Progress Report: November 1973 - January 1974
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Ground Survey of Active Central American Volcanoes in November - December 1973

February 1974

E-Series

Contents:

Richard E. Stoiber
Department of Earth Sciences
Dartmouth College
Hanover, N.H. 03755

William I. Rose, Jr.
Department of Geology and Geological Engineering
Michigan Technological University
Houghton, Michigan 49931

Summary Statements:

Overall Status:

Second ground survey of active vents is completed, accomplished during the Skylab 4 mission. Several significant changes in thermal patterns were noted.

Recommendations:

None

Expected Accomplishments and Summary Outlook:

Analysis of thermal imagery from Skylab 4 will ensue in this quarter. Hopefully many of the thermal anomalies known from ground surveys will be mappable with Skylab imagery.

Significant Results:

Thermal anomalies at two volcanoes, Santiaguito and Izalco, have grown in size in the past six months, based on repeated ground survey. Thermal anomalies at Pacaya volcano have become less intense in the same period. Large ($>$500 m diameter) thermal anomalies exist at 3 volcanoes presently, and smaller scale anomalies are found at nine other volcanoes.

Travel Summary:

The investigators visited Guatemala, El Salvador and Nicaragua in the months of November and December.

Personnel:

Richard E. Stoiber
William I. Rose, Jr.
Ian M. Lange
Samuel B. Bonis
Michael J. Carr
Richard W. Birnie

Volcano Site Reports

Santiaguito

Pacaya

Izalco

San Cristobal

Cerro Negro

Momotombo

Masaya

Date January 1974

Volcano Santiaguito

Location Guatemala, 14° 45.5' N 91° 32.9' W

Dates of latest information 16-19 November; 11 December 1973

Dates and locations of PRT-5 Work

1 November from Buena Vista, 2.0 km N of the Caliente vent
1 November from La Loma trail 0.7 km NW of the Brujo vent

PRT-5 Summary

Anomalously hot surface temperatures in areas near both the Caliente and Brujo vents.

Volcanic Activity Summary

Caliente vent: large plume of vapor is evident, but lava production has slowed, probably ceased altogether. Growth of the lava flow within the 1902 crater Jan. 1972-July 1973 has covered most of the crater floor east of the Caliente vent, and has filled the deep barrancas which had been eroded there in the 1960's.

El Brujo vent: The lava flow, which began in Dec. 1971 is still flowing, it has now reached a point about 2.5 km to the south of the vent, still following the bed of the Río Concepcion. The September nuée eruption had its source at the front of this flow and caused the destruction of part of the advancing lobe. This in turn caused more rapid flow in the downstream portion of the flow, causing most of the flow to sink down within its levees. Small nuées were observed from the toes of the flow on 11 December.

Expected Thermal Anomalies

Same as August report, except the size of the Brujo flow anomaly is larger, now perhaps 2500 x 300 m.

Investigators Rose, Lange, Stoiber, Bonis, Carr and others

Date January 1974

Volcano Pacaya

Location Guatemala 14° 23.0' N 90° 36.2' W

Dates of latest information 5 December 1973

Dates and locations of PRT-5 Work

5 December 1973, from Cerro Chino, 1 km NNW of crater
17 November 1973, from triangular hill near El Patroncinio, 2 km WSW of crater

PRT-5 Summary

Same pattern as July, see August report.

Volcanic Activity Summary

The lava flow on the SW flank has shown no activity since July. Activity in the MacKenney crater consists of infrequent (2 per hour) small explosions, producing vapor and small amounts of fine ash. The height of these ash clouds is usually about 100 m.

Expected Thermal Anomalies

Same as August report, except that the flow on the SW flank has cooled noticably.

Investigators Rose, Carr, Stoiber and others

Date January 1974

Volcano Izalco

Location El Salvador 13° 48.9' N 89° 38.1' W

Dates of latest information 23 November, 2 December 1973

Dates and locations of PRT-5 Work

23 November 1973, from Hotel de la Montaña

PRT-5 Summary

Only anomaly is near the summit crater, but its size and intensity have increased greatly since July. (See Addenda)

Volcanic Activity Summary

No activity. Fumaroles all cooling.

Expected Thermal Anomalies

In addition to the areas noted in the August report, a 1000 m^2 area on the north slope of the cone just below the summit is a growing thermal anomaly.

