

Comparison of UV-RSS Spectral Measurements and TUV Model Runs for the May 2003 ARM Aerosol Intensive Observation Period

Joseph Michalsky (NOAA) and Piotr Kiedron (CIRES)

- The UV-Rotating Shadowband Spectroradiometer
- Model inputs (most are extrapolations from visible) to the Tropospheric UV Visible (TUV) RT model
- The trouble with ET spectra
- Comparisons of diffuse and direct transmittance

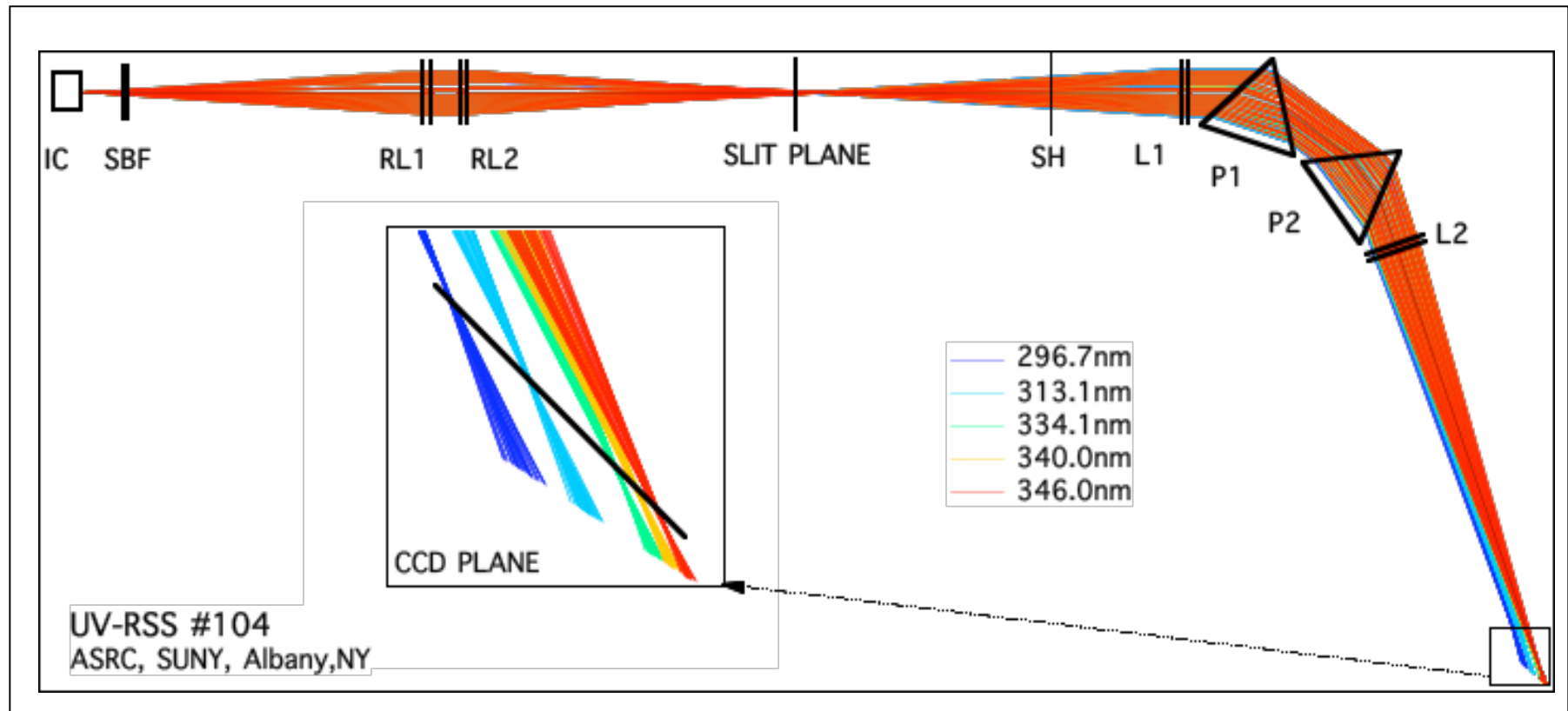
Deployments

10/97 Intercomparison, Table Mt., CO
Prototype NMOS: 512 pixels

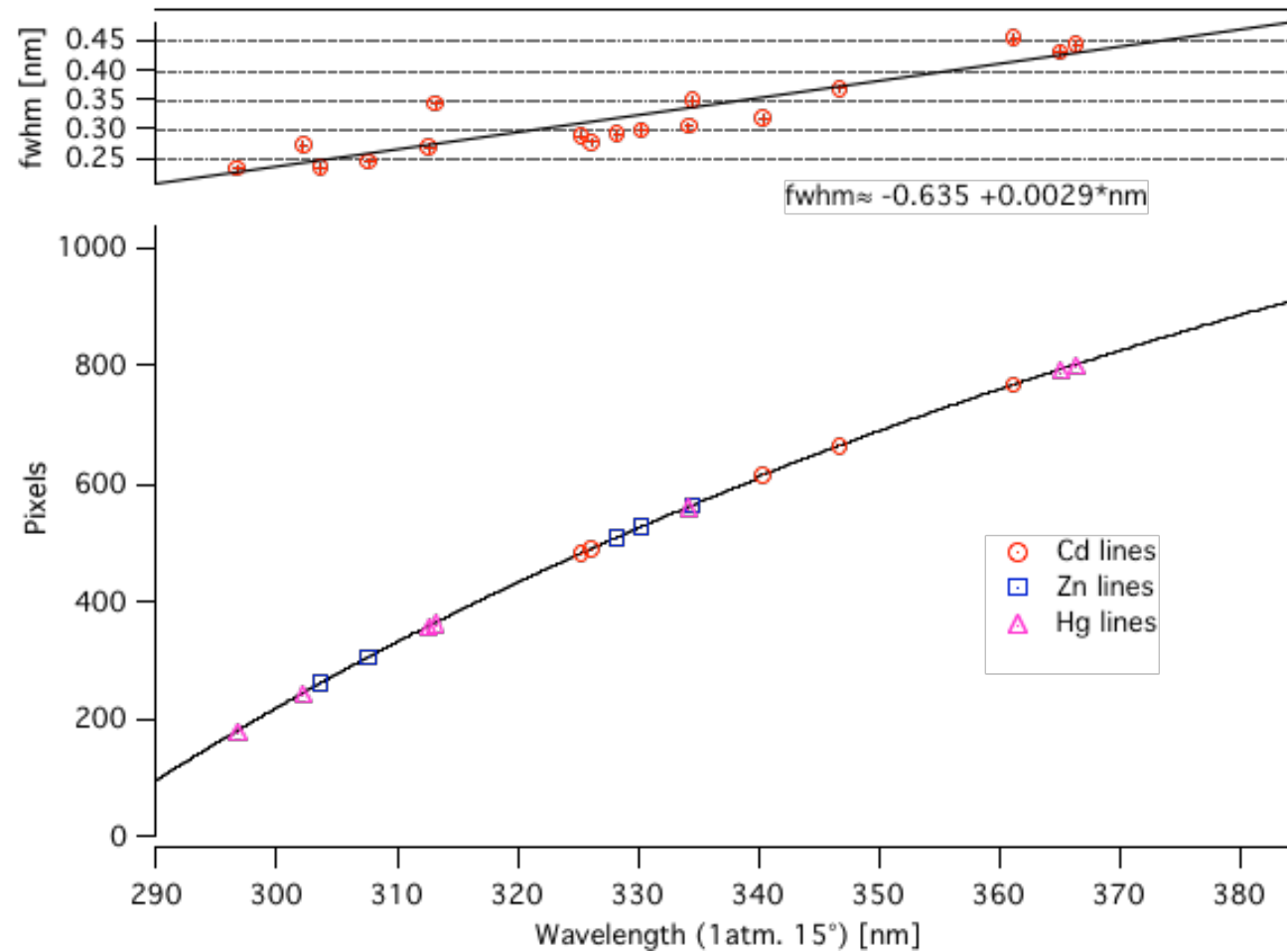
09/01 Diffuse IOP, SPG, OK
05/03 Aerosols IOP, SPG, OK
06/03 Intercomparison, Table Mt., CO



