

U. S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

**GEOCHEMICAL DATA FROM THE
DEPARTMENTS OF CHOCO AND ANTIOQUIA, COLOMBIA
Part A: General Discussion**

by

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and

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INTRODUCTION

This report contains geochemical data for Colombia from the files of the U.S. Geological Survey. The data are believed to be a result of U.S. Geological Survey (USGS)-Instituto Nacional de Investigaciones Geológico - Mineras (INGEOMINAS)-U.S. AID cooperative projects in the 1960's and 1970's and subsequent regional geologic studies by INGEOMINAS. Permission was granted in 1994 by Sr. Antonio Romero Hernandez, Director General of INGEOMINAS, to publish this information. Little documentation remains with the data, but the geochemical data in this report are probably a subset of those used for regional studies such as the geologic study of Planchas 167 and 187 by Humberto González I. (1980). Much of the background information in this compilation is from that report.

CHEMICAL ANALYSIS

Samples of stream sediments and rock (10 mg in size) were analyzed for 31 chemical elements by a six-step semiquantitative method of emission spectrography (Grimes and Marranzino, 1968) in the laboratories of INGEOMINAS. In this method, the determinations are made by optical comparison and the concentrations are classed in terms of intervals whose limits increase logarithmically.

Concentrations are reported as decimal multiples, or sub-multiples, of 1, 1.5, 2, 3, 5, or 7 which are the numbers representing midpoints of the six concentration intervals. Upper and lower limits of determination for each element are given in table 1. Some elements

Table 1. Limits of determination in parts per million (ppm) for the spectrographic analysis of rocks and stream sediments.

Element	Determination Limits	
	Lower	Upper
Iron (Fe)	500 ppm	200,000 ppm
Magnesium (Mg)	200	100,000
Calcium (Ca)	500	200,000
Titanium (Ti)	20	10,000
Manganese (Mn)	10	5,000
Silver (Ag)	0.5	5,000
Arsenic (As)	200	10,000
Gold (Au)	10	500
Boron (B)	10	2,000
Barium (Ba)	20	5,000
Beryllium (Be)	1	1,000
Bismuth (Bi)	10	1,000
Cadmium (Cd)	20	500
Cobalt (Co)	10	2,000
Chromium (Cr)	10	5,000
Copper (Cu)	5	20,000
Galium (Ga)	10	2,000
Lanthanum (La)	20	1,000
Molybdenum (Mo)	5	2,000
Niobium (Nb)	20	2,000
Nickel (Ni)	5	5,000
Lead (Pb)	10	20,000
Antimony (Sb)	100	10,000
Scandium (Sc)	5	100
Tin (Sn)	10	1000
Strontium (Sr)	100	5,000
Vanadium (V)	10	10,000
Tungsten (W)	20	10,000
Yttrium (Y)	10	2,000
Zinc (Zn)	200	10,000
Zirconium (Zr)	10	1,000

for parts of some data sets were reported on the original laboratory report records with detection limits other than those indicated in table 1 (i.e. with a lower detection level for zinc of 100 ppm, not 200 ppm); the data in the tables are shown as originally reported. Panned concentrates and leached sediments were analyzed for a subset of elements.

