

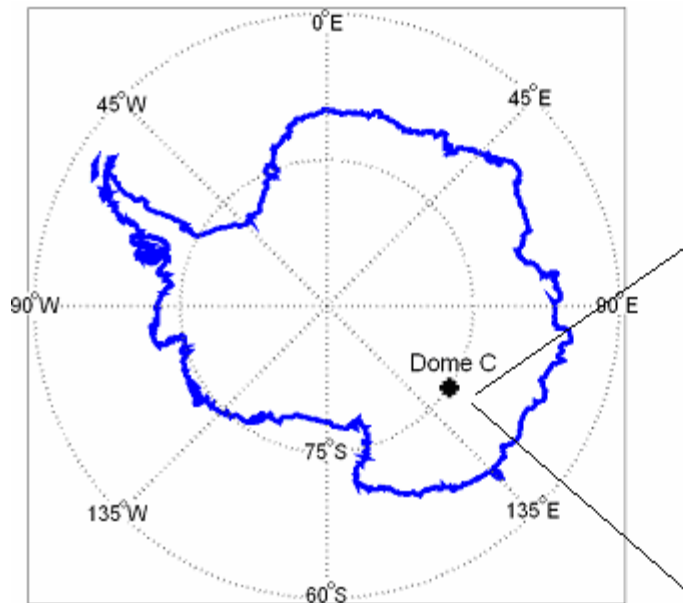
Establishing the Dome C Community Calibration Reference Standard Site for the VNIR bands of Polar- Orbiting Radiometers

A Study Report

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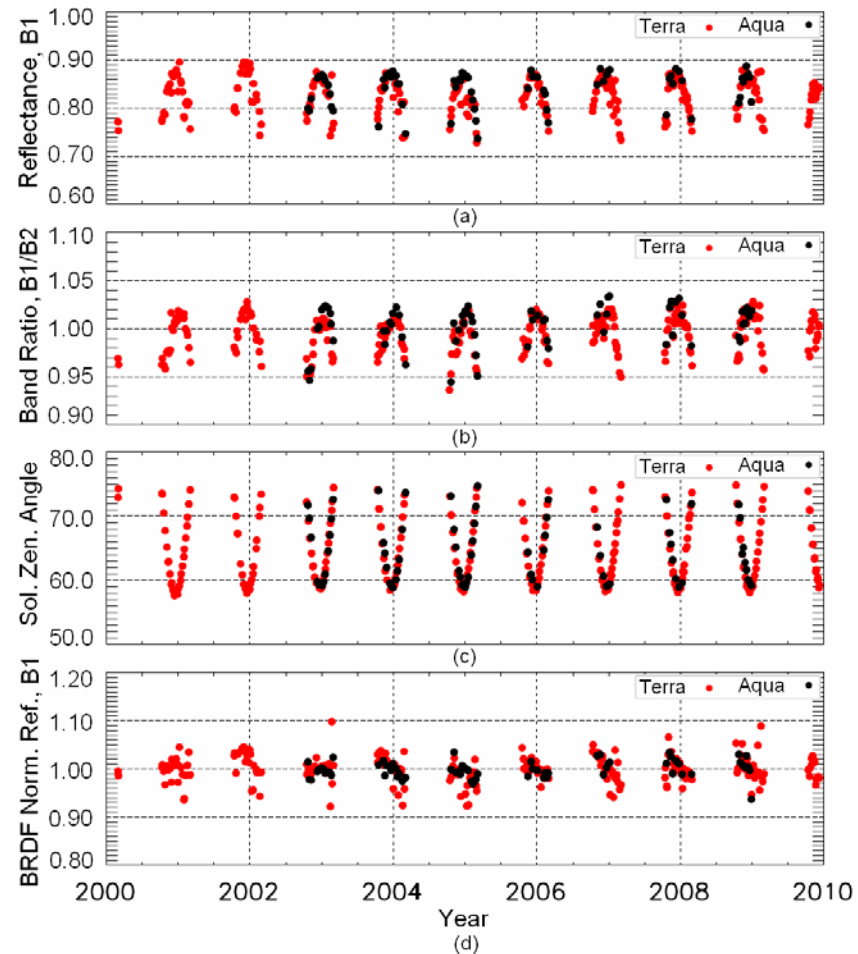
Location of the Antarctic Dome C Site ($75^{\circ}06'S$, $123^{\circ}21'E$) (Right: Hyperion observations with 30 m resolution)



Elevation: 3.3 KM, thin and relatively constant atmosphere,
clear sky most of the time

