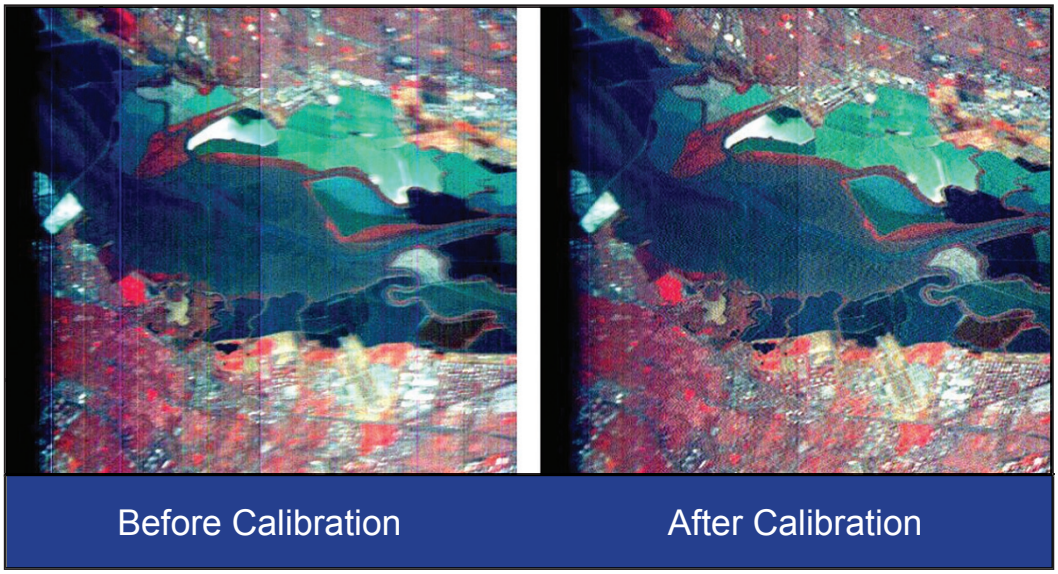
Air Force Research Laboratory|AFRL

Science and Technology for Tomorrow's Air and Space Force

Success Story

CALIBRATION OF FOURIER TRANSFORM HYPERSPECTRAL IMAGERY DATA



Space Vehicles Directorate scientists successfully performed an on-orbit calibration of the Fourier Transform Hyperspectral Imager (FTHSI), the first flown in space. Hyperspectral imaging data has great potential for meeting warfighter requirements by determining the types of materials observed in terrain imagery.

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Accomplishment

Directorate scientists performed on-orbit calibrations of the spectral and radiometric performance of the FTHSI sensor, which flew on the MightySat II satellite. The spectral calibration determined the absolute wavelength associated with each of the 146 spectral wavelength bins collected by the sensor.

Directorate scientists used the validated MODTRAN atmospheric transmission code to determine the precise spectral locations of absorption features due to atmospheric water vapor and oxygen. By identifying these features in the FTHSI data, they determined the absolute wavelength of each spectral bin.

To relate the intensity of the radiance incident on the sensor to the observed signals, the scientists performed a radiometric calibration using FTHSI observations of a spatially uniform site. They measured the site's radiometric properties on the ground and determined the site's atmospheric absorption along the line of sight. The scientists validated the radiometric calibration using data collected by the well-characterized, aircraft-based NASA Jet Propulsion Laboratory instrument, AVIRIS hyperspectral data, to validate the materials present in the scenes imaged by FTHSI.

Background

FTHSI demonstrated the first successful earth-observing operation of hyperspectral imaging technologies in space. To exploit the unique data collected by FTHSI, both spectral and radiometric calibrations of the sensor are required.

Space Vehicles
Emerging Technologies

Additional information

To receive more information about this or other activities in the Air Force Research Laboratory, contact TECH CONNECT, AFRL/XPTC, (800) 203-6451 and you will be directed to the appropriate laboratory expert. (02-VS-12)