



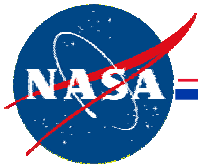
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# Initial Radiometric Calibration of the AWiFS using Vicarious Calibration Techniques

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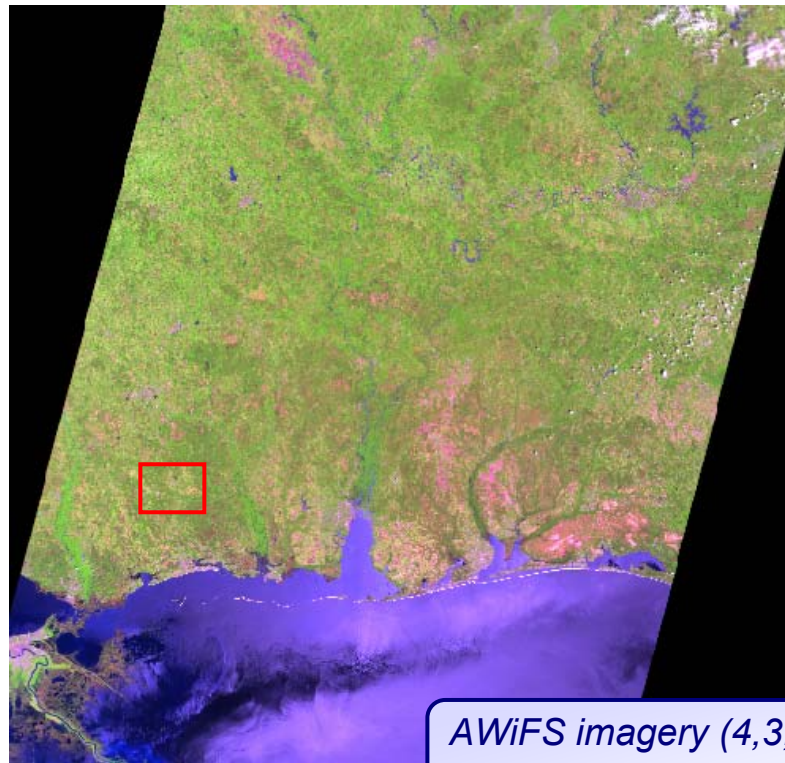


# Selected Targets – Wiggins, MS

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Four selected targets of opportunity near Stennis Space Center are hundreds of meters across:

- Two gravel pit sand sites
- Large monoculture fields
- Cut grass amateur golf course



Gravel Pit Sand near Perkinson, MS

Rye Grass Field near Big Level, MS

Gravel Pit Sand near Wiggins, MS

Grass Field near Big Level, MS

Specific Target Areas Highlighted

0 100 200 Meters

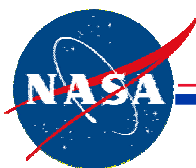
0 200 400 Meters

0 100 200 Meters

0 50 100 Meters

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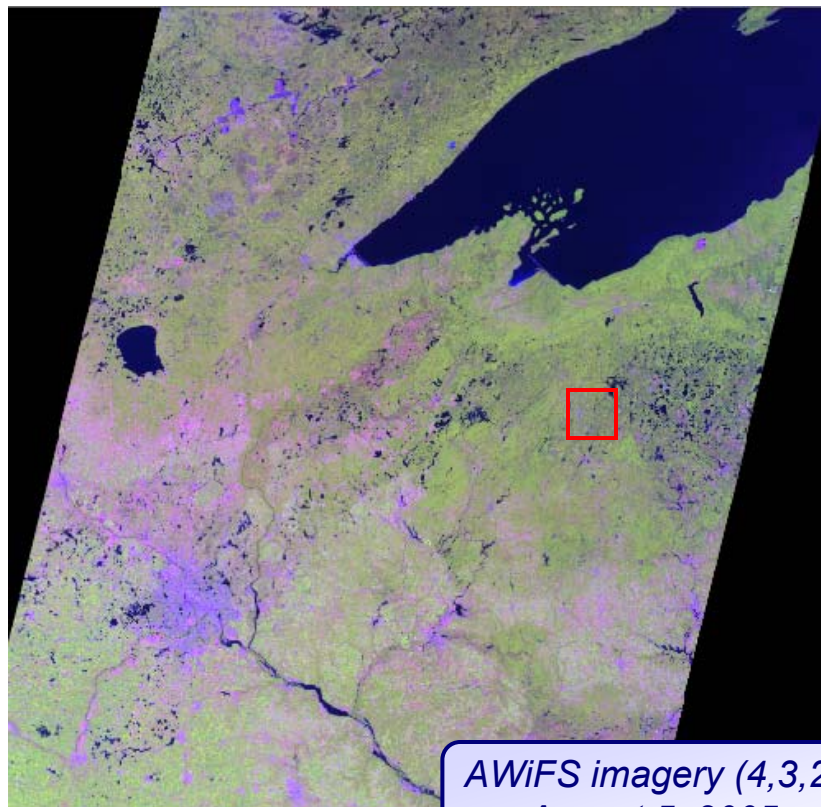


