

ASSESSING THE UTILITY OF HYPERION IMAGERY FOR THE AUTOMATIC IDENTIFICATION OF URBAN CONSTRUCTION MATERIALS

Rashed, T.

1. University of Oklahoma, Department of Geography, 100 E Boyd Street, Norman, Oklahoma, 73019, USA; Tel. +4053255104, Fax: +4053256090; rashed@ou.edu

Remote sensing of the built environments is an important source of information for both the intelligence and civilian communities with respect to mapping and monitoring urban environments on a global basis. The launch of new generations of non-military satellite sensors (e.g., IKONOS-2, QuickBird) have satisfied the demand of these communities for higher spatial resolution of image data and provided a cost-effective means for the global surveillance of a wide variety of targets and activities of national security significance. Despite the commendable spatial resolution of these satellite systems, the "automated" identification and mapping of features in cities remains difficult due to three key factors: (1) the heterogeneity of urban landscapes; (2) design tradeoffs between the spectral and spatial resolutions of operational satellite sensors; and (3) a general lack of knowledge about the spectral properties of urban materials and how they vary over space and time on a global basis. The emergence of hyperspectral imagery (e.g., AVIRIS) has provided new horizons for the automatic mapping of urban features. Nevertheless, the limited spatial coverage of airborne instruments is still an obstacle for assessing the utility of hyperspectral data at a global level. Hyperion is technology demonstration sensor that has been designed by NASA and UCGS to assess the potential of space-based hyperspectral imagery. It provides 220 unique spectral bands with a 10-nm bandwidth. To date, the literature does not include any study that has attempted to document the utility of Hyperion images in the automatic mapping of urban features. This purpose of this paper to contribute to the ongoing dialog with regard to the optimal spectral and spatial configuration required for the global observation of cities and the automated discrimination and mapping of urban features through investigating and assessing the capabilities of the Hyperion instrument in this regard. Through a wall-to-wall exercise conducted in Southern California, the paper discusses (1) the spectral response patterns of urban materials as measured by Hyperion; (2) the optimal portions of the electromagnetic spectrum required for the discrimination between particular types of urban materials; (3) the ideal spectral configuration needed for precise global mapping of the world's cities; and (4) a methodology for using Hyperion imagery in the automatic identification of urban materials via spectral matching and multiple endmember spectral mixture analysis. The insight of these results is critical and can help further our understanding of the potential and limitation of spaceborne hyperspectral sensors that have not yet been seriously examined in the urban context.