An Update on SW QME Activities

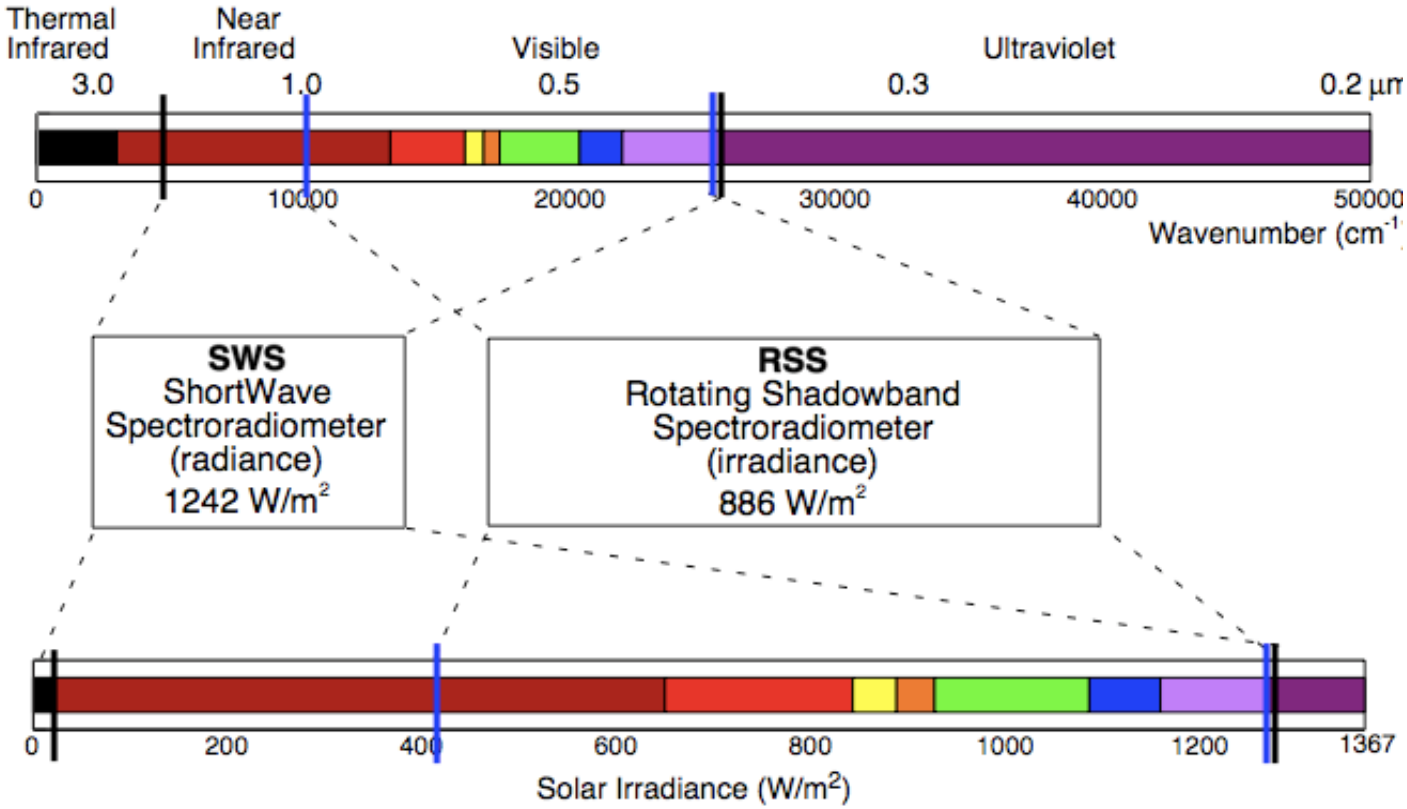
J. Delamere, E. Mlawer (AER, Inc.)

P. Kiedron (CIRES/U. Colorado)

J. Michalsky (NOAA/ESRL/GMD)

C. Long, C. Flynn, T. Shippert, S. McFarlane (PNNL)

P. Pilewskie, P. McBride (LASP/U. Colorado)



Components of RPWG SW QME

- **Direct Beam Clear Sky Study (In progress)**
  - Assess spectral parameters across absorption bands (RSS)

- **Diffuse Clear Sky Studies (In progress, Michalsky presentation)**
  - Analysis of aerosol properties from different sources at SGP (with recent upgrades to AOS) (RSS, SWS)
  - Spectral shortwave surface albedo

- **Cloudy Sky Studies**
  - Validation (Microbase) and retrieval of cloud properties (RSS, SWS)

Deriving H_2O Direct Beam Transmittance (T)

RSS Irradiance Measurement

Derive T(Gases,Rayl,Aerosol) using V_o

LBLRTM/CHARTS

Input MergedSonde

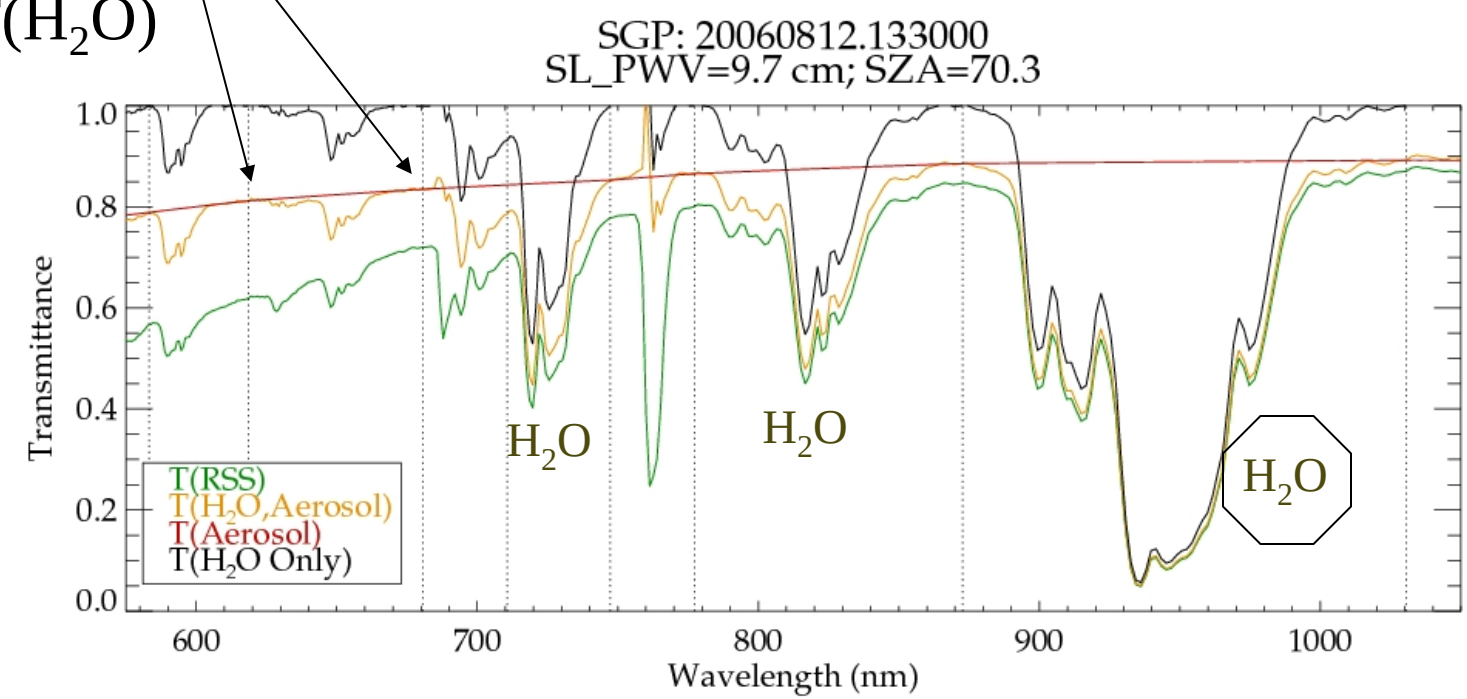
Compute T(Gases,Rayl)

Compute T(Gases w/o H_2O,Rayl)