# Selected Targets - Park Falls, WI

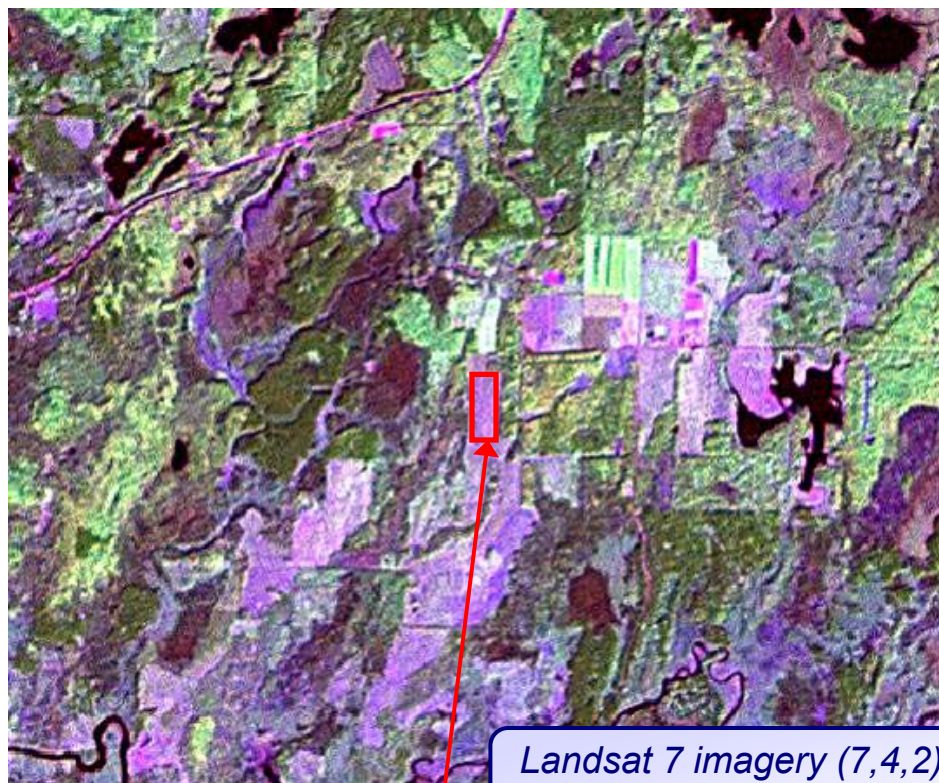
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A target of opportunity was found near an Aerosol Robotic Network (AERONET) site near Park Falls

- Large grass field

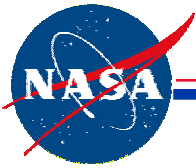


*AWiFS imagery (4,3,2)  
August 5, 2005*



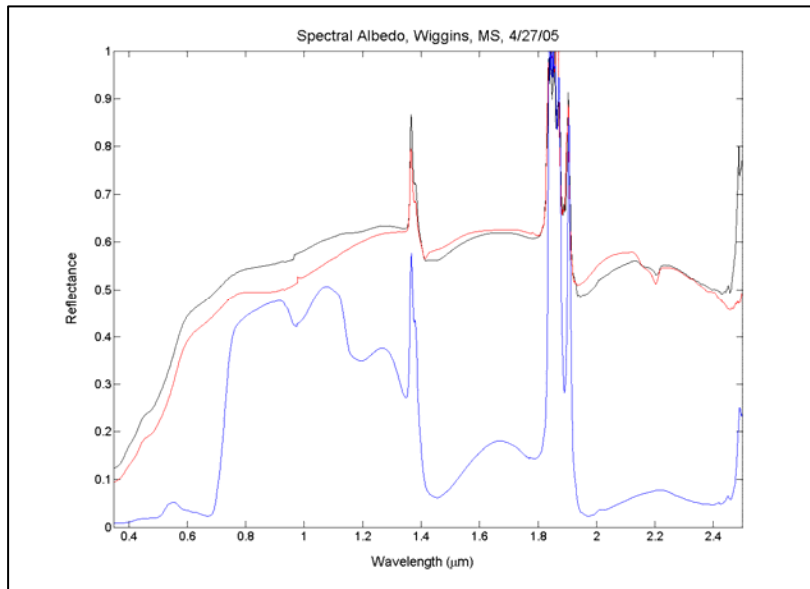
*Landsat 7 imagery (7,4,2)  
August 5, 2005*