GEOCHEMICAL DATA

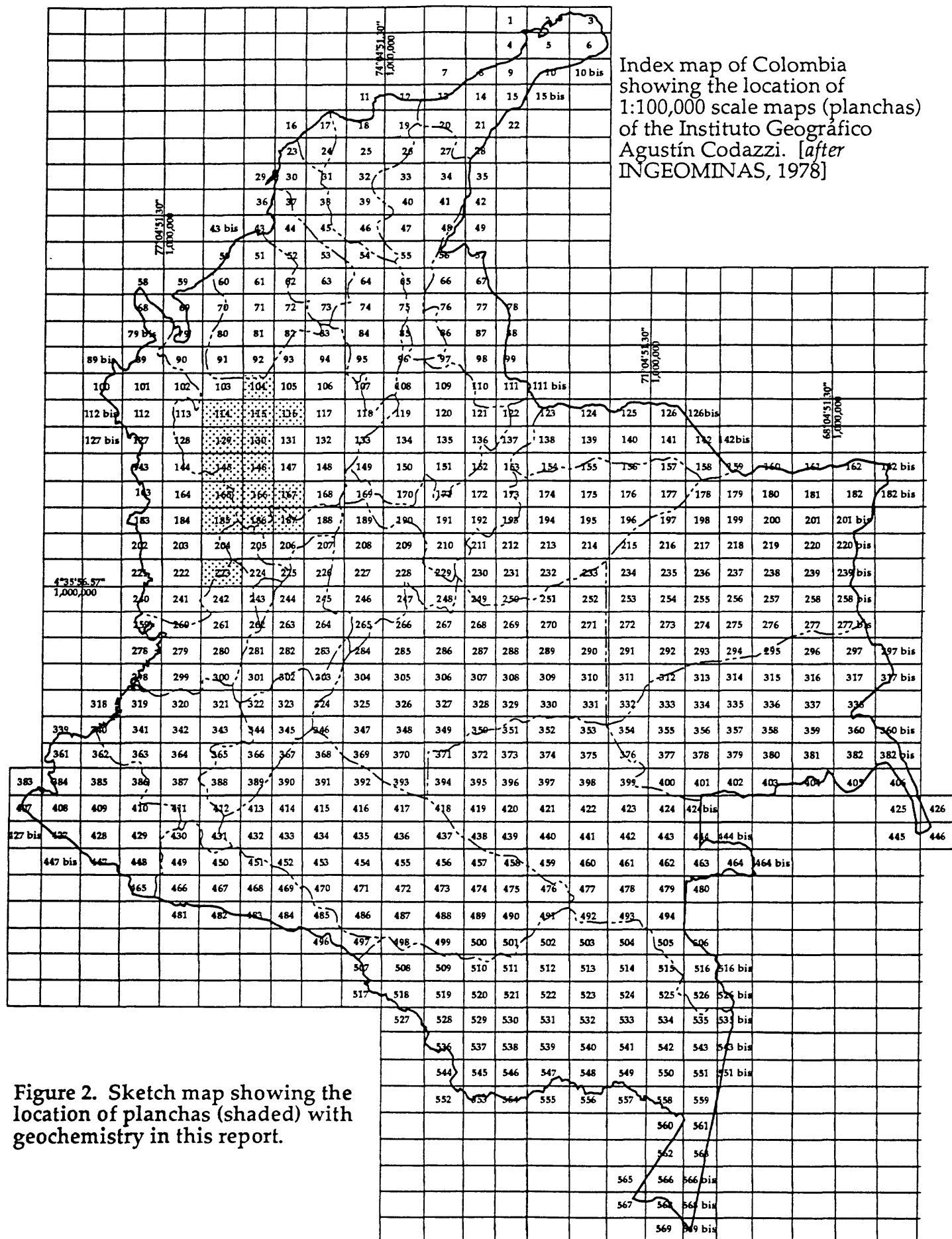
Table 2 shows the number of samples for each of the fifteen 1:100,000 quadrangles (planchas). These planchas occur partly or wholly within the Departments of Choco and Antioguia (figures 1, 2). Figure 3 shows the distribution of the samples. The chemical analyses for each of the samples and their geographical coordinates are