Investigators Rose, Lange, Stoiber, Carr

Date January 1974

Volcano San Cristobal

Location Nicaragua, 12° 42' N; 87° 1' W

Dates of latest information 29 November 1973

Dates and locations of PRT-5 Work

None

PRT-5 Summary

Volcanic Activity Summary

Steam cloud much less dense than in July, probably due to onset of dry season. Temperature of the hottest fumarole within the crater was 350°C, 50° warmer than in July, but comparable to the highest temperatures recorded during the last dry season. Thus there is no evidence of change independent of seasonal influences.

Expected Thermal Anomalies

Same as August report, except:

1. Diminishing of the gas plume should aid imagery.
2. No dome is found in the innermost crater as was suggested by earlier investigators.

Investigators Carr and others

Date January 1974

Volcano Cerro Negro

Location Nicaragua, 12° 31' N, 86° 44' W

Dates of latest information 27-28 November 1973

Dates and locations of PRT-5 Work

None

PRT-5 Summary

Volcanic Activity Summary

Virtually unchanged since July 1973. The only activity is fumarolic, within the main crater. Temperature at the hottest fumarole was 300°C, about the same as July. Thus there is no suspicion of warming.

Expected Thermal Anomalies

Same as August report

Investigators Carr, Rose and others

Date January 1974

Volcano Momotombo

Location Nicaragua 12° 25' N 86° 33' W

Dates of latest information 30 November 1973

Dates and locations of PRT-5 Work

None

PRT-5 Summary

Volcanic Activity Summary

No activity except fumarolic. 300 m diameter crater just below summit to NE, source of last lava flow (1905) has more than one dozen fumarolic vents, the hottest about 300°C. Many colored incrustations. Sketch map of the crater is available.

Expected Thermal Anomalies

1. The crater NE of the summit, where the hot fumaroles are located (300 m diameter).
2. Fumaroles at the base of the cone to the SW.
3. Fumaroles about 1.3 of the way up the cone on a direct line between the crater and the fumaroles at the SW base.

Investigators Britton, Carmony, Dann, Duenwald, Hyde, Little, McCartney, Merritt, Paddock, Shenstone, Tenney

Date January 1974

Volcano Masaya

Location Nicaragua, 11° 57' N; 86° 9' W

Dates of latest information 1 December 1973

Dates and locations of PRT-5 Work

None

PRT-5 Summary

Volcanic Activity Summary

Steam emission at about the same rate as July 1973. Incandescent lava no longer visible, however - and overall temperatures on the lava lake surface are undoubtedly lower than in July. Other than the one steam vent, there is little other fumarolic activity on the lava lake.

Expected Thermal Anomalies

Same as August report, but the anomaly is of lesser magnitude.

Investigators Carr, Stoiber and others

Addenda

I. Santiaguito activity to December 1973.

II. Izalco thermal anomaly (report submitted to Smithsonian Inst. Center for Short-Lived Phenomena).

Santiaguito Activity to December 1973

W. I. Rose
Memo

Caliente flow

The extrusion of the latest Caliente lava flow, which began in January 1972, stopped in early 1973. Its areal extent is plotted on the attached map and is about 375,000 m^2 with an average thickness of approximately 30 m for a volume of about 1×10^7 m^3.

