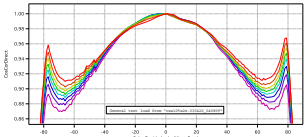
Rotating Shadowband Spectroradiometer (RSS) at SGP: Performance Data Processing and Value Added Products

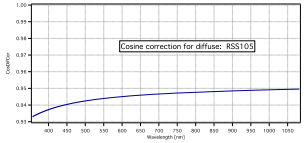
P. Kiedron, and J. Schlemmer
Atmospheric Sciences Research Center , SUNY at Albany, New York

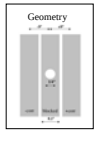
RSS Shadowbanding Principles

RSS103, UV-RSS104, RSS105 (from left to right)
Aerosol IOP at SGP. May 2003.

Shadowbanding Geometry			
	RSS105	RSS103	RSS102
Diffuser aperture	0.25°		
Shadowband width	8.1°		
Shadowband radius	3.50°		
Shadowband length	135°		
Shadowband position at corrections	±9°		
Shadowband axis angle	45°	Parallel with Earth axis	Parallel with Earth axis
Shadowband center on diffuser	yes		







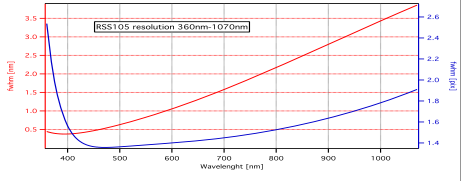
$$I_{Diffuse} = [Unblocked - \tfrac{1}{2}(Cor^{\circ} + Cor^{\cdot}) + Blocked] / A_{Diff}$$

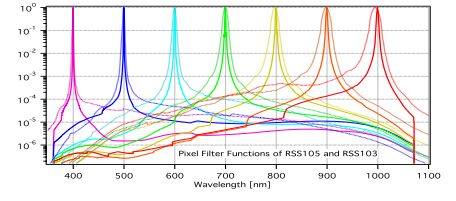
$$I_{Direct} = [\tfrac{1}{2}(Cor^{\circ} + Cor^{\cdot}) - Blocked] / A_{Dir}(\alpha, \zeta)$$

$$I_{Total} = I_{Diffuse} + I_{Direct}$$

Spectrometric Specifications

Spectral characteristics	RSS1 05	RSS1 03	RSS1 02
Number of pixels	1024	512	1024
Nominal Spectral Range (NSR) [nm]	360 - 1050	360 - 1050	360 - 1050
Number of Pixels within NSR	1001	442	988
Resolution [FWHM] [nm]/[pixels]			
@400 nm	2.37/1.56	1.28/2.32	0.37/1.52
@500 nm	0.62/1.36	2.57/2.47	1.14/2.44
@800 nm	1.05/1.40	4.84/2.81	1.77/2.32
@700 nm	1.57/1.44	7.80/3.12	2.21/2.00
@900 nm	2.16/1.52	11.02/3.37	2.53/1.75
@900 nm	2.79/1.63	14.32/3.61	2.81/1.62
@1000 nm	3.42/1.78	17.11/3.83	3.10/1.58
Filter functions			
95% below maximum	Gaussian	Gaussian	Gaussian
Gaussian parameter from	rss105_ GaussWidth	rss103_ GaussWidth	rrss10 2_GaussWidth
Below 95% is defined by following files	rss105_ ff_respEQ1 rss105_ respQM rss105_ RespW	rss103_ ff_respEQ1 rss103_ RespQM rss103_ RespW	rss102_ ff_respEQ1 rss102_ RespQM rss102_ RespW