*Target field 150 m x 400 m*

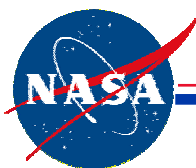


# Ground Reflectance Measurements

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- ASD FieldSpec® FR spectroradiometer measurements of Spectralon® panels and several target areas were taken
  - ~50 m x 50 m area of a grassy field/golf course
  - ~100 m x 200 m area of a rye grass field
  - ~100 m x 100 m area of two sand sites
- Measurements were taken along transects aligned with the sensor azimuth
  - Measurements were taken at nadir and satellite elevation angles to account for BRDF effects
  - All measurements were taken while walking to increase spatial averaging
  - Periodic Spectralon panel measurements were taken
- All data were acquired within 40 minutes of satellite overpass



# SSC Calibration and Characterization of ASD FieldSpec Spectroradiometers

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- NASA SSC maintains four ASD FieldSpec FR spectroradiometers
  - Laboratory transfer radiometers
  - Ground surface reflectance for V&V field collection activities
- Radiometric Calibration
  - NIST-calibrated integrating sphere serves as source with known spectral radiance
- Spectral Calibration
  - Laser and pen lamp illumination of integrating sphere
- Environmental Testing
  - Temperature stability tests performed in environmental chamber





# Novel Hyperspectral Sun Photometer

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- Novel hyperspectral sun photometer is capable of acquiring measurements comparable to both ASRs and MFRSRs by making use of the laboratory radiometric calibration of the FieldSpec FR spectroradiometers
  - Optical Depth/Transmission
  - Diffuse-to-Global Ratio
- Sun photometer developed with fewer limitations than current sun photometers, utilizing equipment already used in the field
  - Radiometrically calibrated FieldSpec FR spectroradiometers
  - 99% reflectance Spectralon panels
- Measurements are made only at the time of overpass, thus reducing the impact of a changing atmosphere on the calculation of optical depth

SSC 1/10/04 - 16:33 GMT				
	ASR 27	ASD	Difference	Percent Difference
Band	Generated	Generated	ASR-ASD	1 - (asd/asr)
380 nm	0.588	0.5982	-0.010	-1.74%
400 nm	0.495	0.4852	0.010	1.99%
440 nm	0.366	0.3216	0.044	12.14%
520 nm	0.224	0.1988	0.025	11.25%
610 nm	0.161	0.1563	0.005	2.91%
670 nm	0.108	0.1002	0.008	7.26%
780 nm	0.07	0.0691	0.001	1.33%
870 nm	0.049	0.0508	-0.002	-3.58%
		<b>RMS 1:8</b>	<b>0.019</b>	

Sample Results



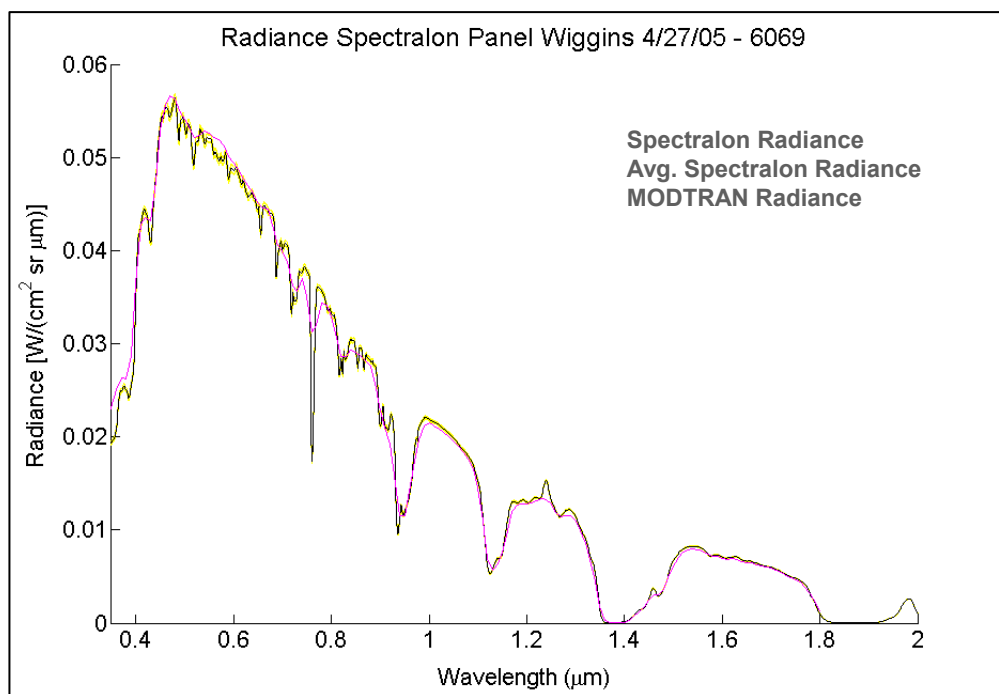
Novel Hyperspectral Sun Photometer Setup