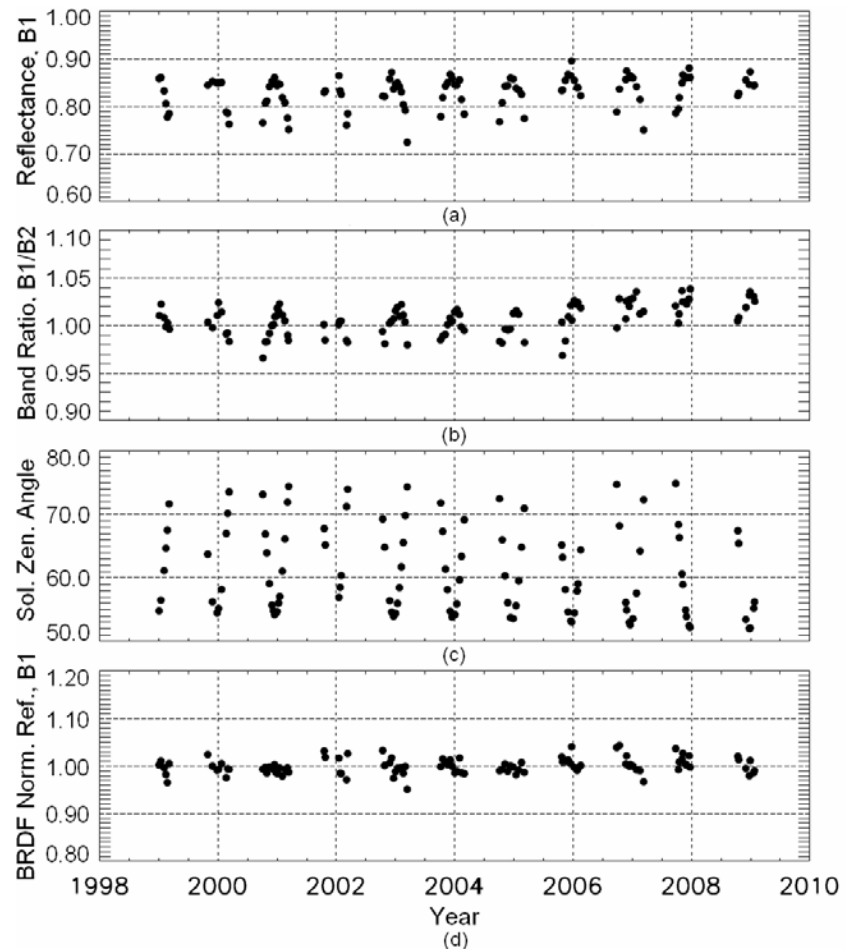
MODIS Observations at the Dome C Site

- MODIS observations show snow BRDF effects but the site is relative stable at 2% level
- Band ratio shows solar zenith angle dependency, suggesting that the BRDF of the two bands (0.6 and 0.8 μ m) are not the same
- Slight increase in the band ratio around 2007 may indicate climate anomalies?