El Brujo flow

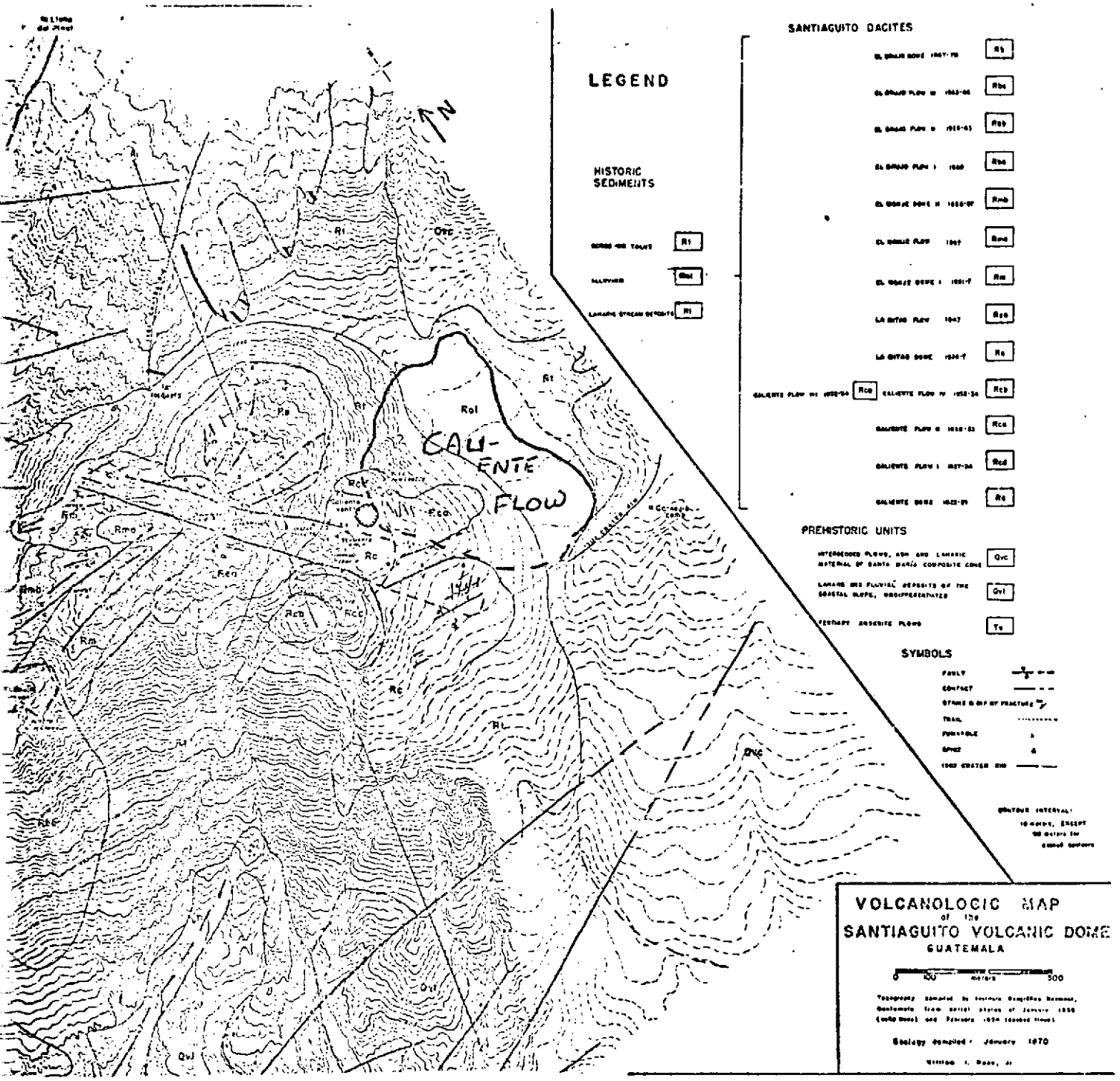
The current flow, which began in early 1972, after a small plug dome was extruded in late 1971, has advanced markedly between December 1972 and December 1973. As noted in earlier memo, all of the activity in the last year has been in the southwest lobe which is following the Rio Concepcion Valley. In one year it has flowed a distance of about 1 km and the total volume of this flow is in excess of 2×10^7 m^3.