Table 2. Numbers of analyzed samples in this report

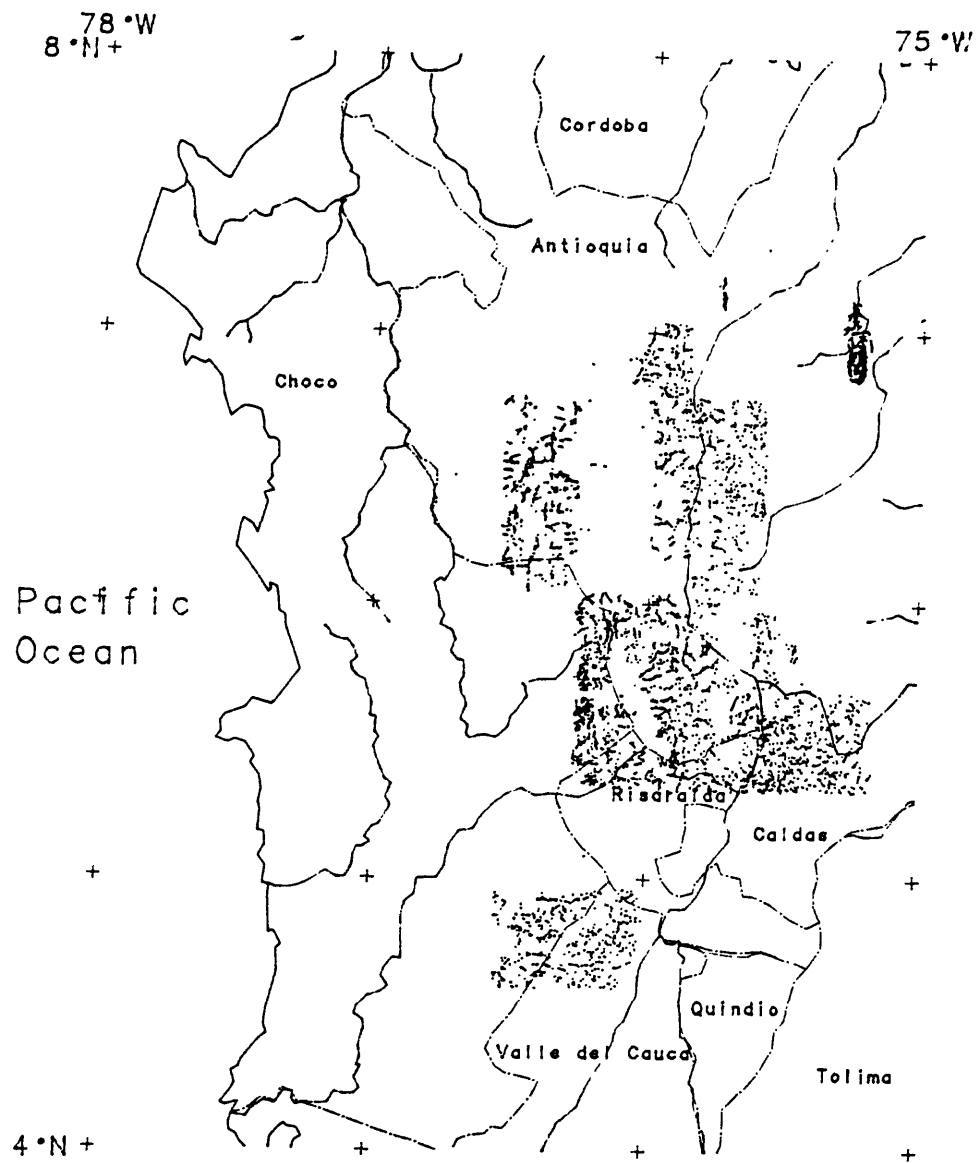
Plancha	No. Samples	Plancha	No. Samples
104 (pc)	29	146	325
114	73	165	584
115	196	166	478
116 (pc)	62	167	63
116 (ls)	481	185	594
129	539	186	778
130	492	187	610
145	400	223	555



Figure 1. Sketch map of Colombia showing its Departments.



