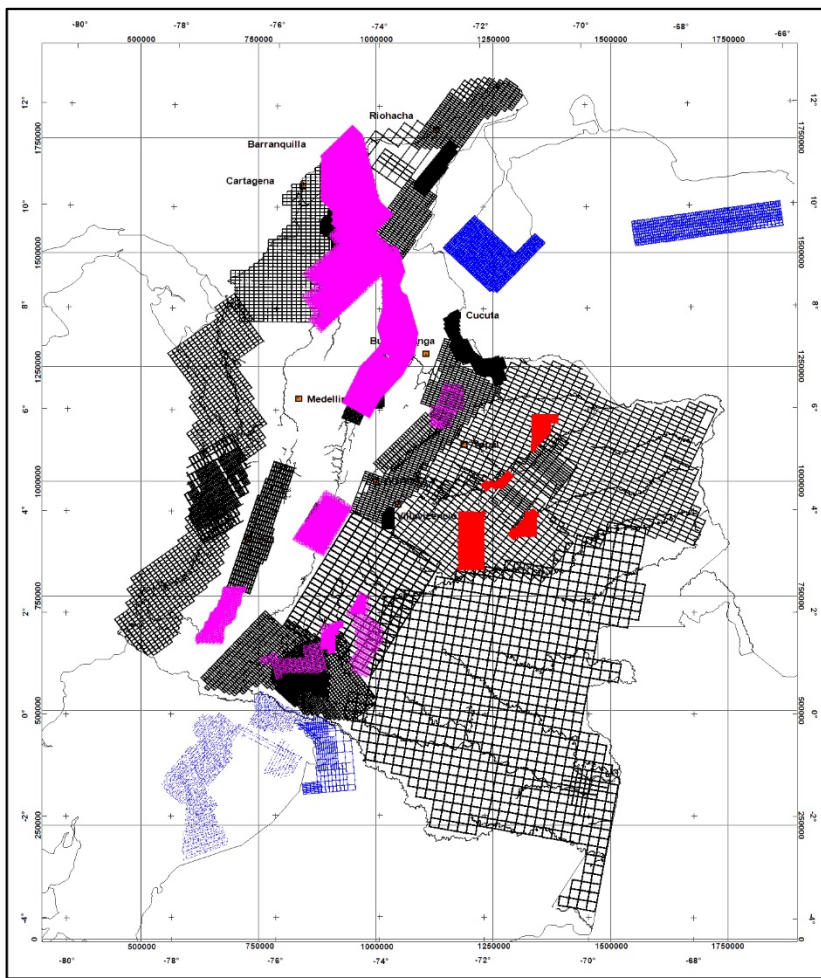


No.	PROGRAM NAME	OPERATOR	CONTRACTOR	YEAR	FLIGHT GRID SIZE	FLIGHT HEIGHT
1	Amazonas	Amoco	CARSON	1985	20 x 20 km	1000m
2	Amazonas	Shell	CARSON	1988	4 x 6 km	1000m
3	Ecuador	SAPG	Getech	1990	5x5 km	NA
4	South American Gravity Project	Universidad de Leeds	Varios	1998	9 x 9 km	NA
5	Group Survey Ecuador	Amoco, Triton, CGG y Mobil	CARSON	1998	2 x 6 km	2000 m
6	BOUGCITY Ecuador	City Investments	CARSON	1999	3.5 x 6 km	2000m
7	Alejo	CARSON	CARSON	1999	4 x 4 km	1400 M
8	Perú	Perez Companc	CARSON	2001	4 x 4 km	2000m
9	Toledo, Cirirí, Catleya, capacho & San Miguel	REPSOL - ECOPETROL	CARSON	2005	1 x1 km	1263 m
10	Caguán High	ANH	CARSON	2005	12 x 24 km	4634 m
11	Caguán Low	ANH	CARSON	2005	12 x 24 km	1370 m
12	Río Cauca	ANH	CARSON	2006	5 x 10 km	4565 m
13	Pacífico Norte	ANH	CARSON	2006	7.5 x 10 km	1280 m
14	Pacífico Sur	ANH	CARSON	2006	7.5 x 10 km	1280 m
15	Doima	HOCOL	CARSON	2006	24 x 12 km	2245 m
16	Orquídea	HOCOL	CARSON	2006	9 X 5 km	1200 m
17	Buenaventura	ECOPETROL	CARSON	2006	8 x 4 & 8 x 6 km	1,500 m
18	Llanos Sur	ANH	CARSON	2007	10 x 20 km	1214 m
19	Humadea	PETROBRAS	CARSON	2007	3 x 5 km	2734 m
20	Muisca	HOCOL	CARSON	2007	12 x 6 km	4280 m
21	Comunero	ODEBRECH	CARSON	2007	4 x 4 km	2,000 m
22	Cesar Rancheria	ANH	CARSON	2007	5 X 10 KM	1500 m
23	Putumayo	ANH	CARSON	2008	5 x 10 km	1200 m & 4600 m

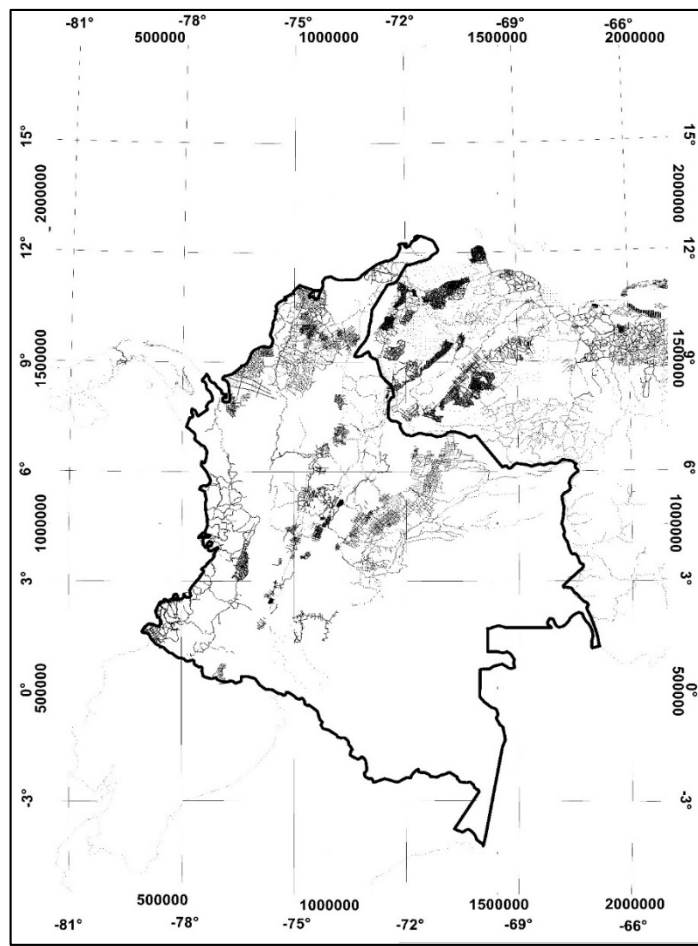
COLOMBIA AIRBORNE, GROUND AND SATELLITE GRAVITY AND MAGNETISM INFORMATION SOURCES



