INGEOMINAS

OBSERVATORIO VULCANOLOGICO DE COLOMBIA

Manizales

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I N G E O M I N A S

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ENERO DE 1989

Manizales, Colombia

OBSERVATORIO VULCANOLOGICO DE COLOMBIA
INGEOMINAS
MONTLY BULLETIN
JANUARY 1989

INTRODUCTION

It give us a great pleasure here at the Volcanological Observatorio of Colombia to be able to send this montly bulletin for the firts time in English.
We hope that this bulletin with Ruiz information, written in a languaje that will reach a wider reading audience could contribute to further volcanological knowledge.

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SEISMOLOGY
January 1989

ABSTRAC

During the month the seismic activity at Ruiz Volcano compared with the previous month experimented a slight increase in the number of high frequency events and a larger increase in the number of low frequency events. The release energy showed a moderate to high increases of the values. Brief increases in tremor intensity frecuently associated with small ash emissions.

HIGH AND LOW FREQUENCY EVENTS

It was recorded 1143 High Frequency events that which only represented a slight increased respect to the previous month, while the low frequency activity showed a higher increase with 3160 events (see Figures 1, 2). It is important to point out that during the month, there frecuently ocurred long period events, especially on the 17th and 29th with two swarms each day.

RELEASE ENERGY

The release of energy curve for both kinds of events (high and low frequency) showed an important increase on the 19th associated with increase in low frequency activity (see Figure 3). In general, the energy release was higher than previous month.

LOCATION OF HIGH FREQUENCY EVENTS

The majority of the high frequency earthquakes were located (Table 1) in an elongated zone with a W-SE heading, between the Arenas Crater and the Nevado del Cisne (see Figure 6). Some events ocurred about 2 kms SE from Nevado del Cisne. For all earthquakes the most common depths were between 0.5 to 4.5 Kms (see Figures 7, 8).

SHALLOW EARTHQUAKES

The level of the shallow activity was low, as was the tendency since december 1988. There were 86 events, recorded 47% less than the previous month (see Figure 9).

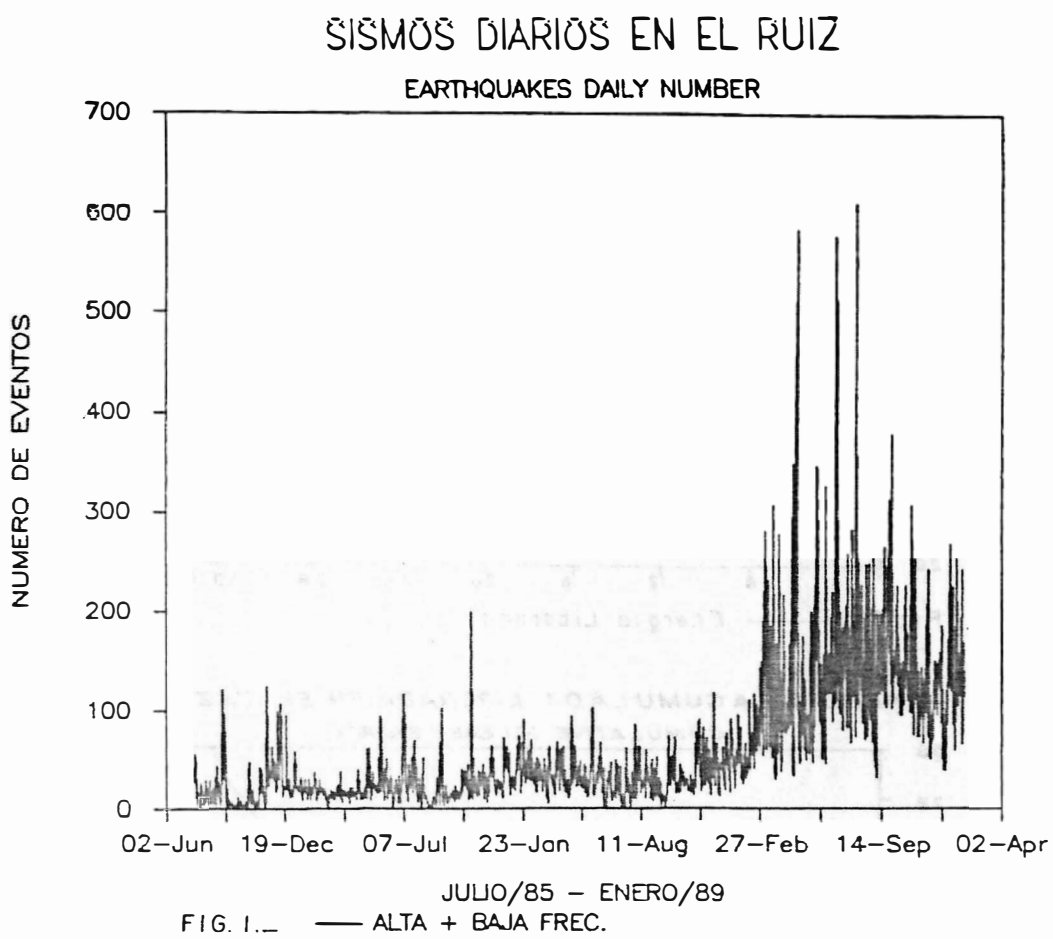


FIG. 1._ —— ALTA + BAJA FREC.