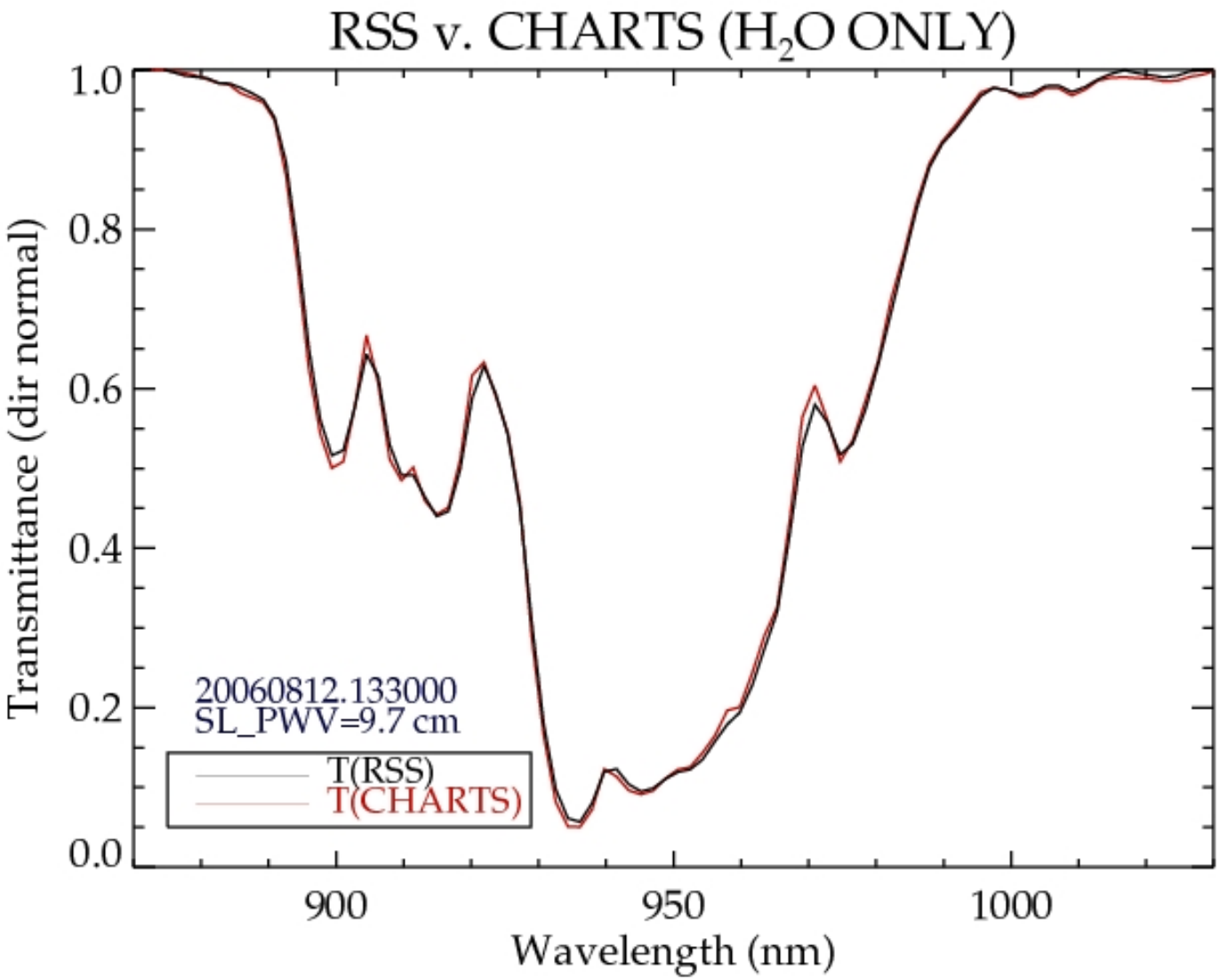
$T(H_2O)$

$T(Aerosol,H_2O)$

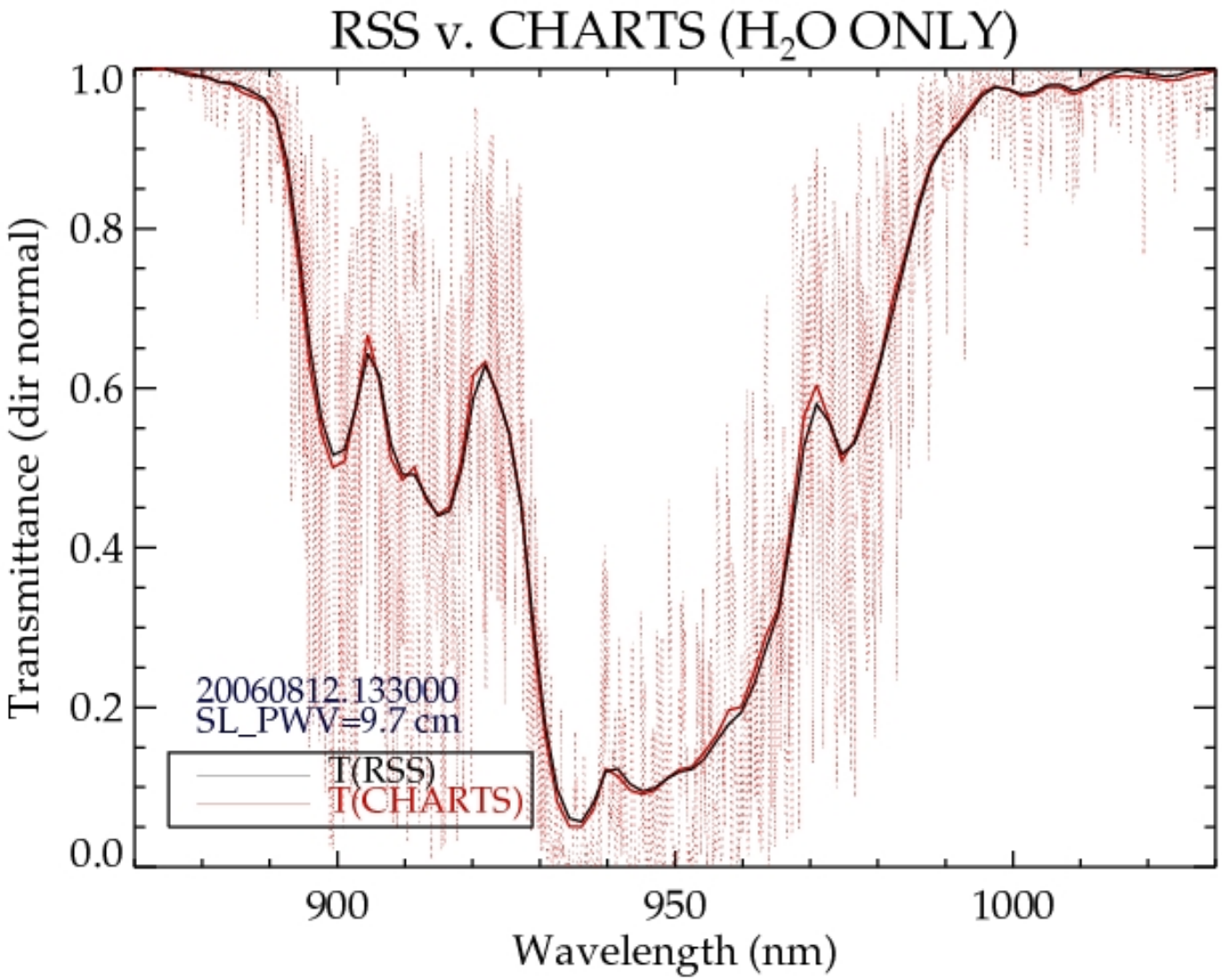
$T(H_2O)$



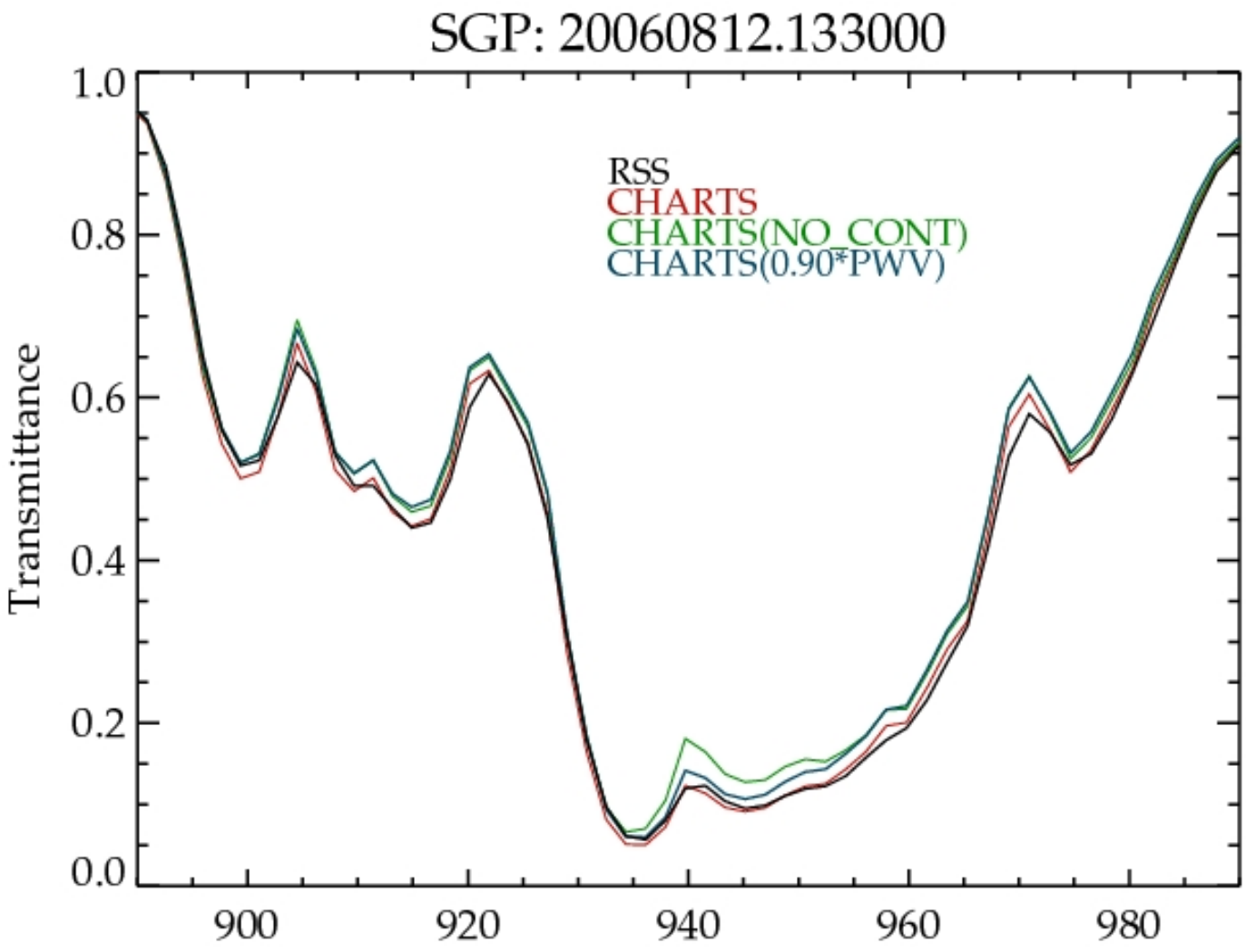
A Look at the 940 nm Band



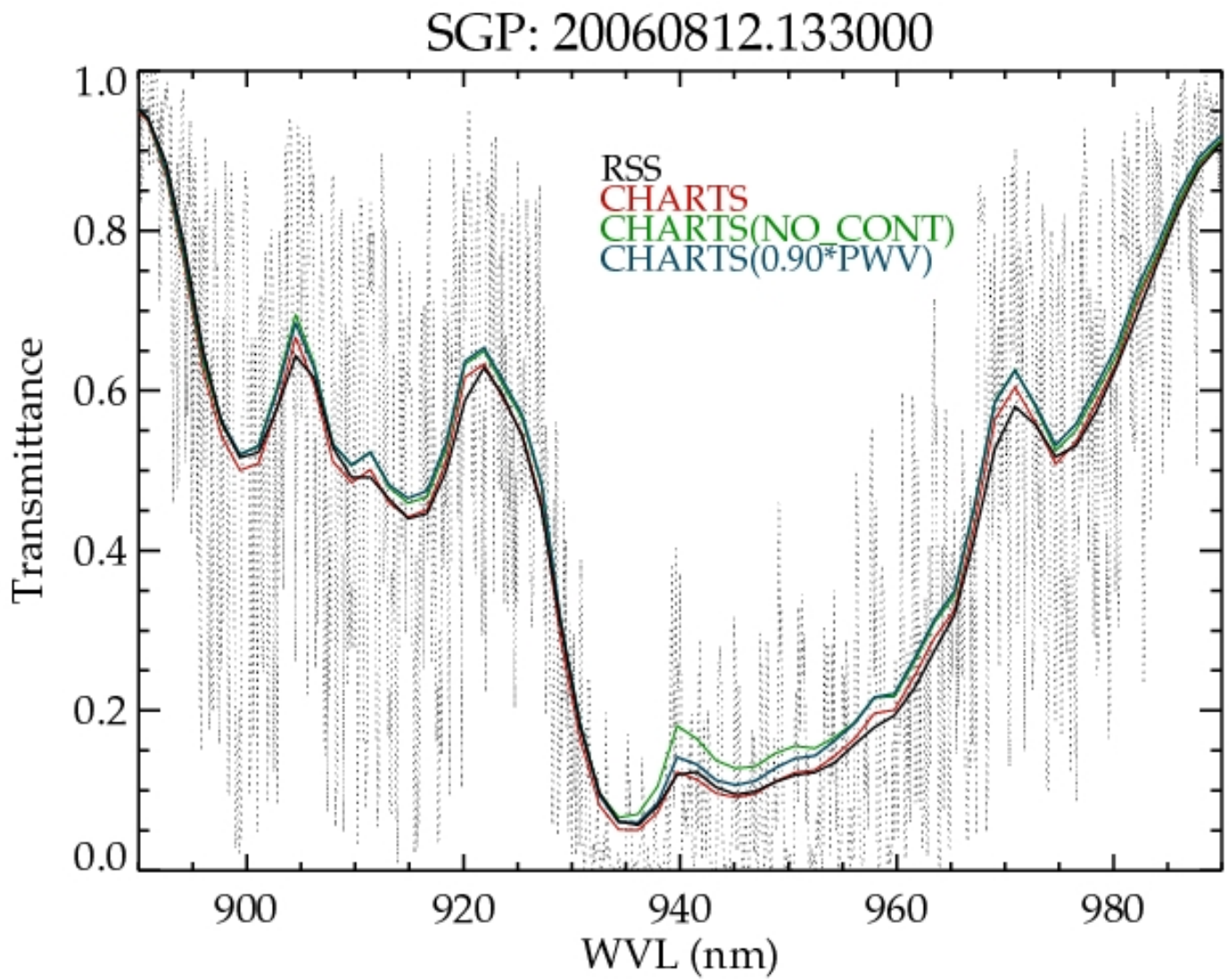
A Look at the 940 nm Band

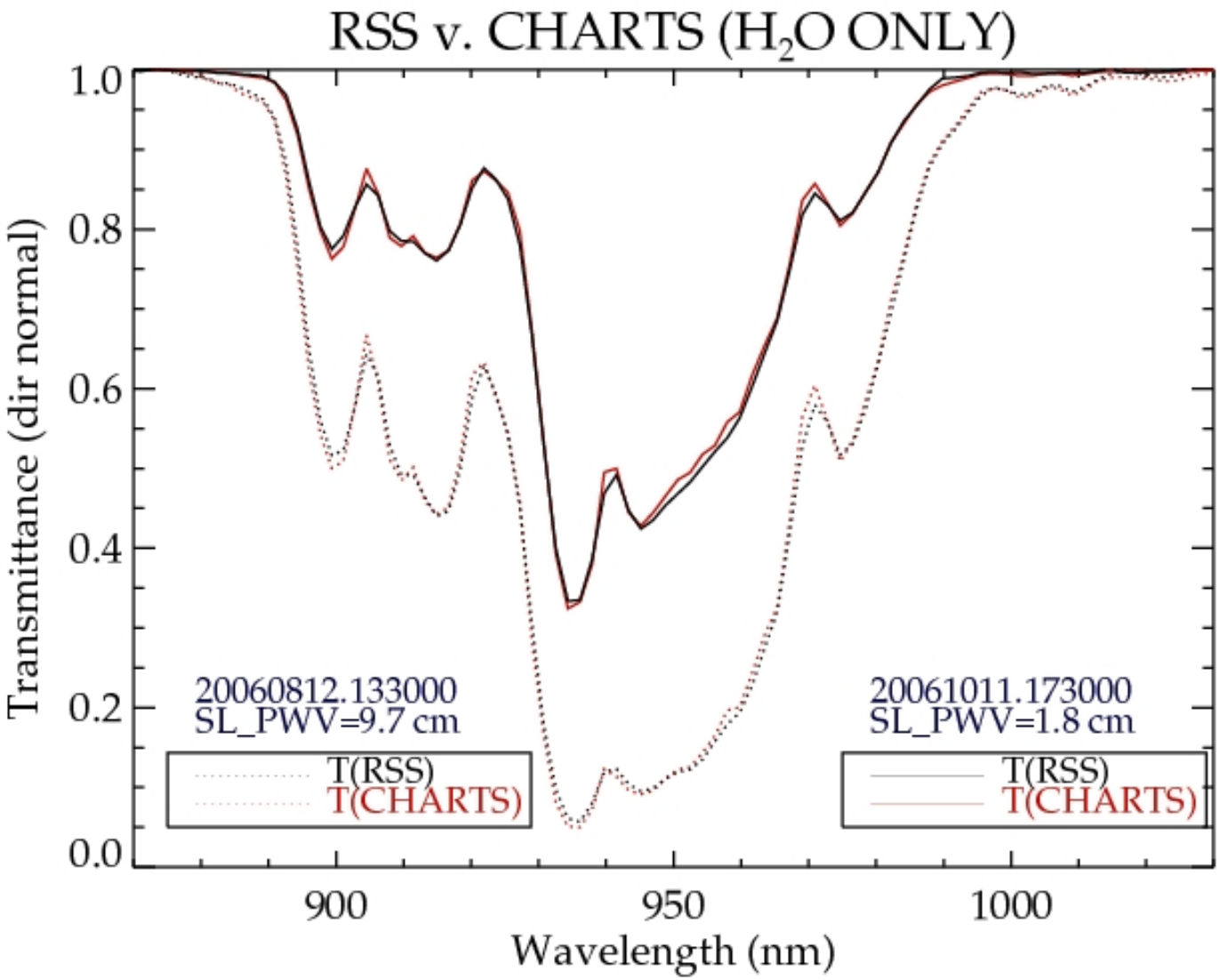


Analyzing the Spectroscopy



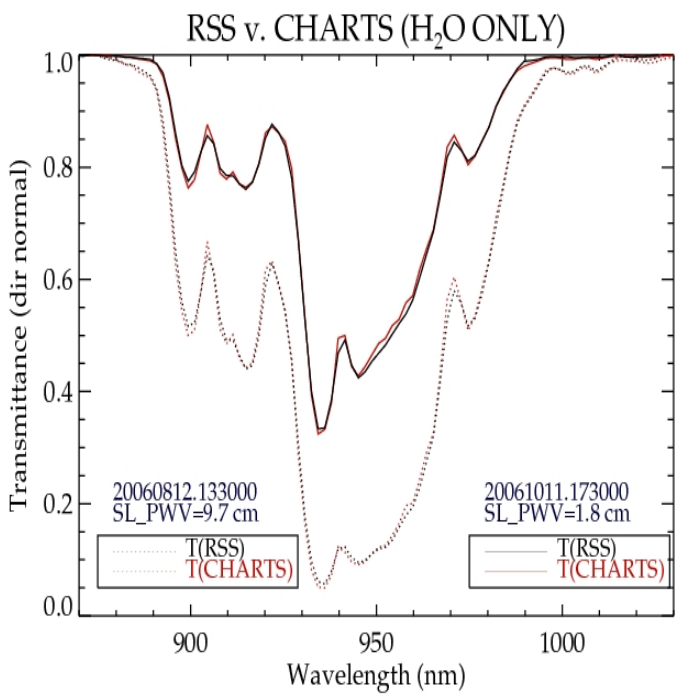