No.	PROGRAM NAME	OPERATOR	CONTRACTOR	YEAR	FLIGHT GRID SIZE	FLIGHT HEIGHT
24	Caguán Pacarana	CANACOL	CARSON	2009	4 x 12 km	1800m
25	Caguán	Hupecol	CARSON	2009	1 x 1 km	2000m
26	Tea Tacacho	Pacific Rubiales Energy	CARSON	2009	2.5 x 10 km	1215 m
27	Cordillera	ANH	CARSON	2009	4 x 6 km	4280 m
28	Bloque Cedrela	CANACOL	SANDER	2011	0.75 x 2.8 km	1800 m
29	Bloque Cedrela	RANCHO HERMOSO S.A.	SANDER	2011	750 X 2500 m	1500 m
30	CPO1, CPO6, CPO12 v CPO14	Pacific Rubiales Energy	FUGRO	2011	1 x 2 km	1500 m
31	Merecure	CEPCOLSA	FUGRO	2011	1 x 2 km	1500 m
32	Valle Superior del Magdalena Norte	ANH	FUGRO	2012	1x1km	2200m
33	VSM 22	TELPICO	SANDER	2012	0.5 X 0.5 km	2500 m
34	Cauca Patía Grantierra	GRANTIERRA	SANDER	2012	5 x 1 km	1000 m
35	COR 15 & COR 24	PACIFIC RUBIALES ENERGY	SANDER	2013	2 x 2 km	4,500 m
36	VIM	ANH	SANDER	2013	1 X10 km	DRAPE 300 m
37	Caguán	Pacific Rubiales Energy	SANDER	2014	3 x 12 km	1250 m
38	Sinu	GRANTIERRA	SANDER	2014	2 x 1 km	1500 m
39	Caribe 2d offshore	ANH	WESTERN GECO	2014	NA	NA
40	Fuerte norte & sur offshore	BHP BILLITON	AUSTIN EXPLORATION	2017	NA	NA
41	VMM	ANH	SANDER	2019	1 X10 km	DRAPE 300 m
42	Información terrestre	Varias	Varias	Varios	NA	NA
43	“The Gravity Field and Steady-State Ocean Circulation Explorer GOCE”		ESA	2013	5 x 5 km	268 km
44	Free Air Marine Gravity (mgal) Sandwell v23.1.GRD)		GEOSAT	2014	30 x 30 km	800 Km
45	EMAG2(v3): Earth Magnetic Anomaly Grid (2-arc-minute resolution)			2017	222 x 222 km	4 km



