CEOS 2008 Action DA-06-02_1:

Dome C Calibration Experiment

Progress Update

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Dome C calibration experiment:

- Basic questions

- Assuming the snow reflectance is stable long-term at Dome C, and the atmospheric effect is small, can this site be used for accurate cross calibration for sensors?
- How well can we do with the Dome C site (how low can the uncertainty be)?
- What will it take to make Dome C calibration SI traceable?

Datasets used in the Dome C study

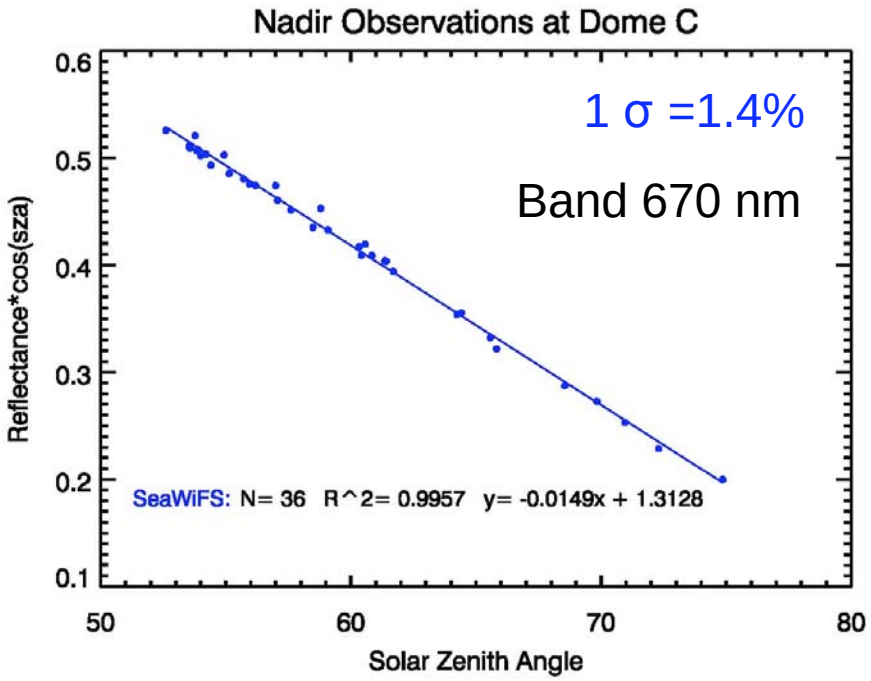
- SeaWiFS
  - With dedicated lunar calibration, SeaWiFS is one of the most stable instruments (uncertainty < 1% per 8 years) that can potentially meet the climate change detection requirement.
- MODIS
  - Stable with absolute calibration accuracy ± 2% (mission requirement)
- AVHRR
  - Relying on vicarious calibration
- Hyperion
  - Most useful in resolving the spectral differences
- Thuillier 2002 solar irradiance
  - Used to assess the Esun values from different instruments

