

Data Processing and First Products from the Hyperspectral Imager for the Coastal Ocean (HICO) on the International Space Station

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Abstract – The Hyperspectral Imager for the Coastal Ocean (HICO) was installed on the International Space Station on September 24, 2009. HICO is the first spaceborne hyperspectral imager optimized for environmental characterization of the coastal zone. HICO data are collected and processed to produce maps including coastal bathymetry, bottom characteristics, and water column optical properties. Here we describe the HICO data processing system and give examples of HICO products.

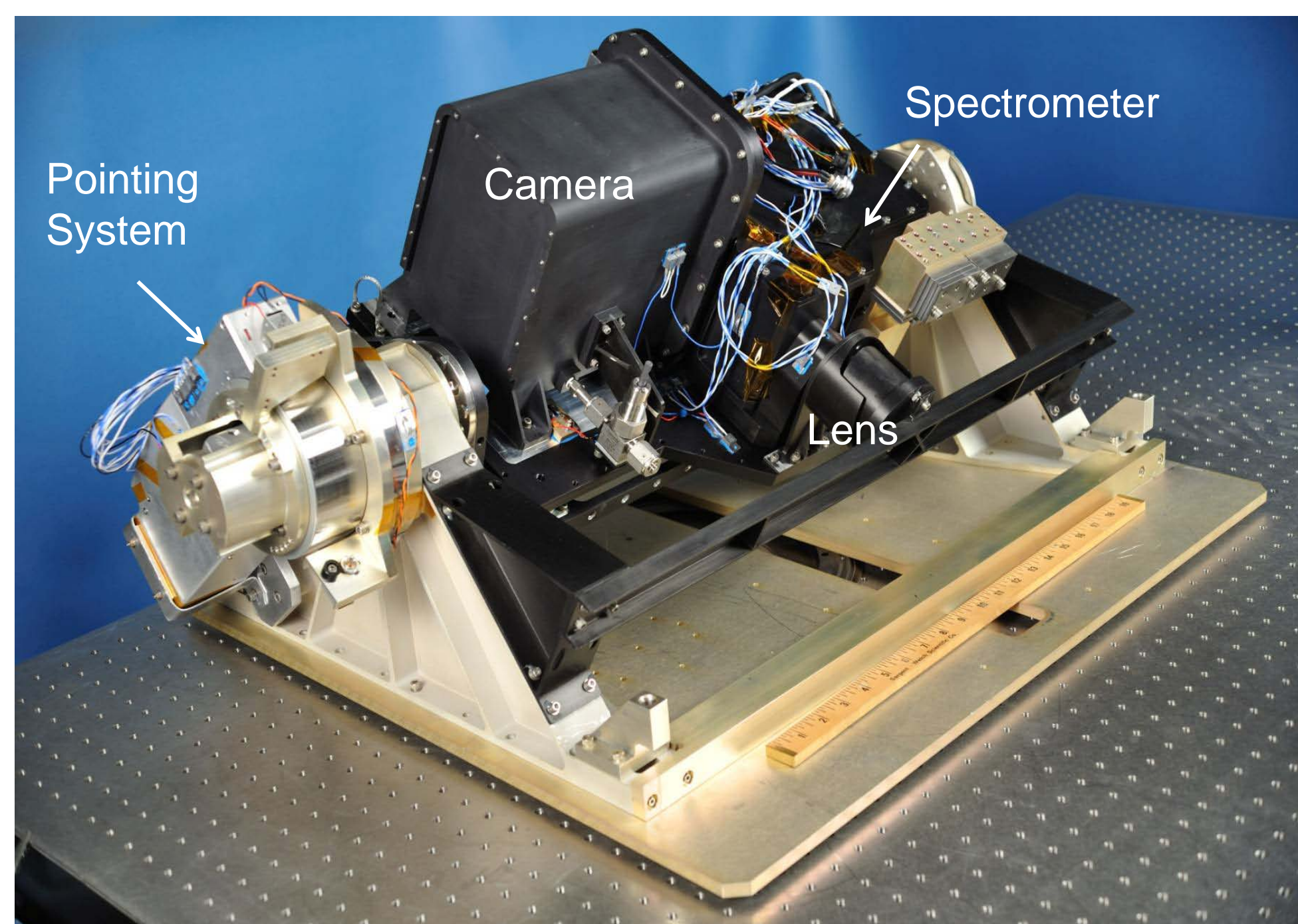
Introduction: HICO on the International Space Station (ISS)