Gross Extrusion Rate

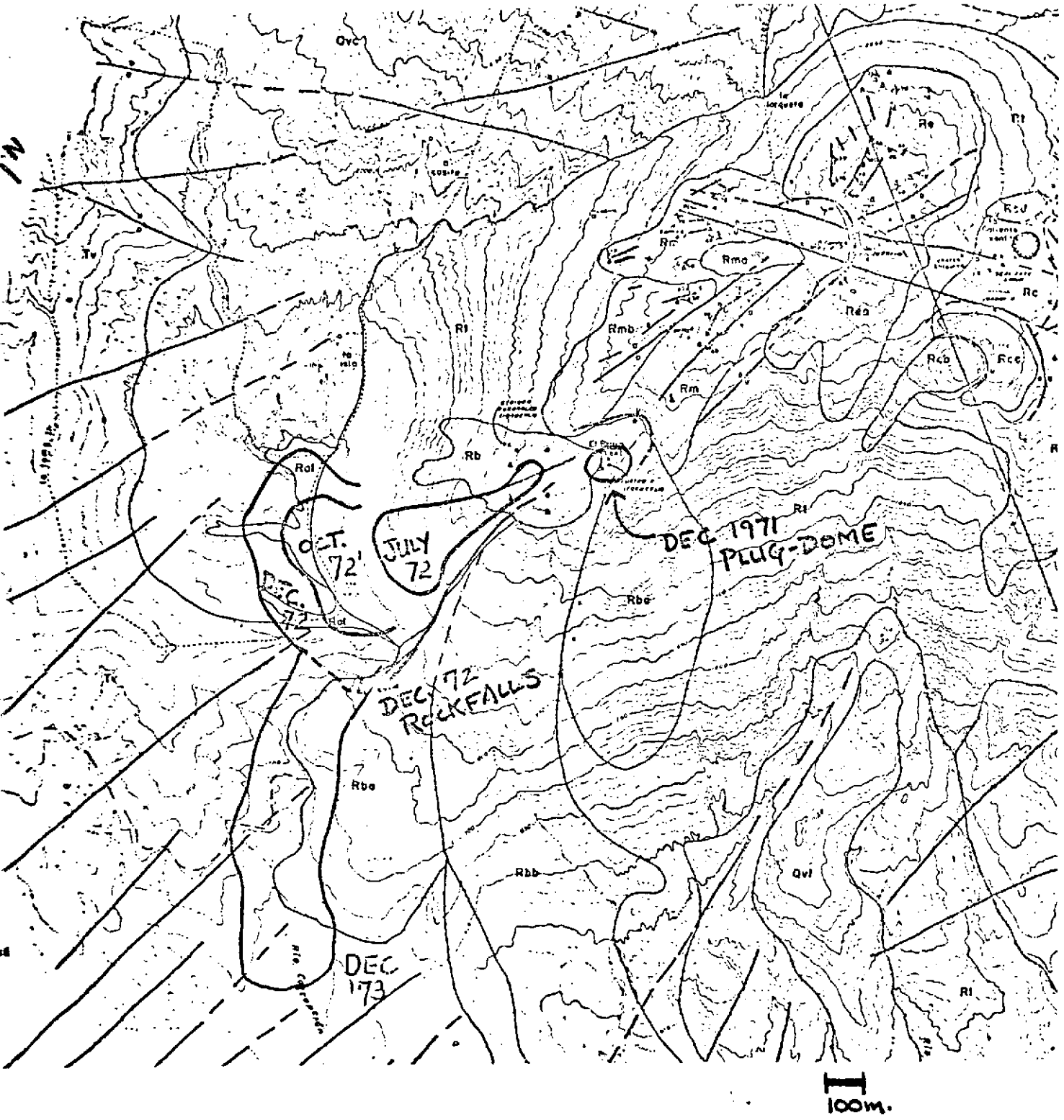
Santiaguito has in 1972-1973 produced new lava at a rate of about 1.5×10^7 m^3/yr. This is about its 50 year average, and represents a definite increase compared to the 1965-71 period.