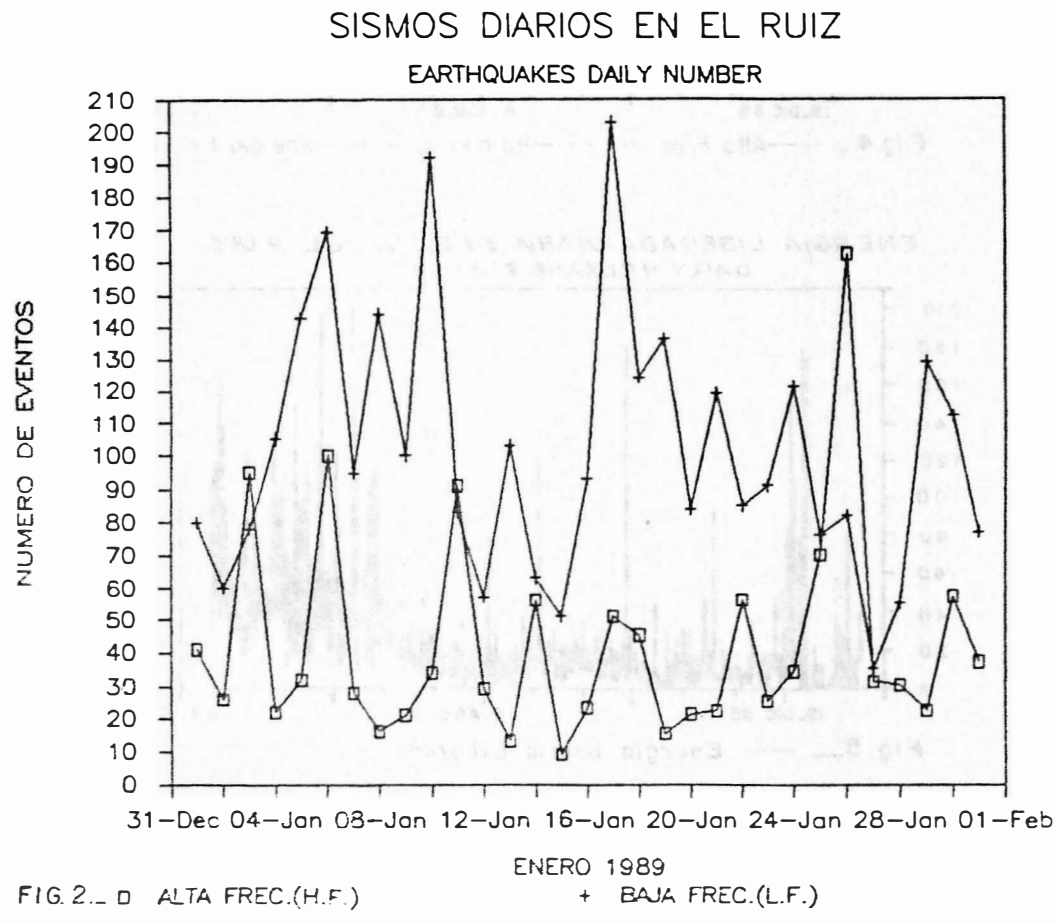


FIG. 2._ □ ALTA FREC.(H.F.) + BAJA FREC.(L.F.)

ENERGIA LIB.DIARIA DE ALTA Y BAJA FRECUENCIA

DAILY RELEASE ENERGY

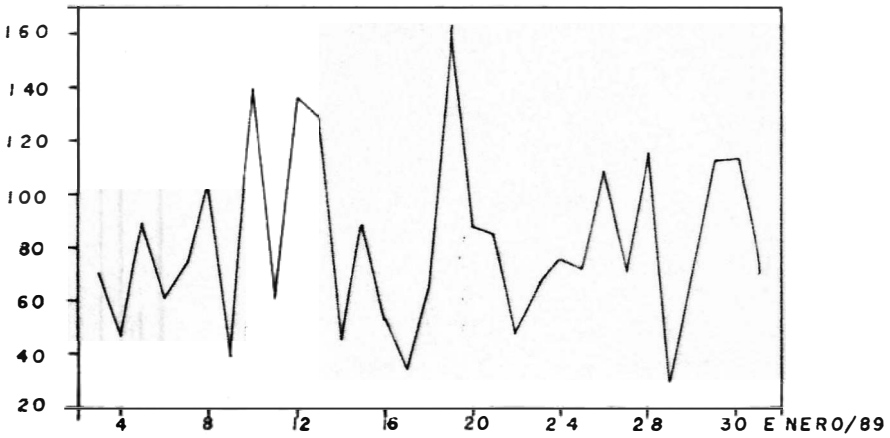


Fig. 3._ ——— Energia Liberada

ENERGIA ACUMULADA LIBERADA EN EL RUIZ

CUMULATIVE RELEASE ENERGY

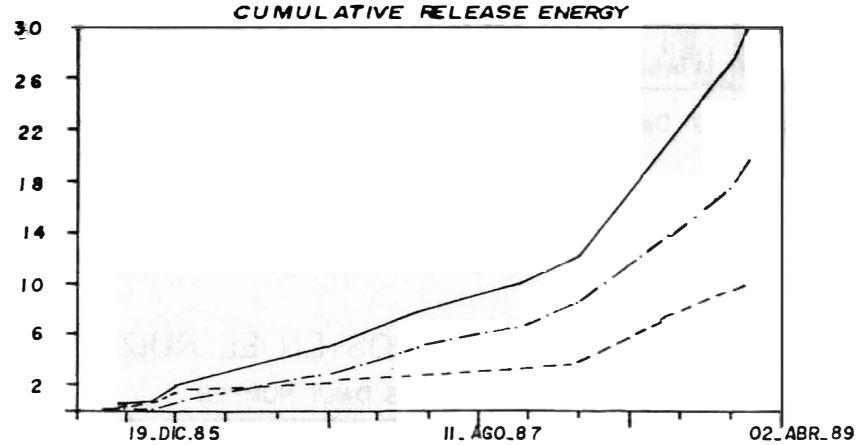


Fig. 4._ ——Alta Frec. —·—·—Baja Frec. – – – –Energia Liberada

ENERGIA LIBERADA DIARIA EN EL V. DEL RUIZ

DAILY RELEASE ENERGY

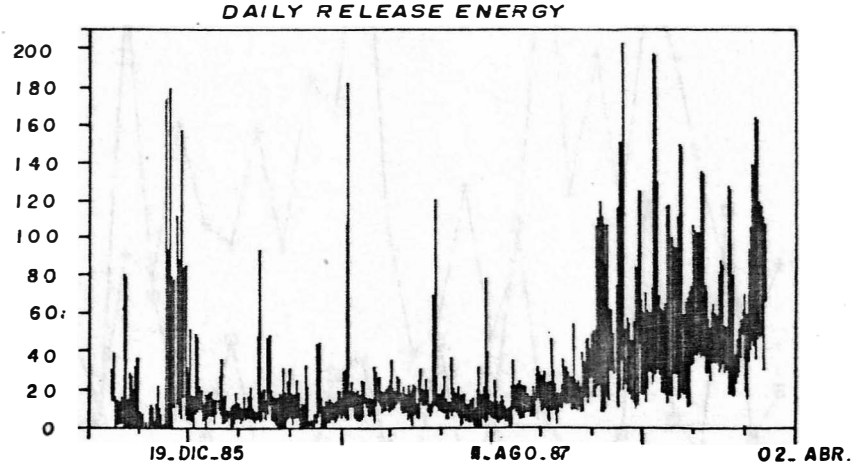


Fig. 5._ —— Energia Diaria Liberada

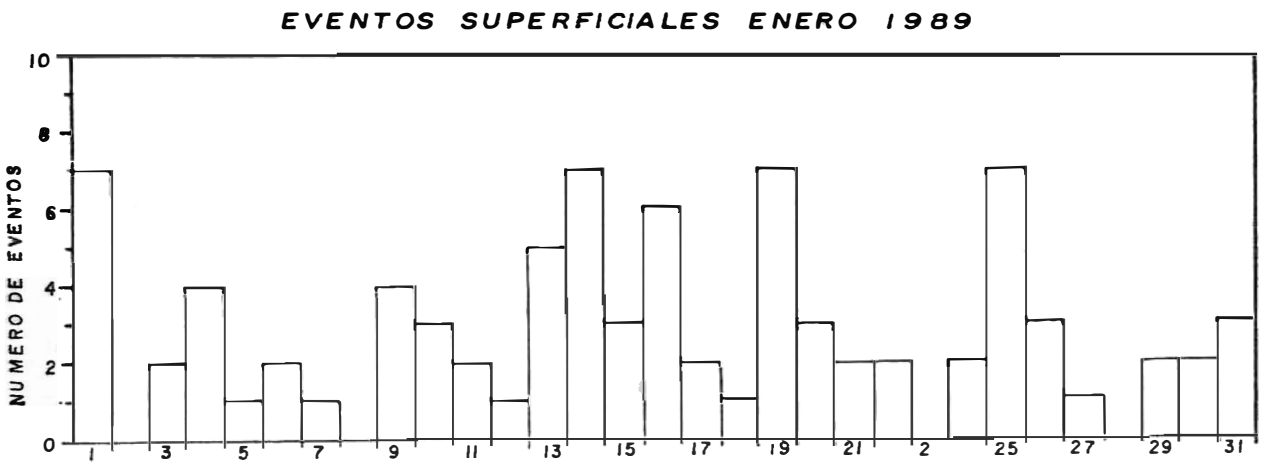


Fig. 9._ SHALLOW EARTHQUAKES

TREMOR

During January, the tremor signal was generally the same as in previous months, characterized by brief increases in the intensity associated with small ash emissions usually preceded by long period events.