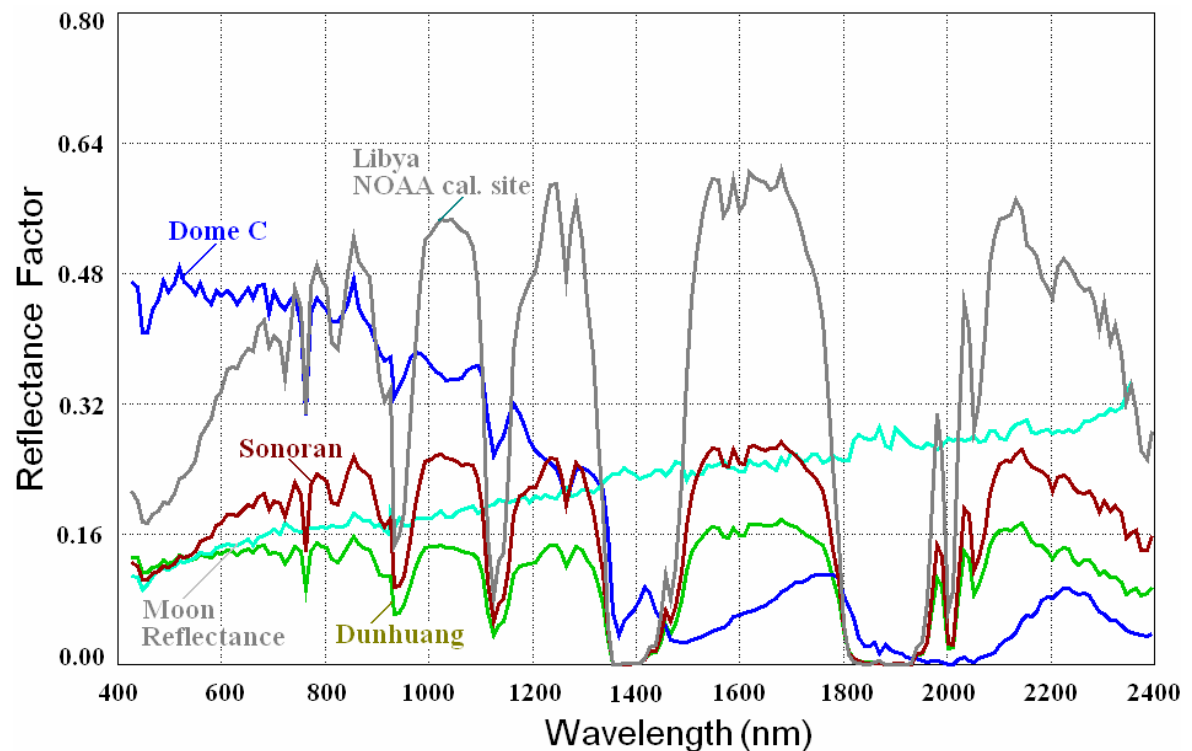
SeaWiFS Observations of the Dome C

- SeaWiFS is probably the most stable instrument due to its dedicated lunar calibration
- However, the SeaWiFS orbit drifts over time, changing the observation time and solar zenith angle
- SeaWiFS doesn't have true nadir observations (tilted 20deg)



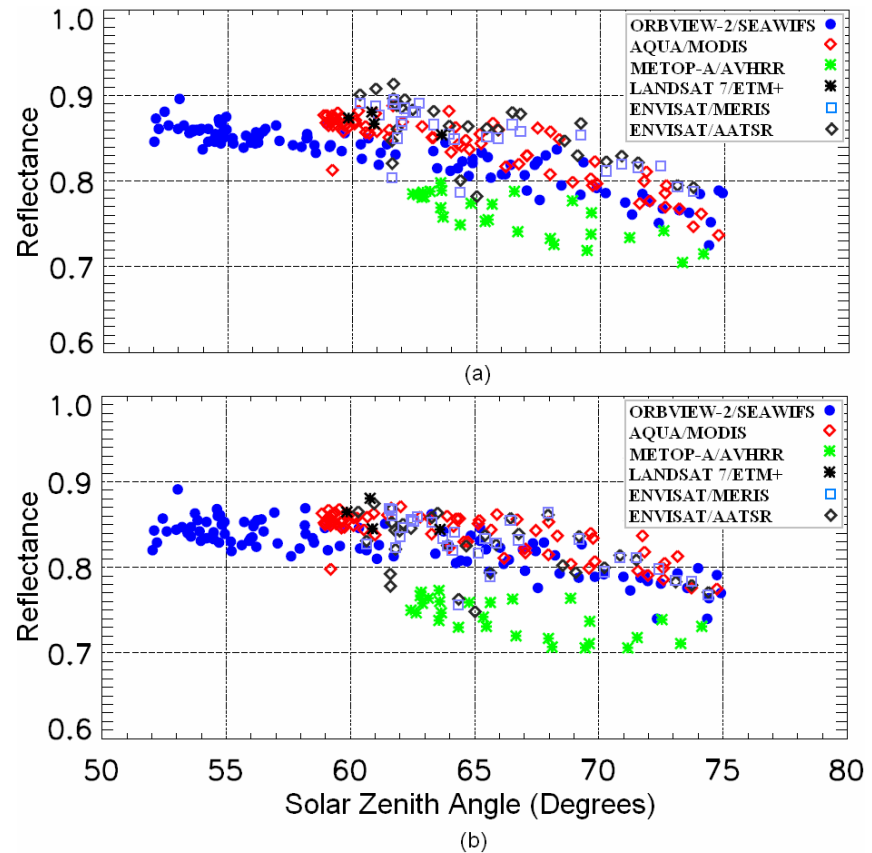
Spectral Characterization of Dome C

- Some sites have significant challenges if used for calibration
- Dome C spectra is relatively flat in the 0.5-0.7 μ m spectral region
- Libyan desert has sharp spectral slope
- Dunhuang is more sensitive to clouds due to low reflectance