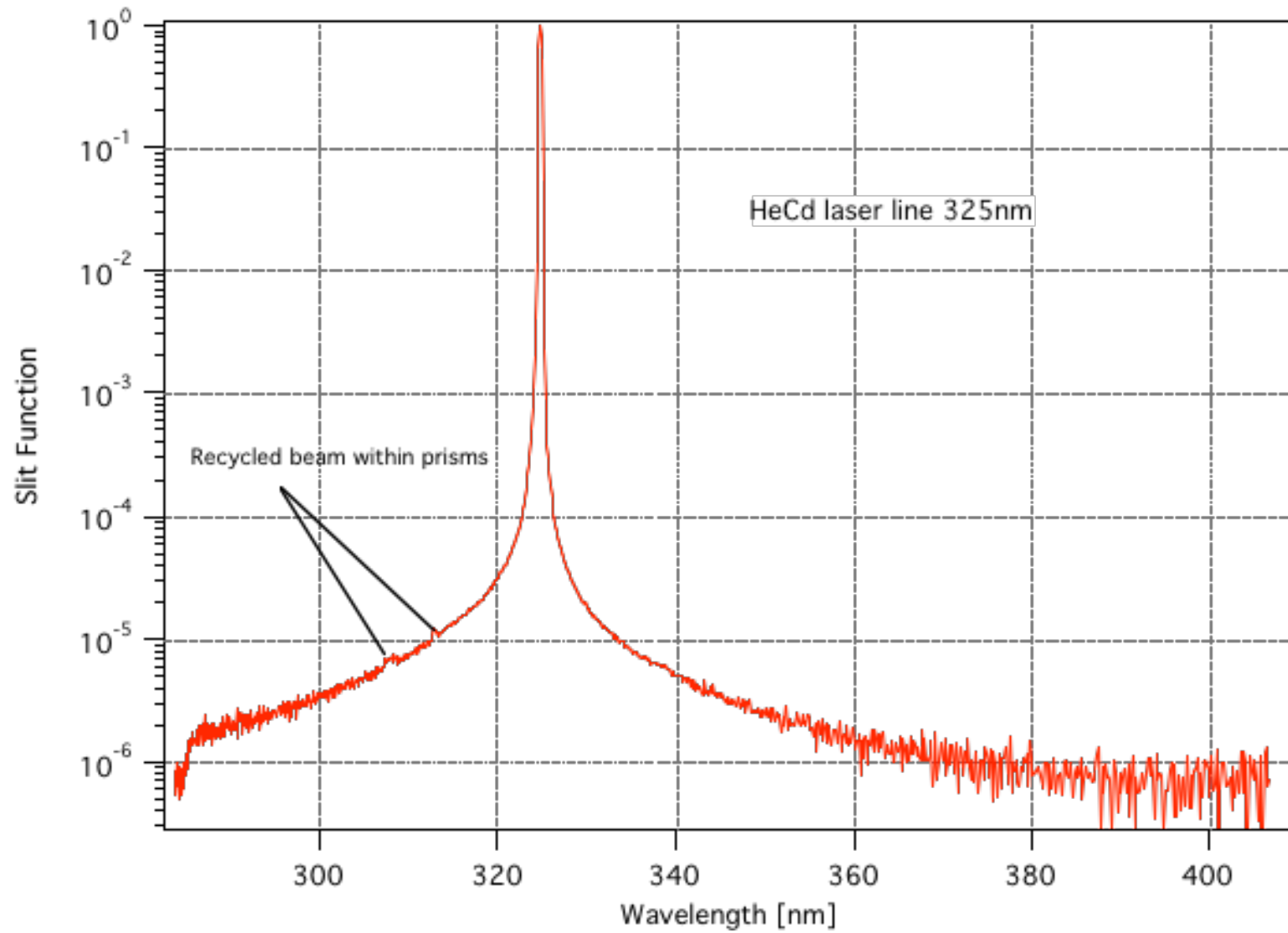
UV-RSS optical layout and ray-trace



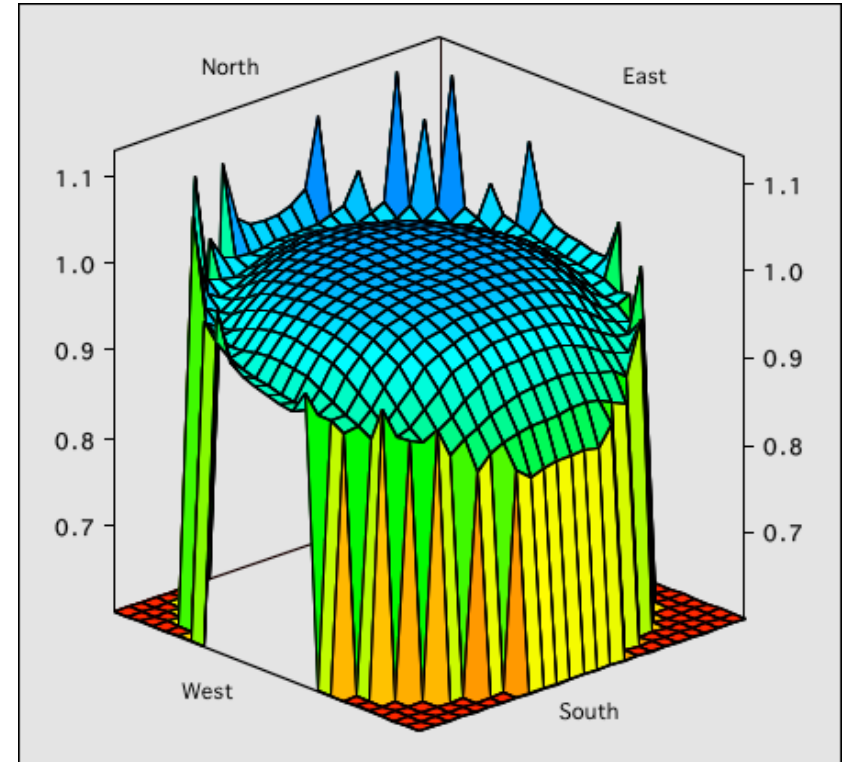
