Impact of the SWS direct irradiance contamination on the analysis of transition zone between cloudy and cloud-free regions

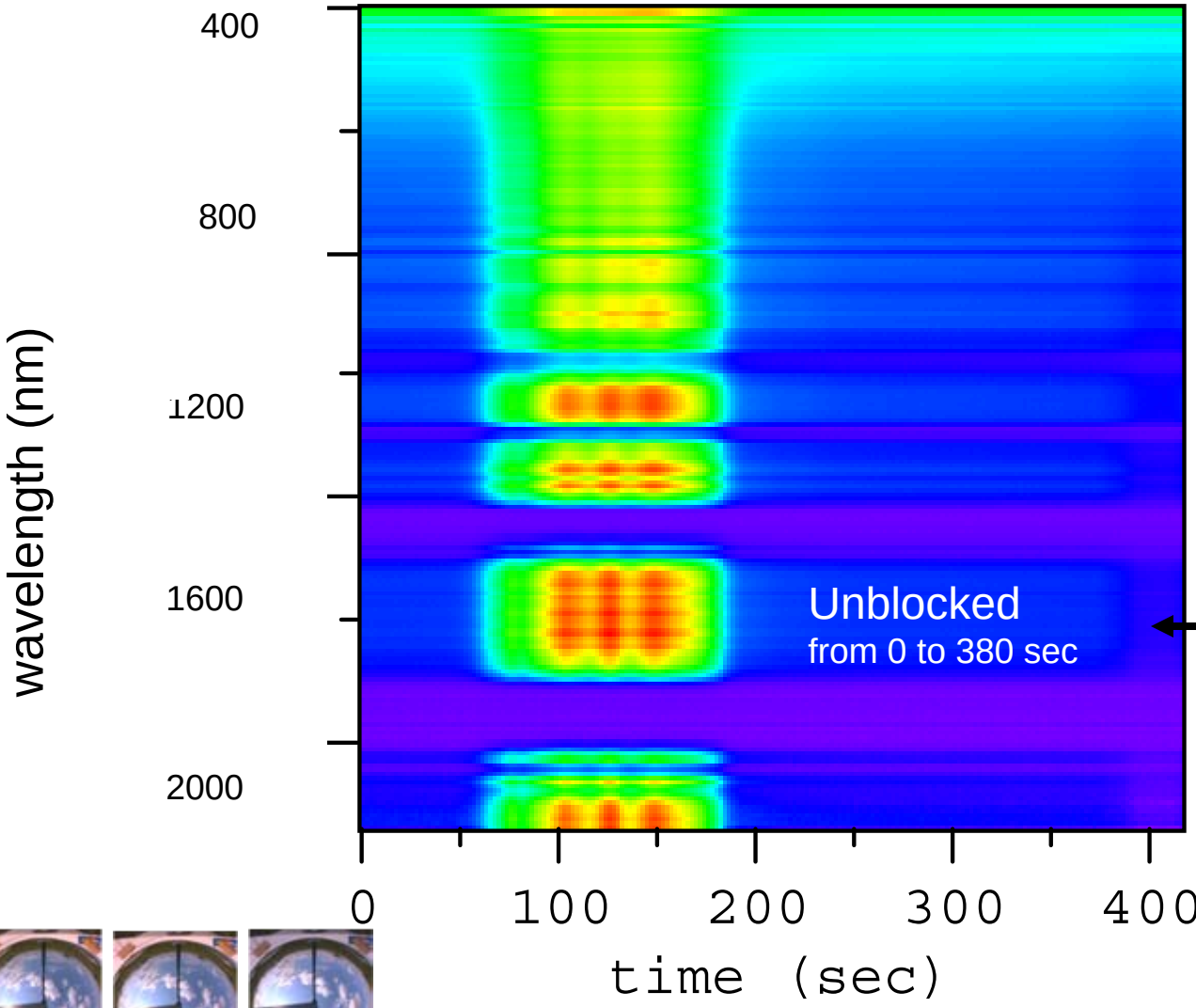
Alexander Marshak (GSFC) and Christine Chiu (UMBC)