On the 2nd on 3rd the tremor signal showed a different pattern, because of a continuos and monochromatic character accompanied by sporadics increases of the intensity of the tremor. It's average amplitude was about 1 um/sec; and the dominant period between 0.35-0.45 seconds with a very shallow origen because the attenuation of the amplitude with the distance.

During the month on 193 ocassions there were short increases in the amplitude of the tremor (pulses), mainly on the 3rd and 4th with 19 pulses.

The maximun amplitude reached 5,32 um/sec on 1st of January.

In general the dominant periods were between 0.10 to 1.0 sec. Between 0.15 to 0.30 sec was the most common.

The reduced desplacement was calculate based on Rayleigh waves, if taking into account the quick attenuation of the amplitudes, locating the origen of the tremor in the most upper part of the volcanic system. The maximun reduced displacement reached on the 19 was about 2.61 square cms (see Figure 10).

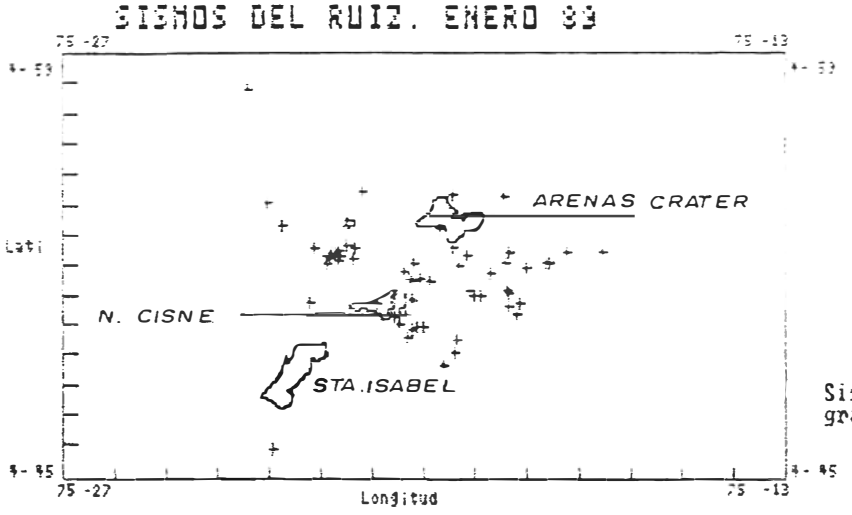


Fig. 6._

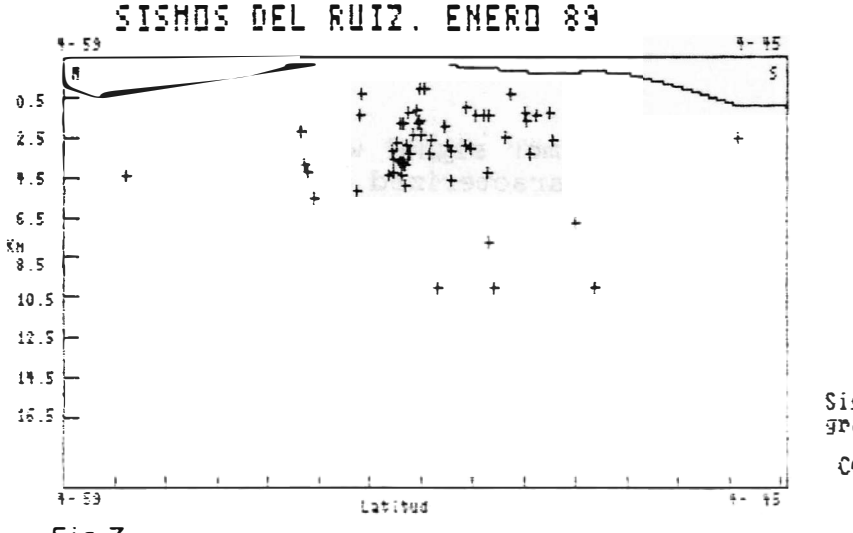


Fig. 7._

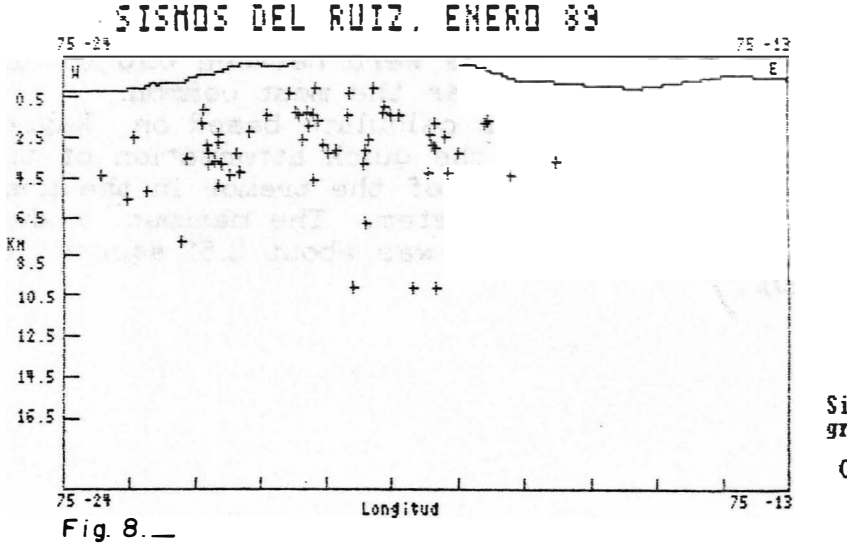


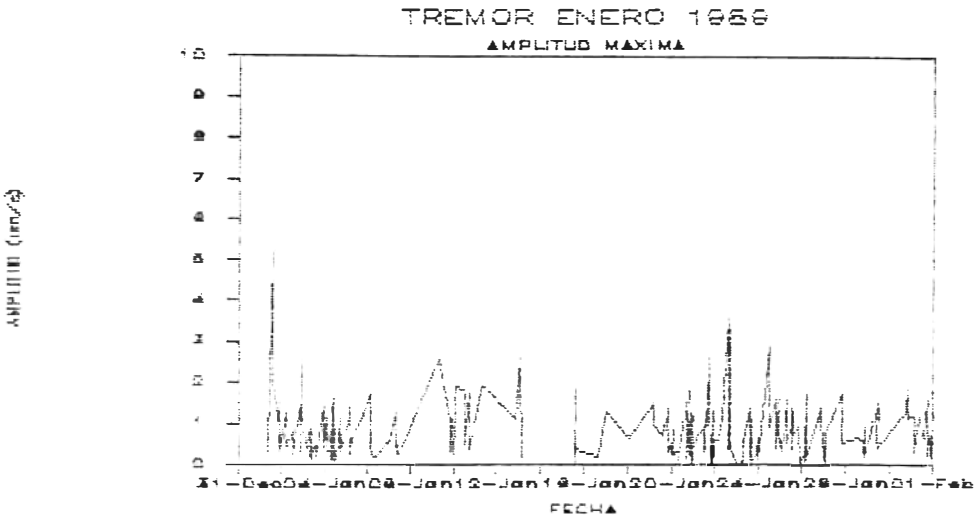
Fig. 8._

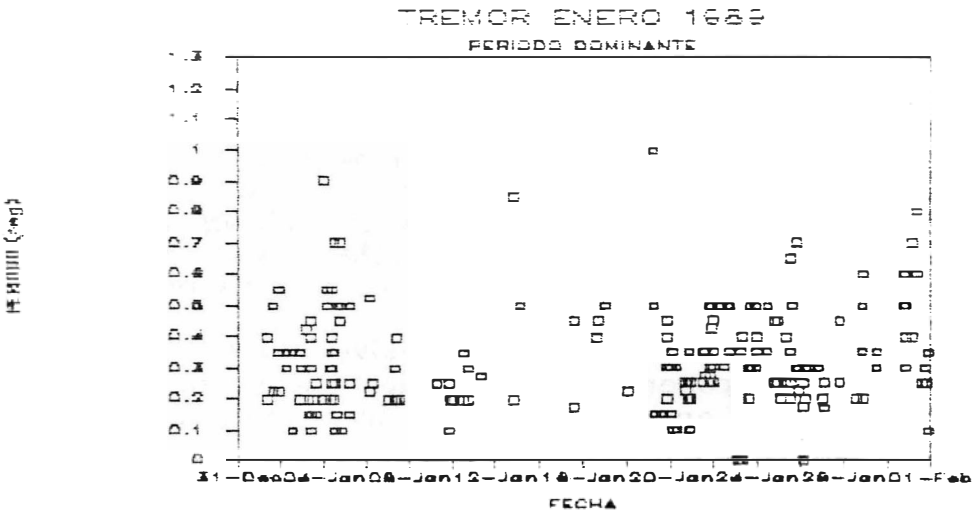
TABLA I.— *Parametros de Localización Sismos de Alta Frec. en el Volcán Nevado del Ruiz. Enero 1989.*

DATE	ORIGIN	LAT N	LONG W	DEPTH	MAG	NO	GAP	DMIN	RMS	ERH	ERZ	QM
890101	5 6 42.64	4-52.48	75-17.21	4.47	1.57	7	258	2.1	0.12	2.5	1.8	C1
890101	1352 52.04	4-50.90	75-20.42	1.52	1.08	9	166	4.5	0.05	0.2	0.3	B1
890102	1840 52.99	4-57.90	75-23.42	4.44	1.16	8	297	2.6	0.09	1.0	1.4	C1
890103	1037 45.85	4-51.53	75-19.86	3.24	0.96	5	250	5.1	0.03	0.7	1.9	C1
890103	1940 48.67	4-51.59	75-20.05	2.90	1.17	8	149	3.4	0.06	0.4	1.2	B1
890104	1 41.72	4-52.52	75-18.34	1.85	0.85	5	223	0.9	0.06	9.0	4.6	B1
890104	2 9 34.11	4-52.06	75-19.28	0.08	1.19	5	136	1.9	0.07	0.0	0.0	C1
890104	1047 33.90	4-50.41	75-20.56	0.33	0.52	6	178	5.2	0.07	0.3	1.3	B1
890105	217 2.50	4-51.26	75-18.38	2.91	1.52	7	226	1.4	0.18	2.4	3.4	C1
890105	217 2.73	4-52.12	75-18.41	2.39	1.24	7	172	0.4	0.15	2.6	2.7	C1
890106	1228 45.96	4-49.57	75-19.36	2.60	0.72	7	225	5.0	0.13	1.2	4.8	C1
890106	1230 51.27	4-49.13	75-19.40	6.82	1.30	9	233	5.7	0.17	1.4	2.5	C1
890106	1232 44.47	4-50.07	75-20.11	1.73	0.78	7	196	5.0	0.11	1.0	2.5	C1
890106	1241 39.61	4-50.00	75-19.97	3.34	0.24	6	201	4.9	0.08	1.3	2.9	C1
890106	1337 0.25	4-48.75	75-19.61	10.00	1.58	7	236	6.5	0.13	2.4	2.7	C1