Analyzing the Spectroscopy



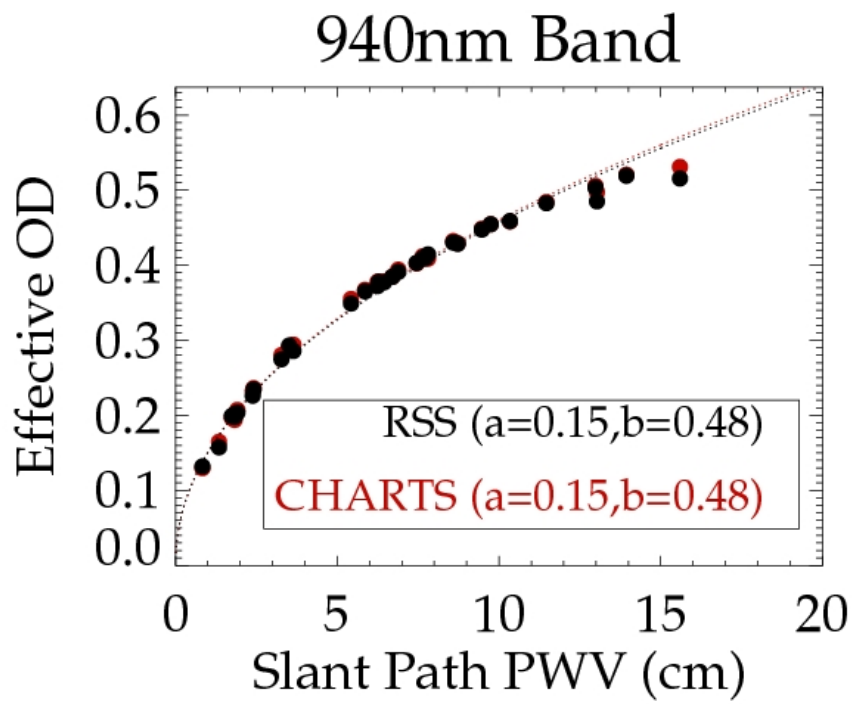

RSS v. CHARTS (H_2O ONLY)
Transmittance (dir normal)
Wavelength (nm)
1.0
0.8
0.6
0.4
0.2
0.0
900
950
1000
20060812.133000
SL_PWV=9.7 cm
T(RSS)
T(CHARTS)
20061011.173000
SL_PWV=1.8 cm
T(RSS)
T(CHARTS)

Curve of Growth Analysis

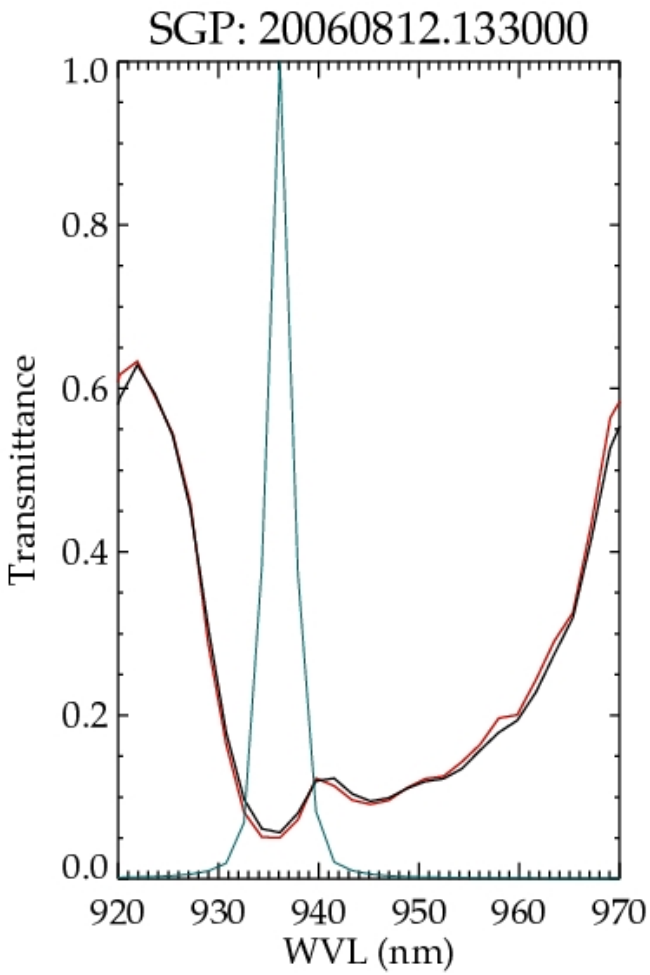