The HICO sensor:

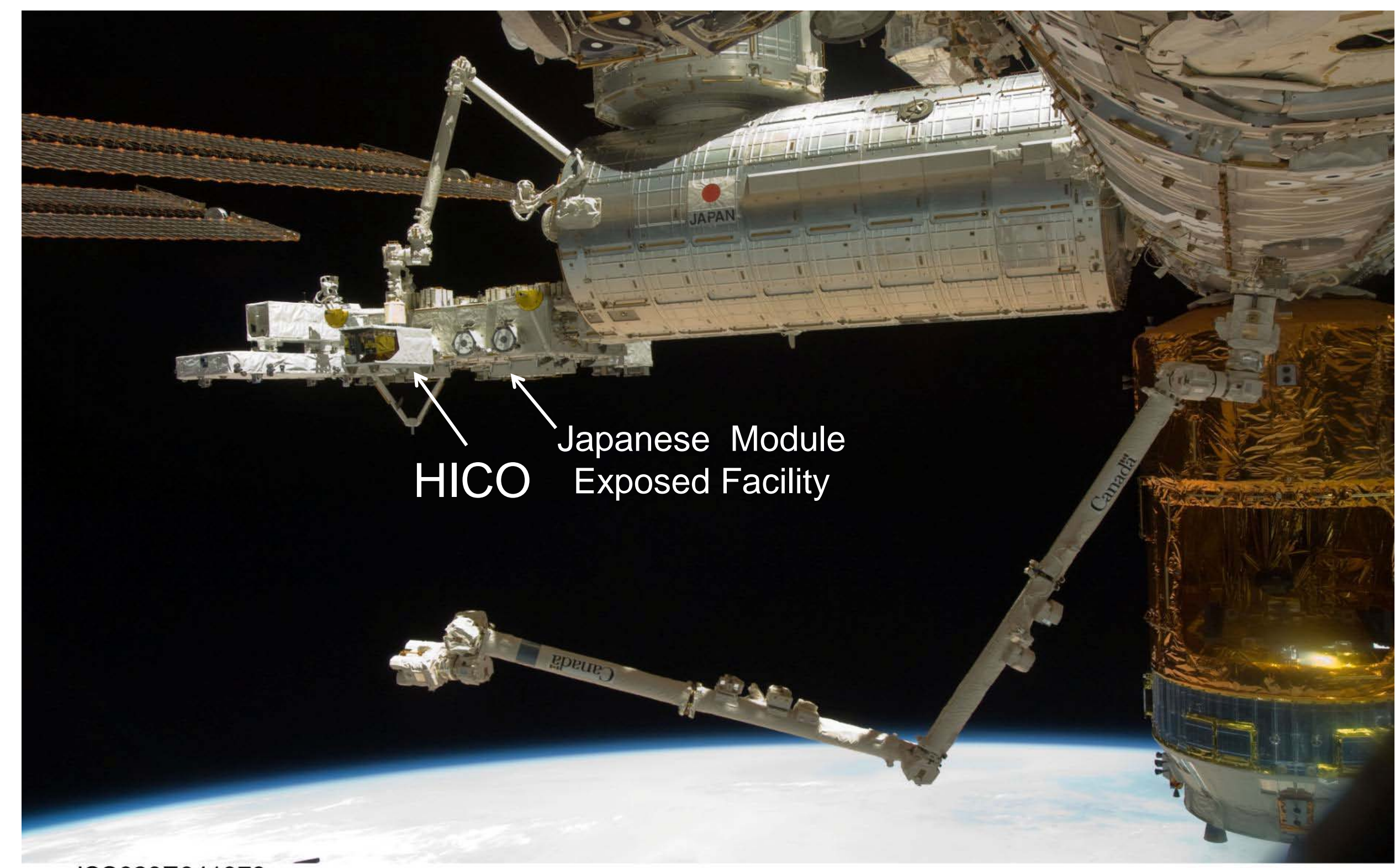
- first spaceborne imaging spectrometer designed to sample coastal oceans
- samples coastal regions at 90 m (400 to 900 nm at 10 nm sampling)
- has high signal-to-noise ratio to resolve the complexity of the coastal ocean