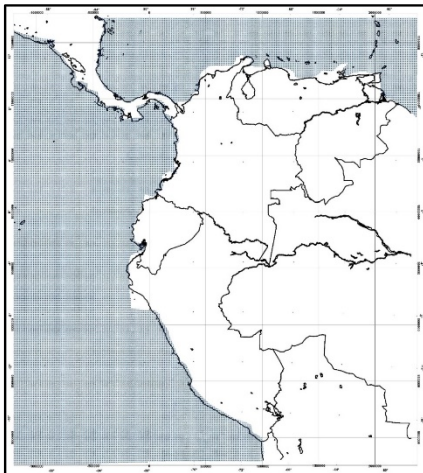
AIRBORNE GRAVITY AND MAGNETIC DATA



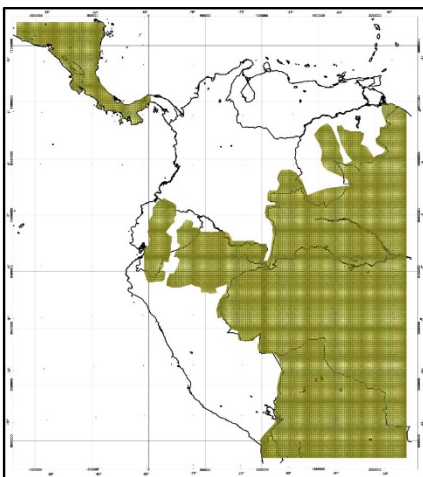
LAND GRAVITY DATA



**AIRBORNE AND GROUND GRAVITY AND MAGNETISM
INFORMATION SOURCES**

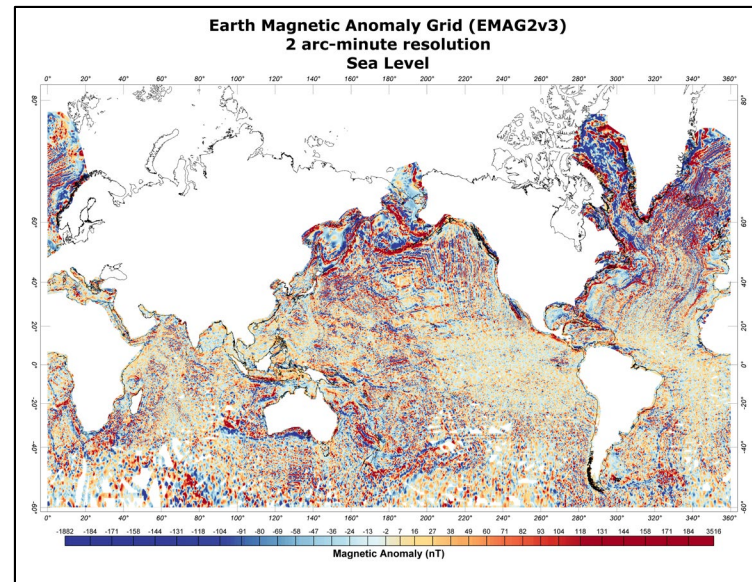


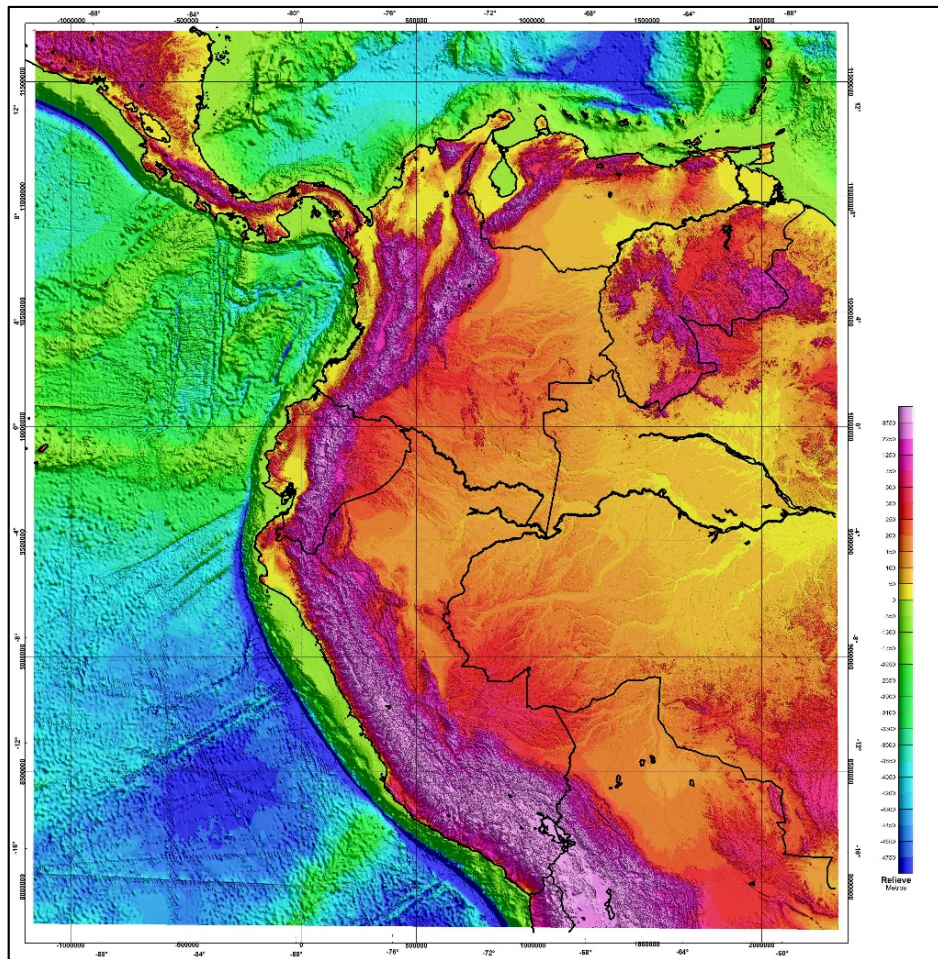
**Satellite coverage of
gravimetry and
magnetometry** Source:
Free Air Gravity (mgal)
Sandwell v23.1.GRD.
2014
The Gravity Field and
