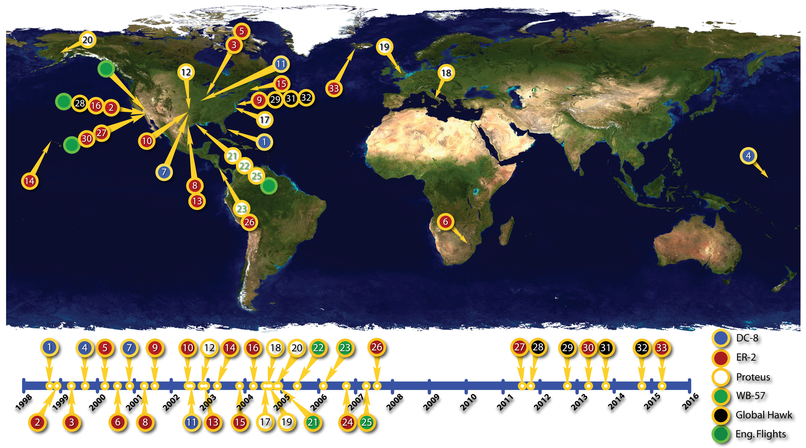
Scanning High-resolution Interferometer Sounder (S-HIS) Radiometric Calibration and Performance During HS3

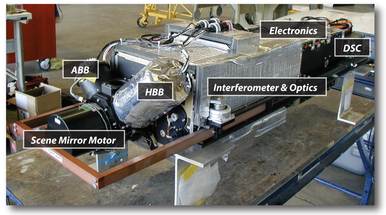
Joe K. Taylor, H. E. Revercomb, F. A. Best, D. C. Tobin, R. O. Knuteson, N. C. Ciganovich, D. Deslover, S. Dutcher, R. K. Garcia, P. J. Gero, D. Hackel, D. Hoese, D. D. LaPorte, C, Pettersen, M. W. Werner
Space Science and Engineering Center, University of Wisconsin-Madison, 1225 West Dayton St., Madison, WI, 53706

HS3 Science Team Meeting 2015

Instrument Overview

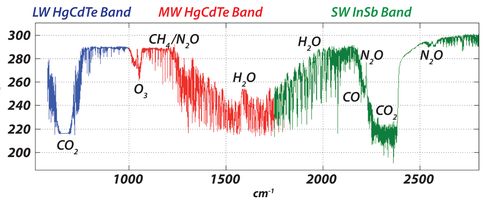
The S-HIS is an Infrared Fourier transform spectrometer with **spectral coverage from 580 - 3000 cm^{-1} at 0.5 cm^{-1} resolution** and produces **high-resolution, three-dimensional temperature and RH profiles.** It was originally designed for UAV use, which imposed significant constraints on the mass, power, and size requirements. It is advanced version of the High-resolution Interferometer Sounder (HIS) NASA ER-2 instrument developed between 1996 and 1998 at the UW-SSEC with the combined support of the US DOE, NASA, and the NPOESS Integrated Program Office.





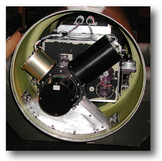
IFOV:	100 mrad (2km @ 20km, nadir)
Scene Coverage:	Programmable 45° scene mirror nadir ± 40° typical
Spectral Coverage:	LW (HgCdTe), 580 - 1180 cm^{-1} MW(HgCdTe), 1000 - 1820 cm^{-1} SW (InSb), 1750 - 3000 cm^{-1}
Spectral Resolution:	0.5 cm^{-1}

S-HIS mounted on AV-6, Zone 25



Sample upwelling S-HIS brightness temperature spectra.

WB-57 wingpod



ER-2 centerline pod

DC-8

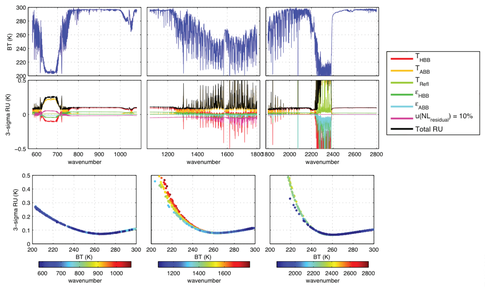
Proteus wing boom

Radiometric Calibration

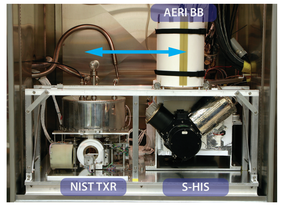
Calibration, Calibration Verification, and Traceability

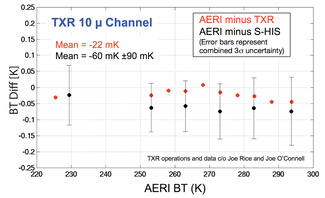
- Pre-integration **calibration of on-board blackbody references** at subsystem level
- **Pre and post deployment end-to-end calibration verification**
- Periodic **end-to-end radiance evaluations under flight like conditions with NIST transfer sensors.**
- Instrument calibration during flight using **two on-board calibration blackbodies**