The HICO Program:

- Developed as an Innovative Naval Prototype (INP) for the Office of Naval Research
 - Supported by the Space Test Program for Integration and Launch
 - Additional support from NASA and JAXA for launch and integration onto the Japanese Experiment Module Exposed Facility (JEM-EF) on the International Space Station (ISS)
- Below: HICO (Inside HREP) being installed on the ISS September 24, 2009 (NASA photo)



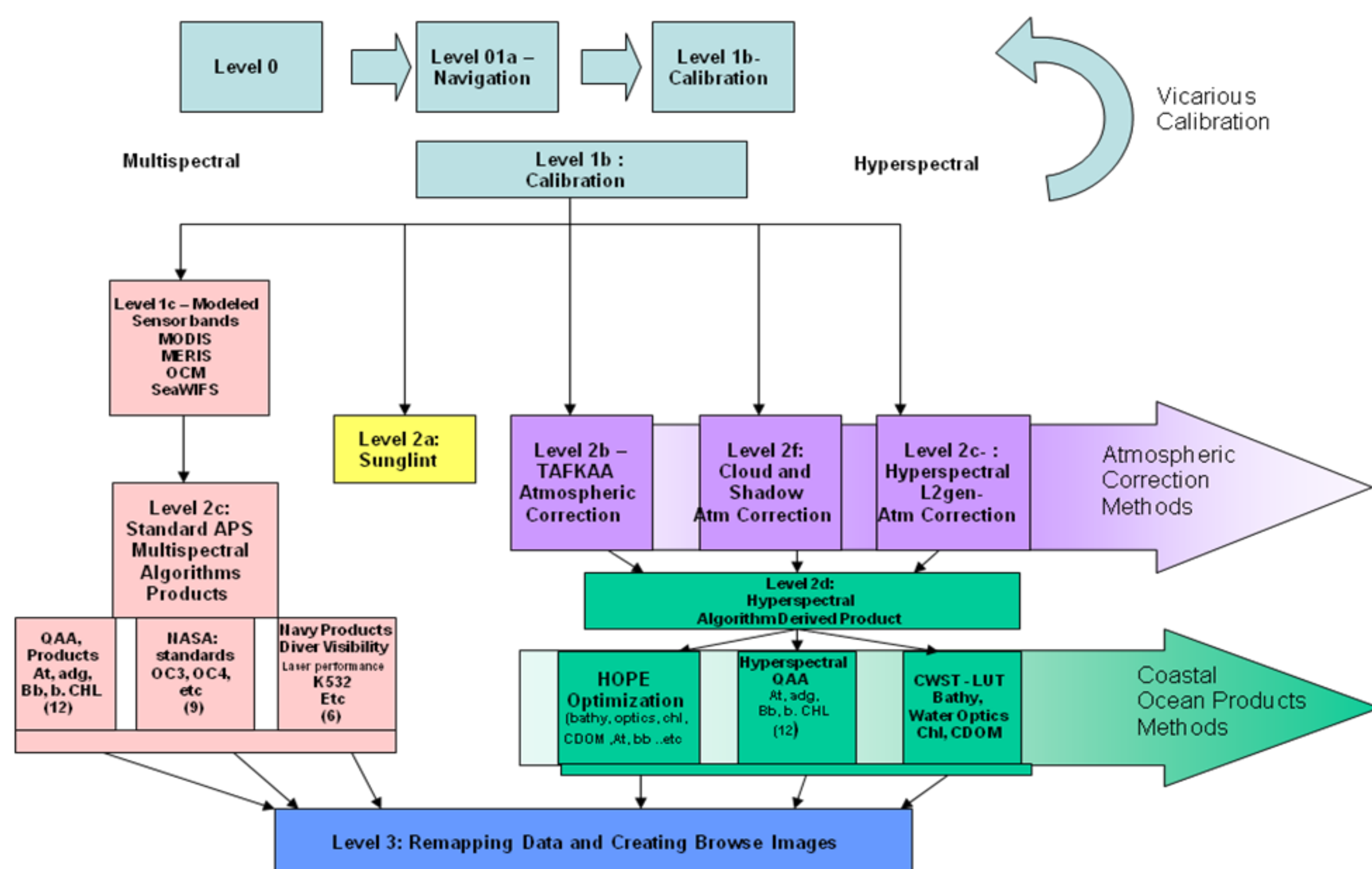
Completed HICO instrument in the laboratory before integration with RAIDS into the HICO-RAIDS Experiment Payload (HREP).