Steady-State Ocean
Circulation Explorer
GOCE, 2009-2013



**Land Gravity
SOUTH AMERICAN
GRAVITY PROJECT.**
Source: Authors, map
based on Leeds University
data 1988-1991

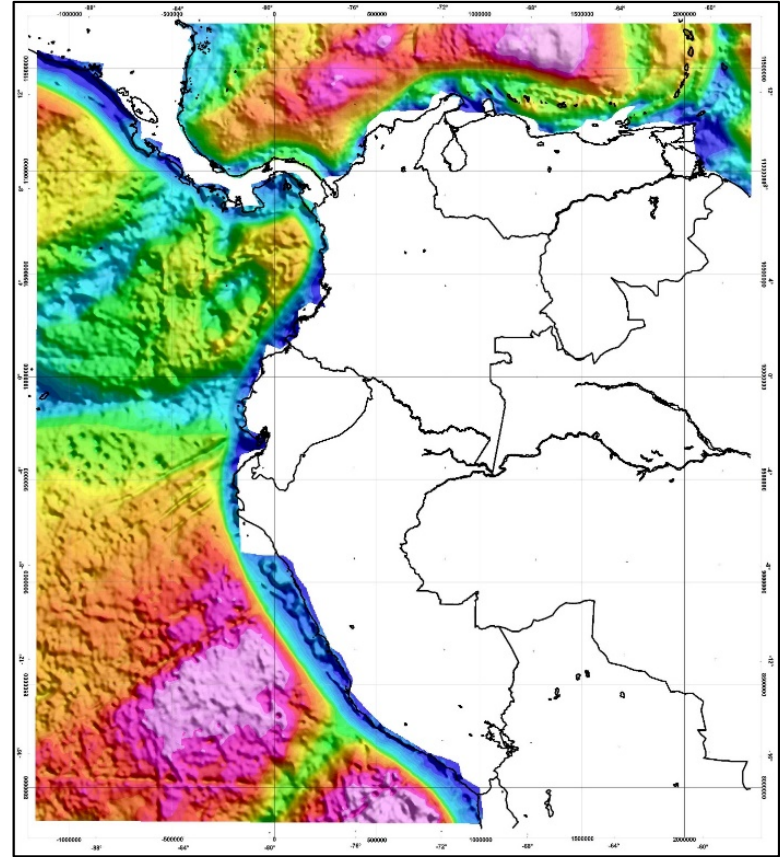
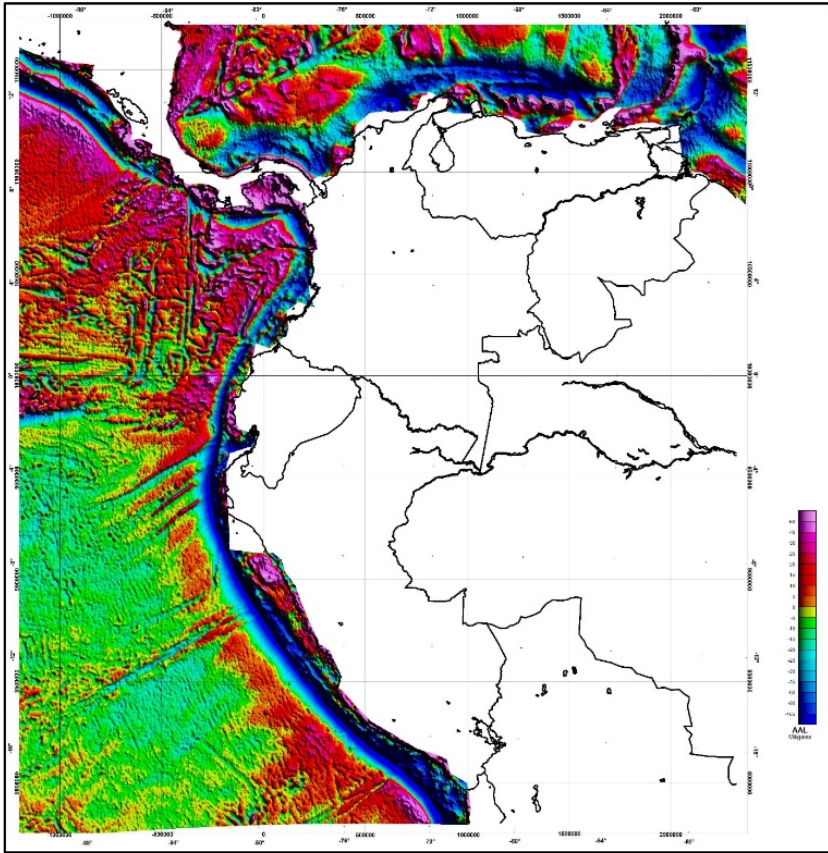
Magnetometry satellite coverage
EMAG2v3: Earth Magnetic
Anomaly Grid (2-arc-minute
resolution). Source : NOAA
National Centers for Environmental
Information. ncei.info@noaa.gov



