Sensor Temperature Effects on CrIS Radiometric Performance

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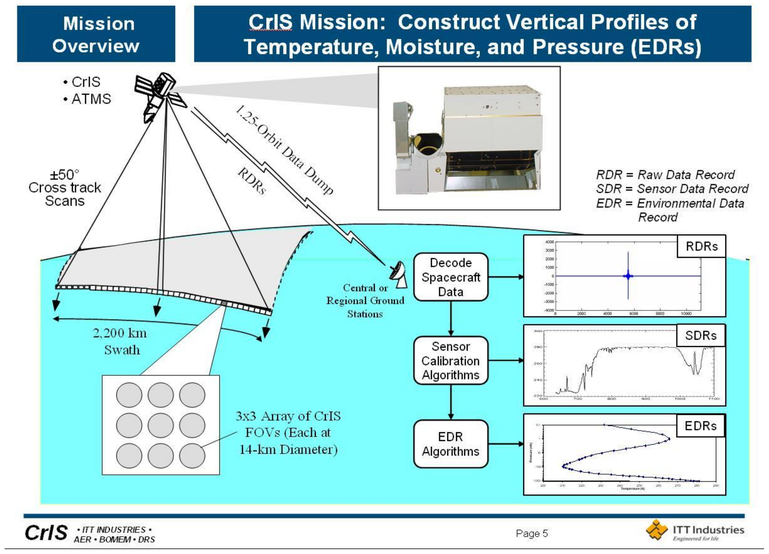
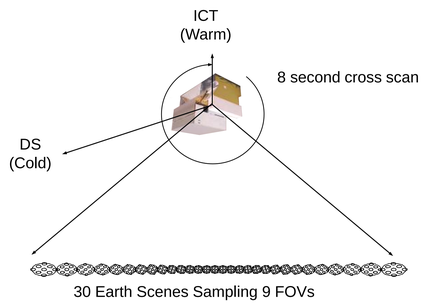
CrIS Sensor Overview



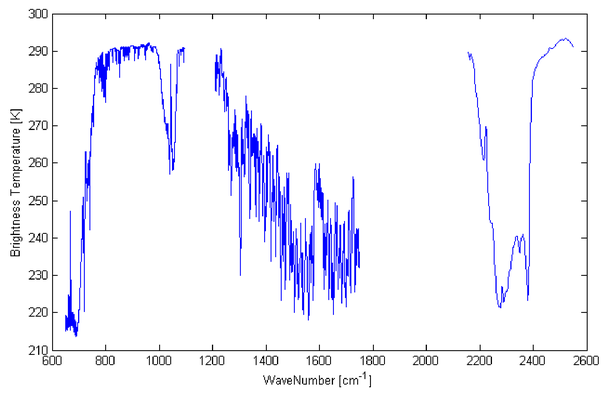
Specifications

30 Earth locations
9 FOVs per location
3 spectral bands per FOV
- LWIR 650-1095 cm^{-1}, resolution: 0.625 cm^{-1}
- MWIR 1210-1750 cm^{-1}, resolution: 1.25 cm^{-1}
- SWIR 2155-2550 cm^{-1}, resolution: 2.5 cm^{-1}

CrIS Calibration Concept

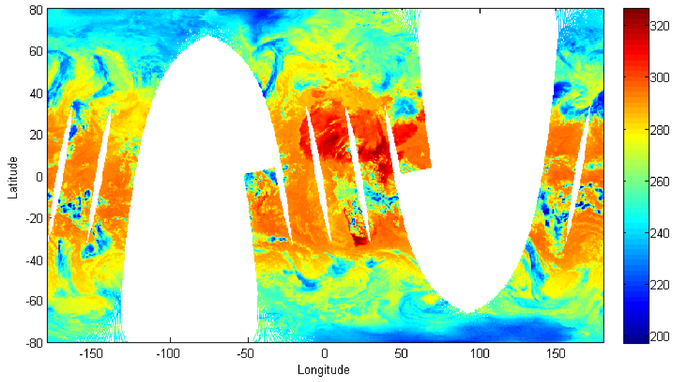


Example Earth Scene Spectrum



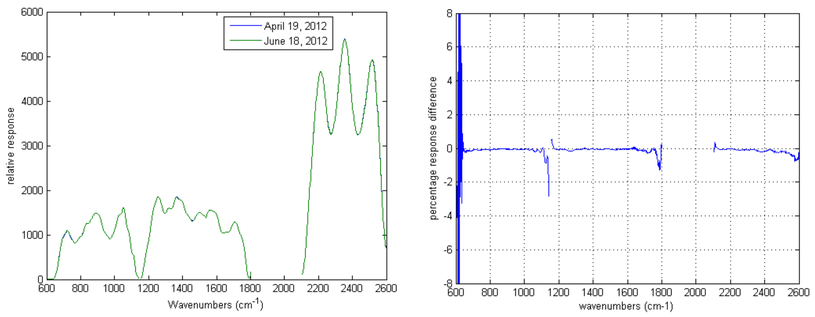
Spectrum from tropical clear sky ocean from orbit 01704 (February 25, 2012) with Hamming apodization.