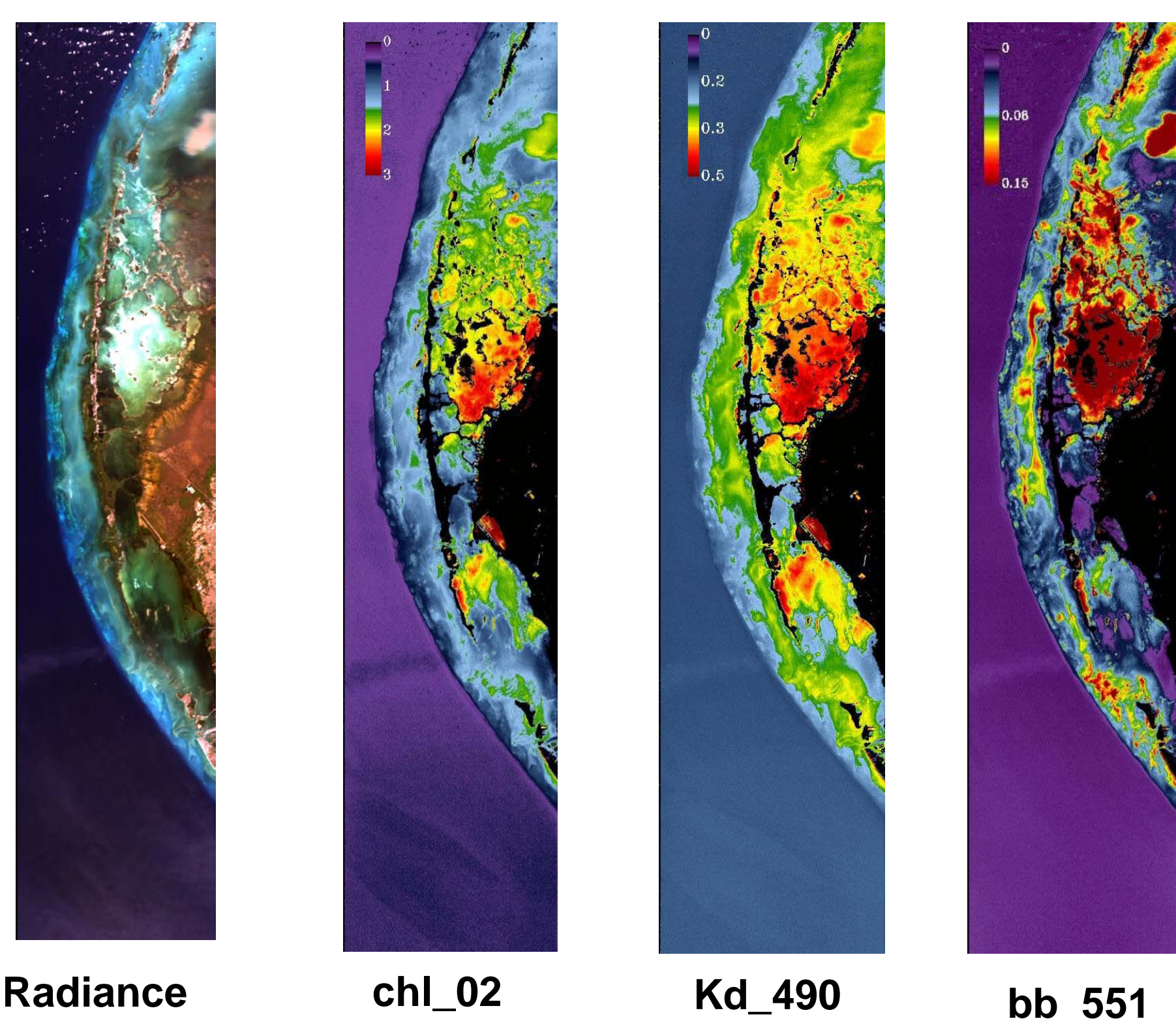
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Data Processing