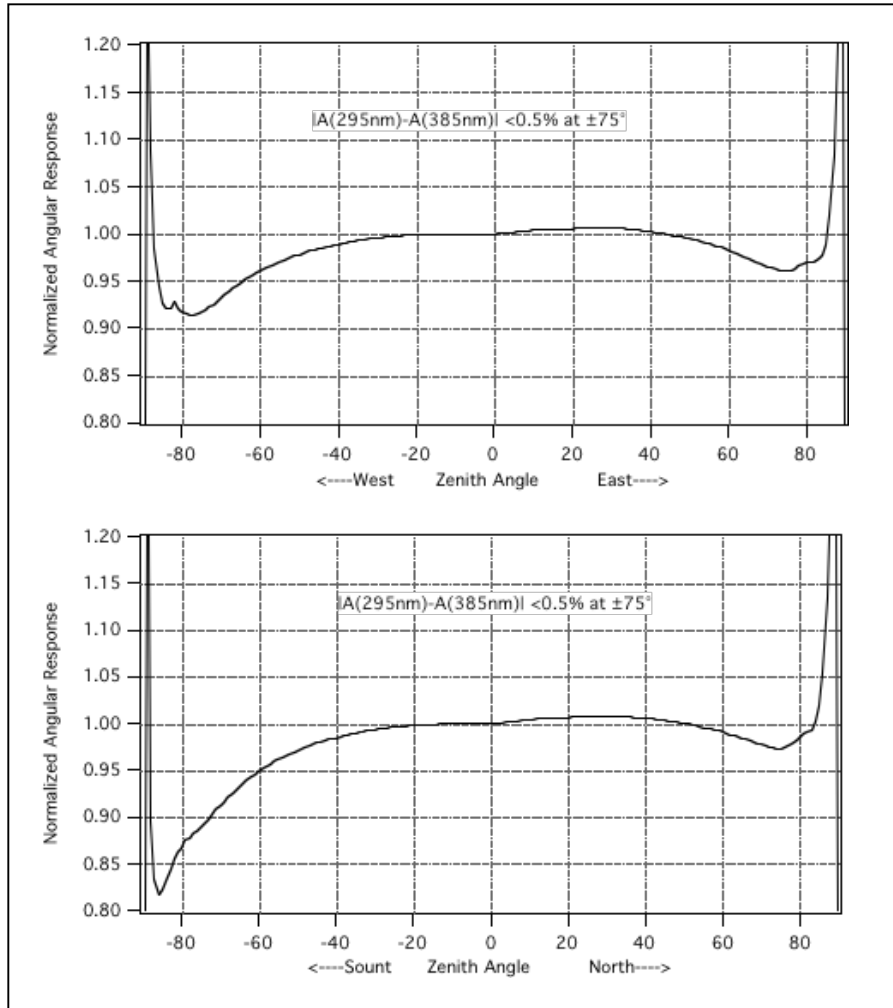
RSS104 resolution and pixel-wavelength dependence