890106	1344 27.14	4-49.64	75-20.30	1.33	0.45	7	203	5.8	0.13	2.4	2.9	C1
890106	1356 13.03	4-50.81	75-22.23	7.73	0.33	6	173	6.2	0.15	3.0	3.6	C1
890106	14 3 1.14	4-50.72	75-18.34	10.00	0.77	7	239	2.4	0.16	2.4	2.6	C1
890106	14 6 29.14	4-51.53	75-20.20	4.71	0.03	10	149	3.7	0.08	0.4	0.9	B1
890106	1428 32.18	4-49.90	75-20.19	1.45	1.26	7	199	5.3	0.10	1.9	2.3	C1
890108	518 16.84	4-52.67	75-19.41	3.25	0.85	5	165	2.5	0.09	2.4	4.3	C1
890108	558 4.80	4-52.19	75-21.88	1.21	0.58	6	130	3.6	0.16	1.6	1.7	B1
890108	2041 23.68	4-54.49	75-21.16	2.25	0.09	5	103	0.9	0.06	1.0	0.9	C1
890109	2216 46.57	4-52.13	75-20.18	0.17	0.66	6	128	3.6	0.04	0.3	0.3	B1
890109	2250 58.58	4-50.12	75-20.46	1.29	1.54	6	188	5.4	0.05	1.1	1.6	C1
890111	012 59.48	4-50.83	75-18.14	4.28	2.31	7	248	2.2	0.09	1.3	1.4	C1
890111	030 8.25	4-51.07	75-18.88	1.51	1.59	7	204	2.1	0.08	1.4	1.2	C1
890111	119 26.82	4-51.14	75-18.34	3.08	1.84	7	233	1.6	0.05	1.0	1.1	C1
890115	1738 22.50	4-52.37	75-19.14	1.38	0.57	8	116	1.8	0.03	0.2	0.2	B1
890115	2031 12.37	4-52.46	75-16.51	3.68	0.56	9	269	3.3	0.08	0.7	0.5	C1
890116	234 26.77	4-54.43	75-19.43	3.90	0.63	8	138	2.7	0.03	0.2	0.2	B1
890117	1955 20.86	4-51.06	75-19.01	1.46	0.65	5	198	2.3	0.05	1.3	1.3	C1
890121	1717 42.57	4-53.30	75-19.67	1.44	1.45	9	117	2.7	0.06	0.3	0.3	B1
890123	521 14.91	4-50.48	75-18.19	2.59	1.45	7	247	2.8	0.08	0.9	1.9	C1
890123	16 4 48.26	4-51.95	75-17.99	3.35	1.45	9	216	0.5	0.14	1.0	0.8	C1
890124	39 57.26	4-54.35	75-18.43	4.30	1.45	8	186	4.0	0.07	0.6	1.0	C1
890125	15 2 14.15	4-52.15	75-17.55	1.66	0.81	6	253	7.1	0.09	1.9	3.1	C1
890125	17 4 36.77	4-52.17	75-17.61	1.82	0.81	6	252	7.0	0.07	1.4	2.4	C1
890126	654 9.04	4-51.66	75-20.27	2.04	0.66	6	144	3.8	0.06	0.8	24.0	C1
890126	59 25.31	4-50.82	75-20.91	1.49	0.28	5	160	5.4	0.11	1.2	1.7	C1
890126	85 25.48	4-52.36	75-21.37	3.37	1.44	5	178	3.3	0.01	0.1	0.2	C1
890126	937 0.64	4-52.73	75-21.48	4.37	1.65	5	171	2.6	0.00	0.0	0.0	C1
890126	10 3.23	4-52.27	75-21.64	2.34	1.24	6	172	3.4	0.06	0.7	2.5	C1
890126	10 31.85	4-52.64	75-21.34	4.22	1.69	5	175	2.8	0.01	0.1	0.1	C1
890126	1044 14.94	4-52.39	75-21.62	3.00	1.78	7	28	3.2	0.04	0.3	0.9	
890126	1256 19.74	4-53.39	75-22.75	5.19	0.50	7	220	2.6	0.17	1.2	1.2	C1
890126	1257 25.82	4-52.57	75-21.64	2.81	1.70	6	124	2.9	0.15	0.5	1.2	B
890126	7 3 34.18	4-52.64	75-22.12	3.54	0.81	7	135	2.9	0.14	0.3	0.7	C1
890126	1821 45.12	4-52.53	75-21.70	3.78	1.19	6	126	3.0	0.07	0.7	0.8	B1
890127	420 38.38	4-51.26	75-19.11	1.10	.49	7	194	2.1	0.13	0.8	0.9	C1

