

Monitoring Forests with Hyperspectral and Polarimetric Radar Sensors

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1 Forestry Drive
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Refreshments served at 3:30 pm

Abstract

Monitoring Canada's forest from space is essential to ensure their sustainable development. Hyperspectral sensing can provide valuable information on forest species and forest health. Airborne hyperspectral sensing with its higher spatial and spectral resolutions provides a basis for algorithm development to create forest information products. On July 27, 2006, AISA hyperspectral data were acquired by Terra Remote Sensing and the University of Victoria over the Greater Victoria Watershed District (GVWD) test site. AISA has high spectral resolution (492 bands; 400 nm to 2400 nm) and high spatial resolution (2m). The calibrated reflectance data were used to generate forest species classifications, end member fractions, and biomass estimates. AISA data were shown to have a similar SNR in the VNIR as AVIRIS (2002), but were worse in the SWIR. Both sensors gave accurate forest classifications with 86.0% for AISA and 84.7% for AVIRIS. Hyperspectral data were also used to determine canopy chemistry, such as chlorophyll and nitrogen, which were used to map forest health.

Complementary to the HSI data, polarimetric radar has the advantage of being all weather. It can provide accurate mapping of clearcuts and historical fire scars. Fire scars from current to 80 years old can be detected. This new tool will be used to assess fire frequency and area trends.

Large data holdings require sophisticated data management systems. We have created the SAFORAH system (www.saforah.org) which connects to the international GEOSS program. SAFORAH conforms to OGC and FGDC standards, is GRID-based, uses high bandwidth connectivity, petabyte data stores, and parallel computing. This permits the computation of remote sensing products on-demand, based on the data holdings, such as aboveground carbon mapping.

Biography

Dr. David G. Goodenough is a Senior Research Scientist at Pacific Forestry Centre in Victoria, BC, of the Canadian Forest Service, Natural Resources Canada. He is also an Adjunct Professor of Computer Science at the University of Victoria. He is a Fellow of the IEEE and a recipient of the IEEE Third Millennium Medal. He was President of the IEEE Geoscience and Remote Sensing Society (1992-1993) and served as Past-President (1994-1996). He was an Assistant Professor of Astronomy at Wheaton College in Norton, MA (1970-1973). Dr. Goodenough worked at the Canada Centre for Remote Sensing (1973-1991), where he was a Chief Research Scientist and Head of the Knowledge-Based Methods and Systems Section. He has published extensively and has received several awards: Government of Canada's Award of Excellence; the IEEE GRS-S Distinguished Achievement Award; the Canadian Remote Sensing Society's Gold Medal Award; the IEEE GRS-S Outstanding Service Award; a Natural Resources Canada Departmental Merit Award; an Energy, Mines, and Resources Merit Award; and NASA Group Achievement Awards. Dr. Goodenough is Principal Investigator of a Radarsat-2 Forest Applications Project, a Hyperspectral Forest Applications Project, and a Co-I of a Scientific GRID Computing and Data Project for producing Above-Ground Forest Carbon Maps. Dr. Goodenough was Principal Investigator (PI) of the NASA project, Evaluation and Validation of EO-1 for Sustainable Development (EVEOSD) of forests. He is also PI of a CHRIS project with the European Space Agency. He is a member of a USAF/DND hyperspectral team for a new hyperspectral sensor, ARTEMIS. Dr. Goodenough's current research interests focus on methods and algorithms for forest information from hyperspectral and polarimetric radar systems in order to create geospatial products for forest species, forest health, and forest carbon.