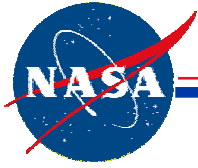


# Comparison to Spectralon Panel

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- Verification of parameters used to generate MODTRAN at-sensor radiance estimate
  - Measuring the radiance of Spectralon panel with a well-calibrated spectroradiometer is a way of measuring atmospheric global and diffuse irradiance
  - Use ground truth data and geometry modeling an ASD FieldSpec FR spectroradiometer measuring a 99% reflectance Spectralon panel as input to MODTRAN to predict radiance
  - Compare MODTRAN-calculated radiance to actual radiance measured from Spectralon panel to verify the atmospheric model

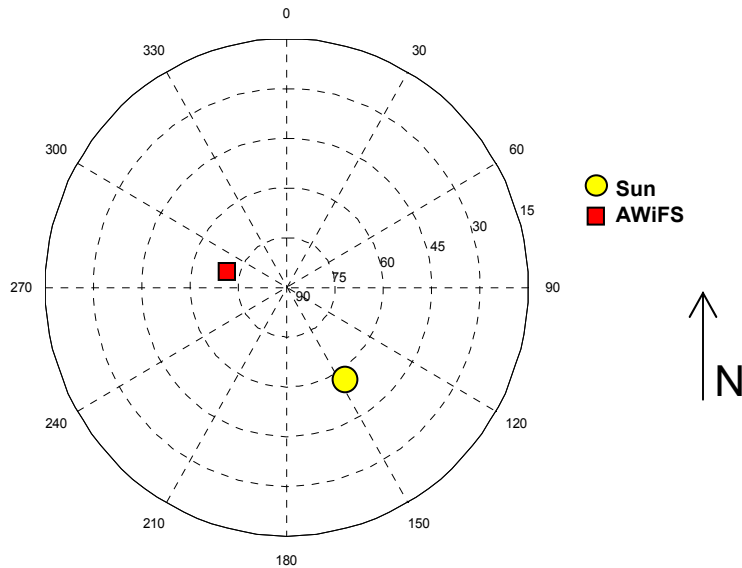




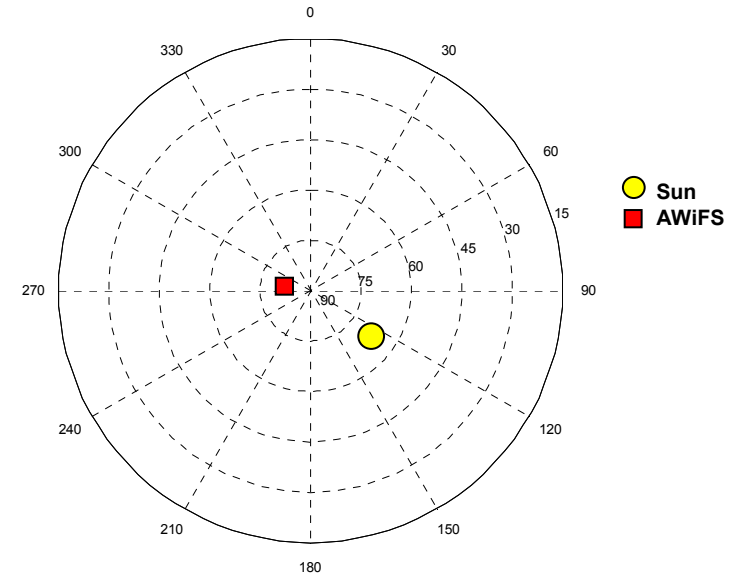
# Data Acquisitions – Wiggins, MS

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Date	Camera	Overpass Time (UTC)	Satellite Elevation	Satellite Azimuth	Sun Elevation	Sun Azimuth
Mar 24, 2005	B	16:59	71.1 deg	285 deg	57.2 deg	149.8 deg
Apr 27, 2005	B	16:50	84.5 deg	285 deg	67.7 deg	135.4 deg

