The use of thermomagnetic parameters to identify tephra.

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Volcanic tephra is a useful tool for investigation of volcanic eruptions as it can be found far from eruptive centers, and is preserved for a long time after initial deposition. The correlation of tephras found at different localities depends on many generic properties such as color, mineral content and geochemistry etc. However, correlation is commonly difficult due to gravitational and eolian processes that occur at time of deposition. To counter these effects, we propose a method of identification and correlation of volcanic ashes based on corresponding thermomagnetic parameters related to magnetic susceptibility or analogous induced magnetization, $I_i(T)$, of magnetic minerals. Such minerals are commonly found volcanic ashes and it is possible to detect magnetic properties, such as Curie point, that are unaffected by processes that occur during settling over distance.

In this preliminary study, 0.3 g samples of different grain sizes were taken from five volcanoes on the Kamchatka Peninsula, Russia: Shiveluch, Bezymianny, Opala, Ksudach and Khangar. Measurements of the induced magnetization were made using an especially developed magnetometer, and took place in the natural magnetic field of the laboratory. The samples were subject to a slow increase temperature and changes in the magnetization were recorded on a plotter. For each sample, two primary and secondary demagnetization curves were obtained in order to establish how stable ferromagnetic is during heating. Curie points for natural titanomagnetites varied from 100 - 580□C, and it was hoped that the parameter could be used for ash layer identification. Unfortunately in the study samples, the range of Curie points for different volcanoes overlapped. However, initial results show that the shape and slope of the $I_i(T)$ curves for individual ash layers from a single eruptive center are similar, even over different size fractions, and different for each of the other volcanoes in the study. For example, $I_i(T)$ curves obtained for different ash layers of Bezymianny volcano (eruptions of 1969, 1985, 1986) show a well distinguished peak in the range of 360-370□C, probably due to iron sulfide, in all volcanic ashes from this volcano. Such a unique feature allows for reliable identification of ashes from that volcano.

The authors hope that future work will support the thermomagnetic parameters of presented here and allow improved tephrachronology of ash layers in Kamchatka and elsewhere.