LOCATION PARAMETER

DATE	ORIGIN	LAT N	LONG W	DEPTH	MAG	NO	GAP	DMIN	RMS	ERH	ERZ	QM
890127	19 4 22.24	4-50.27	75-19.86	0.44	0.78	7	117	2.7	0.08	0.4	0.7	B1
890127	2029 27.71	4-51.91	75-20.76	2.77	1.31	7	134	3.9	0.06	0.5	2.6	B1
890128	20 5 42.02	4-48.94	75-22.94	2.51	0.72	7	296	4.0	0.03	0.9	0.6	C1
890129	10 6 21.84	4-51.79	75-18.69	10.00	1.30	6	171	3.9	0.26	1.2	2.0	C1
890129	1421 27.64	4-54.22	75-27.03	5.65	0.94	8	190	2.3	0.17	2.4	1.1	C1
890130	844 2.47	4-52.74	75-21.80	3.34	0.90	8	128	3.7	0.05	0.5	1.2	B1
890130	844 40.49	4-52.45	75-21.90	1.81	0.83	5	130	3.2	0.04	0.5	0.8	C1
890130	845 23.63	4-52.50	75-21.79	3.84	1.22	7	128	3.0	0.01	0.1	0.1	B1
890130	846 14.98	4-52.42	75-21.61	3.86	1.76	8	124	3.1	0.00	0.0	0.0	B1
890131	10 5 3.82	4-52.41	75-21.64	5.00	1.35	5	172	3.2	0.02	0.4	0.5	C1


TREMOR ENERO 1986
AMPLITUD MAXIMA
FECHA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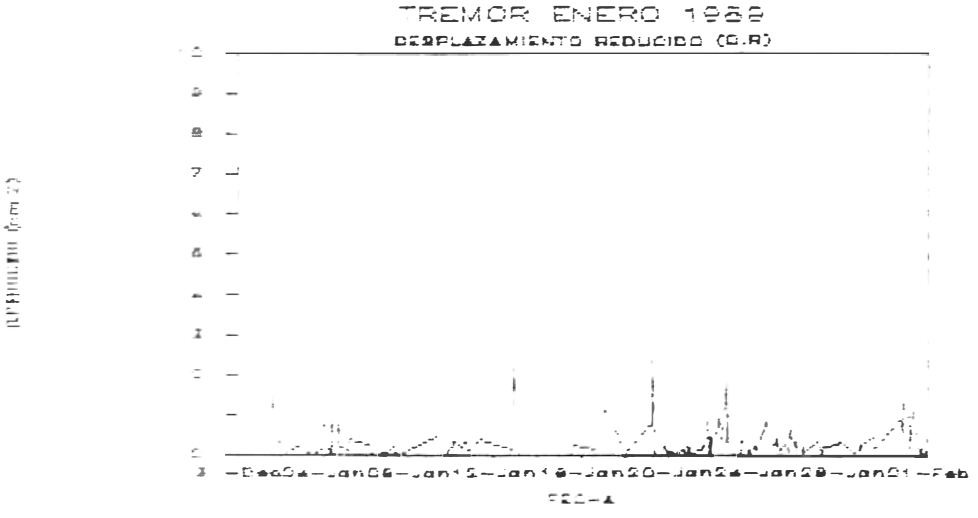

TREMOR ENERO 1986
DESPLAZAMIENTO REDUCIDO (C.R)

FIG. 10 .—

DEFORMATION

ABSTRAC
This month there were (8) out of the (11) dry tilt stations occupied.The total number of measurement were 17 and the values found were less than 10 microradians, except for 1 value of 19 microradians on the 23rd at the Molinos station.

There were 565 data form the North componentand 563 form the East component which were received at the refugio electronical tilt station. This situation is because for the first four days of the month the instrument was broken. From the radial component in the Recio electronical tilt station it was possible to obtained 637 data during the month. Two levelling vectors were occupied at the end of the month and the differences found were about one hundredth of milimeter.

1 DRY TILT

Figure 1 shows the behaviour of the different stations, in fuction of the inflation vector mainly in the Nereidas station on the 11th and 18th with 5 and 3 microradians respectively, but after this, the tendency changed to a small deflation equal to the other stations, so it´s possible to assume the stability of the system.