$$\tau_{eff}^{(sl)} = -\ln T$$

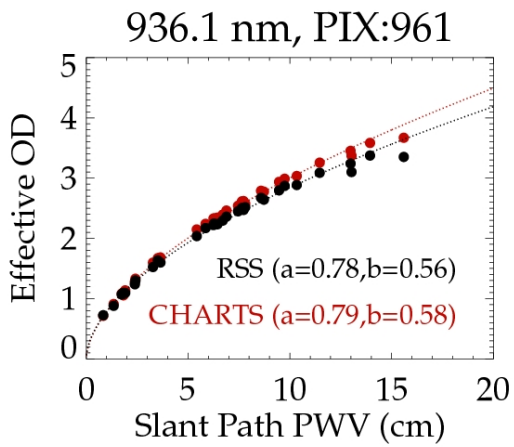


$$\tau_{eff}^{(sl)} \propto a(PWV)^b$$

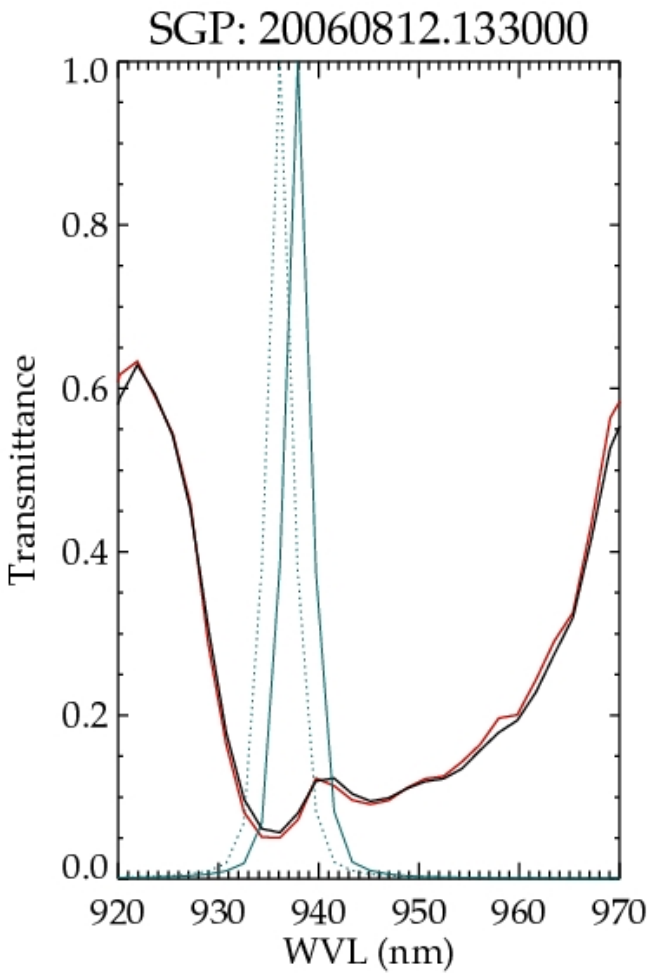


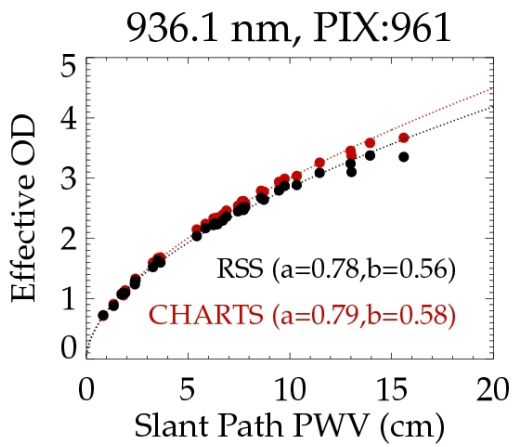
$$\tau_{eff}^{(sl)} \circledcirc a(PWV)^b$$

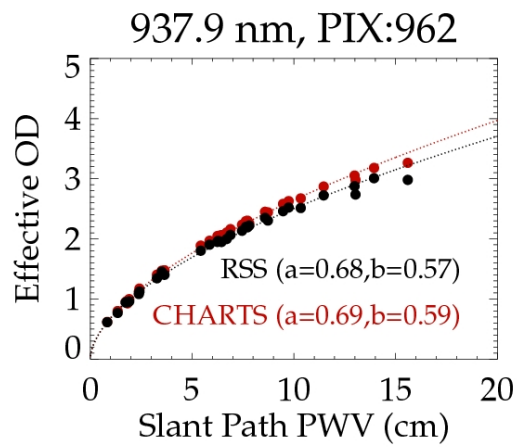




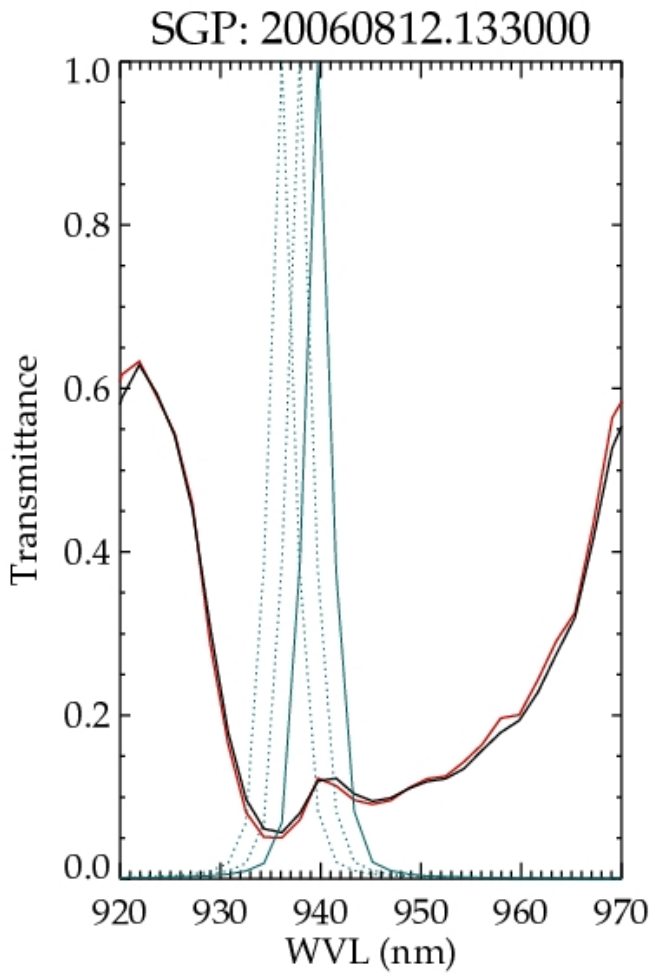
$$\tau_{eff}^{(sl)} \circlearrowleft a(PWV)^b$$

