



Morphochronological dating of monogenetic volcanic fields: characterizing the degree of erosion of individual scoria cones with a high-resolution DEM analysis of the contour curves and the vertical profile shapes

Maria Cristina Zarazua (1) and Servando De la Cruz-Reyna (2)

(1) Universidad Nacional Autónoma de México, Posgrado en Ciencias de la Tierra, Distrito Federal, Mexico (maria.c.zarazua@gmail.com), (2) Universidad Nacional Autónoma de México, Instituto de Geofísica, Distrito Federal, Mexico

Morphological characterization of scoria cones provides useful information on their degree of erosional shape alteration, which can be used to apprise the relative ages of the volcanoes. Monogenetic fields may contain hundreds of volcanoes over extensive areas which are commonly used for agricultural activities or may be located at or near large cities. It is thus of special interest developing tools designed to readily calculate the relative ages of many cones to support the hazard assessment distribution in a volcanic field.

We have developed a morphological analysis methodology designed to quantify the type and degree of erosion of monogenetic scoria cones, based on the description of their elevation profiles and contour curves obtained from airborne and satellite high-resolution digital elevation models of the terrain. The analysis focuses on the combination of two types of shape parameters related to erosional and mass redistribution processes. The first type is related to the frequently used morphometric parameters obtained from the analysis of the cone's elevation profiles. The second one is obtained with a Fourier Elliptical Descriptor decomposition of each of the level contour curves of the scoria cone. We developed a linear model combining these quantities to relate the morphometric characteristics of each volcanic cone with its age.

We present the results obtained for 19 radiometrically-dated scoria cones from the Sierra Chichinautzin Volcanic Field in Central Mexico, and its potential use as a morphochronological dating method.