Pyroclastic Activity

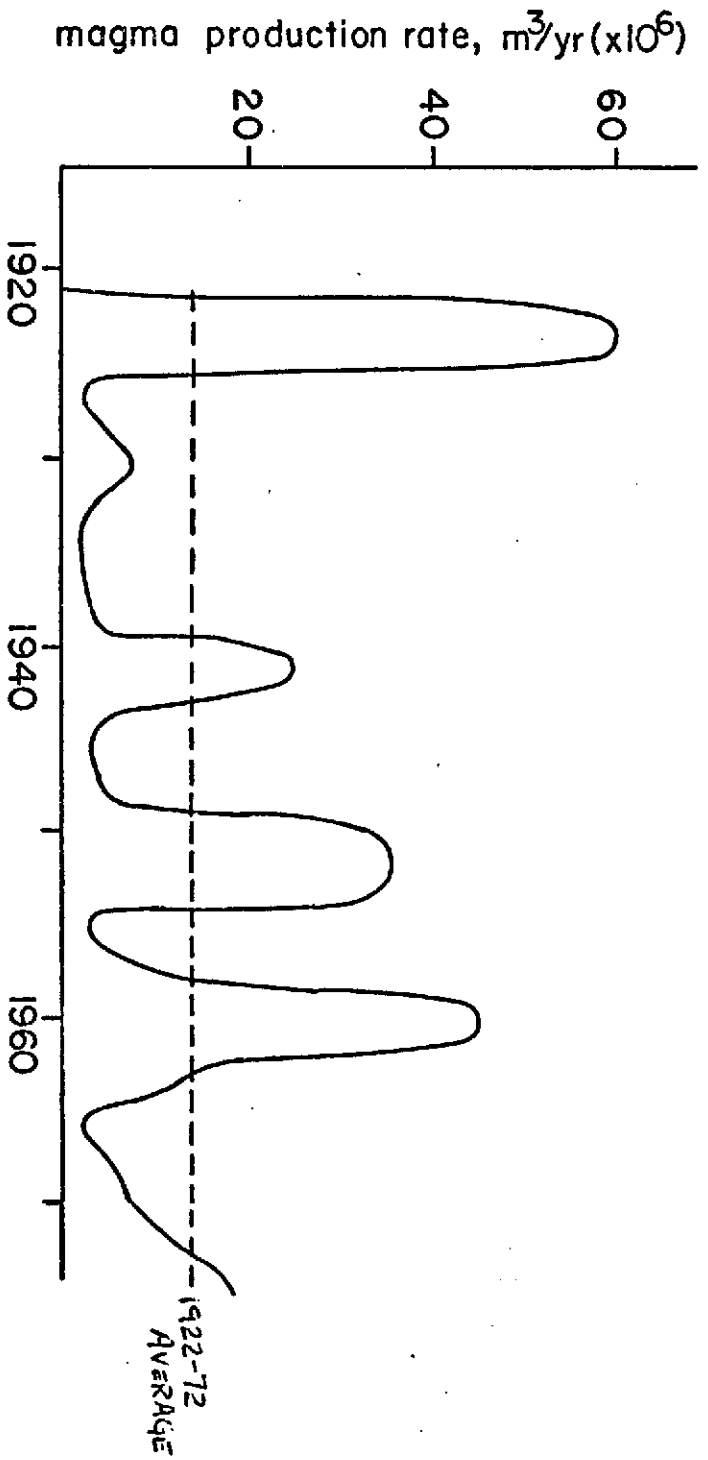
Two major pyroclastic eruptions also occurred in the past year. Both were nuée ardentes. On April 19, 1973 a nuée descended from the Caliente vent down a tributary of the Río Nimá II. Details are given in a separate report, but the devastated zone is shown in an attached map. On September 16, 1973 another nuée issued from the foot of the El Brujo lava flow and traveled down the valley of the Río Concepcion. A detailed report on this event is being prepared to supplement the initial reports. A sketch map of the devastated area is attached.