RSS104 Slit function



UV-RSS cosine response



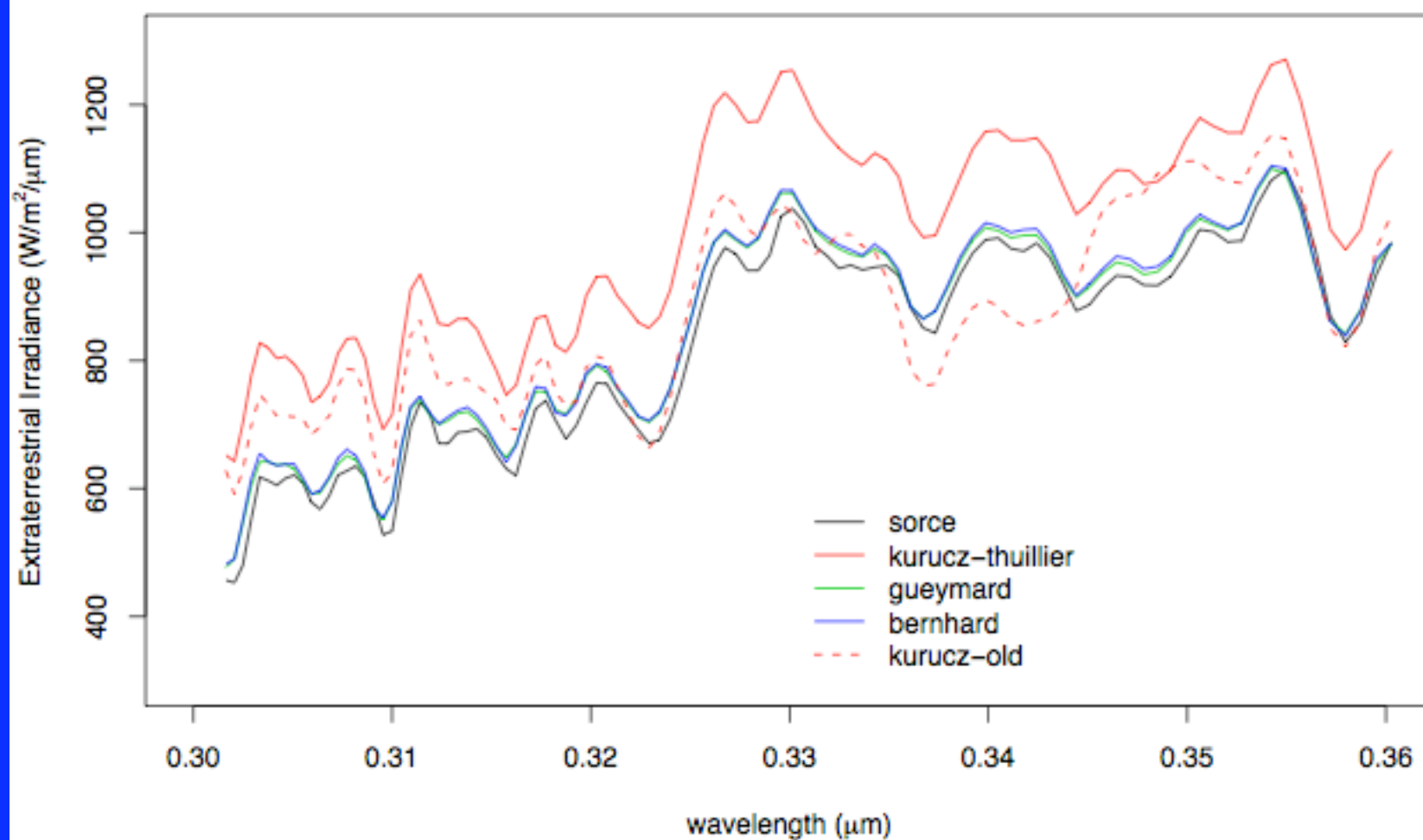
$$\iint \sin(\xi) \cos(\xi) (A_R(\xi, \alpha) - 1) R d\alpha d\xi < 0.5\%$$

Tropospheric UV Visible (TUV) RT Model (Madronich@NCAR)