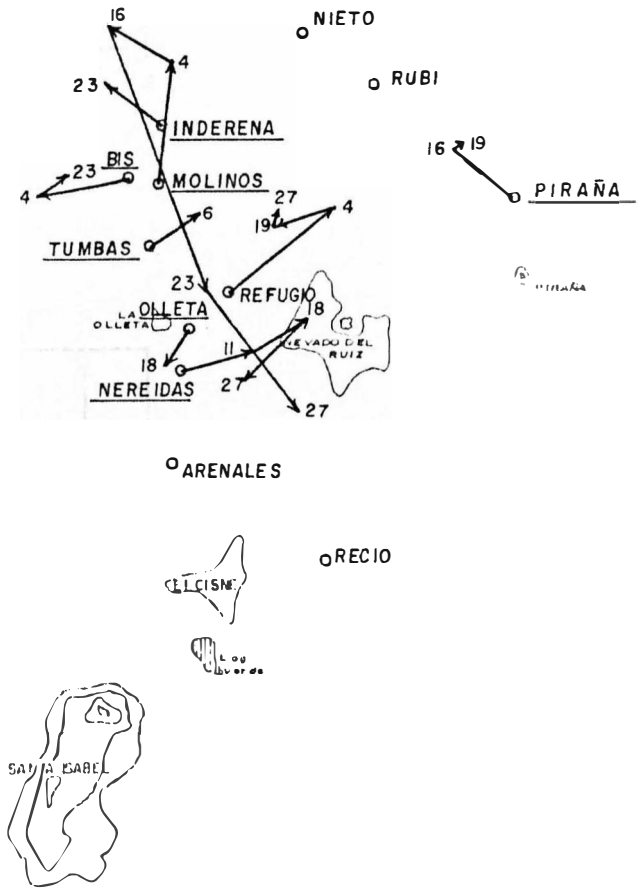
Figures 2 and 3 show the cumulative values from the North and East component of the occupied stations. The unique significant change is in the Molinos station, but it is due to the rainfall factor.

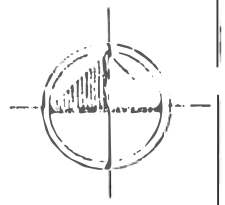
2 ELECTRONICAL T'LMETER

The upper part of the Figure 4 shows the Refugio´s behaviour (North and East component). The North componen shows 4 microradians change, while the East shows 1 microradian, so, the general behaviour is stable.

For the radial component from the Recio station (look at the bottom part of Figure 4) the data shows complete stability. During the month the biggest difference was 15 microradians. This value is very small if taking into account the resolution of the instrument.

At the end of December the Rafaga electronic tilt station was installed, but there have been upto now several problems with the radio signal.





0 5 10 15 20 MICRORADIANES

ESCALA GRAFICA

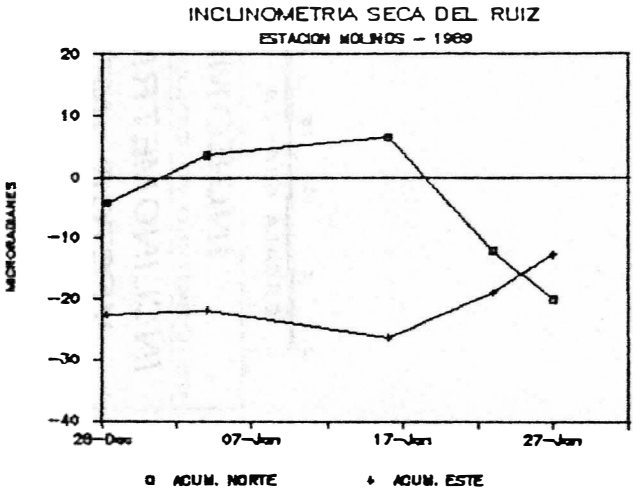
INGEOMINAS

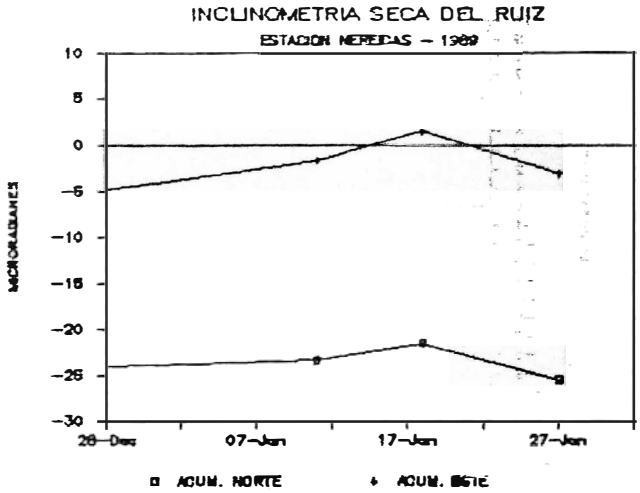
OBSERVATORIO VULCANOLOGICO DE COLOMBIA

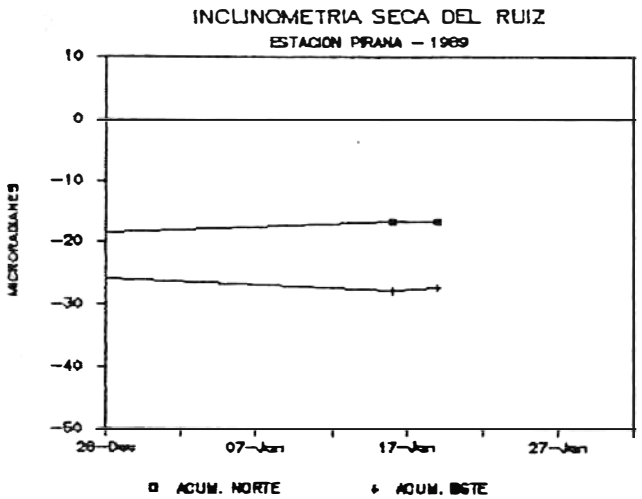
INCLINOMETRICA SECA
VECTOR INFLACION
(DRY TILT , INFIATION VECTOR)

Autor Grupo de Deformación	Dibujo Clara Ines Restrepo V.
2 1 0 1 2 Km	ENERO/89 Fig. 1 de 5