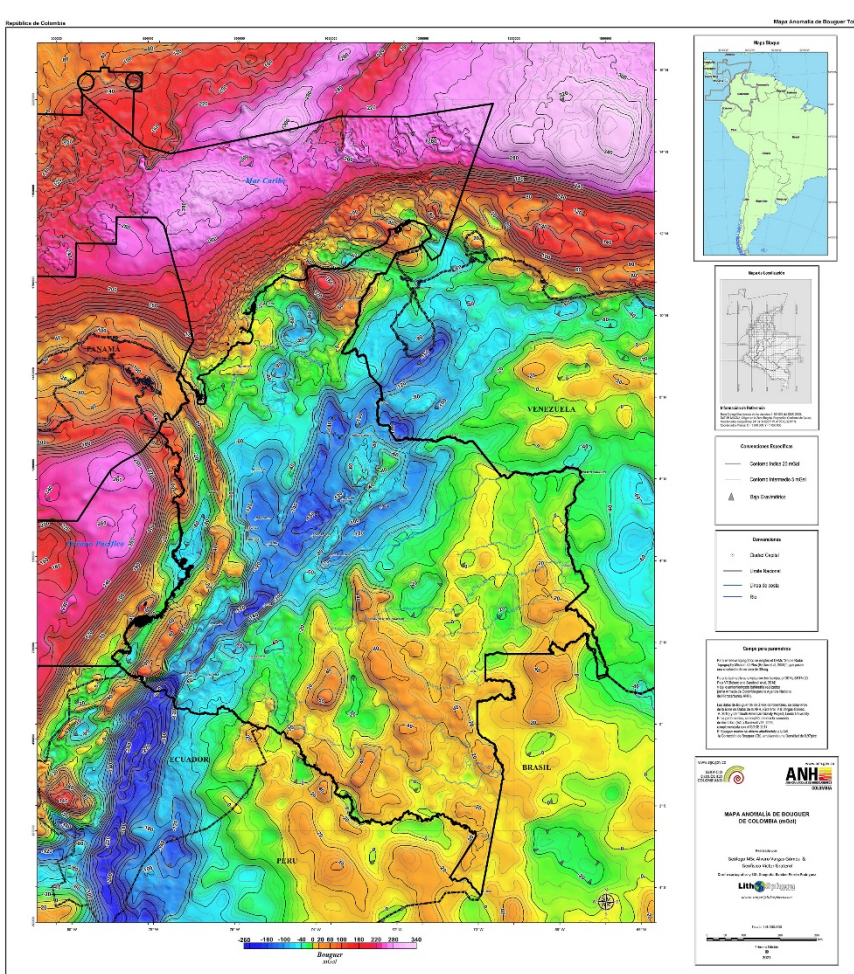


TOPOGRAPHY AND BATHYMETRY USED IN THE PROJECT

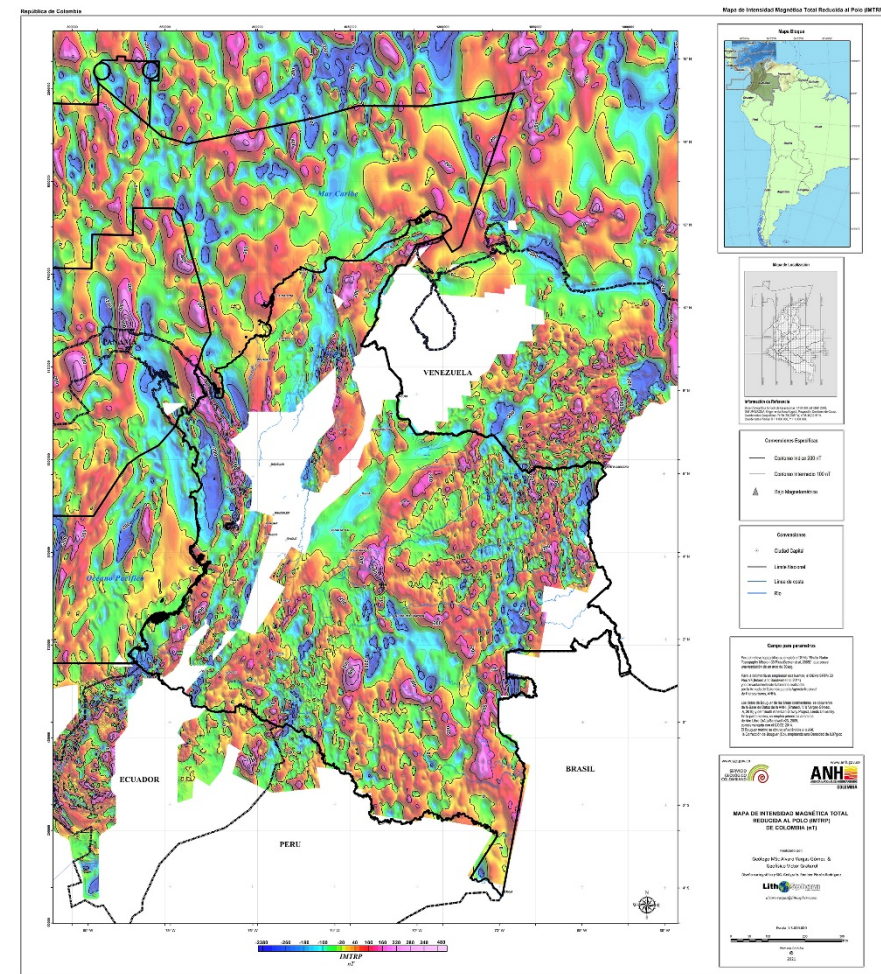
Source: Authors using SRTM 30 Plus V7, ANH-DIMAR Región Caribe 2013 – 2019



Free Air & Bouguer Anomaly Maps of marine areas made from satellite data.
Source: Vargas-Gómez, 2021



Total Bouguer anomaly new map



IMTRP Reduced to the Pole Total Magnetic Intensity new map

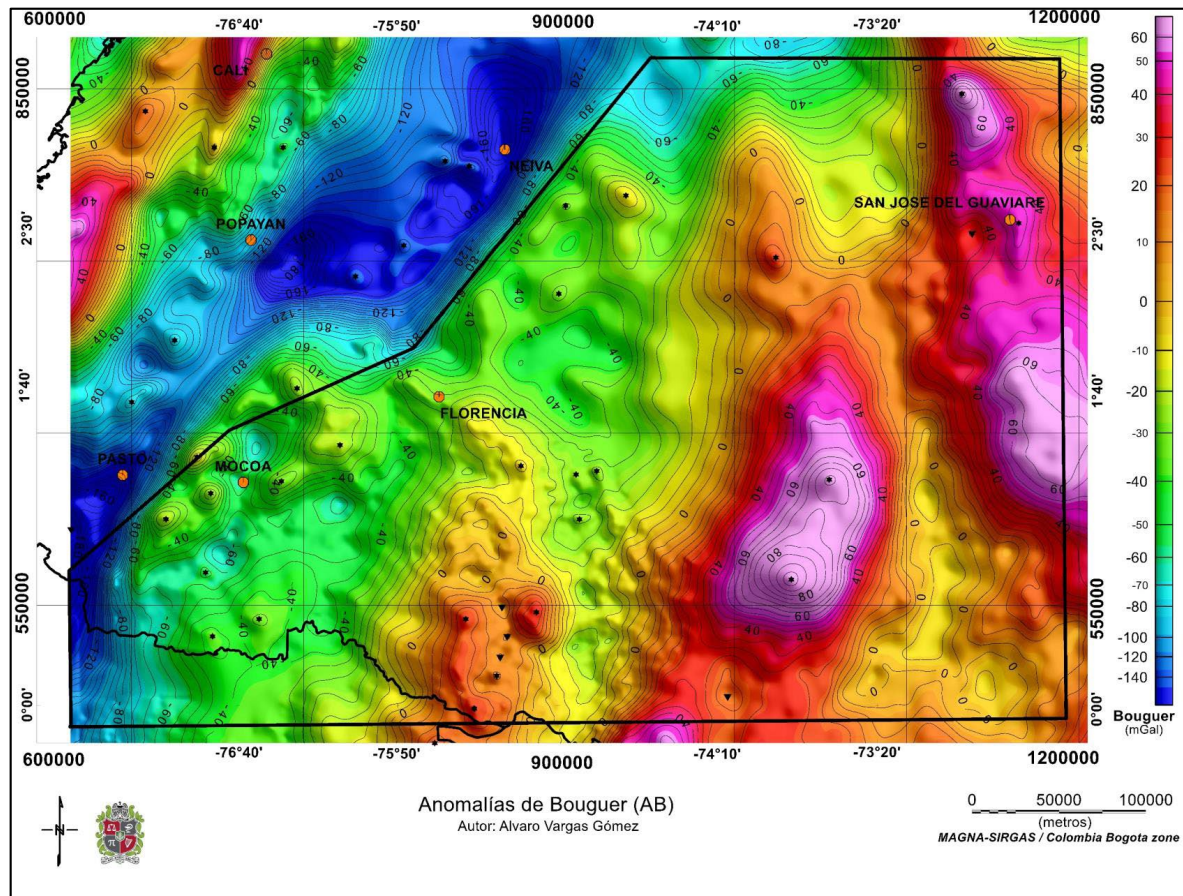


DIRECT USES

(Two examples of Quantitative Interpretation of the true basement by Subsurface Direct Control from wells and seismic data)