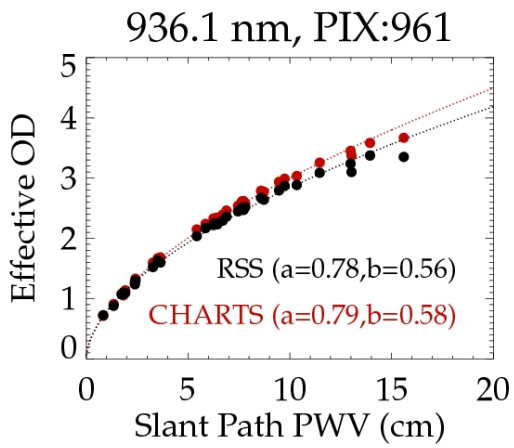


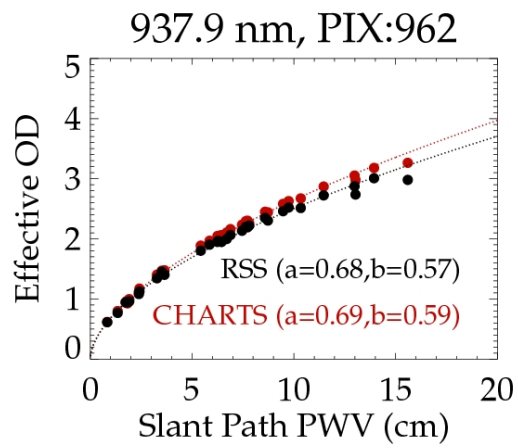


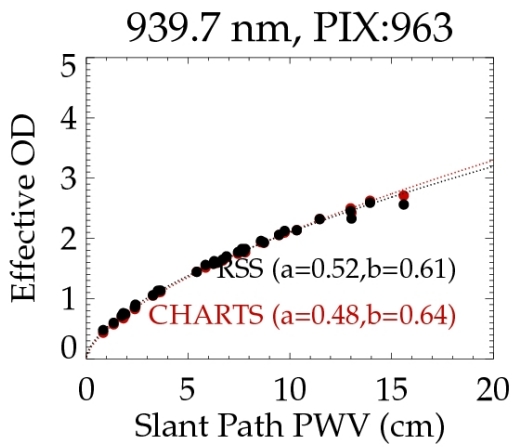


$$\tau_{eff}^{(sl)} \approx a(PWV)^b$$

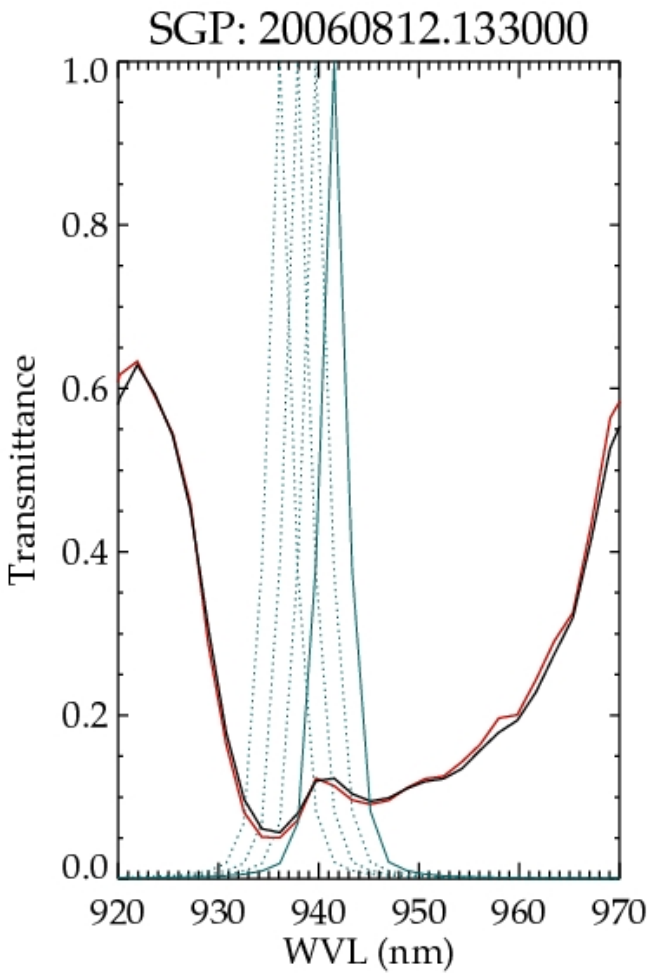


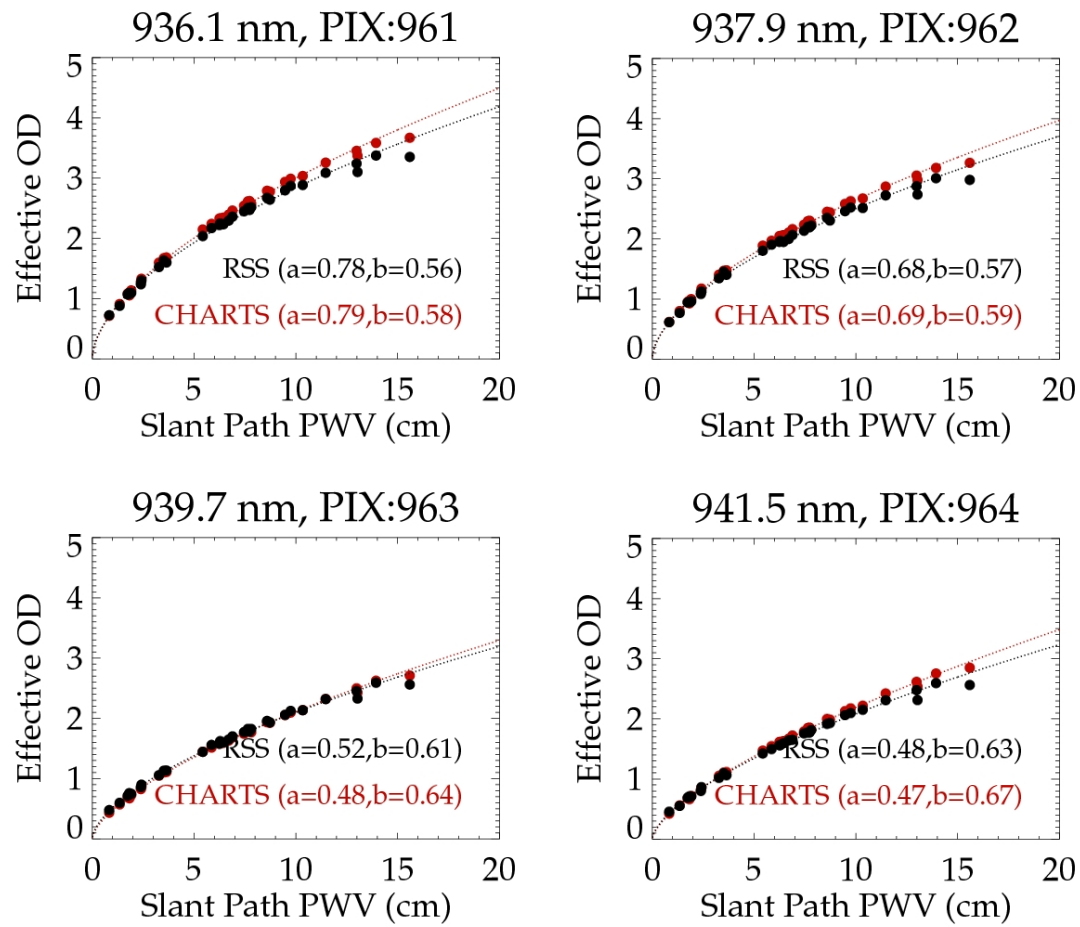




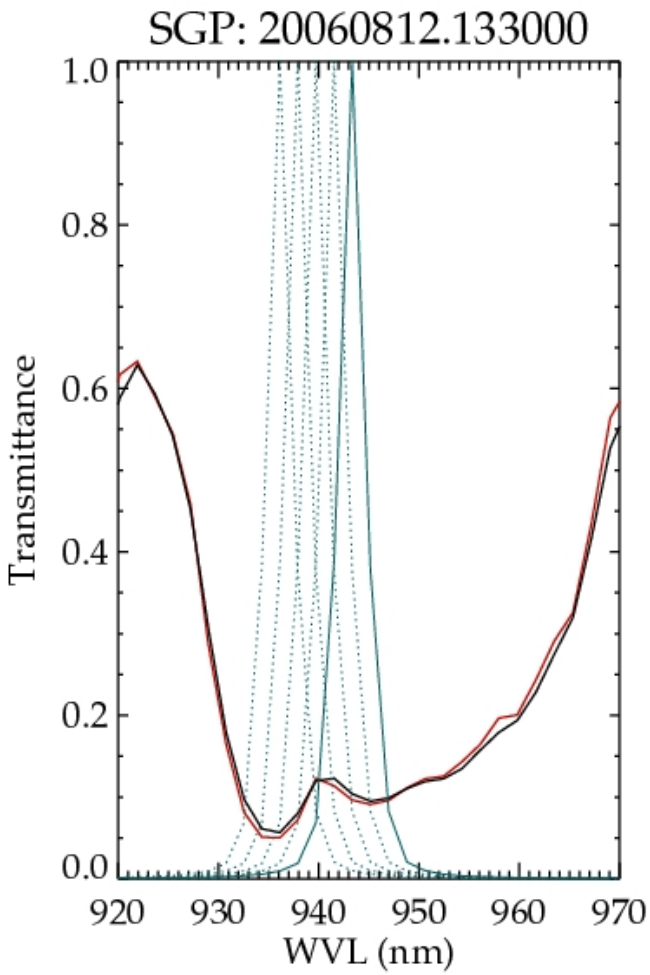


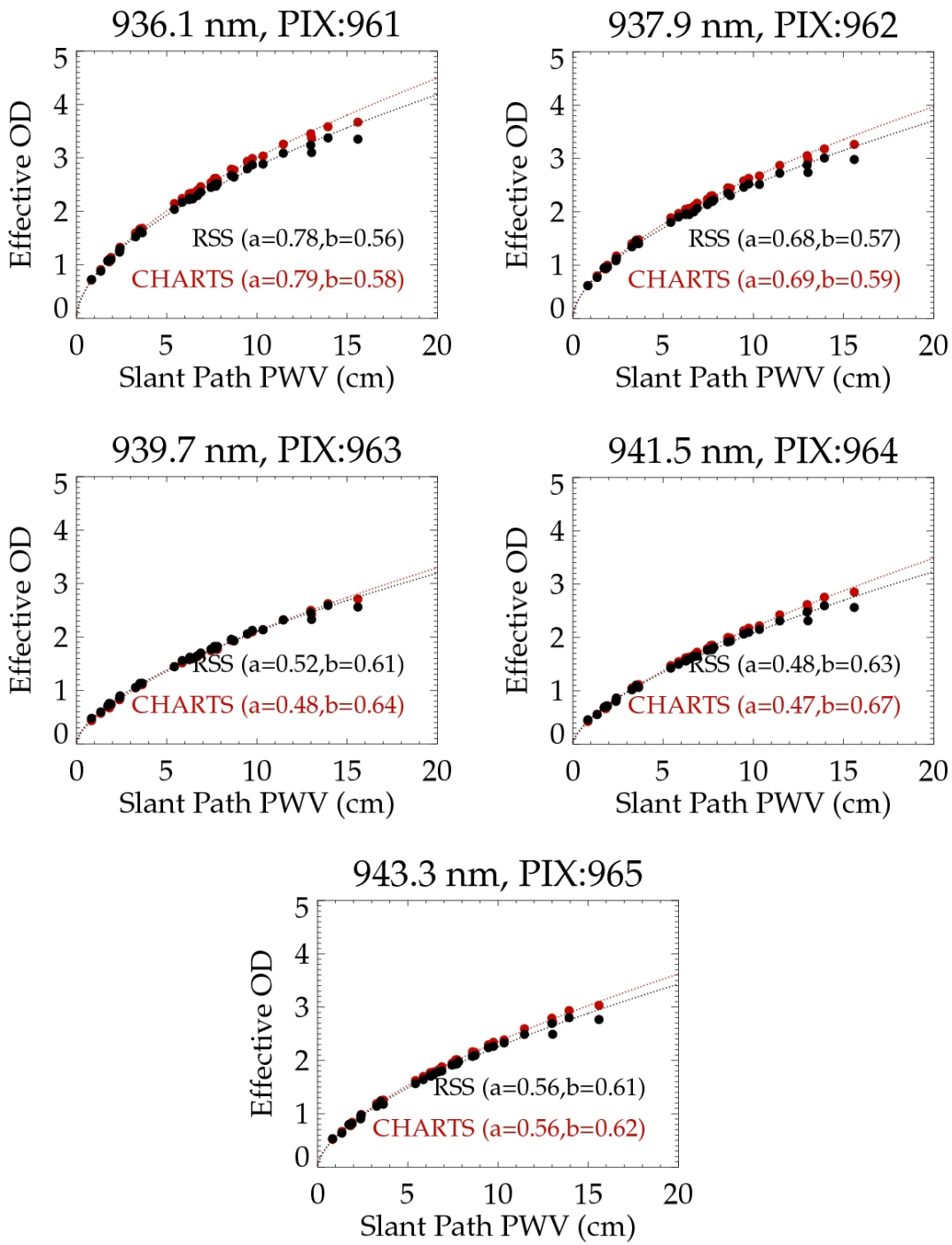
$$\tau_{eff}^{(sl)} \approx a(PWV)^b$$