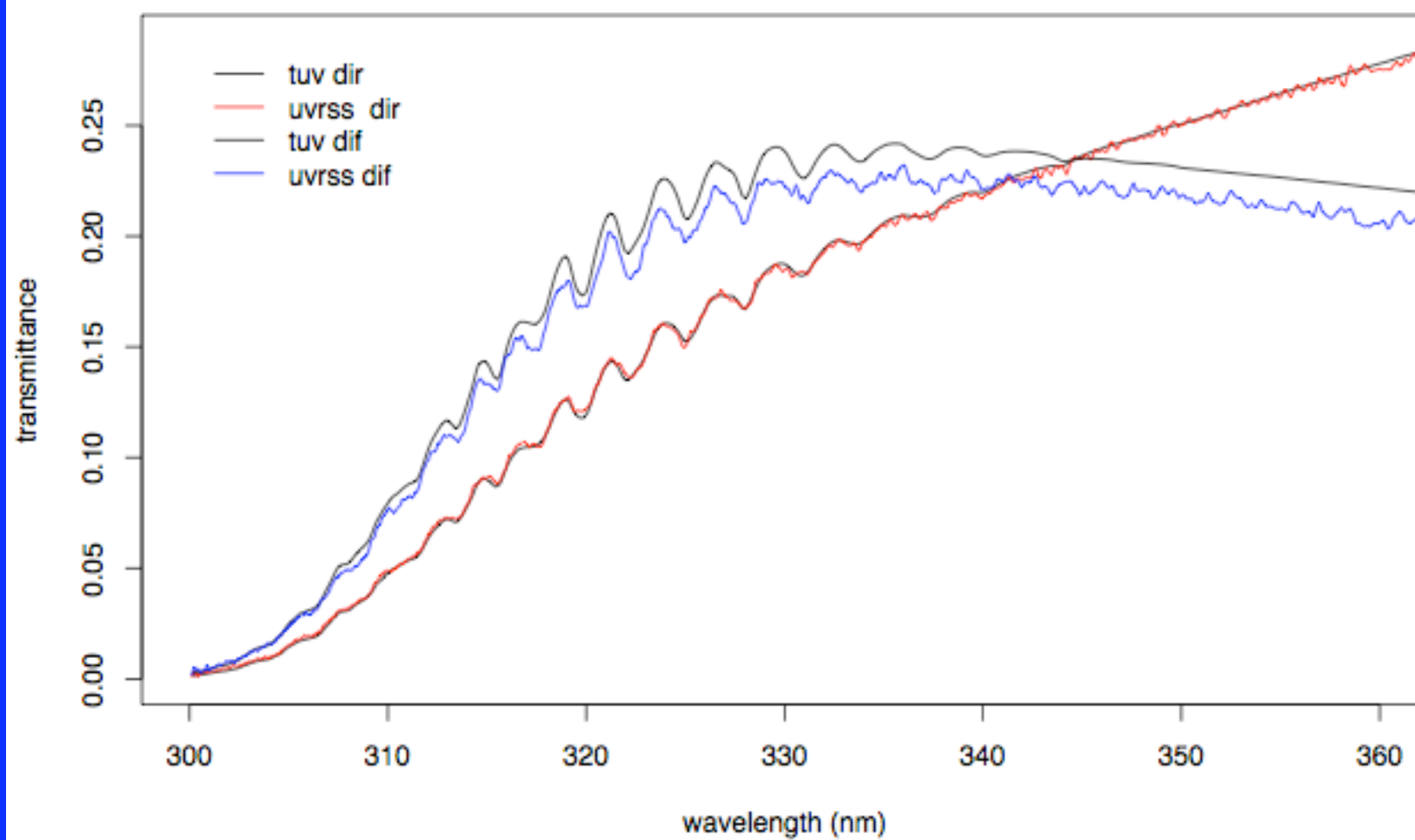
- Run at 0.1 nm resolution from 300-360 nm
- Bernhard ET spectrum (JGR-Atmos 2004)
- **Inputs:** 550 nm ssa; 550 nm asymmetry parameter; AOD and alpha based on τ @ 332, 415, and 500 nm; ozone was average of up to five measurements; assumed 0.015 surface albedo

