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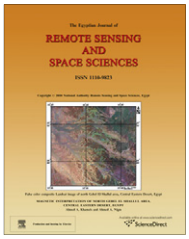

Spectral properties of carbonatized ultramafic mantle xenoliths and their host olivine basalts, Jabal Al Maqtal basin, South Eastern Desert, Egypt, using ASD FieldSpec spectroradiometer

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KEYWORDS

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Abstract Understanding the spectral properties of the carbonatized ultramafic mantle xenoliths and their host olivine basalts exposed at Jabal Al Maqtal strike-slip basin, south Eastern Desert, Egypt using portable ASD FieldSpec is the main task of this article. Field data revealed the presence of ultramafic mantle xenoliths at different stratigraphic levels within Jurassic olivine basalts. Ultramafic mantle xenoliths are recorded within highly altered olivine basalt topped by hard, compact brown conglomerate (erosional surface) of 1.5 m thick. They have different sizes (5–25 cm) and shapes (rounded, sub-rounded and elliptical). The spectral data are collected using ASD FieldSpec in sunny, free-cloud day. Data measurements were resampled as reference-target scan. Nearly all the mineralogical constituents of the studied ultramafic mantle xenoliths were replaced by Mg-Free (< 0.5 wt%) calcium carbonate (calcite). Spectrally the ultramafic mantle xenoliths can be categorized into two main groups based on their Fe and Mn content which produce absorption features at shorter wavelength regions. The spectral profile of the first group shows a pronounced absorption features around 0.50 μm, 0.65 μm and 0.90 μm wavelength regions. These features are attributed to the electronic processes within the unfilled d-shells of

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transition Mn^{2+} and Fe^{2+} metal cations (MnO and Fe_2O_3 content are 2.11 wt% and 12.6 wt% respectively as indicated by XRF analyses). The spectral profile of the second group shows a very week absorption features in shorter wavelength regions which is attributed to the low MnO (0.7 wt%) and Fe_2O_3 (2.17 wt%) content. Both ultramafic mantle xenoliths groups show pronounced absorption features in longer wavelength regions (1.8–2.55 μm). Inspection of the spectral profiles of the mantle xenoliths revealed the presence of six absorption features around 1.80 μm, 1.95 μm, 2.00 μm, 2.35 μm, 2.4 μm. and 2.5 μm wavelength regions which are attributed to the vibrational processes of the carbonate ion. Absorption feature around 1.40 μm wavelength region is probably due to microcrystalline silica alteration. The spectral profile of fresh olivine basalt shows low flat reflectance curve whereas the reflectance curve of altered basalt shows three little absorption features around 1.40 μm, 1.95 μm and 2.35 μm wavelength regions. These absorption features are mainly due to calcite alterations.

1. Introduction

Jurassic volcanics in south Eastern Desert, Egypt is an important feature that characterized Jabal Al Maqtal strike-slip basin. They contain ultramafic mantle xenoliths, brought to the earth surface during basaltic extrusions. Madani (2012) presented a new detailed geological map for Jabal Al Maqtal basin showing the distribution of the Jurassic volcanics (Fig. 1). Madani (2000) recorded the ultramafic mantle xenoliths in the Natash volcanics exposed at the south Eastern Desert, Egypt. He studied in detail field occurrences, petrography and geochemistry of the ultramafic mantle xenoliths recorded at sites A and B. The present study is the first study that deals with the spectral properties and reflectance profiles of the mantle xenoliths and their host basalts using Analytical Spectral Devices (ASD) FieldSpec spectroradiometer. Abe et al. (2011) used electron and ion

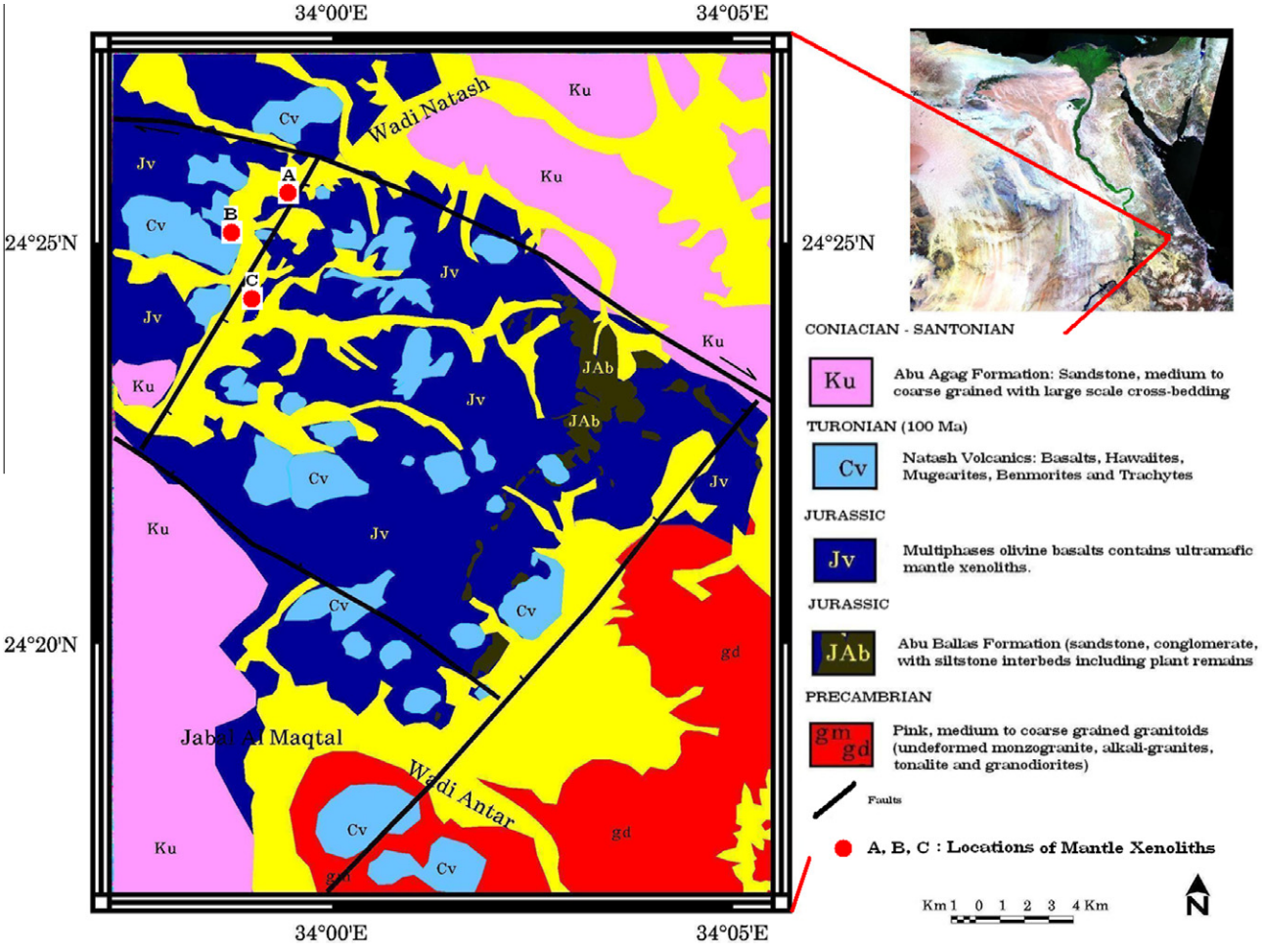

Figure 1 Geological map for the study area modified after Madani (2012).