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Figure 3. Distribution of the samples in this compilation.

compiled in tables 1 through 16 in Part B of this report and are also available on diskette (Part C). Each table contains the data for a single plancha. The data in this report are largely for the <1.0 mm fraction of stream sediment samples, but some soil or rock samples may be present in the stream sediment datasets. Panned concentrate data are listed in tables following the tables of stream sediment data. Each table is recorded on the accompanying diskette (Part C) in data interchange format (DIF) and can be imported into most spreadsheet and database application software. Data files in Part C are identified by their plancha number followed by a 2-letter code (ss = stream sediment, ls = leached sediment, pc = panned concentrate), and the suffix ".DIF".

The first column of the data tables lists the laboratory number of the sample. The second and third columns contain the latitude and longitude in decimal degrees (latitudes and longitudes are missing for approximately ten of the samples). The remaining 31 columns list the concentrations of elements. The symbols ">" (greater than), "<" (less than), and "N" (not detected) may occur with, or instead of, numerical values. In addition, in some datasets not all elements were reported, in these cases the fields were left blank. Table 3 lists the maximum, minimum, and median values of the 31 elements analysis of the stream sediments for each plancha.

REFERENCES CITED

González I., Humberto, 1980, Geología de las planchas 157 (Sonson) and 187 (Salamina): Colombia Instituto Nacional de Investigaciones Geológico - Mineras Boletín Geológico, v. 23, no. 1, p. 1-174.

Grimes, D.J., and Marranzino, A.P., 1968, Direct-current arc emission spectographic field methods for semiquantitative analysis of geologic materials: U.S. Geological Survey Circular 591, 6 p.

Table 3. Statistics of 31 element semiquantitative geochemistry (exclusive of Plancha 116).

		FE (ppm)	MG (ppm)	CA (ppm)	TI (ppm)	MN (ppm)	B (ppm)	BA (ppm)	CO (ppm)	CR (ppm)	CU (ppm)	GA (ppm)	LA (ppm)	NI (ppm)	PB (ppm)
PLANCHA															
104	max	200000	30000	70000	5000	5000	70	500	70	100000	200	20	150	1500	70
	min	30000	10000	10000	1000	500	N	< 20	15	500	7	10	N	500	N
	med	70000	20000	50000	3000	1000	20	200	50	10000	30	20	150	1000	10
114	max	2410000	100000	9000	20000	10000	1000	1	200	N	100	500	N	N	300
	min	33014	15000	2000	1000	2000	200	1	N	N	10	100	N	N	100
	med	100000	30000	5000	3000	4000	300	1	N	N	20	300	N	N	200
115	max	150000	70000	100000	>10000	5000	10	2000	N	1000	2000	N	N	> 500	200
	min	10000	2000	1000	500	150	0.5	N	N	N	< 20	N	N	50	10
	med	50000	7000	20000	4000	400	1	200	N	10	200	N	N	200	30
129	max	> 200000	70000	100000	30000	7000	150	500	10	300	> 5000	15	10	20	500
	min	10000	3000	500	1500	150	N	N	N	N	20	N	N	N	N
	med	30000	15000	3000	3000	700	0.7	400	10	20	500	< 1	< 10	< 20	15
130	max	200000	100000	100000	50000	3000	1.5	700	N	210	1500	150	5	N	70
	min	10000	500	< 500	700	50	N	N	N	N	N	N	N	N	< 5
	med	50000	10000	10000	5000	700	0.7	300	N	15	300	1	< 5	N	20
145	max	200000	70000	50000	30000	3000	7	N	15	500	5000	10	< 10	15	150
	min	10000	1000	< 500	1000	N	N	N	N	< 10	70	N	< 10	N	5
	med	30000	10000	2000	3000	500	0.375	N	15	20	300	0.5	N	N	15
165	max	200000	50000	70000	10000	3000	20	500	N	100	20000	20	10	20	500
	min	10000	3000	500	200	150	N	N	N	N	70	N	N	N	5
	med	50000	15000	5000	3000	500	1	500	N	20	500	1	< 5	12.5	15
166	max	> 200000	50000	70000	50000	3000	5	N	N	200	2000	15	10	N	100
	min	N	500	50	1000	50	< 0.5	N	N	N	50	N	N	N	5
	med	50000	7000	5000	5000	500	0.5	N	N	30	500	1	< 5	N	20
167	max	30000	15000	20000	10000	1000	2	N	N	50	700	2	20	N	50
	min	5000	1500	500	700	150	0.5	N	N	N	N	< 1	N	N	N
	med	20000	3000	2000	3000	300	0.5	N	N	15	200	1	12.5	N	10

Table 3. Statistics of 31 element semiquantitative geochemistry (exclusive of Plancha 116).