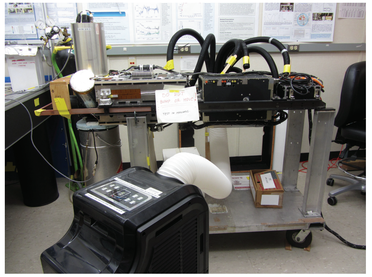
S-HIS Brightness Temperature Spectra and Radiometric Uncertainty (RU)
(For a typical warm, clear sky spectrum)



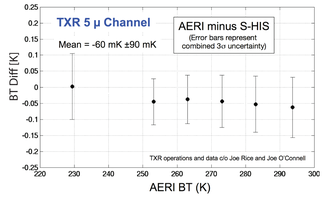
Comparison to NIST TXR



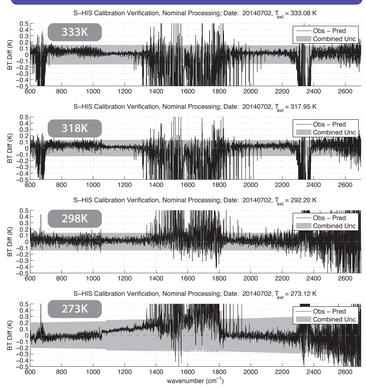




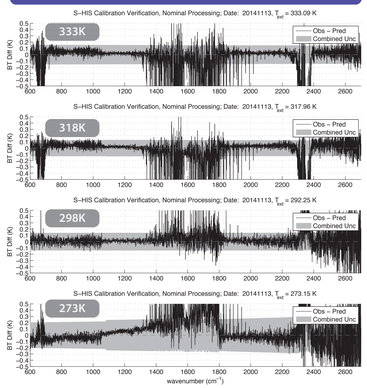
End-to-end calibration verification



Pre-deployment End-to-end Cal Verification



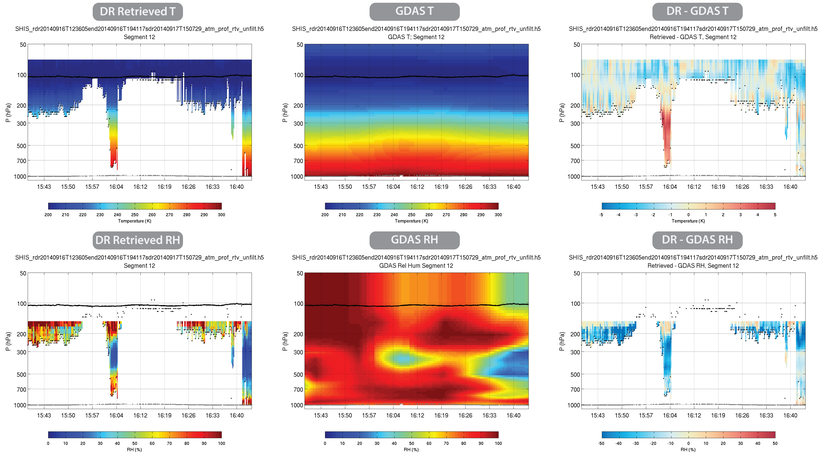
Post-deployment End-to-end Cal Verification

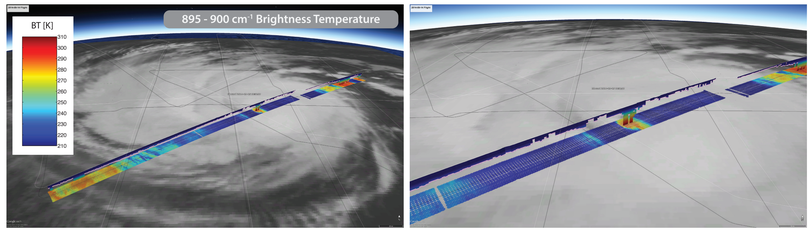


HS3 2014

- S-HIS operated nominally (**>99.8% uptime and data availability**)
- S-HIS real-time products available for all flights
- **Mission post processing and QC complete**, radiance and retrieval products are available via the UW-SSEC download site
- **Brightness Temperature and Retrieval Quick-looks available via S-HIS website (shis.ssec.wisc.edu)**

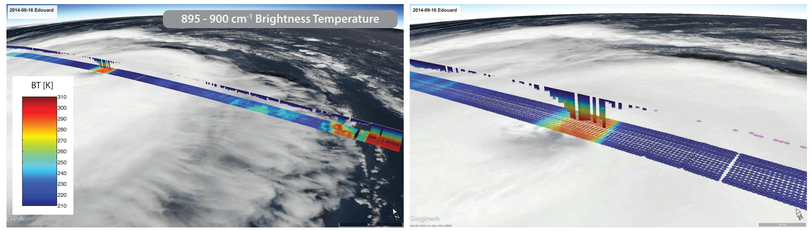
14 Sept 2014: Edouard





S-HIS footprints, colored by BT (895 - 900 cm^{-1} mean), and retrieved nadir temperature profile overlaid on GOES-E 10.7 μm Band. GOES-E images produced using McIDAS-V.

16 Sept 2014: Edouard



S-HIS footprints, colored by BT (895 - 900 cm^{-1} mean), and retrieved nadir temperature profile overlaid on VIIRS true color imagery. VIIRS images produced using polar2grid.

joe.taylor@ssec.wisc.edu, Space Science and Engineering Center, University of Wisconsin-Madison, 1225 West Dayton Street, Madison WI 53706 USA