Background

The Earth Observing One (EO-1) Mission, launched in November, 2000 as part of NASA’s New Millennium Program, is in its ninth year of operation. From the start it was recognized that a key criteria for evaluating the EO-1 technology and outlining future Earth science mission needs is the ability of the technology/strategy to characterize terrestrial surface state and processes. The EO-1 Science Validation Team conducted a range of investigations to ascertain how well the employed technology and acquisition strategy served to enhance the extraction of scientifically viable information. Investigators engaged in NASA’s Terrestrial Ecology, Carbon Science, Land Use Change and other programs using the EO-1 Hyperion imaging spectrometer have achieved results with accuracies far exceeding those reached with the current space borne fleet of multispectral sensors.

Current Status

EO-1 is participating in a broad range of investigations, demonstrating the utility of imaging spectroscopy in applications relating to forestry, agriculture, species discrimination, invasive species, desertification, land-use, vulcanization, fire management, homeland security, natural and anthropogenic hazards and disaster assessments and has provided characterization for a variety of instruments on EOS platforms. By generating a high spectral and spatial resolution data set for the coral reefs and islands, it is contributing for realizing the goals of the National Decadal survey and provides an excellent platform for testing strategies to be employed in the HyspIRI mission.

Preparing for HyspIRI

Tools and prototypes for new science products are being developed to provide vegetation biophysical parameters such as LAI and fAPAR at <100 m spatial resolution for selected EOS validation sites. These will be used to resolve variability in heterogeneous areas (e.g. agriculture, urban areas, river valleys) and for managed ecosystems less than 10 km². A set of invariable reference targets (e.g. sun, moon, deserts, Antarctica) are being characterized to allow cross-calibration of EO sensors, comparison of land products generated by multiple sensors and retroactive processing of time series data. Such products are needed to develop Science Requirements for the next generation of hyperspectral satellite sensors and to address global societal needs.

To date, over 45000 EO-1 scenes have been acquired

Hyperion Characteristics and Performance

State of the Art Performance

Hyperion Performance

Hyperion Data Specification

Spectral Resolution: 30 m
Swath Width: 7.5 km
Spectral Range: 400 – 2400 nm
Spectral Resolution: 10 nm

EO-1 Toolkit

EO-1 Hyperion: Seasonal Dynamics of Major Land Cover Types, USDA ARC, Greenbelt, MD

EO-1 Hyperion: Seasonal Dynamics of Forest Cover, Hyperion 2008; Harvard Forest, MA

EO-1 Hyperion: Mapping land cover diversity in a fragmented ecosystem

Environmental Disaster Assessment

Mapping to the Mt.Etna, Sicily July 22, 2011

Fire Danger Assessment

Spectral Mixture Model

Technology Applications: EO-1 Prototype L2 Tools and Reflectance Products

Seasonal Dynamics of Major Land Cover Types, USDA ARC, Greenbelt, MD

Comparison of ATREM and ACRN

Linear temporal profile of Hyperion’s spectra demonstrates the relative stability of the spectral characteristics for major bands over the Railroad Valley Playa.

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