Semi-empirical Modeling of Ash-deposit Thickness for Different Eruption Scenarios. Applications to Popocatepetl Volcano, Mexico

S De la Cruz-Reyna; Alex Onar Gonzalez-Mellado (Instituto de Geofisica UNAM, C. Universitaria, Mexico 04510; ph 52-55-56224098; fax 52-55-5502486; email: sdelacrr@tonatiuh.igeofcu.unam.mx)

The impact of ash-fall on people, buildings, crops, water resources, and infrastructure depends on many factors, such as duration of fallout, thickness of deposits, granulometric distribution and composition of the falling tephra and of its leachates, among others. Preparedness against tephra falls over large regions around an active volcano requires an understanding of the processes controlling those factors, and a working model capable of predicting most of them. However, the complexity of tephra dispersion and sedimentation makes the search of an integral solution a difficult problem. An attempt is made here to address one of those factors, namely the thickness of ash deposits. A semi-empirical model is used to estimate the thickness of non-compacted deposits produced by an explosive eruption around a volcano in the distance range 4-150 km from the eruptive source. A graphic interface is used to picture the expected deposits of a potential explosive eruption. The model was elaborated from analysis of the geometric distribution of deposit thickness of 14 well-documented eruptions. The model was developed to depict deposits of a potential eruption of Popocatepetl volcano in central Mexico, and it may be applied to other volcanoes. It seeks to assist planners and Civil Protection authorities to obtain a feeling of the ash-fall deposit thickness that may be expected for different eruption scenarios. The model requires to be fed with a few parameters that are easy to obtain, namely height of the eruptive column, duration of the explosive phase, and wind speed and direction. The computer graphic interface is user-friendly and has minimum CPU requirements. The model has been tested with available data from some of the eruptions of the current episode of activity at Popocatepetl, which began in 1994. The model thus permits to generate ash-fall deposit scenarios from new situations, or to recreate past situations observed at Popocatepetl, or to superimpose scenarios from eruptions of other volcanoes on a region around Popocatepetl.