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Application of Emission Spectroscopy in Mapping Epithermal Gold Deposits

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The emission spectra from a rock are extremely sensitive to variations in the fabric and bulk chemistry of the rock and the composition of the constituent mineral species particularly feldspars, garnets, pyroxenes, olivines, and SiO2 minerals. For igneous geologists potential applications of thermal infrared spectroscopy include detection of temporal and spatial thermal patterns; mapping recently-erupted volcanic and volcanic-related deposits; discriminating volcanic rock surfaces in terms of textural differences; distinguishing the relative age of volcanic surfaces and thermal inertia mapping. Recent developments in imaging thermal infrared spectroscopy instruments (both ground and airborne based) provide a potential step-change in the range and quality of mineralogical, lithological and morphological remote sensing datasets that can be retrieved over volcanic terrains. The aim of this project is to investigate the potential of thermal infrared spectroscopy in resolving a range of the key mineralogical and lithological information required by geologists studying volcanic terrains. The Island of Milos, Greece. Milos, a dormant volcano in the Southern Aegean Volcanic Arc, is being used as a study area because: **1:** it has an extensive range of fresh and hydrothermally volcanic rocks; **2:** it has high and low enthalpy geothermal energy resources; **3:** there are a number of fossilised, mineralised hydrothermal systems; **4:** the weather is stable with low humidity and high temperatures; and **5:** there is a lack of vegetation and excellent rock exposure. Airborne hyperspectral datasets covering the VNIR, SWIR and TIR have been acquired over MILOS and have been analyzed to produce mineralogical and lithological maps. Supporting field spectral surveys using PIMA and ASD spectroradiometers and MIDAC and Exoscan FTIRs were carried out. A representative range of field samples were analysed in the Laboratory to produce a library of emission and DHR measurements. These samples were then analyzed for their bulk chemistry and mineralogy using quantitative XRD and supporting petrological analyses. The results of this study show the potential of an integrated field and airborne thermal wave range remote sensing study to provide invaluable additional geological understanding to the distribution and genesis of epithermal and hydrothermal mineral deposits.

Biography:

Dr. Ferrier background is in physics and geology with a focus on the utility of hyperspectral remote sensing in the geological mapping and environmental monitoring. Dr Ferrier's current research focus is in the development of new methodologies for ground, UAV and airborne-based emission spectroscopy particularly focused on resource evaluation.