DRY TILT







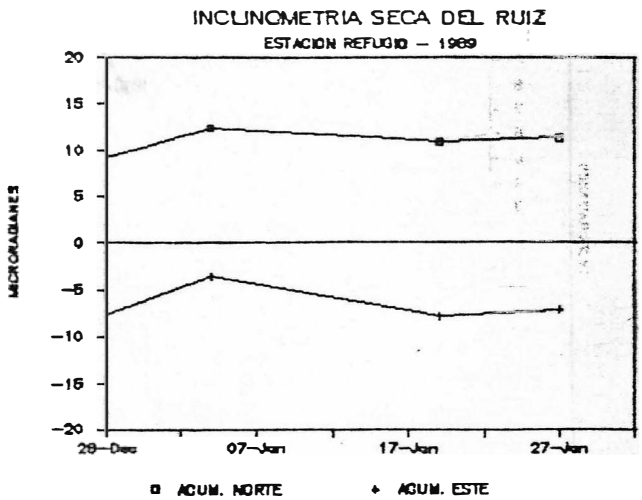
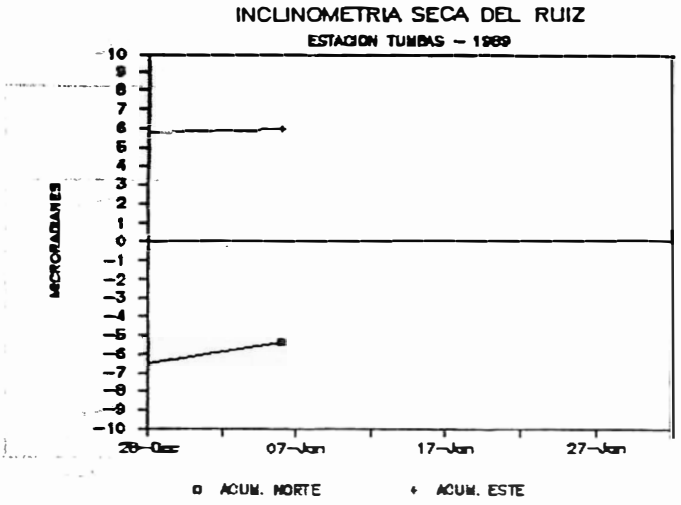
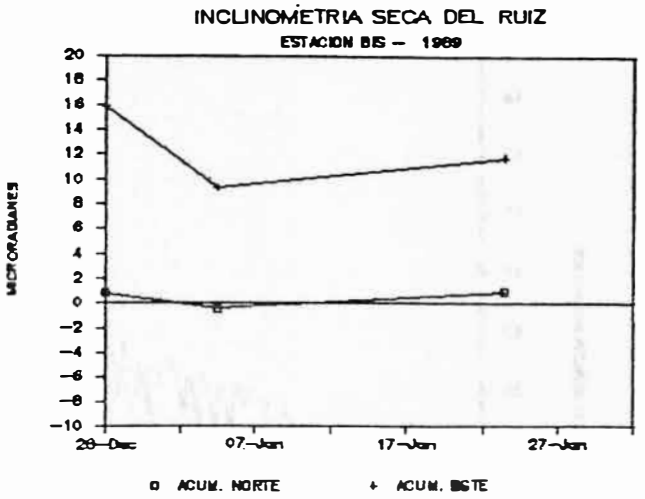
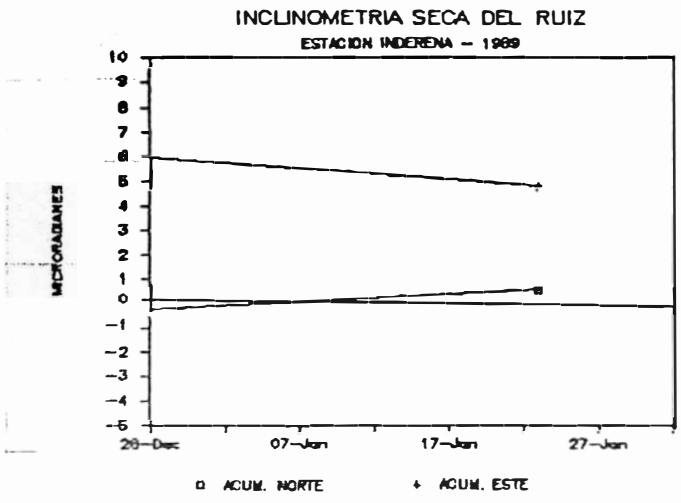


FIG. 2.—

DRY TILT







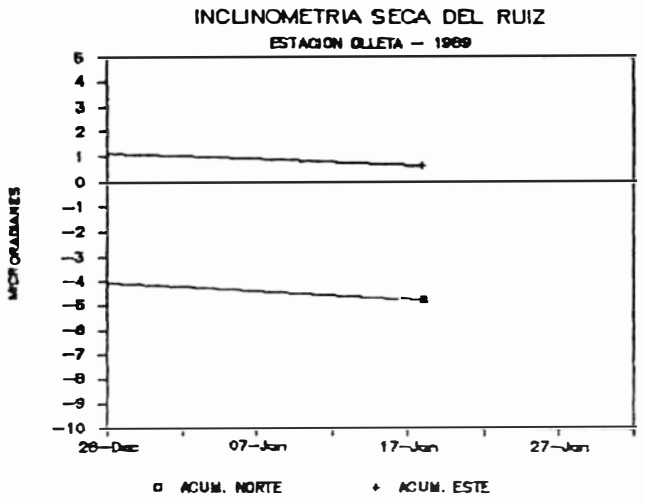
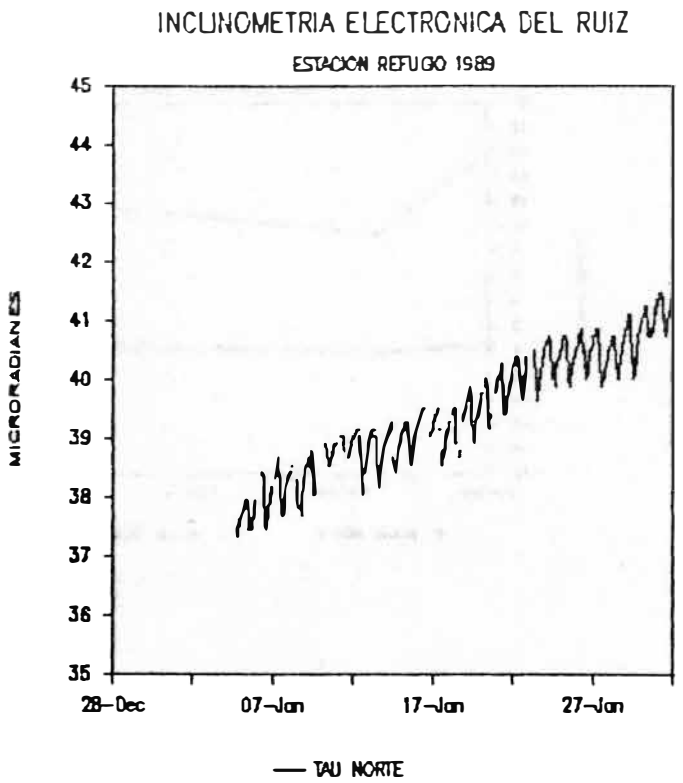
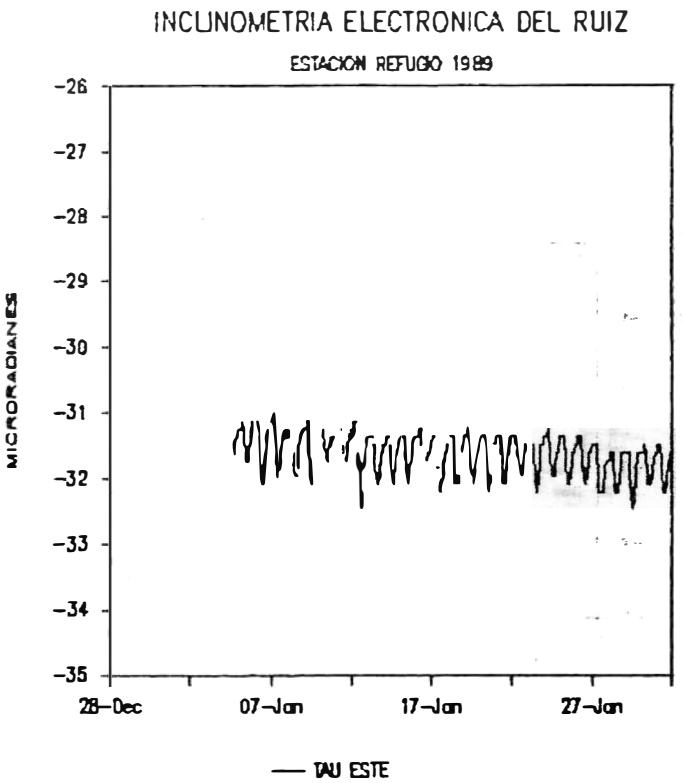