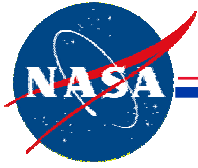


**Wiggins, MS, 3/24/05**



**Wiggins, MS, 4/27/05**

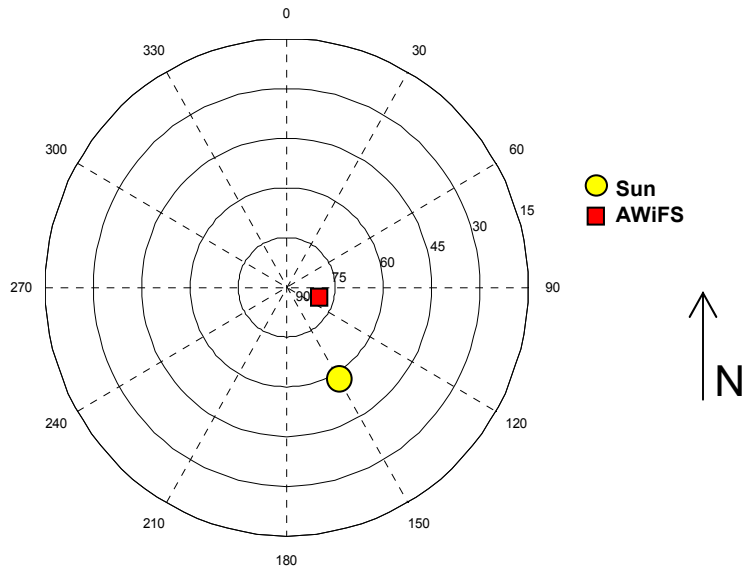




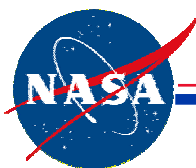
# Data Acquisitions – Park Falls, WI

Stennis Space Center

Date	Camera	Overpass Time (UTC)	Satellite Elevation	Satellite Azimuth	Sun Elevation	Sun Azimuth
Aug 5, 2005	A	17:02	83.9 deg	103 deg	57.8 deg	149.7 deg

