

**CONTRIBUTION OF SELF-POTENTIAL AND SOIL-TEMPERATURE
SURVEYS FOR THE INVESTIGATION OF STRUCTURAL LIMITS AND
HYDROTHERMAL SYSTEM ON UBINAS VOLCANO (PERU)**

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KEY WORDS : Self-Potential, Soil-Temperature, Ubinas volcano, South Peru

INTRODUCTION

Ubinas strato-volcano (16° 22' S, 70° 54' W, 5672 m) is the most active volcano of Peru; it has been reported 23 minor eruptions since 1550. This volcano has been built upon the Altiplano and the Cordillera Occidental and its truncated appearance is due to a broad summit crater or caldera of 1.2 km wide. The south part of the caldera contains a pit funnel-shaped crater (600 m in diameter, 300 m deep), where a permanent fumarolic activity takes place. Increasing gas emission has been reported since late in 1995. White and bluish steam commonly rose 100-500 m over the summit and some times these gases reach filling completely the entire caldera in a few hours.

Observations and thermic measurements realized at the bottom of the pit crater revealed the presence of six zones, located near the walls, emitting gases with strong pressure and high temperatures, until 444° C. These fumaroles constitute the unique rising gas evidence over the entire volcanic edifice.

Detailed Self-potential (SP) and soil-temperature measurements have been carried out inside the summit caldera's floor. SP and thermic maps show no significant anomaly in the caldera. (Figs. 1a, 1b).

Thermic results seems to show an absence of communication between hydrothermal system of today's active crater and the caldera's floor. SP results show no evidence of gas rising organization inside the caldera.

Four long radial SP profiles were also measured over the entire volcanic edifice (Fig. 2). The SP versus elevation profiles show a common pattern on active volcanoes: the lower part is characterised by inverse relationship between SP and elevation whereas it inverts in its higher parts (Fig.3). This lower part is interpreted by normal hydrogeological model, whereas the upper part is a signature of an hydrothermal system (Zhody et al., 1973; Corwin & Hoover, 1979; Anderson & Johnson, 1978; Fournier, 1989).

On the map of the area, the limit between these two parts (hydrogeological and hydrothermal) shows a circular shape of approximately 6 km wide. These results can be interpreted a signature of a deep structural limit of an older great caldera.

CONCLUSIONS

Self-potential and soil-temperature results results suggest that Ubinas hydrothermal system is in over-pressure state having difficulties to evacuate the enormous volume of superficial water infiltrated in the caldeira. Also, results of self-potential long profiles over the entire volcanic edifice show the signature of an old great caldera of circular shape and 6 km wide.

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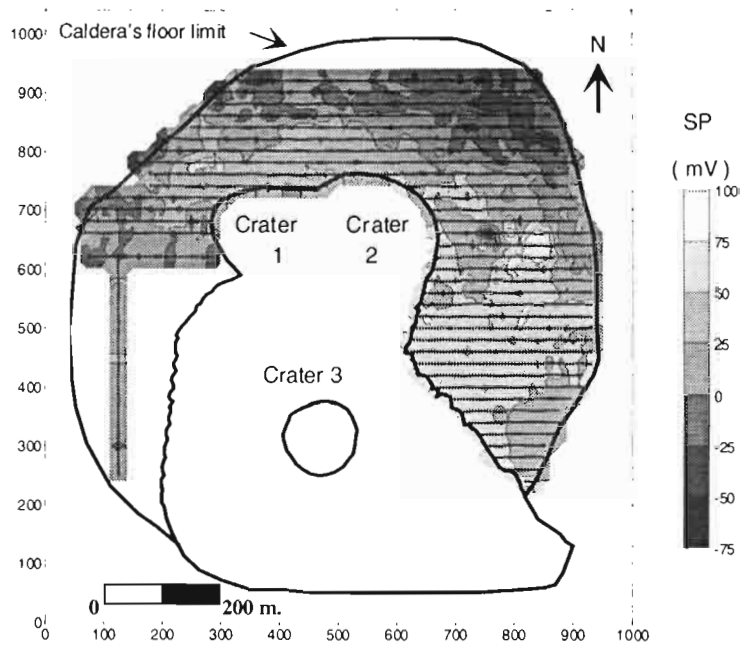


Fig. 1a.- Self-potential map of Ubinas's caldera.