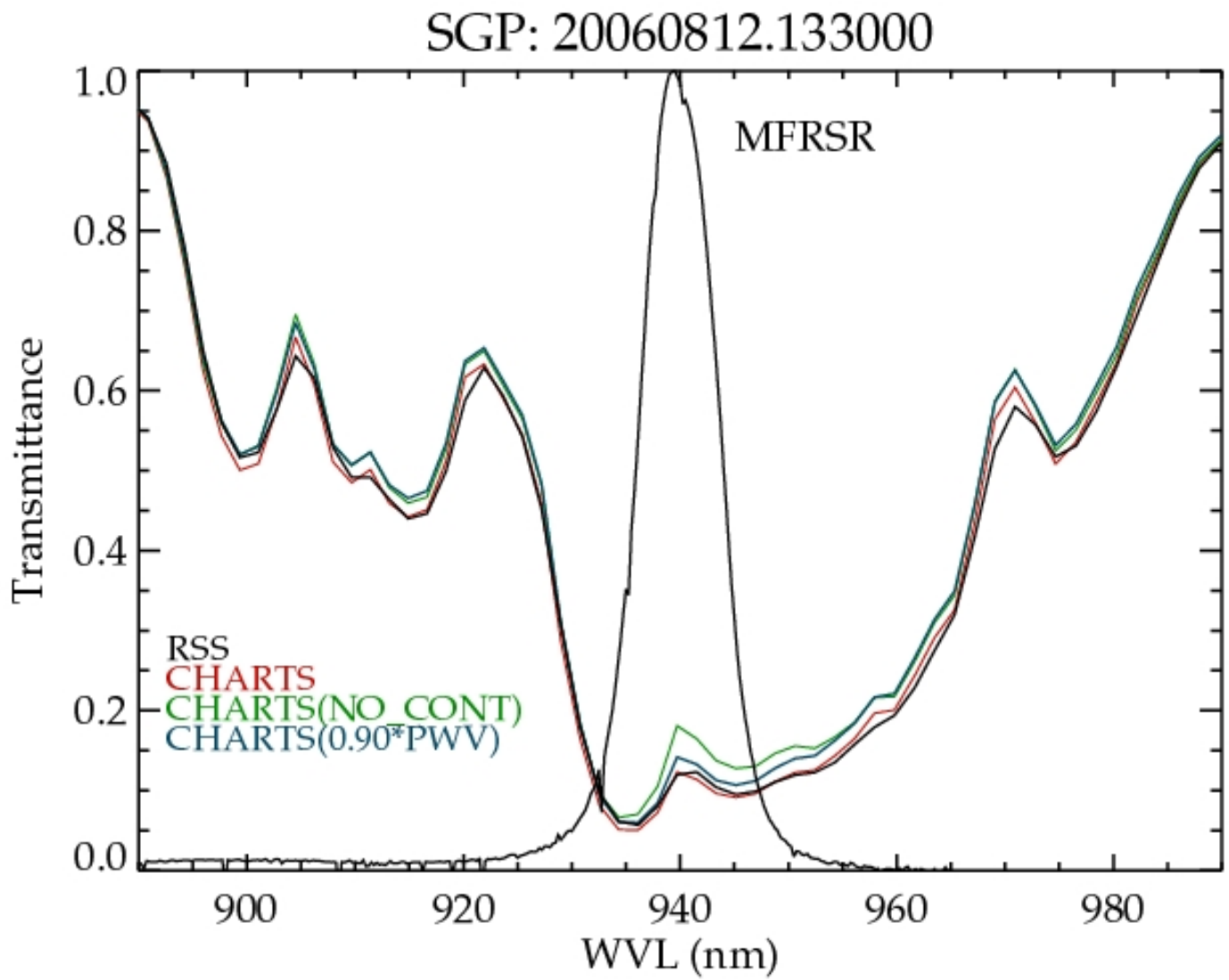


$$\tau_{eff}^{(sl)} \approx a(PWV)^b$$

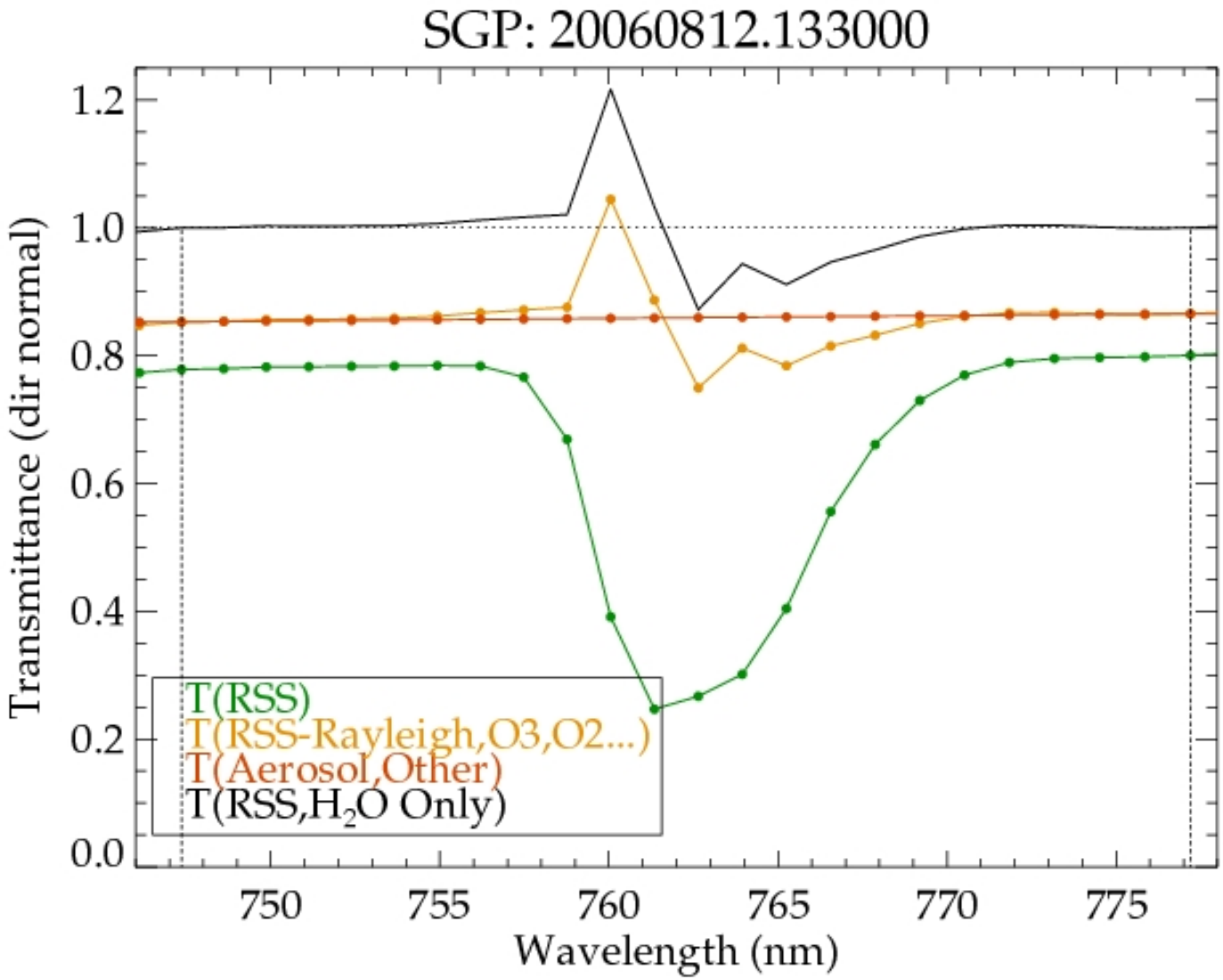




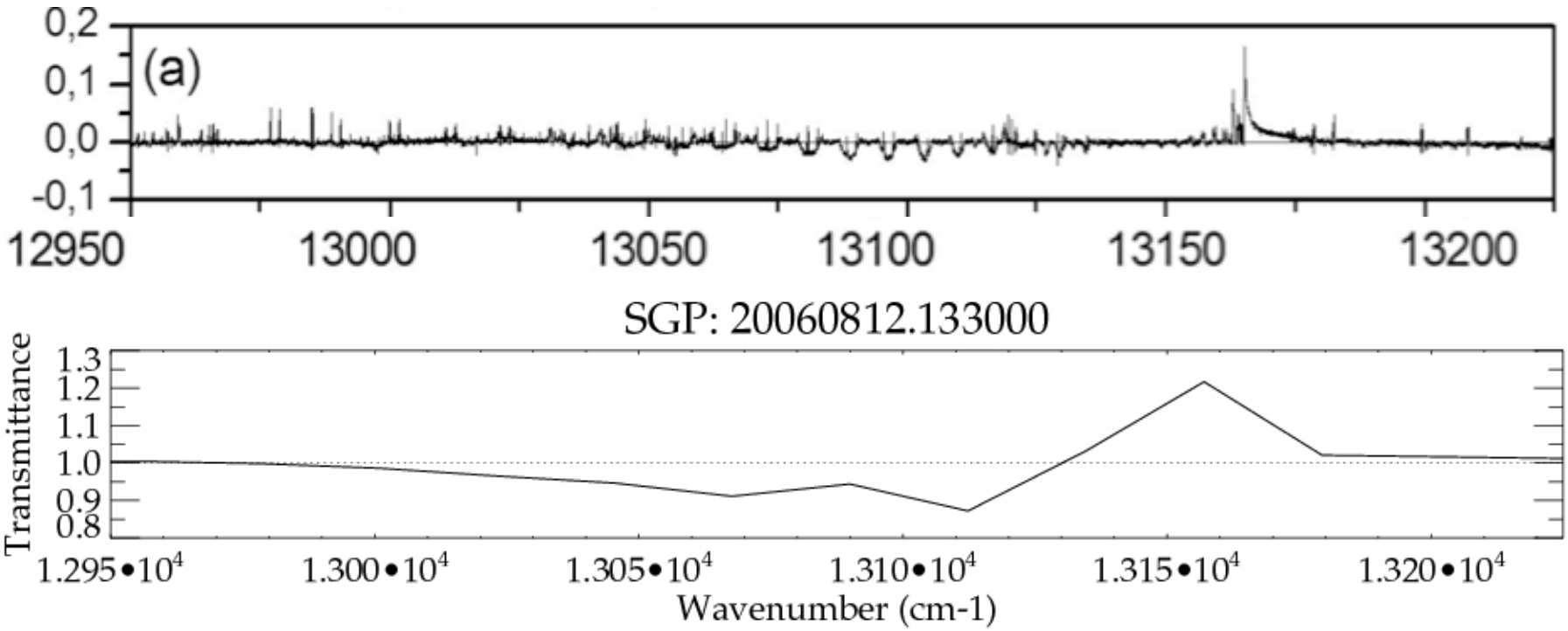
Analyzing the Spectroscopy



Oxygen-A Band



Improved Oxygen Band Absorption (Tran & Hartman 2008)



What's Next in Clear Sky Studies?

- Continued examination of RSS instrument function