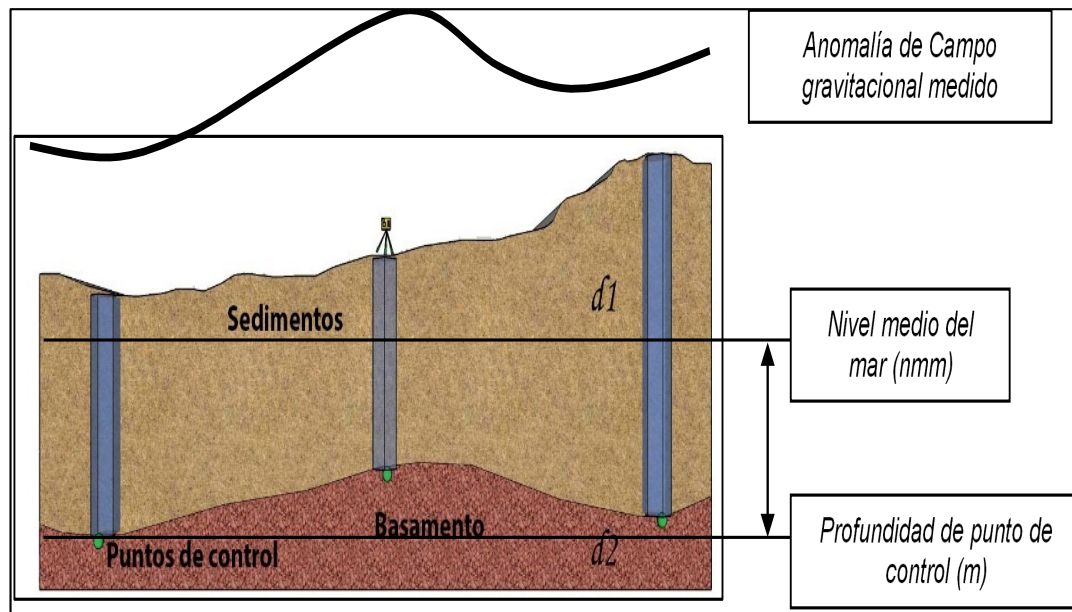


TOTAL BOUGUER ANOMALY MAP





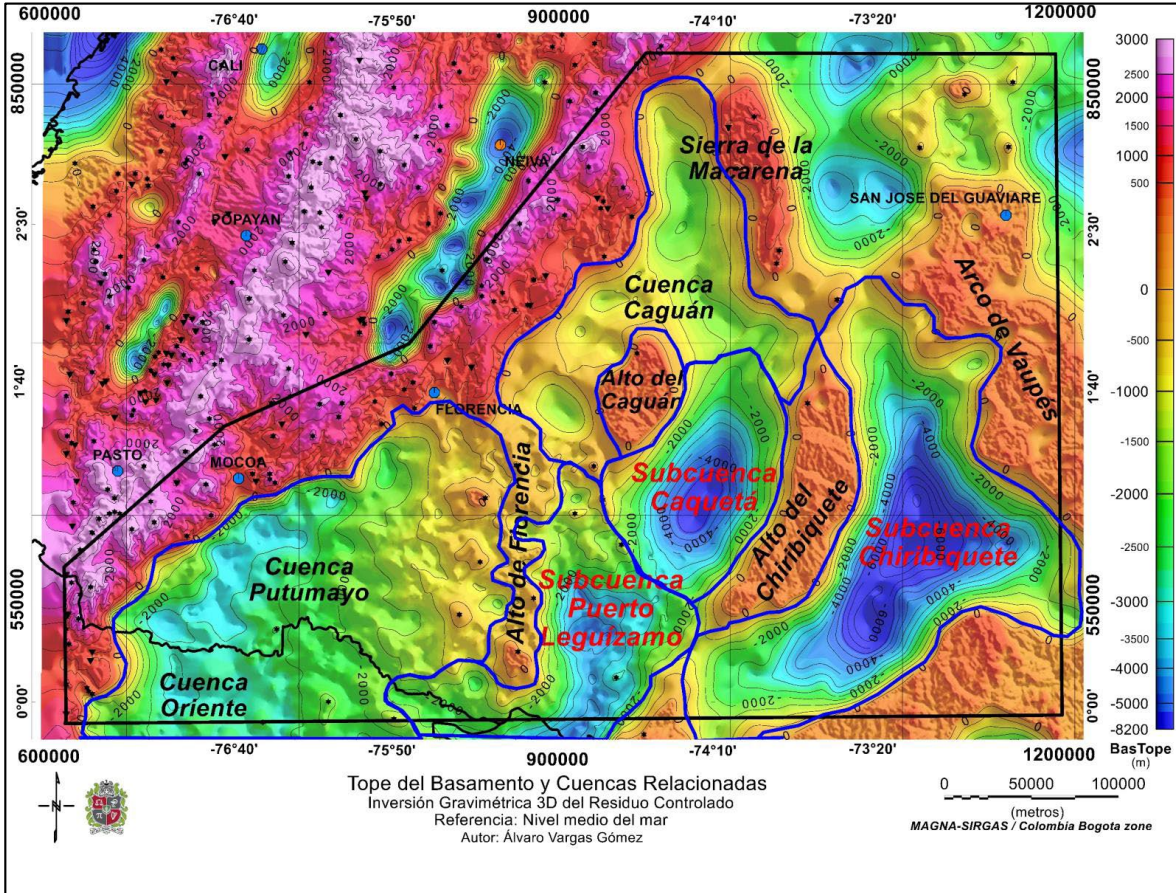
Control point elements applied in the 3D modeling.



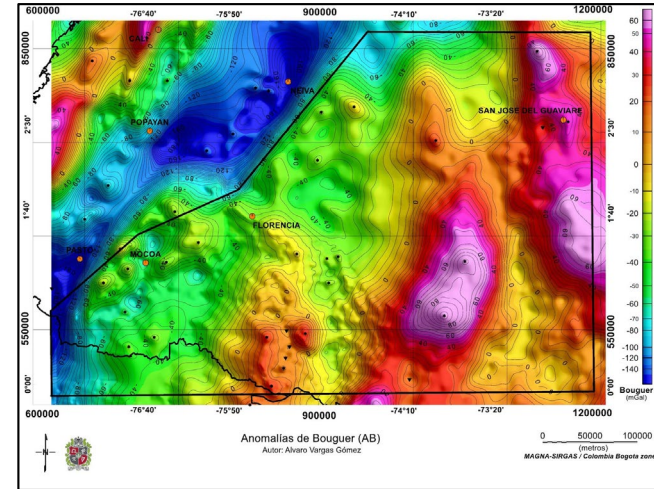
Residual Anomaly: From the top of the basement upwards, from the basement downwards is the regional anomaly.