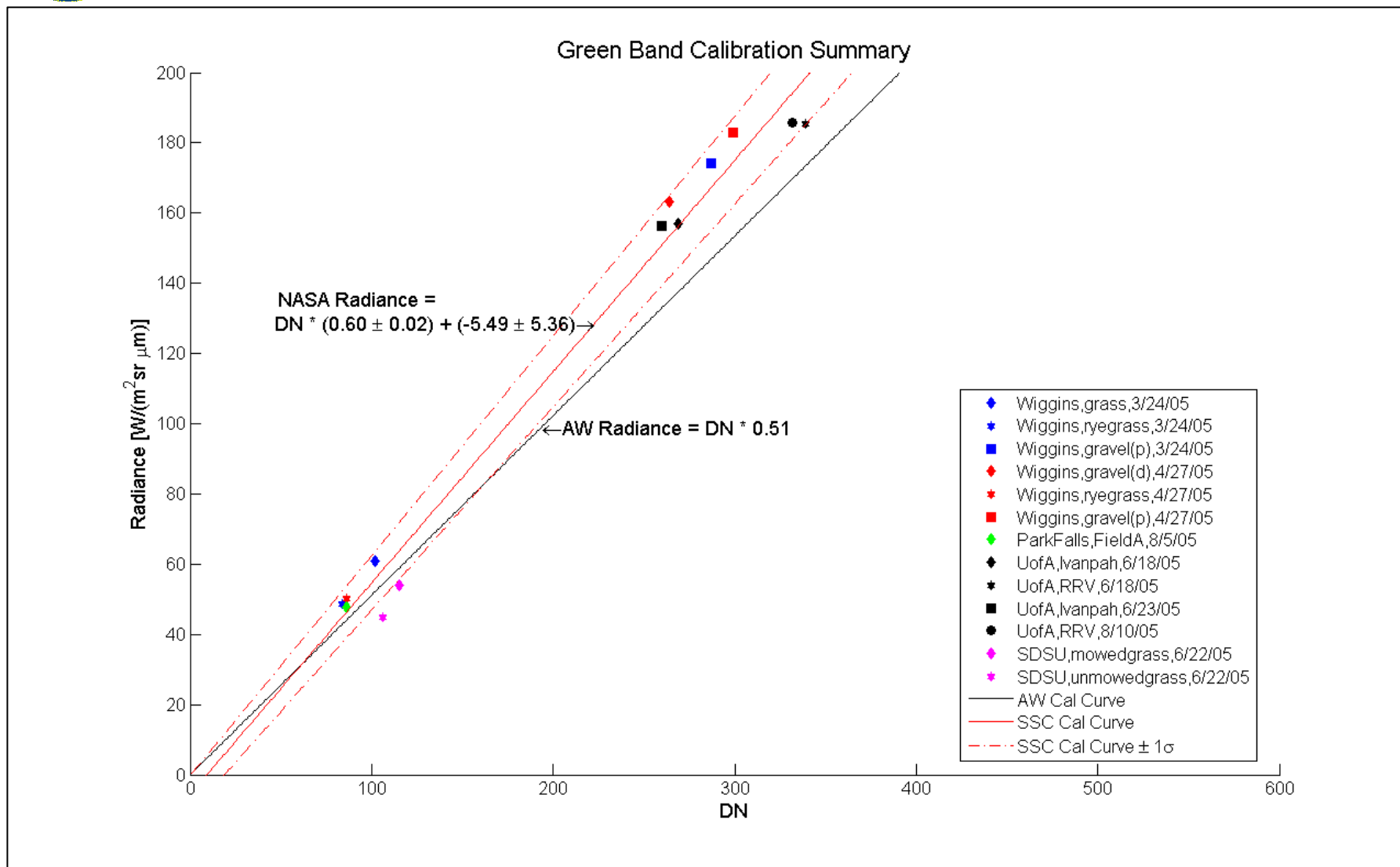


**Park Falls, WI, 8/5/05**



# Green Band Calibration Summary

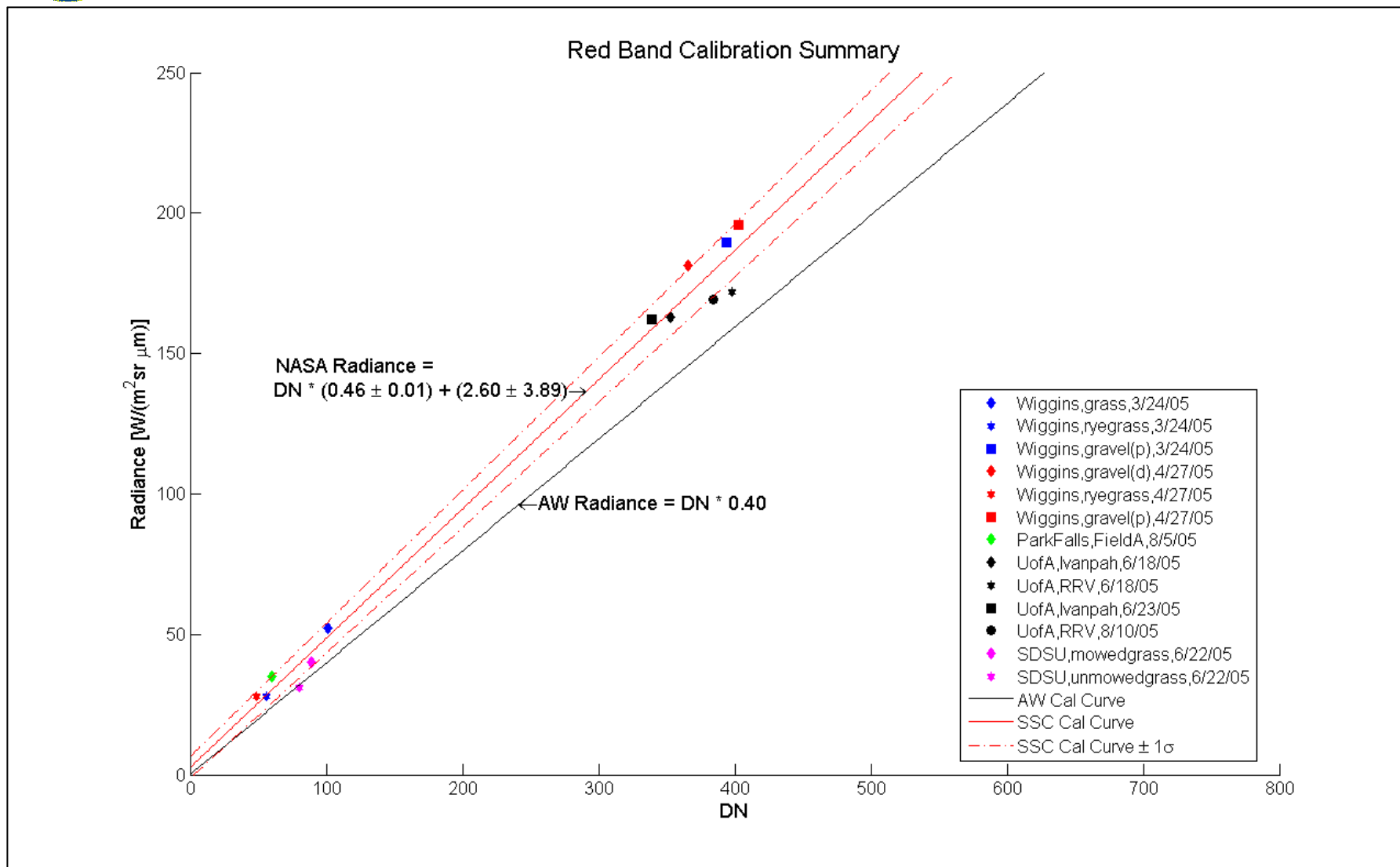
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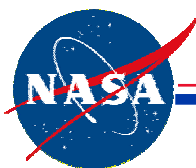