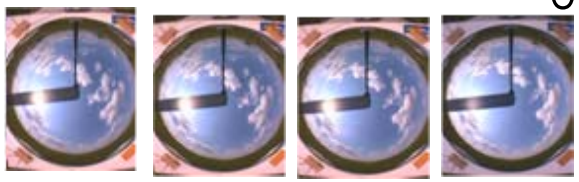
Main Assumption

Cloud-free zenith radiance will be uncontaminated as long as the SWS is not illuminated by directly transmitted solar irradiance

May 18, 2007

SZA=45°

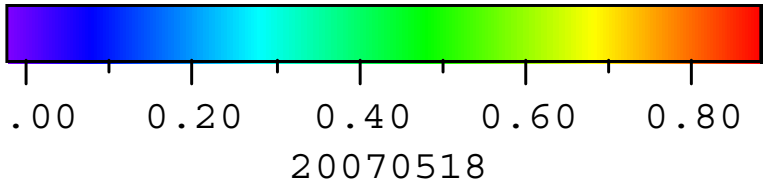




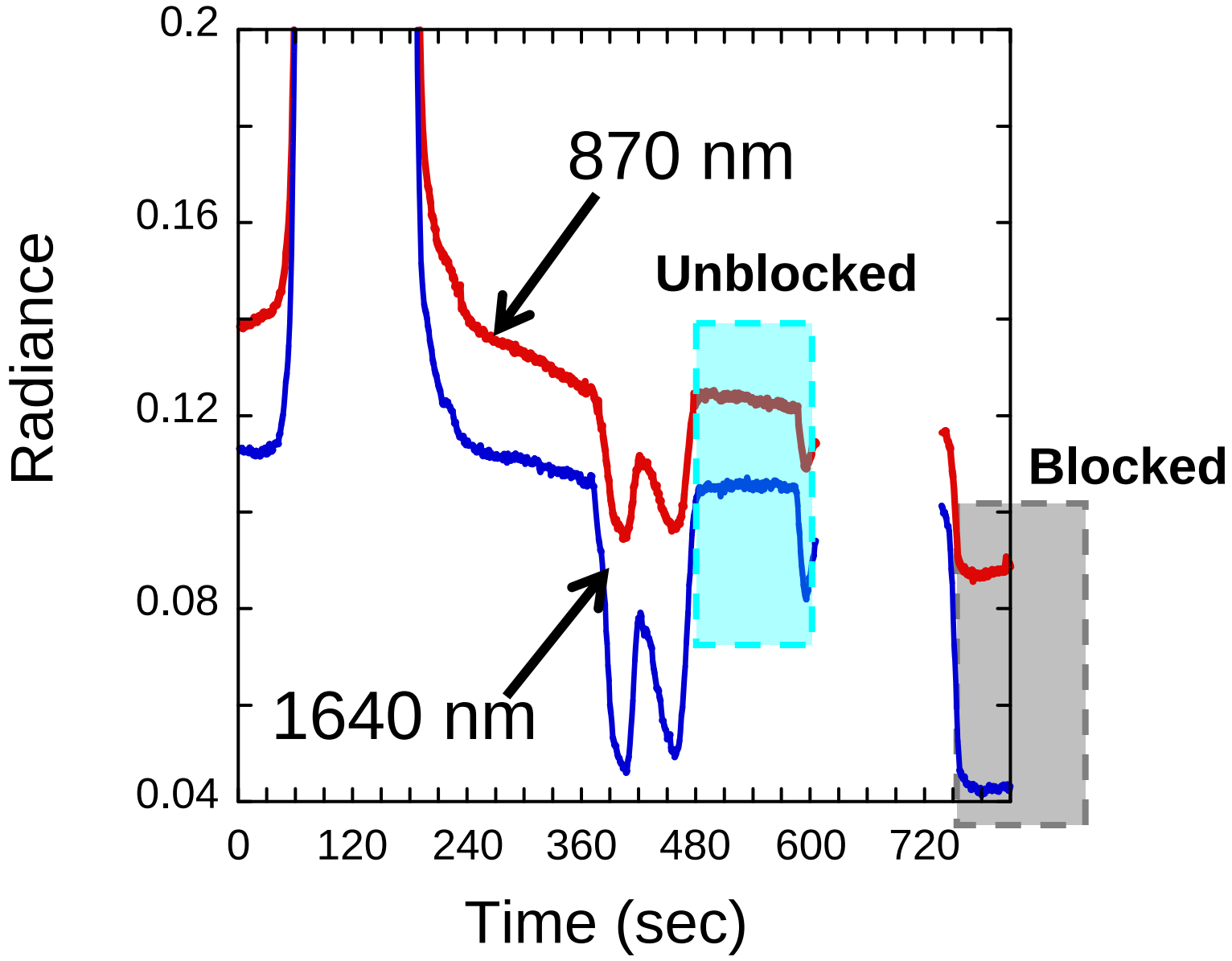
310 340 370 400

Unblocked illuminated

Blocked in shadow

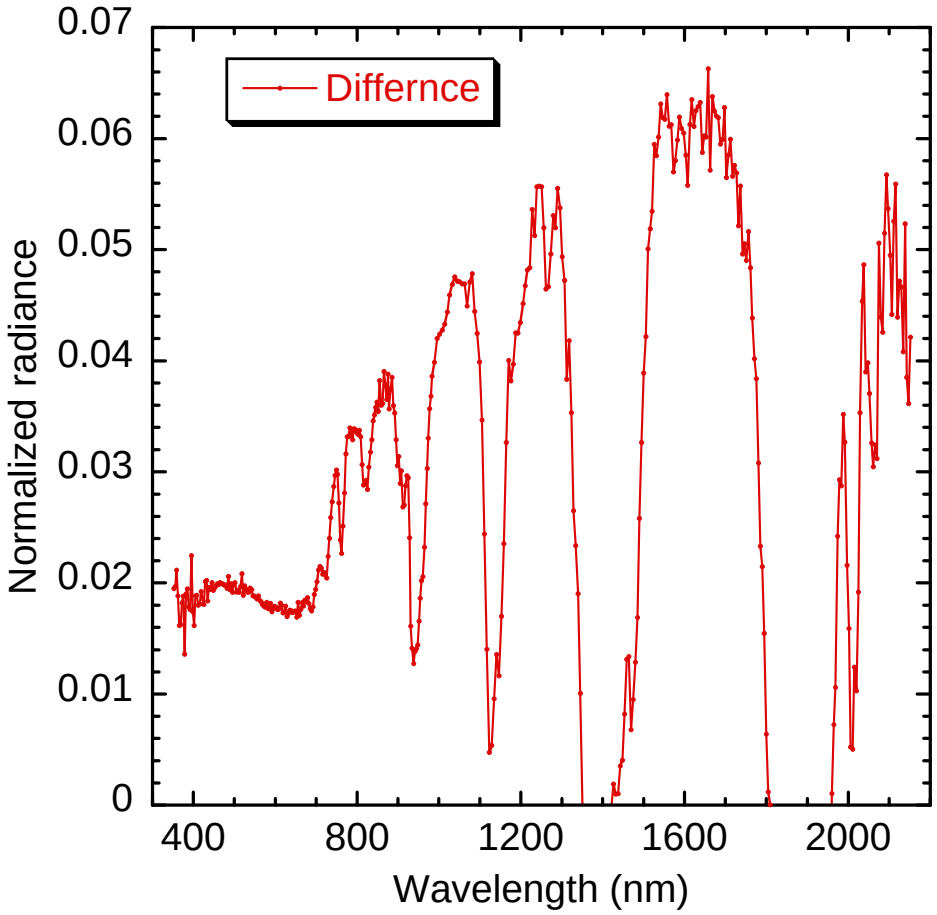


May 18, 2007


0.2
0.16
0.12
0.08
0.04
Radiance
870 nm
Unblocked
Blocked
1640 nm
0
120
240
360
480
600
720
Time (sec)

