Geophysical Research Abstracts
Vol. 14, EGU2012-3477, 2012
EGU General Assembly 2012

A more advantageous and reliable alternative method than widely used anisotropy of magnetic susceptibility (AMS) for determination of vent locations of ignimbrites: High resolution x-ray tomography (micro-CT)

O. Ersoy (1), G. Atici (2), E. Aydar (3), and İ. Tatar (4)

(1) Department of Geological Engineering, Nigde University, Nigde, Turkey (oersoy@nigde.edu.tr), (2) General Directorate of Mineral Research and Exploration, Ankara, Turkey, (3) Department of Geological Engineering, Hacettepe University, Ankara, Turkey, (4) Faculty of Medicine, Department of Anatomy, Hacettepe University, Ankara, Turkey

Most of knowledge of the flow dynamics and mechanisms of pyroclastic flows comes from examination of their deposits. Until recent date, orientations of flow components such as pumice and lithics were used in order to estimate the vent positions for ignimbrite deposits. Recently, anisotropy of magnetic susceptibility (AMS) is widely used for determination of flow directions and source positions of ignimbrites. Owing to the fact that individual grains of most minerals are magnetically anisotropic, magnetic anisotropy works as a petrofabric tool. Magnetically anisotropic minerals magnetize in certain directions which are governed by primarily by crystallography and/or grain shape. Elongate fragments carried in a pyroclastic density current (ignimbrite) may become aligned by the current motion and by interactions with other grains as well as with the substrate. By accepting that the orientation of long axis are parallel to the flow direction and by assuming that the multi domain magnetic minerals have maximum susceptibilities parallel to their long axis, the maximum susceptibility orientations determined by AMS were accepted as the flow directions. However, this condition is not always in this way, unfortunately. Maximum susceptibility orientations perpendicular to the flow axis were determined from AMS measurements from ignimbrite samples having dominantly single domain magnetic minerals. Because the maximum susceptibility orientations of single domain magnetic grains (diameter $\leq 1\mu$m) are perpendicular to their long-axes. AMS results from samples having dominantly multi domain magnetic particles are already controversial. The occurence of paramagnetic minerals such as biotite in rocks complicates the interpretation of AMS results. The physical origin of the AMS fabric in ignimbrites remains still enigmatic. The emplacement temperatures, lithification and welding degrees, and alteration occurred during cooling after emplacements operate to change the magnetic properties. Consequently, interpretation of AMS results needs specialization, additional laboratory measurements and field observations. In this study, as an alternative method for AMS which uses the maximum susceptibilities to determine the long axis orientation of magnetic minerals, a new method which directly measures the orientations of long axes of magnetic or non-magnetic minerals in a rock is offered. The offered new method is high resolution x-ray tomography which image the interior and exterior of samples and distinguish their components (glass, pores, minerals) using their x-ray attenuation coefficients.