Flow diagram for the HICO data processing system. The initial processing takes all data from Level 0 to 1b (blue boxes). Following this, the data follow two primary paths. The multispectral processing line (pink boxes) is used to produce MODIS like products at 90 m GSD. The Hyperspectral processing line (purple and green boxes) uses multiple approaches for atmospheric correction and product production to test and evaluate new approaches to take advantage of the full spectral data. Level three and higher processing (geolocation, binning, remapping, etc.) is then done to both data types.

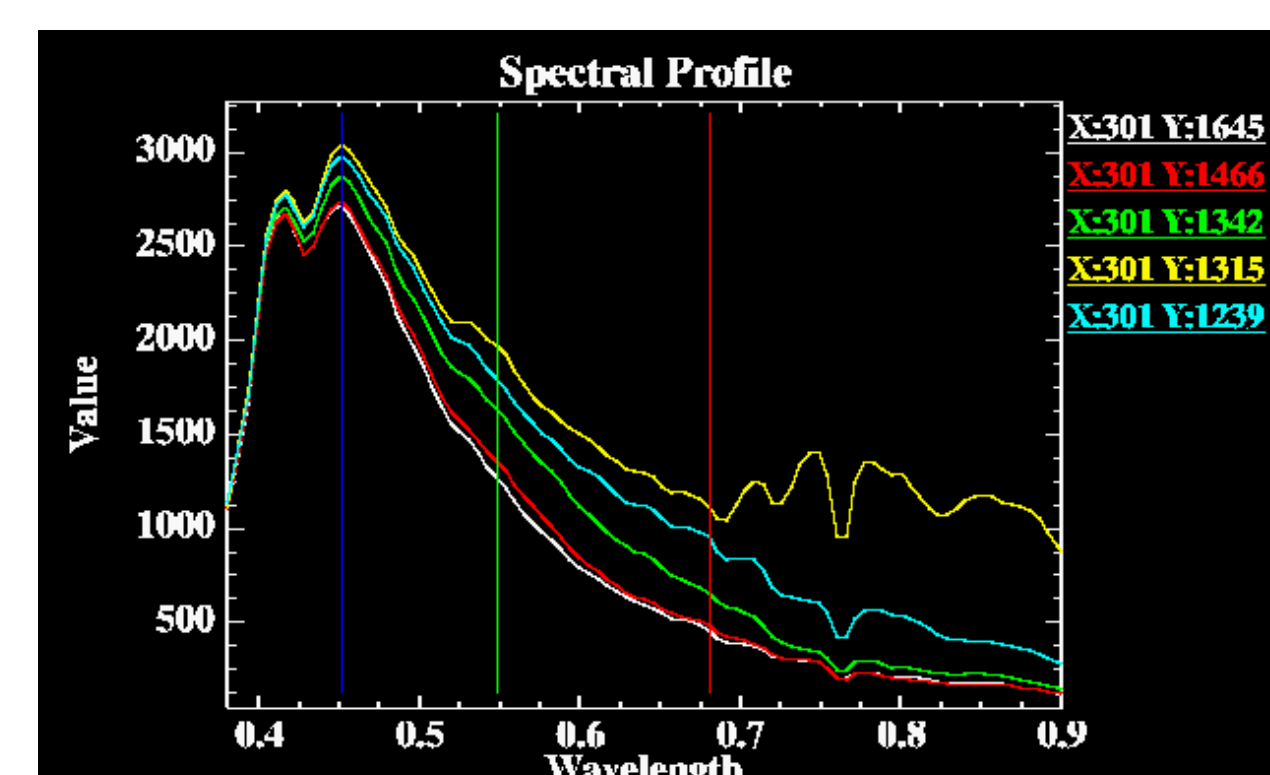


Example of Preliminary Results for APS MODIS like products from a HICO image of the Florida Keys near Key Largo. Orientation is from southwest at the top to northeast at the bottom.