Esun: in-band solar spectral irradiance; W m^{-2} um^{-1}

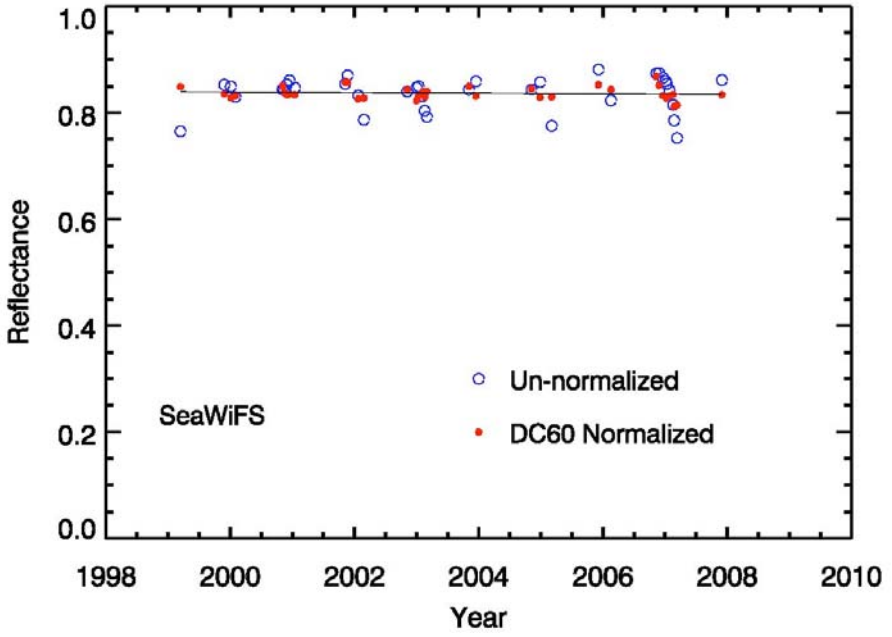
Results

- Preliminary findings presented at WGCV28
- More results presented at the IGARSS in July, 2008
- Current report focuses on:
  - The latest findings with SeaWiFS observations at Dome C
  - Hyperion Dome C analysis
  - Solar irradiance analysis