May 18, 2007

SZA=45°



The direct irradiance contamination of observed radiance can be corrected as

$$I(t,\lambda)_{cor} = I(t,\lambda)_{obs} - s(\lambda)$$

where s(λ) is the difference between the nearest block and unblocked regions (assumed to be the same for the whole time interval).

$$I_{870}^{correct} = I_{870}^{old} - 0.035$$

$$I_{1640}^{correct} = I_{1640}^{old} - 0.061$$

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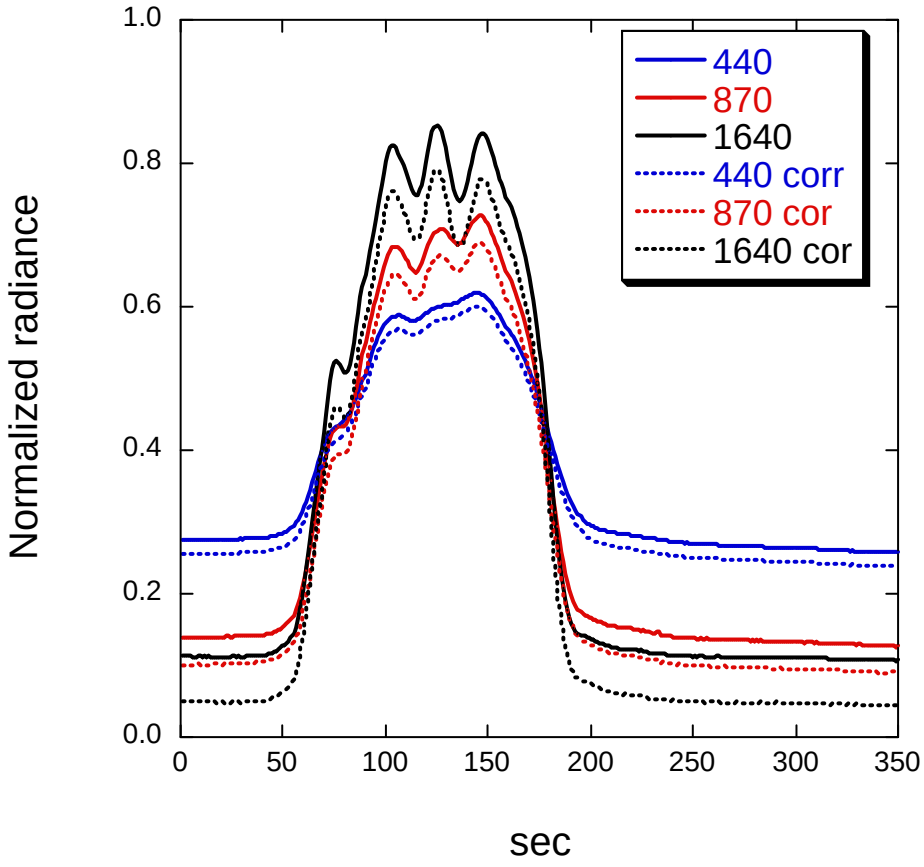
SZA=45°



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Effects of the SWS Direct Irradiance Problem on our Analysis of the Transition zone

- Linear relationship between SUM and DIF at two wavelengths: 870 and 1600 nm allows us to separate radiative signatures of aerosols and clouds

$$I_{870} - I_{1600} = a[I_{870} + I_{1600}] + b$$

Stray light contaminations in SWS measurements affect the intercept of the line in the transition zone '*a*', but NOT the slope of the line '*b*', if the entire time period of interest is completely unblocked or completely blocked.