	SC	SR	V	Y	Zr	ZN
PLANCHA	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
104						
max	50	700	700	150	300	700
min	7	N	100	N	N	N
med	20	200	250	20	100	300
114						
max	70	200	100	70	50	10
min	10	20	30	20	30	5
med	20	70	50	30	50	5
115						
max	100000	2000	115	500	30	N
min	20	2	10	N	5	N
med	150	50	20	50	10	N
129						
max	1500	15000	50	50	30	N
min	N	15	< 10	N	N	N
med	150	70	20	20	5	N
130						
max	10000	500	50	300	30	10
min	N	2	< 10	N	N	N
med	100	70	20	50	< 5	< 10
145						
max	1500	500	50	50	20	50
min	< 10	10	N	N	N	N
med	100	50	15	20	12.5	50
165						
max	2000	> 20000	50	200	30	N
min	N	10	< 10	N	N	N
med	200	100	20	20	7	N
166						
max	2000	300	50	100	15	N
min	10	5	< 10	N	N	N
med	100	70	20	20	3.75	N
167						
max	2000	50	10	300	5	N
min	10	< 5	< 10	N	< 5	N
med	50	20	< 10	50	< 5	N

Table 3. Statistics of 31 element semiquantitative geochemistry (exclusive of Plancha 116).

		FE (ppm)	MG (ppm)	CA (ppm)	TI (ppm)	MN (ppm)	B (ppm)	BA (ppm)	CO (ppm)	CR (ppm)	CJ (ppm)	GA (ppm)	LA (ppm)	NI (ppm)	PB (ppm)
PLANCHA															
185	max	> 200000	50000	70000	10000	2000	20	500	100	150	3000	2	N	N	100
	min	20000	2000	< 500	1500	70	N	N	N	N	70	N	N	N	N
	med	70000	15000	7000	5000	700	0.5	500	100	20	500	< 1	N	N	15
186	max	> 200000	100000	50000	50000	2000	10	1000	50	100	2000	15	10	70	70
	min	N	700	500	200	100	N	N	N	N	10	N	N	N	N
	med	30000	10000	5000	3000	500	1	300	50	20	300	1	< 10	20	15
187	max	70000	70000	20000	15000	2000	10	3000	N	300	3000	2	30	30	70
	min	7000	1000	500	150	100	N	N	N	N	N	N	N	N	5
	med	20000	5000	3000	3000	500	0.5	200	N	15	300	1	15	< 20	15
223	max	100000	50000	70000	50000	> 5000	5	N	N	100	15000	10	5	< 10	70
	min	10000	5000	200	1000	200	N	N	N	N	70	N	N	N	5
	med	50000	20000	15000	5000	700	0.5	N	N	20	1000	1	3.75	N	15

Table 3. Statistics of 31 element semiquantitative geochemistry (exclusive of Plancha 116).

	SC	SR	V	Y	Zr	Zn
PLANCHA	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
185	max	3000	1000	70	50	50
	min	N	15	< 10	N	N
	med	150	100	30	20	< 5
186	max	2000	700	70	100	50
	min	N	N	N	N	N
	med	70	50	20	20	5
187	max	2000	150	20	300	20
	min	5	< 5	N	N	N
	med	70	15	< 10	20	< 5
223	max	1000	200	70	100	20
	min	20	10	10	N	N
	med	200	50	20	30	5