# Red Band Calibration Summary

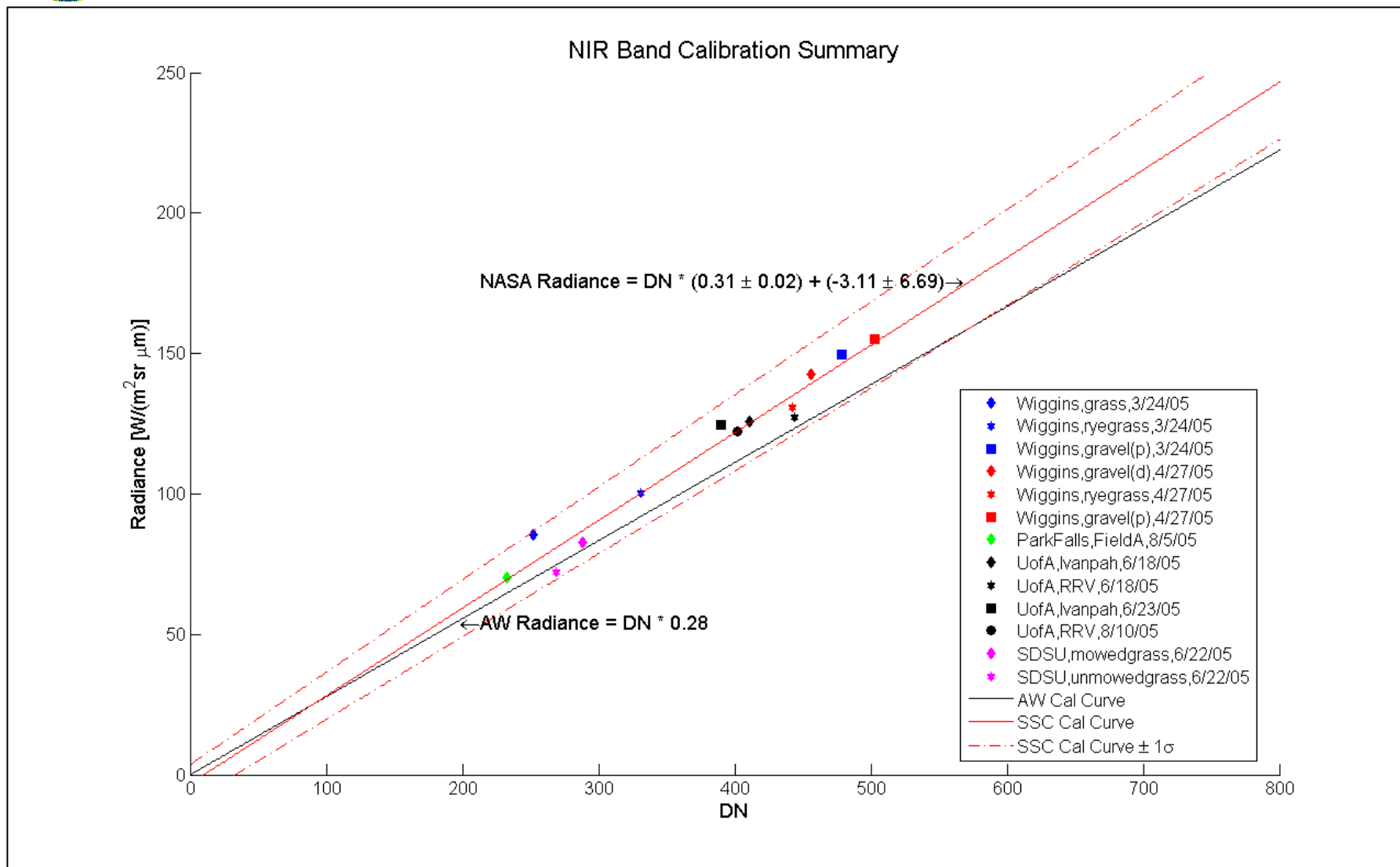
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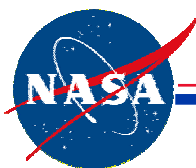




