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# What is controlling spectral reflectance of lava flows? First results of a field spectrometric survey of volcanic surfaces on Tenerife Island

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Space-based remote sensing techniques have demonstrated their great value in volcanic studies thanks to their synoptic spatial coverage and the repeated acquisitions. On satellite images, volcanic surfaces display a wide range of colors, and therefore contrasted reflectance spectra. Understanding the factors controlling the spectral reflectance of volcanic materials at different wavelength is essential to mapping volcanic areas. Detailed investigation into spectra of volcanic materials are, however, restricted due to the trade-off between spatial and spectral resolution of space-based sensors, such as Hyperion imagery that allows resolving 220 spectral bands ranging from 400 to 2500 nm with a spatial resolution of 30 meters. In order to better understand reflectance of volcanic materials, especially lava, a field campaign was launched in Tenerife Island, Spain in November 2013 with an ASD FieldSpec 3 to document the reflectance spectra of historical mafic lava flow surfaces.

20 specific lava and lapilli surfaces, with contrasted age, surface roughness, weathering condition and vegetation coverage were characterized, using a systematic recording method documenting the spectra's variability within a $15\times15$ $m^2$ area. Results show that all the volcanic materials have great differences in spectral reflectance. Among them, lava's reflectance is low but still slightly higher than that of lapilli. Comparison of rough and smooth lava surfaces on the same lava flow suggests that roughness tends to increase the reflectance of lava surfaces. Also, vegetation and lichen alter lava's reflectance in some spectral regions, especially through a rise in the near infrared part of the spectrum. It is therefore suggested that reflectance spectra of lava evolve over time due to weathering processes, such as chemical alteration and growth of lichen and moss. In addition, it is possible to compare field measurements with spectra derived from Hyperion imagery, resulting in a strong match for some surfaces. In order to increase the comparability of field and image spectra, geometric and atmospheric correction should be improved, and field measurements should be optimized by selecting volcanic surfaces to be measured in larger, more homogeneous areas.

The field work that was done in Tenerife Island might provide an insight into spectral properties and evolution of lava flows in other planets.