Crosses: location of measurement stations

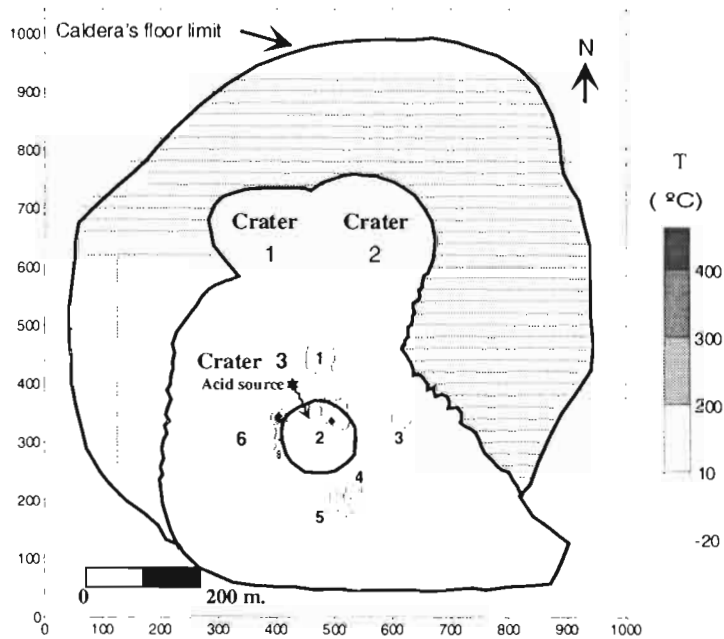


Fig. 1b.- Infra-red thermic map of Ubinas's caldera.

Crosses: location of measurement stations

1,2,3,4,5 and 6: permanent fumarolic zones

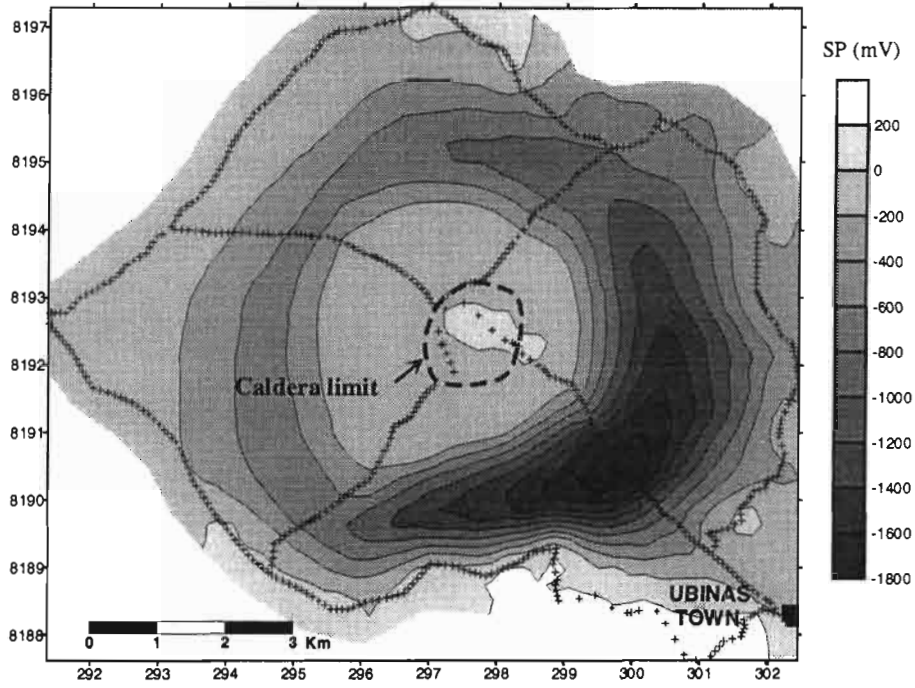


Fig. 2.- Self-potential map of Ubinas volcano
Crosses: location of SP measurement stations

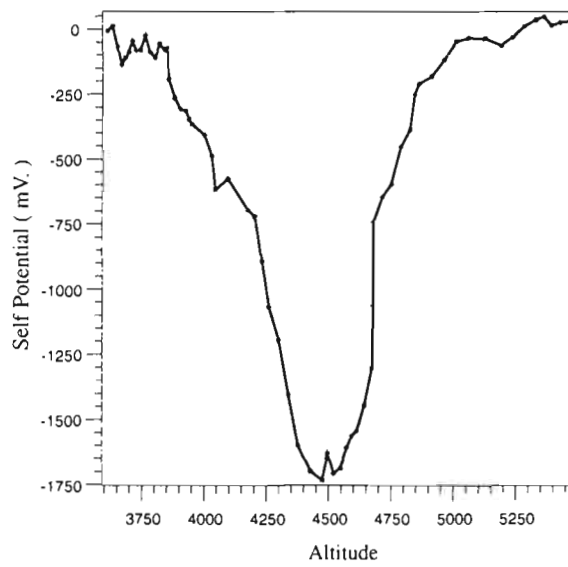


Fig. 3. Example of Self-potential profile obtained
at Ubinas volcano, (SE profile).