  - Resolving the issues in the Oxygen-A band

- Analyze H_2O residuals with respect to the continuum versus line parameters where possible

- Examine 820 nm and 720 nm H_2O bands

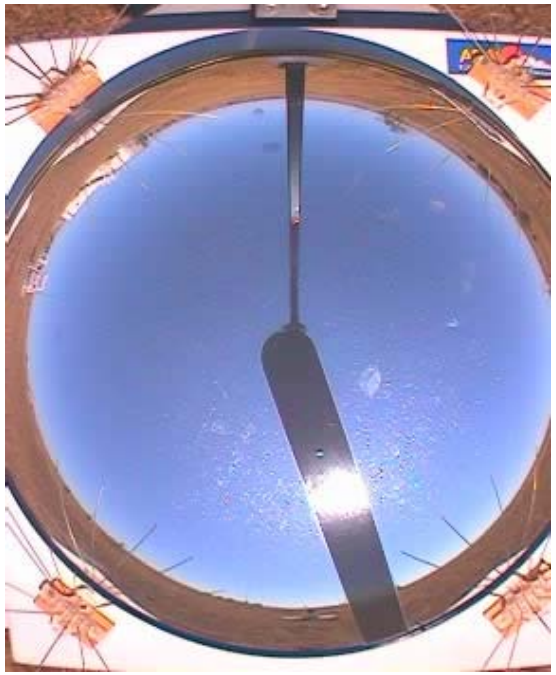
- Other absorbers (O_2-O_2, Chappuis)

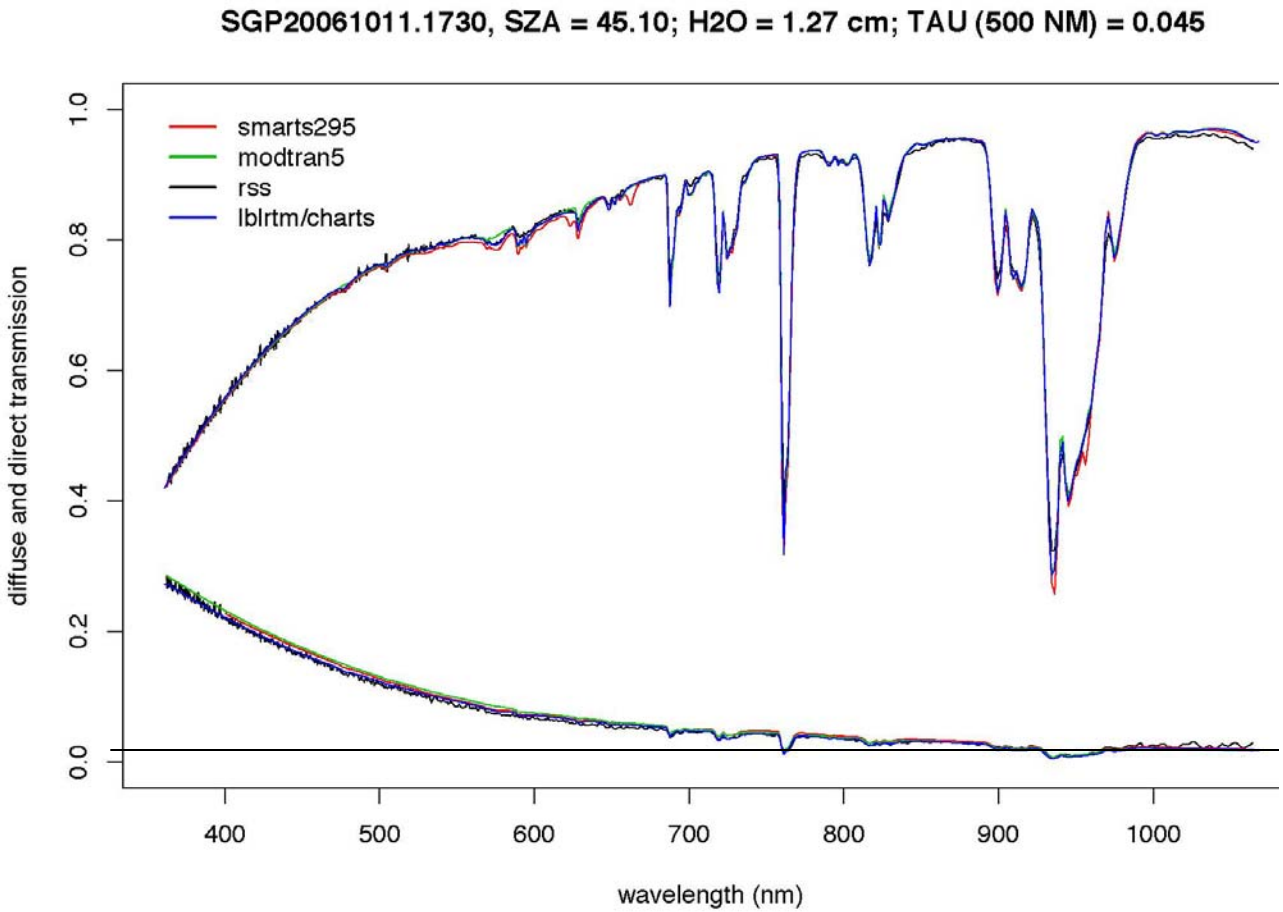
- More RSS diffuse cases for aerosol studies

