Long-term forecast of eruptions from Mono-Inyo volcanic chain, CA, USA

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In collecting data for long-term forecasting in a volcanic region, one of our main goals is to correlate scattered outcrops of deposits to one another, to a particular vent, and ultimately to an eruptive sequence. In this way, we reconstruct the eruptive history and are enabled to forecast future events. It becomes increasingly difficult to correlate layers one to another as the layers are more deeply buried, hence less easily or frequently exposed near the surface, or as they are thinner and less extensive. It becomes increasingly difficult to correlate layers to vents or to eruptive sequences as the number of vents increases or as the eruptive history becomes longer.

We have explored the use of clustering and multiple artificial neural networks combined within the framework of the Transferable Belief Model and Extreme Value Theory to construct a hybrid information processing system as an aid in the correlation of Mono-Inyo pyroclastic layers and eruption forecasting. The idea is that the hybrid system could prove useful in discerning eruptive patterns that would otherwise be difficult to sort and categorize.

Development of the information processing system has proceeded along with improvements in chronometric, geochemical and lithostratigraphic datasets. Our results to date include a systematization of the analysis framework from inception of a forecasting project. We have found that clustering and neural networks can yield a confidenc interval to proposed tephra correlations, but are still limited by analytical uncertainties in the underlying data. Return period forecasts are tempered by the uncertainties in both the data and the mathematical characteristics of the forecast model.