New maps of gravimetric and magnetic field anomalies in Colombia

FINDING THE PRESENT FORM OF SEDIMENTARY BASINS LOOKING FOR THE ACTUAL GEOMETRY OF THE TRUE HIGH DENSITY BASEMENT



BOUGUER ANOMALY MAP

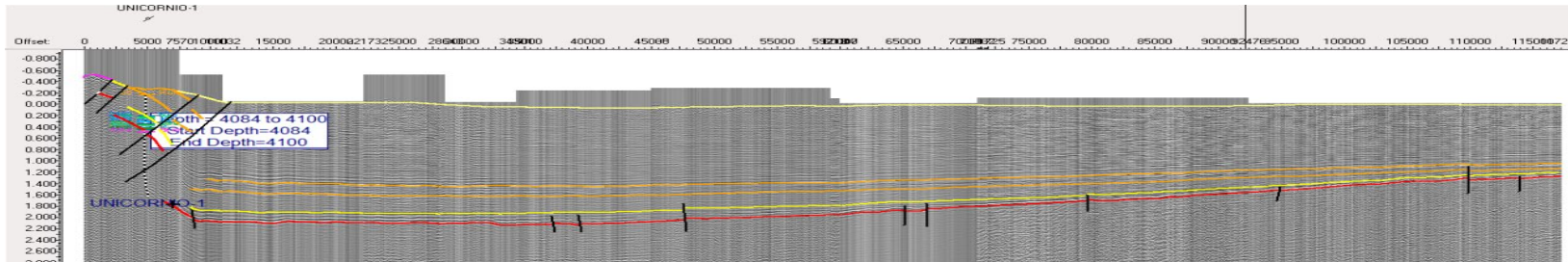
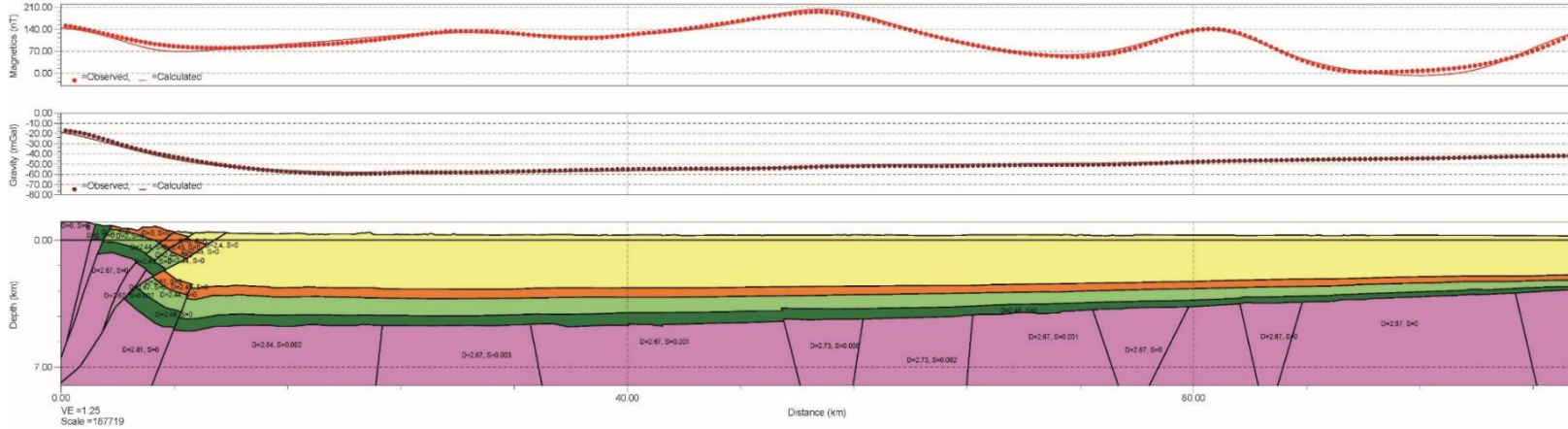


AMAZONIC BASINS
Source: Álvaro Vargas G, 2020

BASEMENT DIRECT MODELING USING POTENTIAL FIELDS, WELLS & SEISMIC



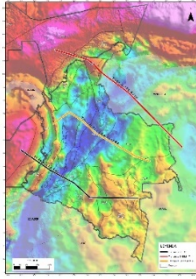
G:\ALV\CaguanPutumayo\UNICORNIO_geosoft_gmsys2d
Generated with GM-SYS



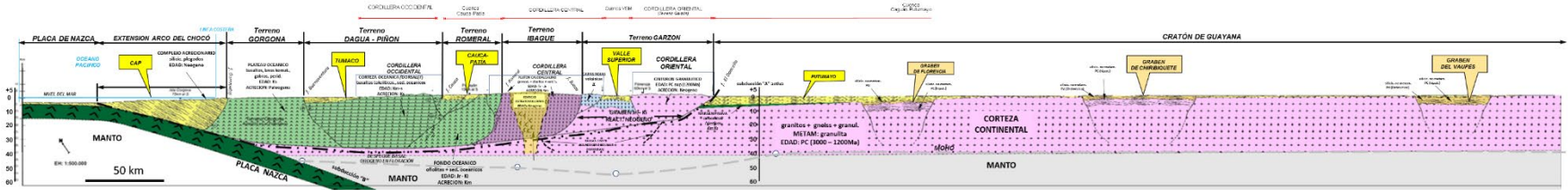
2.5D Geological Geophysical Model of the UNICORN Profile (The Vertical Exaggeration is 1.2).