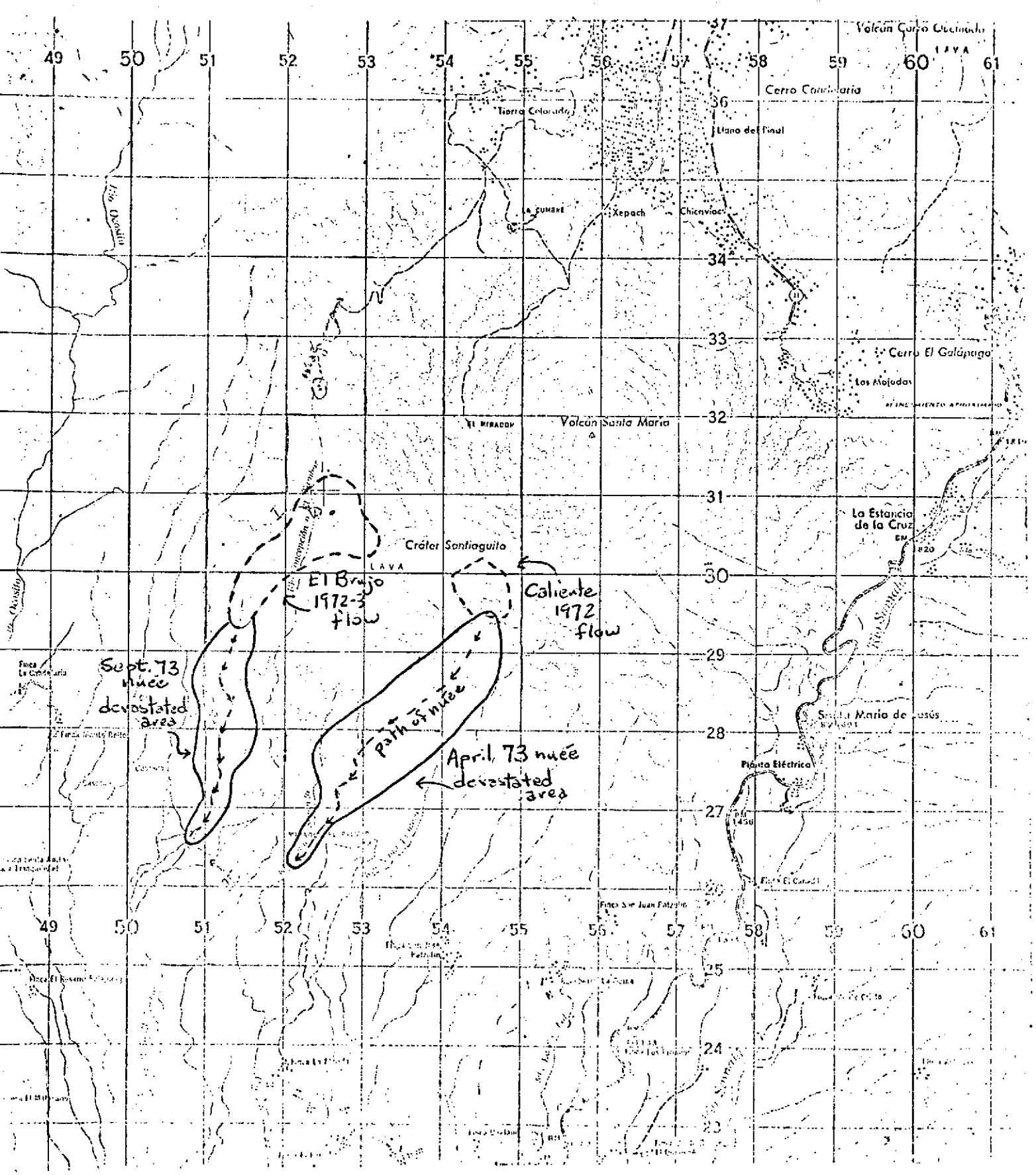
Map showing extent of the newest lava flow from the Caliente vent, Santiaguito, December 1973. Base map (G.S.A. Bull., v. 83, p. 1415).



Map showing extent of the newest El Brujo lava flow, Santiaguito at various dates. Base map (G.S.A. Bull., v. 83, p. 1415).



Estimate of magma extrusion rate at Santiaguito, 1922-73.



Map showing areas devastated by nuee ardentes of April and December 1973 at Santiaguito volcano. (North to the top; squares are 1 km x 1 km) Base map (Colomba sheet 1:50, 000-IGN)

IZALCO THERMAL ANOMALY

Remote infrared thermal patterns have been measured on the northeast flank of Izalco Volcano four times since December 1969. The sensor station is on Cerro Verde at a distance of 1100 m. from Izalco. On July 7, 1973, a thermal anomaly appeared near the summit in a region that had been thermally inactive in earlier infrared studies. The anomaly stretched down slope about 50 m. and covered an area about 1000 sq. m. The highest of the anomalous apparent surface temperatures was 15°C, 2°C above ambiant. Data just processed from the November 24, 1973, observations show the anomaly expanded to the east to cover about 5000 sq. m. The most intense apparent surface temperatures occur in the same spot as the earlier pattern and register 19°C, 8°C above ambiant. The anomaly was intensified. The appearance and intensification of a thermal anomaly at Izalco indicates a change in the thermal regime of the volcano.

The temperatures of the summit fumaroles were not unusually high in early December 1973.

The concentration of intermediate depth earthquakes just south of Izalco was unusually high for the period 1971-72 as compared to 1967-70.

Geophysical observations of these anomalous events are continuing.

Izalco last erupted in October-November, 1966, with a lava flow from its south flank. Prior to that it had undergone intermittent lava and pyroclastic eruptions from 1770 to 1957, building up a composite cone 650 m. above its base.

February 7, 1974

Richard W. Birnie
Dept. of Geological Sciences
Harvard University
Cambridge, Ma.

Ian M. Lange
Dept. of Geology
University of Montana
Missoula, Montana

Richard E. Stoiber
Dept. of Earth Scie
Dartmouth College
Hanover, N.H.