- Bring in the SWS….

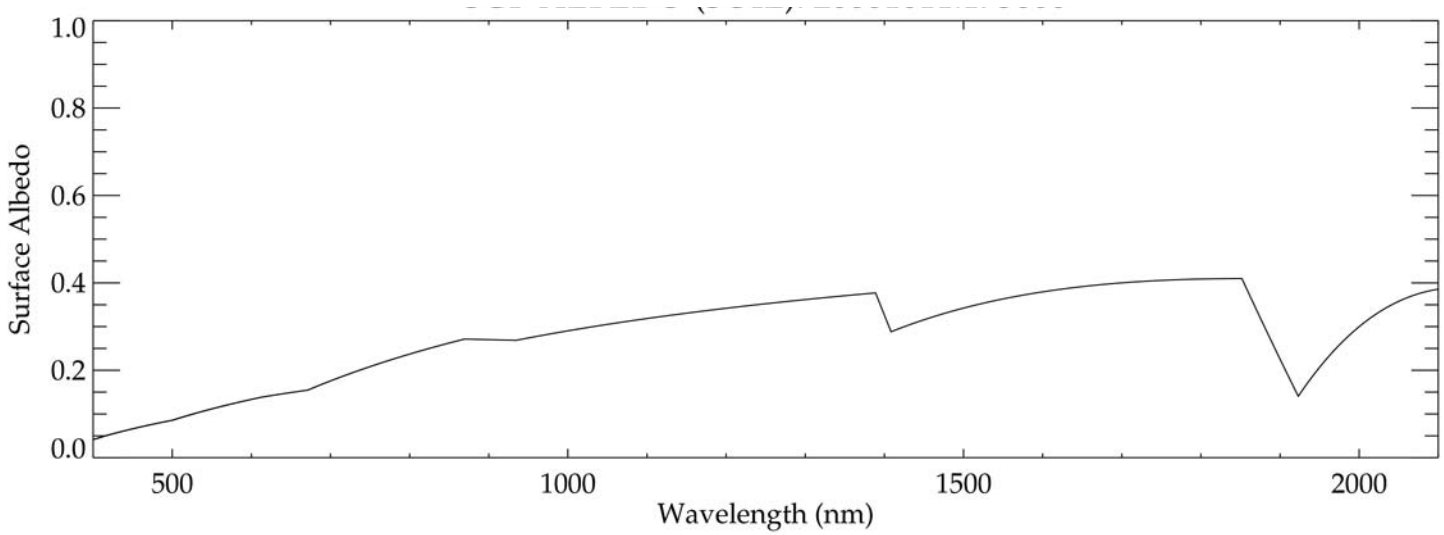
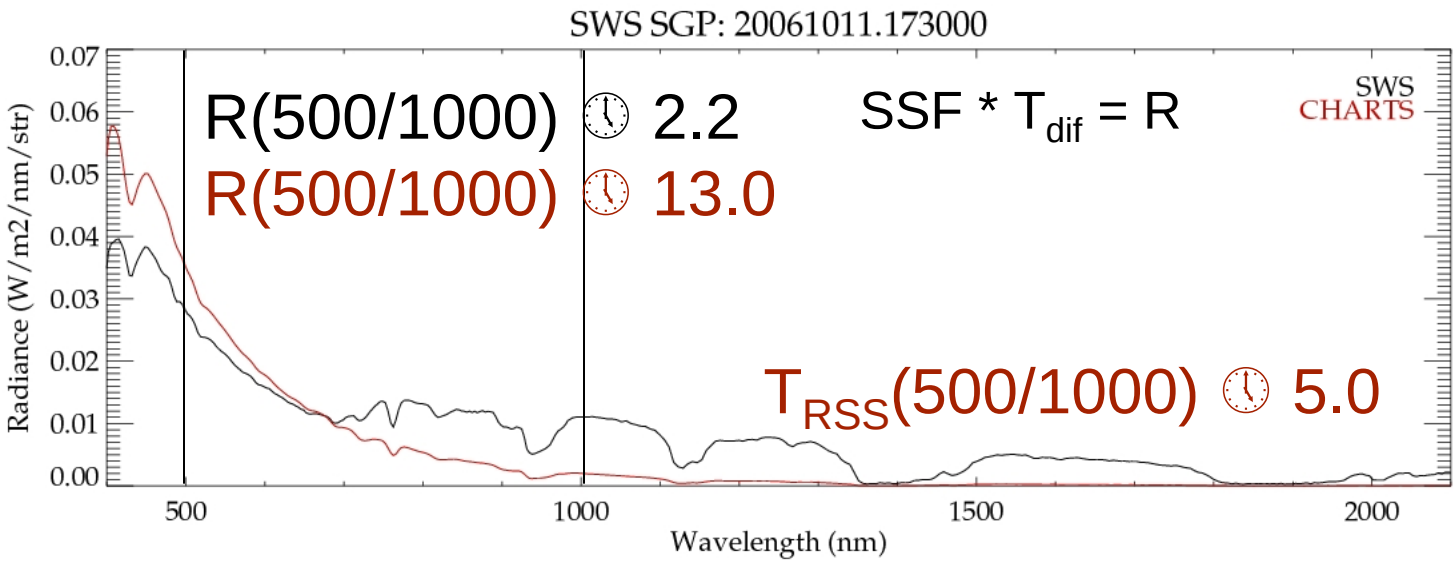
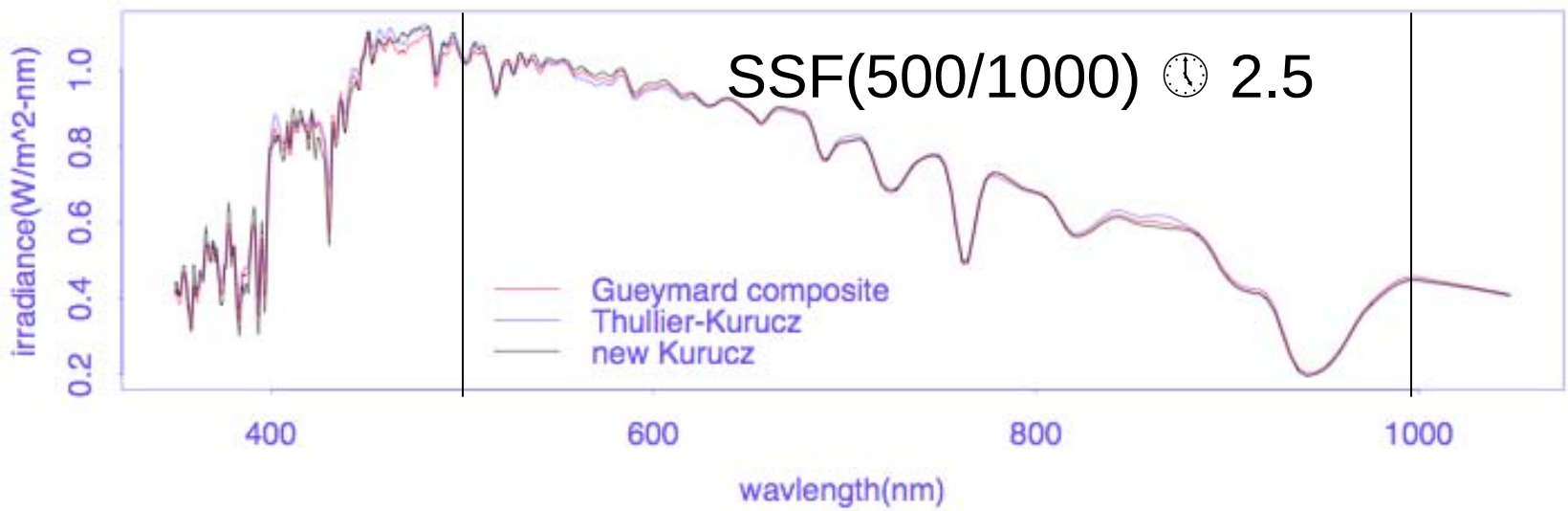
Clear Sky Modeling (RSS v. CHARTS)

20061011.172900





Surface Albedo (Brown)



Clear Sky Modeling (SWS v. CHARTS)