PARTIALY EFFECTED

Effects of the SWS Direct Irradiance Problem on our Analysis of the Transition zone

- spectral invariant analysis of the Transition zone

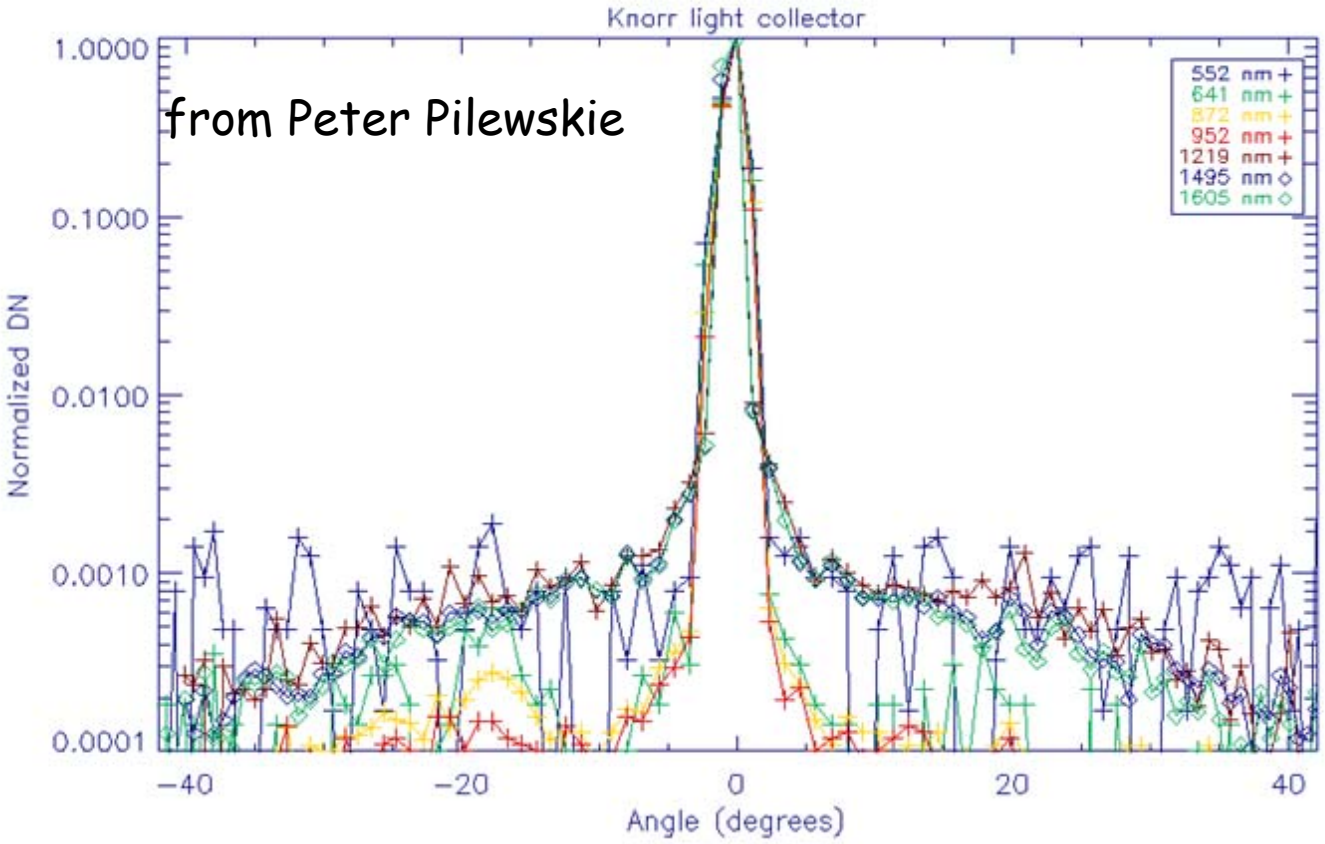
Using spectral measurements of the SWS we test the following hypothesis:
Zenith radiance spectrum in the transition zone is a linear combination of cloudy and clear sky spectra with a wavelength-independent weighting function

$$I(\lambda) = aI_{cloudy}(\lambda) + (1-a)I_{clear}(\lambda),$$

$$a \in (0,1),\ a \neq a(\lambda)$$

$$\frac{I(\lambda)}{I_{clear}(\lambda)} = a\frac{I_{cloudy}(\lambda)}{I_{clear}(\lambda)} + (1-a)$$

UNEFFECTED



It shows off axis rejection of 10^{-3} to 10^{-4}, depending on wavelength