ERUPTIVE MECHANISM OF PHREATOMAGMATIC VOLCANOES
FROM THE PINACATE VOLCANIC FIELD: COMPARISON BETWEEN
CRATER ELEGANTE AND CERRO COLORADO, MEXICO

MARTIN, U. 1 AND NEMETH, K. 2,3
1 Heidelberg, Germany
2 Geological Institute of Hungary, 14 Stefánia út, Budapest, Hungary
3 Ótilló University, Department of Regional Geology, 14 Stefánia út, Budapest, Hungary

Abstract

The Pinacate Volcanic Field is located just near the northern end of the Gulf of California (Sea of Cortez) in Sonora, Mexico. Extensive lava flows cover an area similar to 2000 km2 and which is cut through by more than 400 vents, predominantly scoria cones. Eight of the vents are mafic that erupted immediately after emplacement of pre-maar lava flows, which are exposed in the crater wall. Two of the phreatomagmatic vents are especially spectacular by their size and volume, and their contrasting architecture. Crater Elegante and Cerro Colorado. Crater Elegante is about 1500 m across with a crater that is about 200 m deep, which is surrounded by a few tens of metres complete crater rim. Its age is inferred to be 0.15 Ma, and its pyroclastic deposits are dispersed more than a km away from the crater rim. They form a gentle slope blanketed over pre-maar lava two flows exhibiting peleaning effect over deposits such as pressured edges and linsae broliners of the pre-maar layers. Pyroclastic units are predominantly lapilli tuff that are rich in fine silt, rounded angular, non-vesiculate edemetrinic glass shards leptolithic in composition. The few lapilled tuff and units about a few hundred metres away from the rim are especially rich in angular quartz fragments that are loosely packed. Scoria falls in the pyroclastic succession are calsic cemented. There is a notable trend in a quick reduction in the volume of edemetrinic accidental lithic fragments with the increase pre-maar lavas input in the lapilled tuff flows from the crater rim towards distal areas. Bedding characteristics of the pyroclastic succession are predominantly massive in bedded in near vent settings that quickly changes to dune bedded successions with dunes having a few dm amplitude over metres wavelength. These are characteristics of deposition from sudden blast triggered base surges. The Cerro Colorado is just 10 km to the NE from Crater Elegante and forms a ~ 100 m wide maar basin. The platform is inferred to be either a top set of a volcano or the pre-maar tuff units. The crater is in a few tens of metres below the inferred syn-volcanic surface and forms a ~100 m wide, flat depression. The crater inner wall is mantled by collapsed blocks of tuff breccia and lapilli tuff that feed small reworked volcaniclastic fans. The pyroclastic succession of Cerro Colorado is significantly coarser grained, and thicker bedded than the Crater Elegante succession. Lapilli tuff and tuff units are rich in isomorphous shaped volcanioclastic, highly vesicular edemetrinic lapilli and scoria with leptolithic in composition that are immersed by lapilli tuff breccia. Intact gravelly bed of mud and sand is the main accidental lithic fragments of Cerro Colorado. The distinct differences in size, vesicularity, shape and alteration effect of the edemetrinic shards, the ratio between juvenile to accidental lithic fragments indicates different size of the eruption and fraction of water interacted with the magma.

Volcan Crater Elegante

The Crater Elegante maar basem from top to bottom. The pyroclastic sequences in the crater rim. Its age is inferred to be the crater wall. Two of the phreatomagmatic vents are especially spectacular by their size and volume, and their contrasting architecture. Crater Elegante and Cerro Colorado.

Volcan Cerro Colorado

Cerro Colorado from the distance. Note the small phreatomagmatic maar lake (L) fed from the pre-maar lava units (Pl). The maar lake is filled with post-depositional mud flow deposits. The maar lake is filled with post-depositional mud flow deposits.

Volcanic lithic clast-rich lapilli tuff succession (base surge) next to the western crater rim of the Crater Elegante. This section has no accidental lithic fragments and is common.

Microtextures

SEM photo of a lapilli tuff from the Crater Elegante. Note the bright coloured pyroclastic fragments and the black matrix (empty voids are black fields).

SEM photo of a edemetrinic glass shard from a lapilli tuff from the Cerro Colorado. Note the rounded edges and no vesicularity to the glass shard.
Eruptive mechanism of phreatomagmatic volcanoes from the Pinacate Volcanic Field: comparison between Crater Elegante and Cerro Colorado, Mexico.

Martin, Ulrike
2004-01-01