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'Understanding volcanoes and society: the key for risk mitigation'



Cluster analysis using portable X ray fluorescence (pXRF) data: a fast and powerful method for regional correlation of ash fall deposits

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Ash fall deposits, produced by explosive volcanic eruptions are distributed over broad geographic regions, deposited within hours, days or weeks and are distinctive within the sedimentary records. Therefore, ash fall deposits are ideal time planes and valued as important temporal tool in stratigraphic correlation. Since glass and phenocryst phases generated by each volcanic eruption have distinguishable chemical fingerprint, individual ash fall deposits can in many cases be identified unambiguously based on their geochemistry and can be correlated regionally. Radiometric dating, biostratigraphy and high-precision microprobe analysis on glass and phenocrysts are among the most widely used and effective correlations techniques. However, the main drawback of these methods is that they are high-priced, time-consuming and out of reach for field geologists and field mapping. We present a fast, low cost and accessible methodology for ash fall deposit correlations. In the NW Argentina, widespread ash fall deposits occur interbedded with Quaternary sequences e.g. [1,2]. Chemical fingerprints obtained from pXRF in some of these ash deposits and further statistical treatment provided excellent geochemical correlations. Trace element ratios measured in the samples (Sr/Rb; K/Sr) indicated values that are within the range of Central Andes rhyolites. Three different (rhyolitic) groups resulted from multivariate hierarchical clustering. In order to validate the methodology, we used samples of three ash levels from Tafí valley (Tucuman province) which have good stratigraphic and temporal constraint [3]. Later we applied the same approach to correlate several samples of Quaternary ash fall deposits from different localities in the NW Argentina (e.g. Tonco valley, Calchaquí valley, Lerma valley). Finally, we compared the geochemical groups obtained from the statistical



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analysis with volcanic centres in the Southern Puna that have both well-known Quaternary activity and rhyolitic composition [3,4,5].