FIG. 3.—

ELECTRONICAL TILT





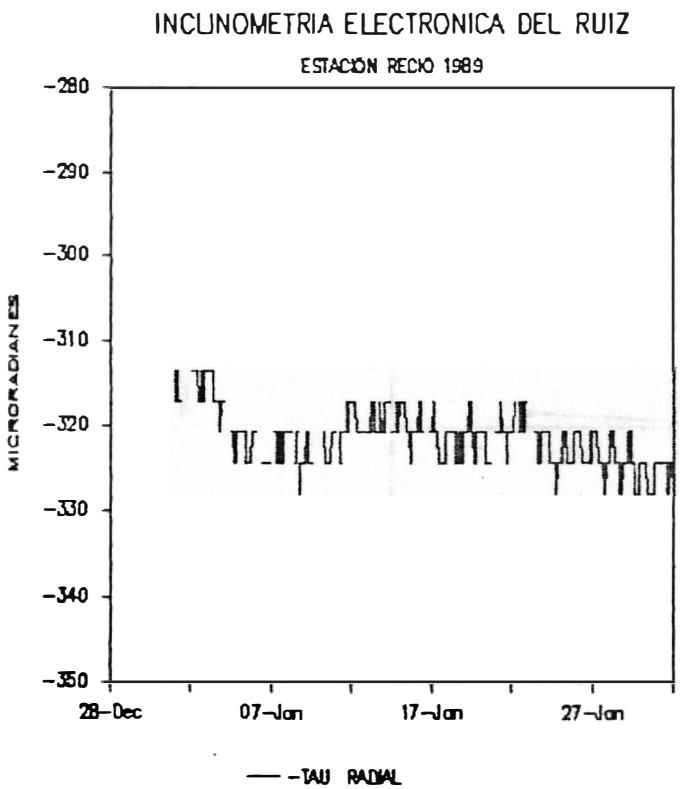
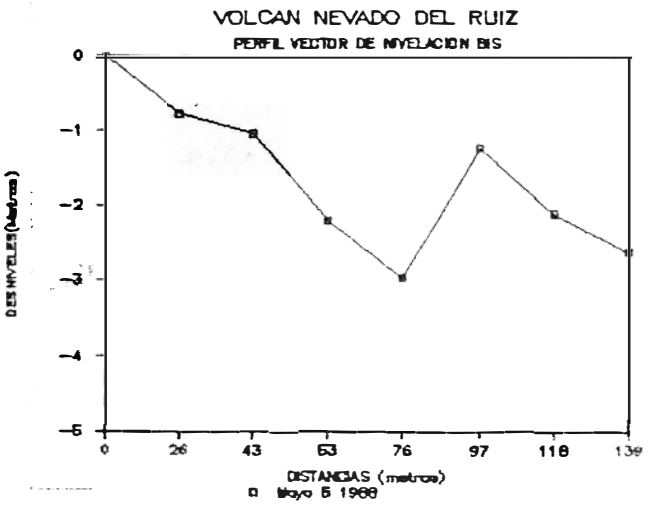
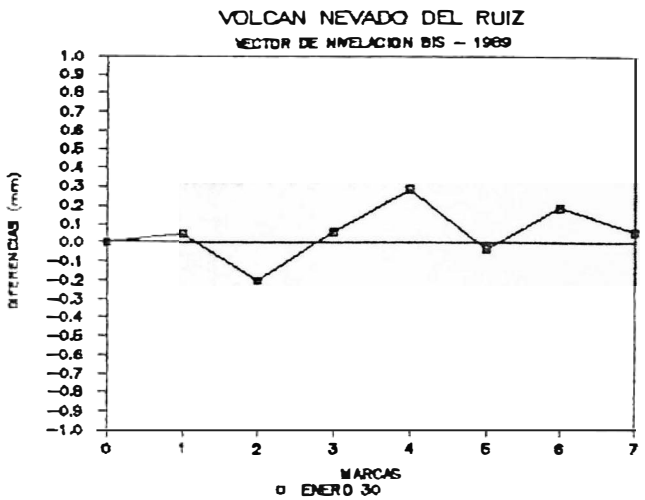
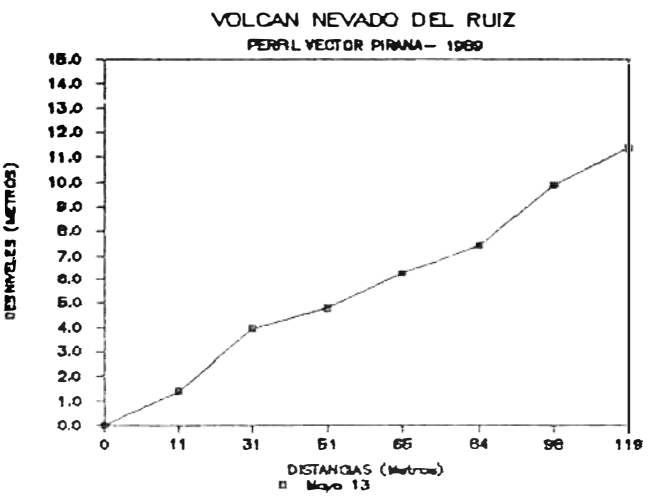


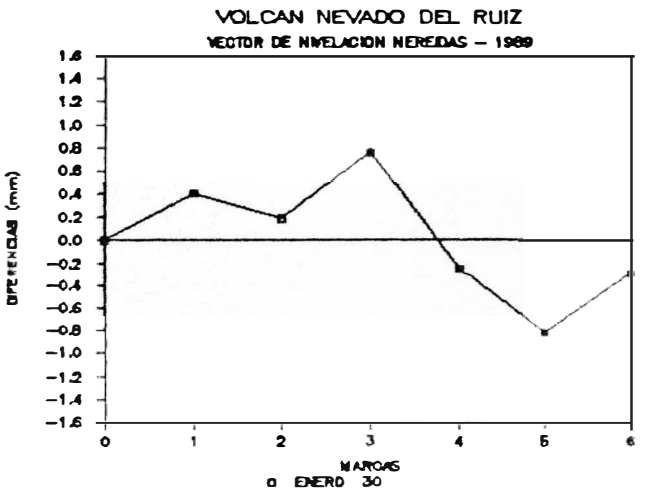
FIG. 4.-

VECTOR OF LEVENING









FIGr 5. —

3 SHORT VECTORS OF LEVELLING

There were mesurements taken in the Bis an Nereidas areas, giving differences of about hundredths of a milimeter (see Figure 5).

4 OTHER ACTIVITIES

On the 19th of January the weather stations of Santa Isabel was changed.

GEOLOGY - GEOCHEMISTRY

During the month the following measurements were taken:

January	2	813 Ton/day
	6	1048 Ton/day
	10	1371 Ton/day
	13	3949 Ton/day

During the rest of the month measurements could not be taken because the equipament was down.

Also flights were made over the Ruiz, Tolima, Santa Isabel, Purace and Huila Volcanoes, with the cooperation of the Colombian Air Force.