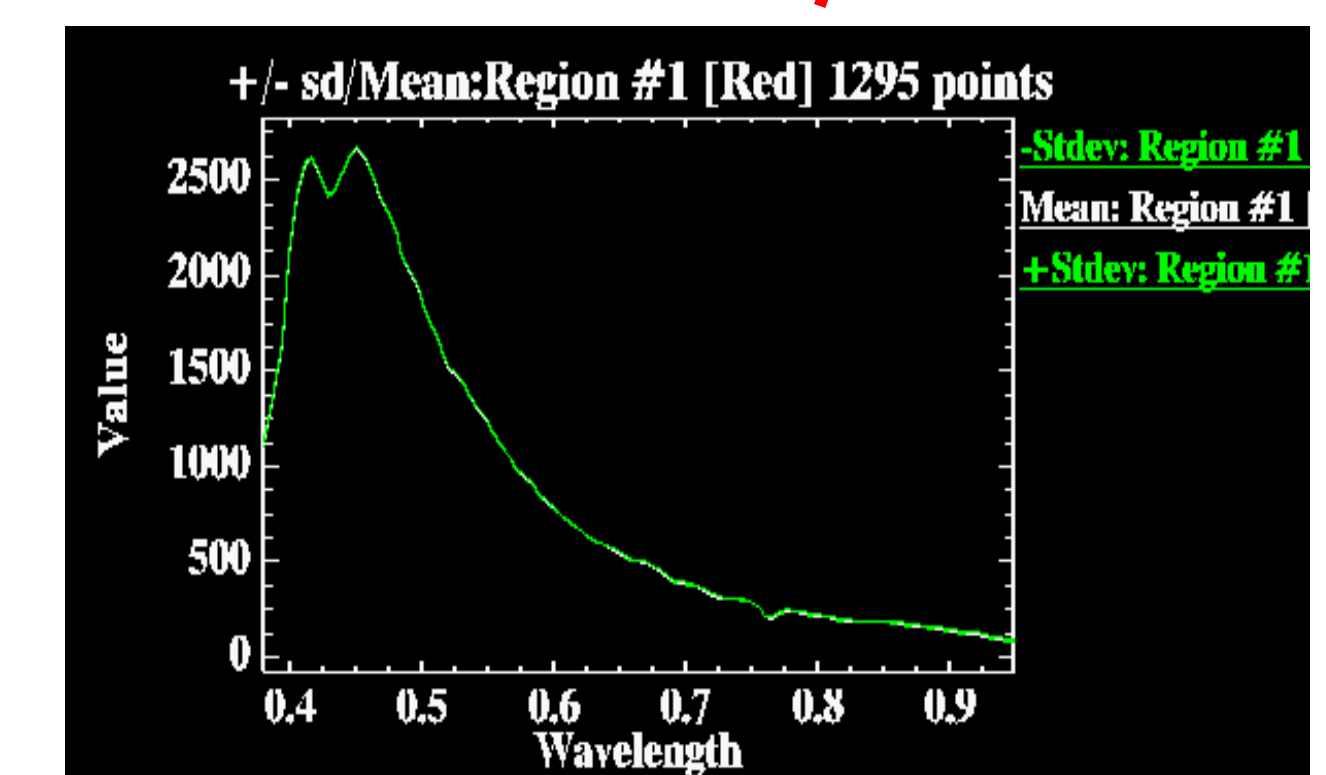


Example HICO image of the Coastal Ocean

Part of an RGB Image made using three channels of HICO data (680, 565, 441 nm) showing the Mouth of Chesapeake Bay, VA. The Chesapeake Bay Bridge-Tunnel connects the Virginia coast in the south with the Delmarva Peninsula to the north (top). There are extensive salt marsh areas on the east side of the Delmarva Peninsula. Sediment plumes are seen around the entrance to the Chesapeake Bay. The shallow bottom is imaged offshore of the Barrier Islands on the East side of the Delmarva Peninsula.



Spectra extracted from pixels along the east-west transect shown in yellow. Approximate locations of the spectra are indicated by same color Xs on the image. Spectra are scaled calibrated at-sensor radiances.



Mean and standard deviation of 1295 pixels in the red Region of Interest. The SNR (μ/σ including all sensor and environmental variations) is $>300:1$ for much of the spectra. Spectra are scaled calibrated at-sensor radiances.

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