SO\textsubscript{2} Emission of the 1974 Eruption of Volcán Fuego, Guatemala

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Abstract

Volcán Fuego in the Central American Republic of Guatemala erupted violently in October, 1974. A remote sensing correlation spectrometer, COSPEC IV, which utilizes the characteristic molecular absorption of SO\textsubscript{2} in the ultraviolet was used to monitor the SO\textsubscript{2} content of the volcanic plume. Over a 60-day period measurements were made on 37 days between and following major eruptive phases. SO\textsubscript{2} emission rates corrected for atmospheric scattering of the spectral signal average 423 metric tons/day with a standard deviation of 252 metric tons/days. Late stage peaks in SO\textsubscript{2} emission at Fuego are consistent with the presence of anomalously high contents of soluble materials on the stratigraphically highest ashes from other Central American eruptions. Indications are that the SO\textsubscript{2} concentration within the volcanic plume increased as activity waned. These features imply that remote spectroscopic sensing of SO\textsubscript{2} and perhaps other gases in a volcanic plume may provide a relatively easy and inexpensive means of determining the cessation of violent eruptive activity.

Introduction

The quantity of SO\textsubscript{2} in the plume of the October-November 1974 eruption of Volcán Fuego, Guatemala was measured using a remote sensing correlation spectrometer. This instrument utilizes the characteristic molecular absorption of solar energy in the ultraviolet for SO\textsubscript{2} and produces an output signal proportional to the concentration-pathlength product (ppm-m) of SO\textsubscript{2}. This marks, to the author's knowledge, the first time such a device has been used to monitor an actively erupting volcano over the duration of an eruption.

Volcán Fuego is a compound strato-volcano rising to a height of approximately 3800 meters, some 100 or so meters less than its sister volcano, Acatengango, 3 km to the north. It is situated in the Central
American Republic of Guatemala about 45 km, WSW of Guatemala City at latitude 14° 28.9' N, longitude 90° 52.9' W (Fig. 2). Since the time of the Conquest it has been the most active volcano in Guatemala (MOOSER et al., 1958). Recent activity includes eruptions of basaltic ash and scoria and strong steam emissions during September 1971 and February-March 1973 (BONIS and SALAZAR, 1973).

The most recent eruption of Volcán Fuego began in October 1974. A chronology of the eruptive events follows:

October 10 - the eruption commenced at 0400 with small eruptions of ash and ash flows.

October 14 - a period of intense activity began at 0200 and persisted to 1900. A thick ash cloud rose over 7.5 km above the summit and numerous hot ash flows cascaded down the slopes of the cone.

October 17 - a renewed eruption lasted from 1745 to 0030 October 18.