# NIR Band Calibration Summary

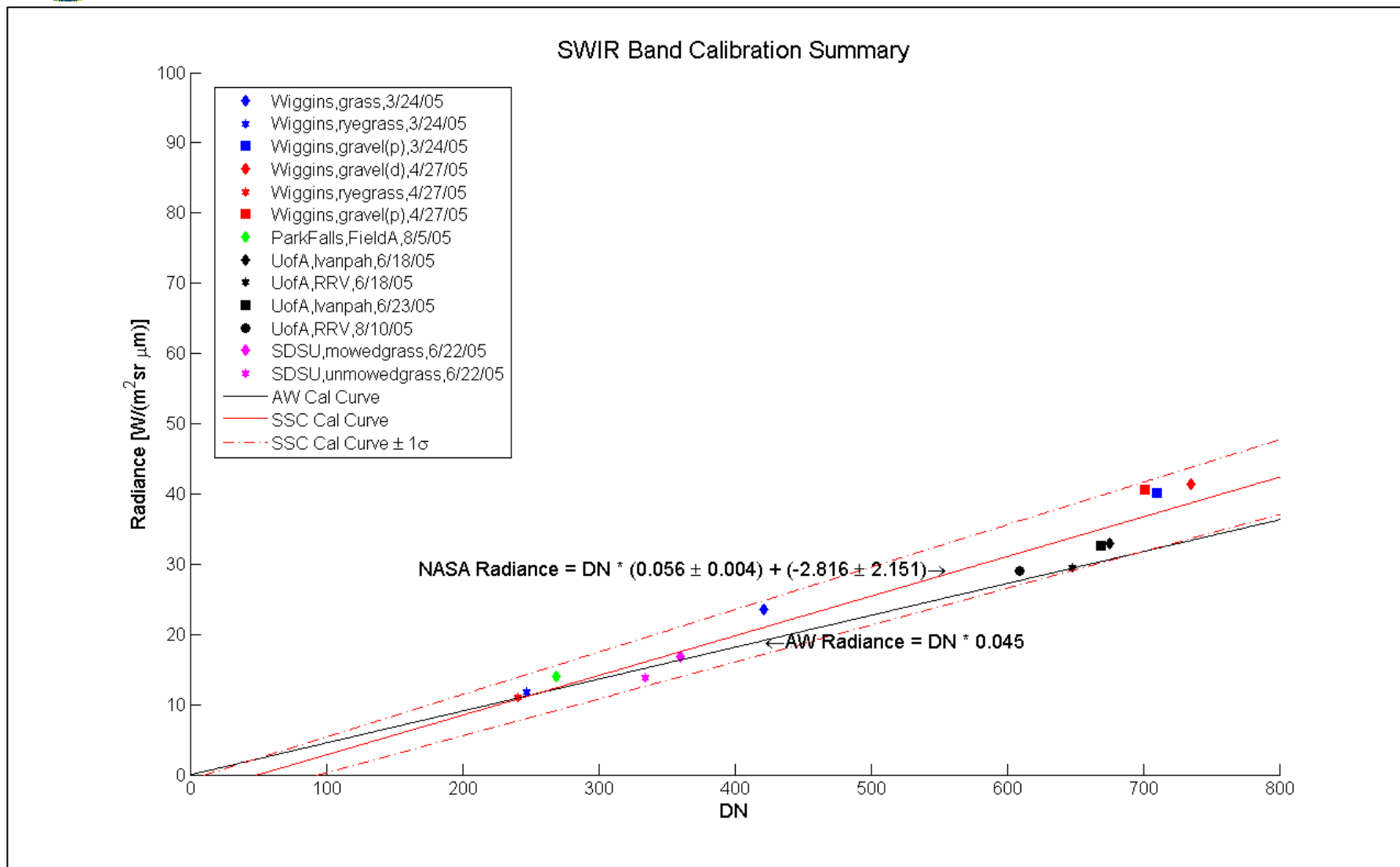
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# SWIR Band Calibration Summary

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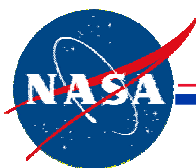




# Initial Radiometric Calibration Coefficients

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	Green	Red	NIR	SWIR
NASA Estimate				
Cal Coeff (W/m <sup>2</sup> sr μm DN)	0.60 ± 0.02	0.46 ± 0.01	0.31 ± 0.02	0.056 ± 0.004
Offset	-5.49 ± 5.36	2.60 ± 3.89	-3.11 ± 6.69	-2.82 ± 2.15
AWiFS Provided				
Cal Coeff (W/m <sup>2</sup> sr μm DN)	0.51	0.40	0.28	0.045
Offset	0	0	0	0



# AWiFS Results Summary

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- The NASA team of University of Arizona, South Dakota State University, and NASA SSC produce consistent results
- The AWiFS calibration coefficients agree reasonably well with the NASA team estimate
- The NASA team will continue to assess AWiFS radiometric accuracy



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