SeaWiFS observations at Dome C

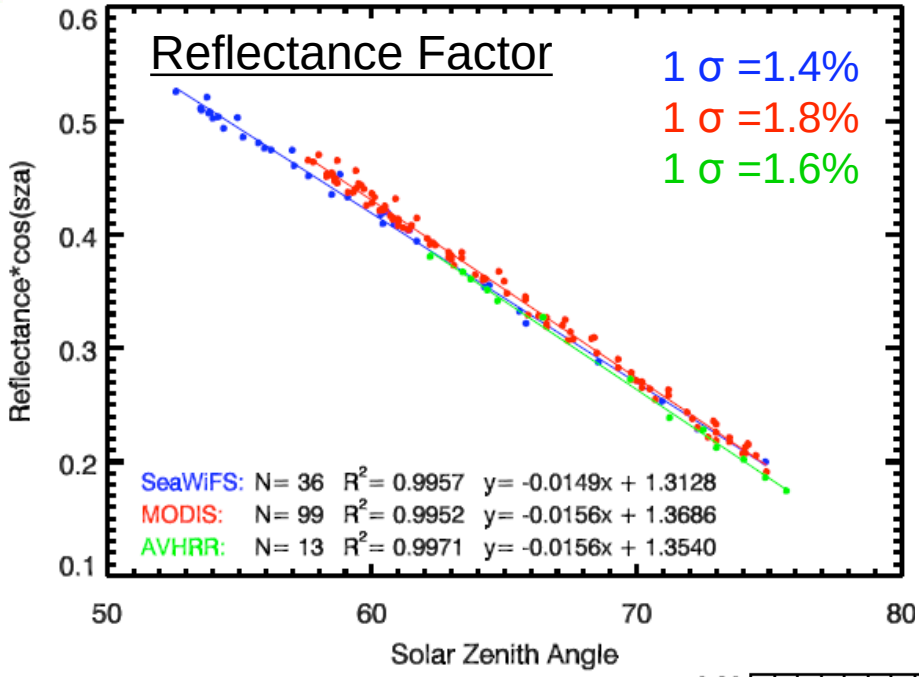


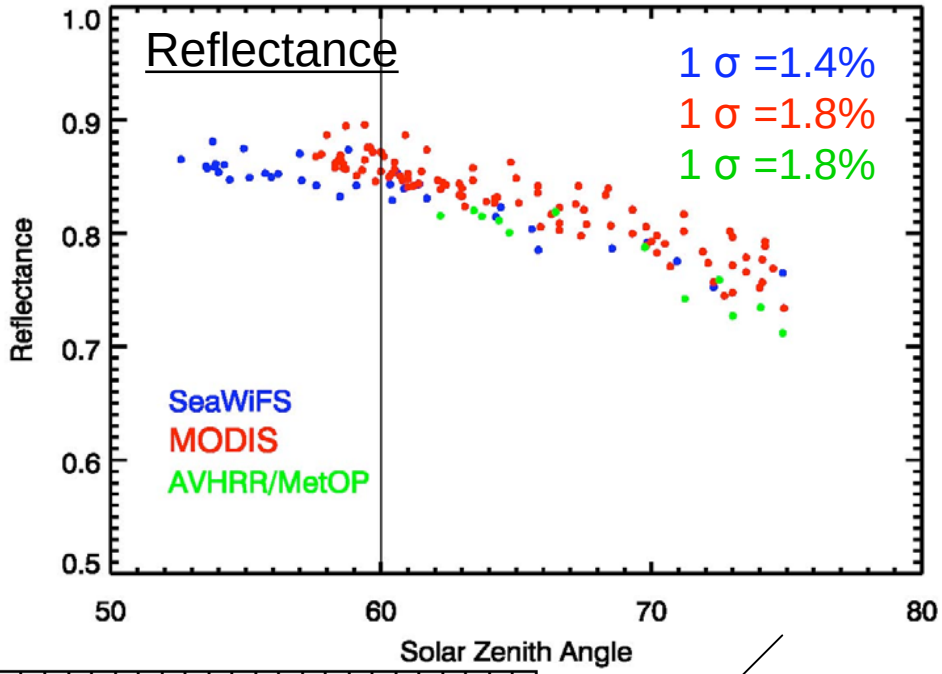
Trend: – 0.5% ±1.4% in 8 years

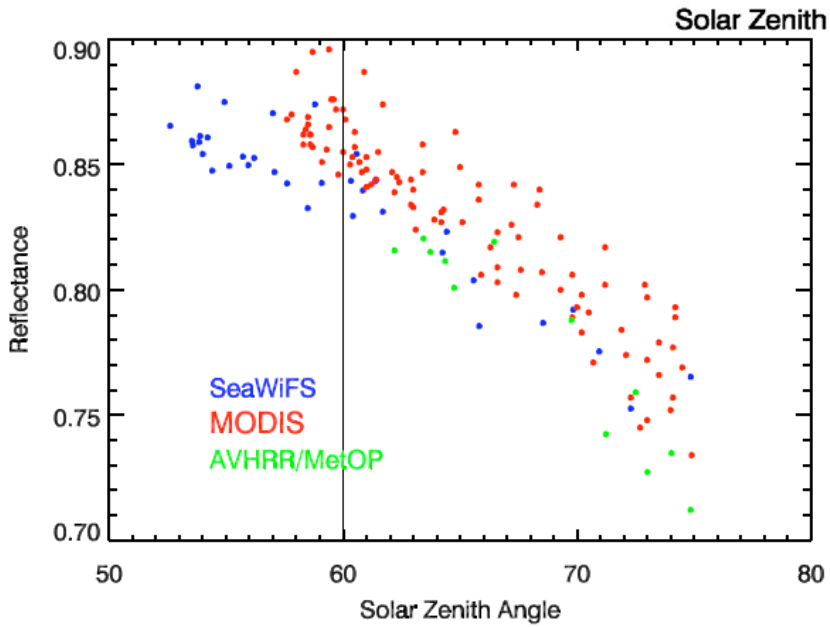


DC60: a simple linear model to correct the BRDF (Bi-directional Reflectance Distribution Factor) effect

