Geophysical Research Abstracts
Vol. 18, EGU2016-1094, 2016
EGU General Assembly 2016

Advances in soil mapping: Mapping quartz content of soil surface using airborne hyperspectral remote sensing in the longwave-infrared region

Shahar Weksler, Gila Notesco, and Eyal Ben-Dor
Tel Aviv University, Tel Aviv, Israel (tonish@gmail.com)

Hyperspectral remote sensing in the longwave-infrared (LWIR) spectral region has proven to be a new and efficient tool for mineral mapping (Adar et al. 2013). Minerals which are featureless in the visible, near-infrared and shortwave-infrared regions, e.g., quartz, have a unique fingerprint in the LWIR region (8–12 μm). This spectral region adds to the optical region in which several important minerals can be characterized with significant features (e.g., clay). Accordingly, using airborne hyperspectral remote-sensing data in the LWIR region is an important and practical means of classifying and quantifying minerals. Day and night airborne data, acquired by the AisaOWL sensor over Nitzana National Park in Israel, were used to demonstrate how LWIR region data can be used to map quartz content on the soil surface in a pixel-by-pixel process. The LWIR radiance image is composed of the surface emissivity (and hence the surface's chemical and physical properties), the radiant temperature (according to the Plank equation) and the atmospheric attenuation (which is different during the day and at night). In this work, we show that it is possible to separate surface emissivity, temperature and atmospheric attenuation by using the radiance measured from a vicarious calibration site which was found to be distinctive for the atmospheric contribution. Applying the spectrum of this area as a gain factor to each pixel in the image reduced the atmospheric effects while emphasizing the mineralogical features. Based on this finding and using the same vicarious calibration site used by Notesco et al. (2015), we further studied the possibility of mapping quartz in an area outside the vicarious calibration site. The resulting emissivity image of Nitzana soils (100 km away from the vicarious calibration site) enabled quantifying the quartz in each pixel and mapping its abundance. The day and night images showed a similar quartz distribution, thereby validating the methodology and demonstrating the potential of the LWIR spectral range as a powerful tool for mapping soil mineralogy.

Adar Simon, Yoel Shkolnisky, Gila Notesco, and Eyal Ben-Dor. 2013. "Using Visible Spectral Information to Predict Long-Wave Infrared Spectral Emissivity: A Case Study over the Sokolov Area of the Czech Republic with an Airborne Hyperspectral Scanner Sensor." Remote Sensing 5(11): 5757–82.

Notesco, Gila, Yaron Ogen, and Eyal Ben-Dor. 2015. "Mineral Classification of Makhtesh Ramon in Israel Using Hyperspectral Longwave Infrared (LWIR) Remote-Sensing Data." Remote Sensing 7(9): 12282–96.