Source: Álvaro Vargas G, 2020

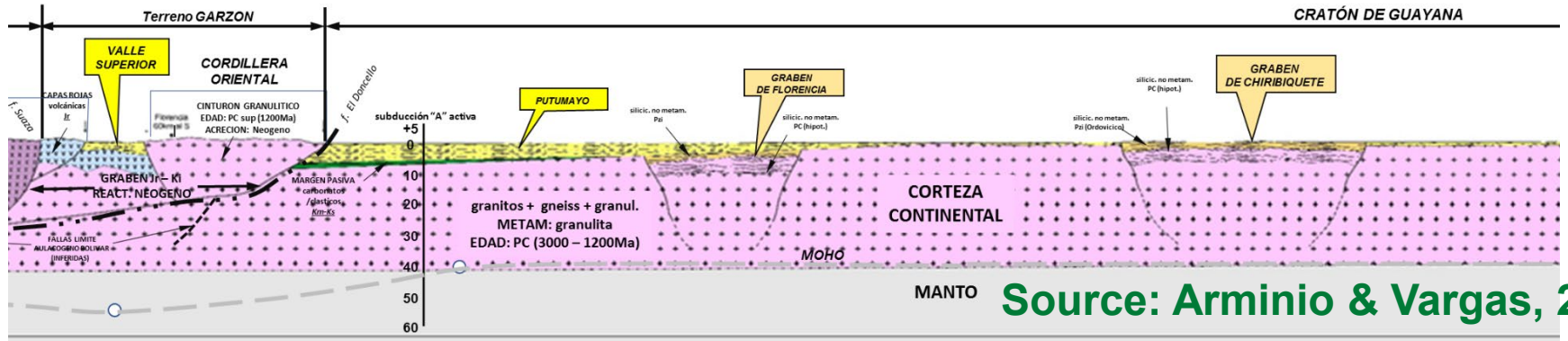
T1



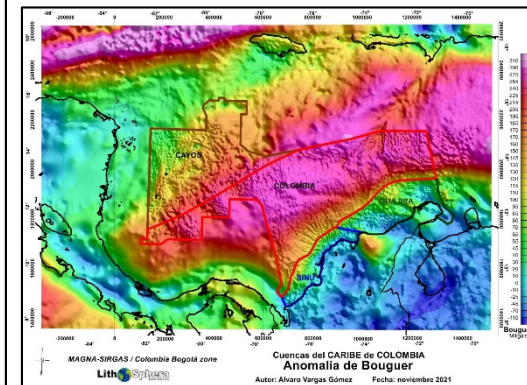
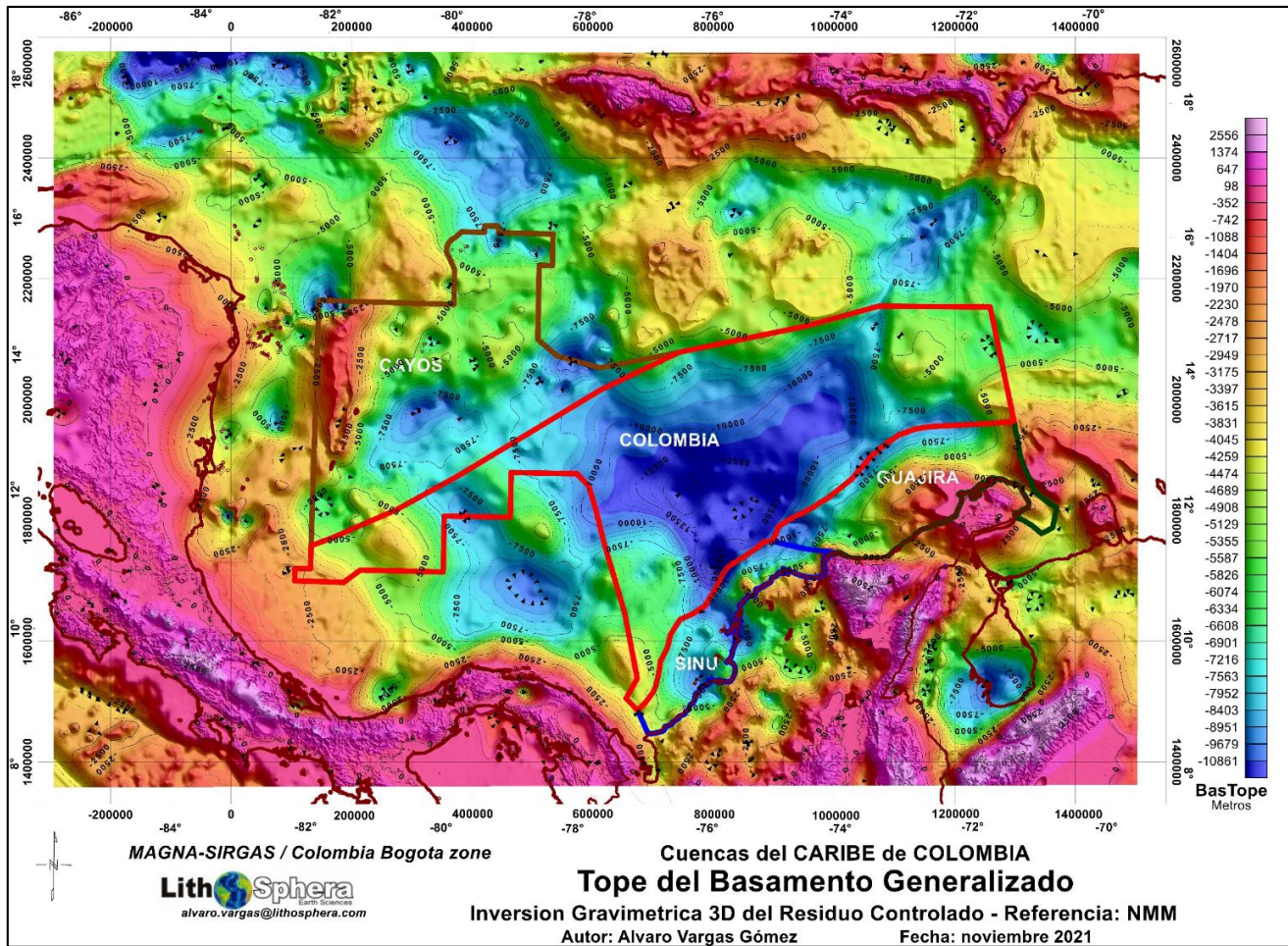
Enlarged area below



ENTRAL Cuenca VSM CORDILLERA ORIENTAL (Terreno Garzón) Cuenca Caguán-Putumayo



Source: Arminio & Vargas, 2022



CARIBBEAN BASINS
Source: Álvaro Vargas G, 2021



Thank you !

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