Nadir Observations at Dome C

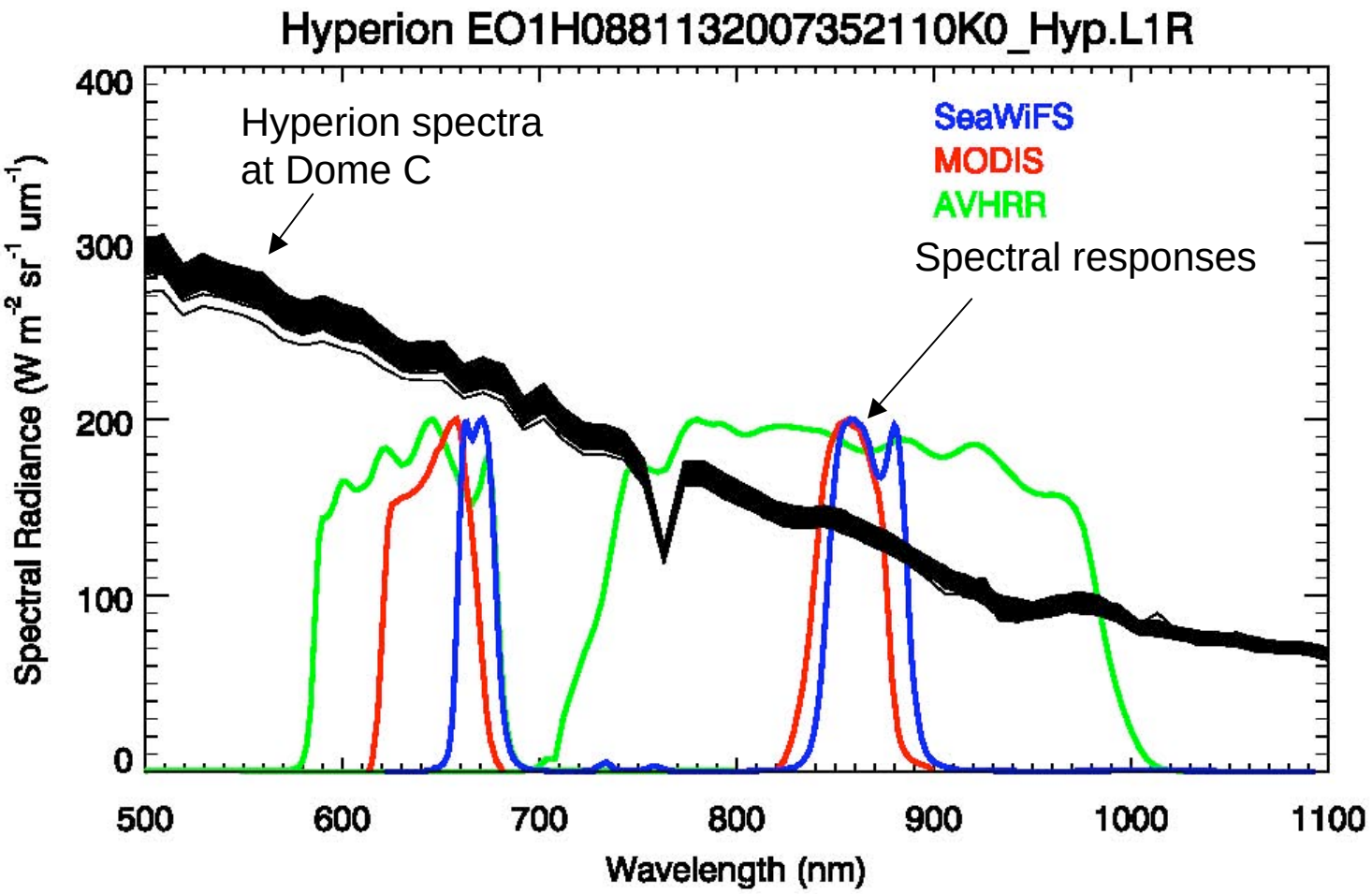






Zoom in

The effect of spectral response function differences

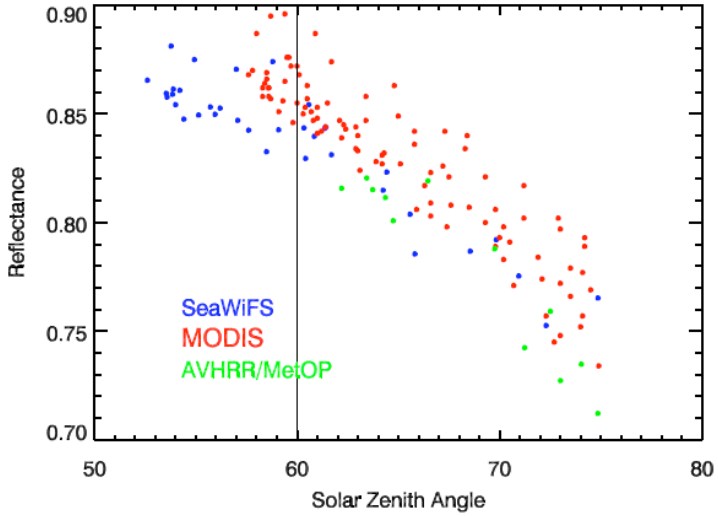


December 18, 2007 23:40:50 UTC
Solar zenith angle: 60°
Azimuth: 67.35°

Resolving the reflectance value differences

Possible causes for the differences?

(*e.g.,* SeaWiFS reflectance is a few percent lower than that of MODIS at SZA=60°)



Band reflectance ratios (SZA=60°): MODIS/SeaWiFS

1) Hyperion	0.98
2) MODTRAN	0.96
3) With Esun from Thuillier 2002	1.00

1) Convolving Hyperion radiance at Dome C with the SRFs of MODIS and SeaWiFS
2) MODTRAN simulation (a radiative transfer model)
3) Esun value solar irradiance analysis with Thuillier 2002

The band reflectance ratio cannot fully explain the difference above.

Summary

- Preliminary Dome C analysis with SeaWiFS observations has been performed at NOAA.
- Assuming SeaWiFS is stable, the Dome C site stability is found to be promising.
- Differences between SeaWiFS and MODIS reflectance values need to be resolved.
- Further study on the BRDF effect is needed.
- We look forward to the standard Dome C procedure being developed by IVOS.