



A probabilistic approach to determine volcanic eruption centres of degraded volcanic edifices

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It is often a difficult problem to determine the position of original eruption centres of degraded volcanic edifices. Beside of the destructive processes acting during the volcanic activity, subsequent erosion, mass movements and tectonic motions modify the spatial distribution of the volcanic features. The observations including dipping strata, clast orientations, lava flows, etc. made on the present surface are therefore biased by the post-eruptive processes making the reconstruction of the original volcanic pattern problematic. The different types of observations and their various error levels complicate the problem further.

We propose a probabilistic approach to evaluate the different types of observations. Each observation type or even each observation may have their own error bars which can be taken into account in this scheme. The only assumption is that it is possible to determine the relative direction of the original volcanic centre based on the specific observation within a given angular accuracy. In our scheme a spatial probability density function (PDF) is assigned to each observation and the weighted sum of these PDFs results in a map. This integrated PDF map then can be evaluated to determine one or multiple eruption centres.

In case of multiple centres further decision can be made on whether the various centres are only virtual, caused by subsequent tectonism or, on the contrary, the original setting had several eruption vents. This decision can be made on targeted grouping of PDFs of different types of observations or spatial selection. The resulting compound PDF maps may outline individual centres.