Example Earth Scene Data



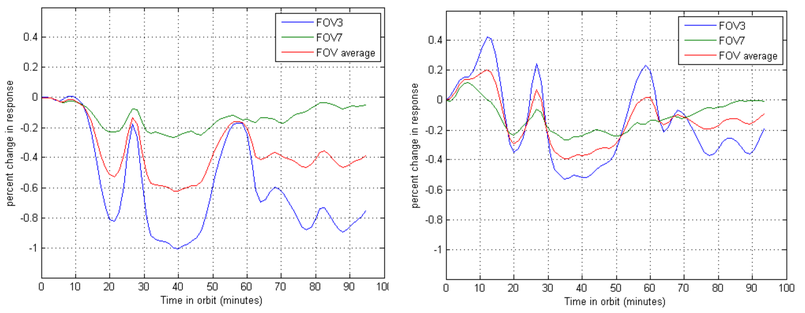
Long wave window band 911.6 to 915.5 cm^{-1} from orbits 01703 – 01706 (February 25, 2012)

Response Between Orbits is Very Stable Over Time



The response is the difference in counts between the spectra of the Internal Calibration Target (ICT) and the Deep Space (DS) view divided by the change in radiance. The response was calculated in the same place of each orbit (in descending mode near the South Pole).

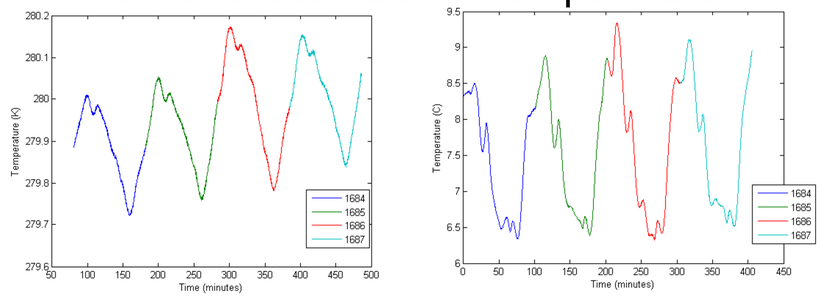
Response Within an Orbit Not as Consistent as Between Orbits



Orbit 1684 Orbit 1686

Percent change in averaged SWIR response over an orbit. Response for FOV3 changes the most and FOV7 the least. North Pole is at about 25 minutes, South Pole at about 75 minutes.

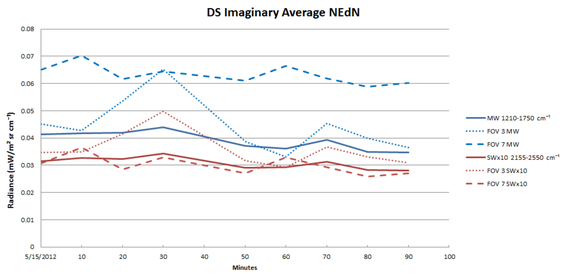
ICT and Scan Baffle Temperature



ICT Scan Baffle

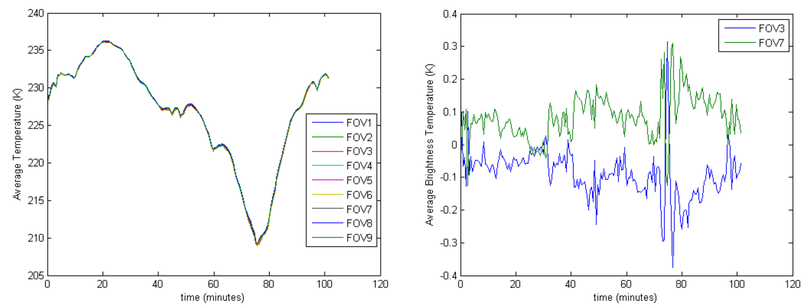
Temperature of the ICT and scan baffle for 4 orbits 01684 – 01687 (February 24, 2012). During ground thermal vacuum testing it was found that a difference in temperature between the scan baffle and the ICT had a slight effect on radiometer calibration (on the order of 35 mK).

Noise Shows a FOV Dependent Variation With Orbital Position



NEdN is the Noise Equivalent Radiance Difference. FOV3 shows unusually high NEdN for polar sections of orbit (Orbit 02840 May 15, 2012).

FOV to FOV Radiance Difference Seen in Cold Earth Scenes



Right panel has the FOV averaged temperature subtracted to show differences. This band is at 2256 to 2302 cm^{-1} where the CO_2 absorption is high so the sensor doesn't see through the atmosphere to the ground. Brightness temperature data has been averaged over one day (May 15, 2012).