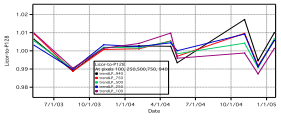


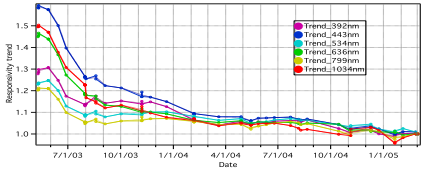


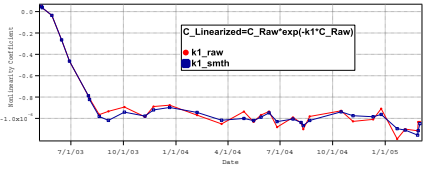
Performance: May 2003 - March 2005

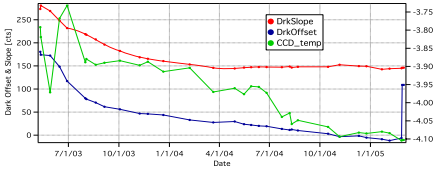
Calibration Schedule

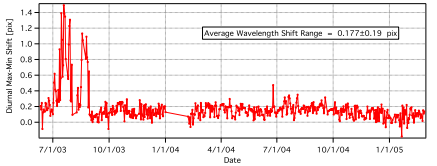
Portable Calibrator: 2/month
Licor Calibrator: 1/month
Oriel Spectral Lamp: 1/month

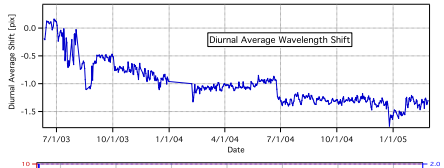


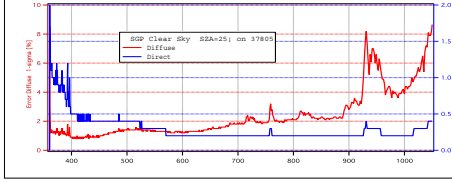




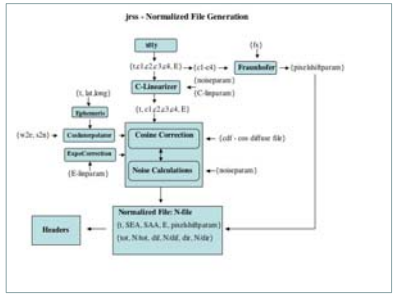


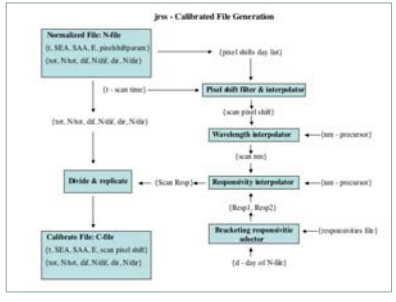






Data Processing Software





Proposed Value Added Products

Primary measured quantities: direct, diffuse, total horizontal spectral irradiances in 360nm-1050nm range.

Langley regression: calibration correction and daily (0, 1 or 2 per day) optical depth (OD).

Instantaneous optical depth (IOD): $\tau = \ln[\text{Direct/Extraterrestrial}]$ (once every minute).

Ozone column (O_3): from Chappuis ozone absorption band (440-760nm).

Water vapor column (H_2O): from 820nm and/or 940nm absorption bands.

Nitrogen dioxide (NO_2): from absorption maximum in 415nm region.

Aerosol optical depth (AOD): Angstrom coefficients from multi-wavelength fit to IOD (with NO_2 correction).

Single scattering albedo (SSA): from direct-to-diffuse ratio.

Surface albedo (SA): from direct-to-diffuse ratio.

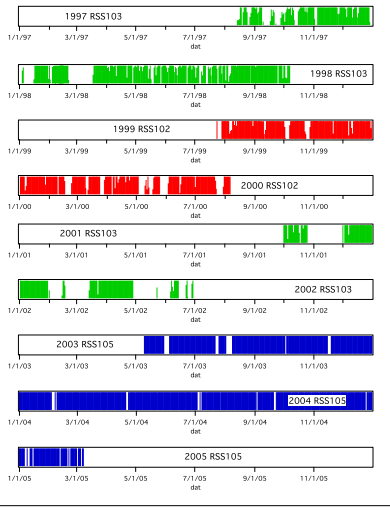
Diffuse effective airmass: from O2 A-band (760nm).

All sky conditions retrievals: H_2O, O_3 and NO_2 using diffuse effective airmass.

Photon path-length: first and second moments from O2 A-band (760nm).

Data Availability

Data Availability			
	RSS105	RSS103	RSS102
Location	SGP	SGP	SGP
Operational epochs	05/09/03 - Present	09/29/01-06/27/02 08/12/97-10/05/98	07/22/99-08/04/00
Measurement period	From sunrise to sunset		
Measurement rate	1 shadowbanding cycle per min		
Number of spectra per day	From 570 spectra in Winter to 970 spectra in Summer		



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