



Analysis of reflectance spectra of volcanic rocks from Deception Island (Antarctica)

Agustin Lobo, Anna Giralt, Jordi Ibañez, and Adelina Geyer

Institute of Earth Sciences Jaume Almera, ICTJA, CSIC, Lluís Sole i Sabarís s/n, 08028 Barcelona, Spain

Because it is a fast and simple technique that can be extensively used, spectrometric information can be of great help for geological mapping provided reflectance spectra can be linked to relevant geological materials. To this purpose, we are analysing the spectral characteristics of samples of volcanic rocks from Deception Island (Antarctica) by acquiring reflectance spectra between 460 and 1700 nm in the laboratory. In a first attempt to link spectra to local geological information, we classified samples into broad rock types (PDC, altered-PDC, Vesiculated Lava, Non-vesiculated Lava, Lapilli, Scoria, Pumice and Spatter) and run a Linear Discriminant Analysis on the spectra using this typology as a grouping variable. Overall accuracy, assessed by cross-validation, was 0.635. Altered-PDC and Lapilli had a higher accuracy (0.82 and 1.0), while Vesiculated Lava, Pumice and Scoria had lower accuracies (< 0.3). Differences of accuracy among classes corresponded to the presence of within-class heterogeneity in terms of spectra. Within a machine learning approach, we discarded those spectra not following the majoritary pattern for each class thus producing a more coherent training set, and run LDA again. We projected the discarded samples on the LD space defined by the training set and discuss the resulting classification with the aid of mineralogical and geo-chemical information. We complement this approach with non-supervised clustering based on a Fréchet distance. This research was supported by de MICINN project POSVOLDEC (CTM2016-79617-P) (AEI/FEDER, UE)