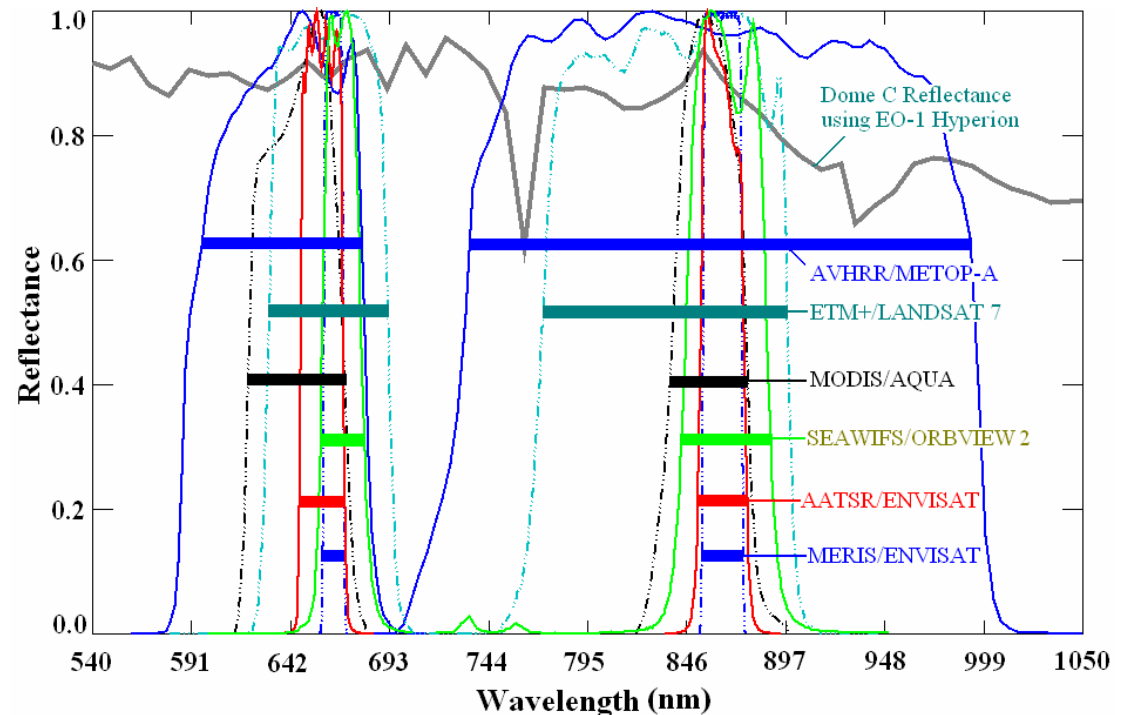
Comparison of Six Radiometers at the Dome C

- MODIS is used as community reference standard for the comparison
- MERIS agrees well with MODIS
- AATSR has large spread due to contamination in the optics
- SeaWiFS differs from MODIS probably due to the 20 deg tilt
- AVHRR is ~9% lower



Comparison of the Spectral Response Functions for the Six Radiometers

Spectral response differences have to be taken into account in the comparisons



Comparison of Reflectance Biases at the Dome C

		MODIS 0.64 μm ($\rho = 86.73\% \pm 1.49\%$ @60 sza)		MODIS 0.86 μm ($\rho = 85.48\% \pm 1.44\%$ @60 sza)	
	@SZA	Observed Bias	Theoretical Bias	Observed Bias	Theoretical Bias
OrbView/SeaWiFS	59°	-2.74% $\pm 1.32\%$	1.95%	-2.09% $\pm 1.57\%$	-1.46%
METOP-A/AVHRR	62°	-8.74% $\pm 1.60\%$	-0.43%	-10.14% $\pm 1.58\%$	-8.21%
Envisat/MERIS	62°	0.74% $\pm 2.28\%$	0.66%	-1.22% $\pm 2.28\%$	0.20%
ENVISAT/AATSR	62°	1.76% $\pm 2.83\%$	1.07%	-1.90 $\pm 2.92\%$	0.43%
Landsat 7/ETM+	60°	1.03% $\pm 0.52\%$	1.17%	1.35% $\pm 1.24\%$	-3.22%
EO-1/Hyperion	60°	+2.63 $\pm 0.48\%$	n/a	+4.35 $\pm 0.18\%$	n/a

Summary

- Dome C is relatively stable based on MODIS and SeaWiFS observations, although possible short-term climate anomalies observed.
- Atmospheric effect is very small.
- BRDFs are different in the 0.6 and 0.8 μm bands.
- Spectrally favorable for the VIS spectrum, spatially uniform (1% level).
- Most of the 7 Radiometers agree within 2% in reflectance.