Date	LST		solar elv (degs)	H2O (cm)	ozone (DU)	ssa	g	alpha	tau (550 nm)
11-May-03	920		45.1	1.09	320	0.971	0.573	1.047	0.078
11-May-03	1230	→	71.3	1.14	320	0.944	0.582	0.69	0.084
11-May-03	1500		51.5	1.13	320	0.957	0.552	0.606	→ 0.07
12-May-03	730		23.3	1.53	328	0.883	0.572	1.25	0.074
12-May-03	950		51.1	1.54	328	0.934	0.562	1.308	0.077
22-May-03	800		30.4	2.43	326	0.939	0.66	1.08	0.18
28-May-03	1800	→	17.9	2.71	322	0.951	0.619	1.108	→ 0.183

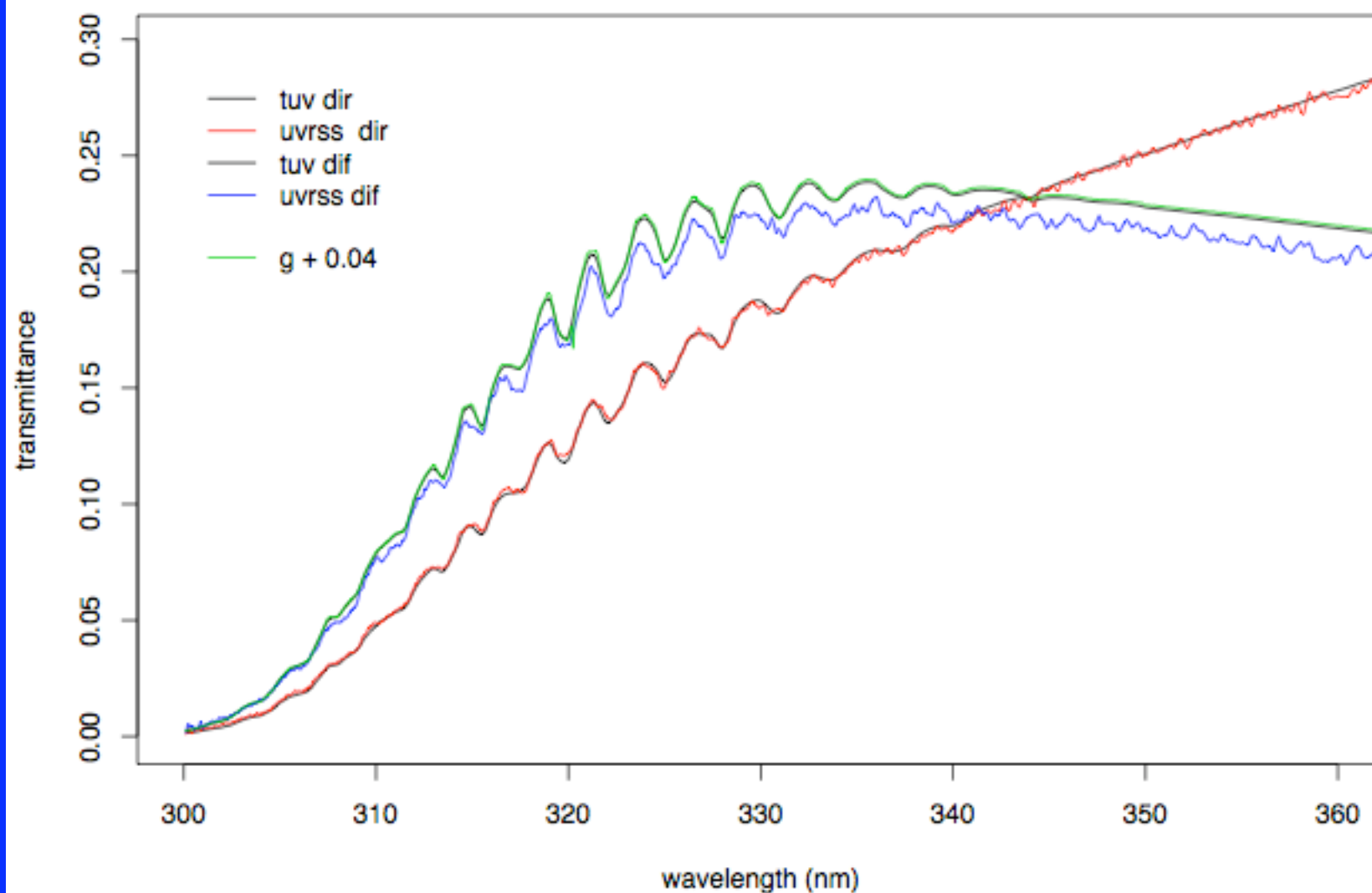
ET Irradiance in UV @ SORCE Resolution



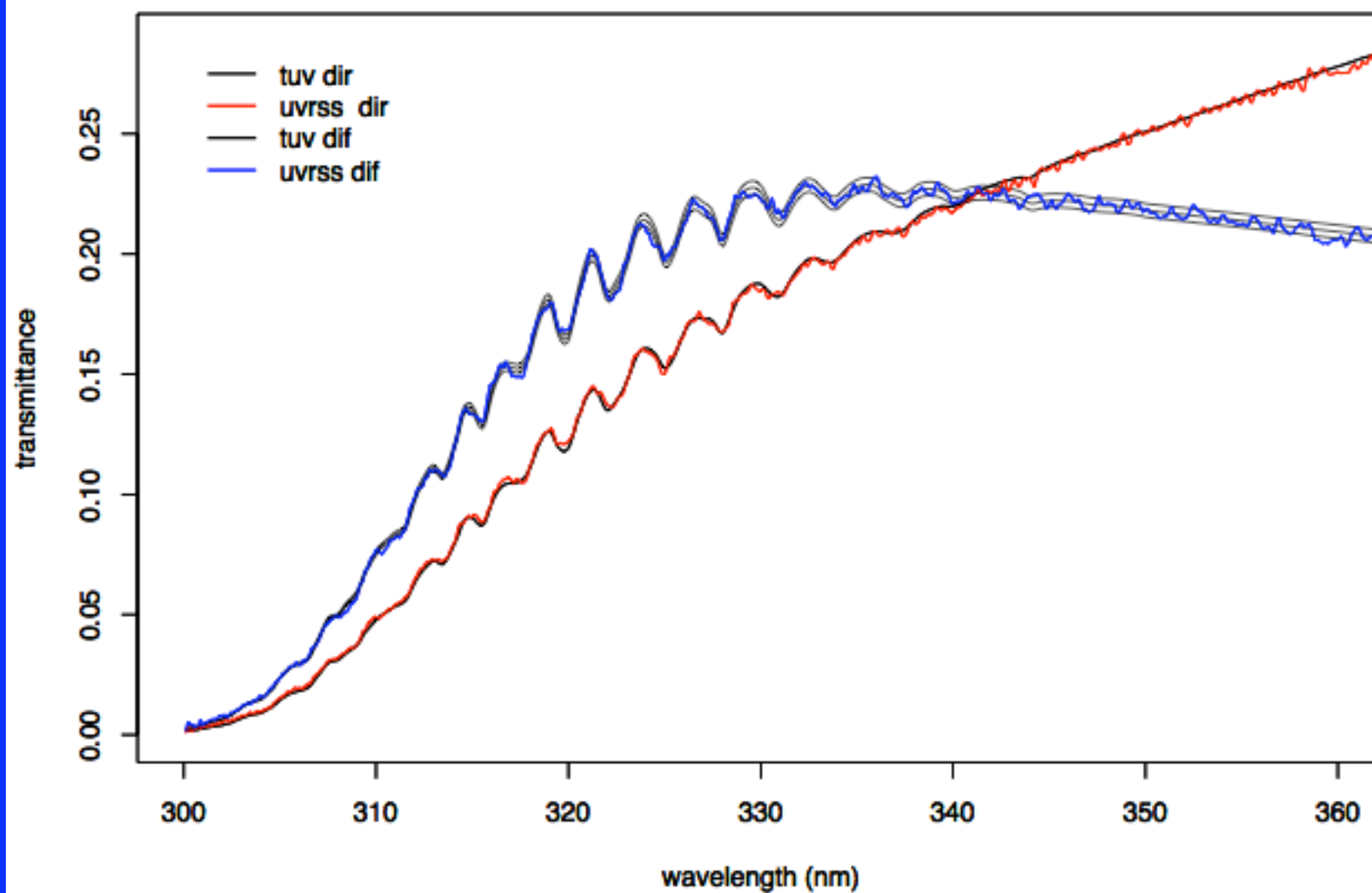
11 May 2003 0920; $\text{sza} = 44.9$; $\tau_{550} = 0.078$



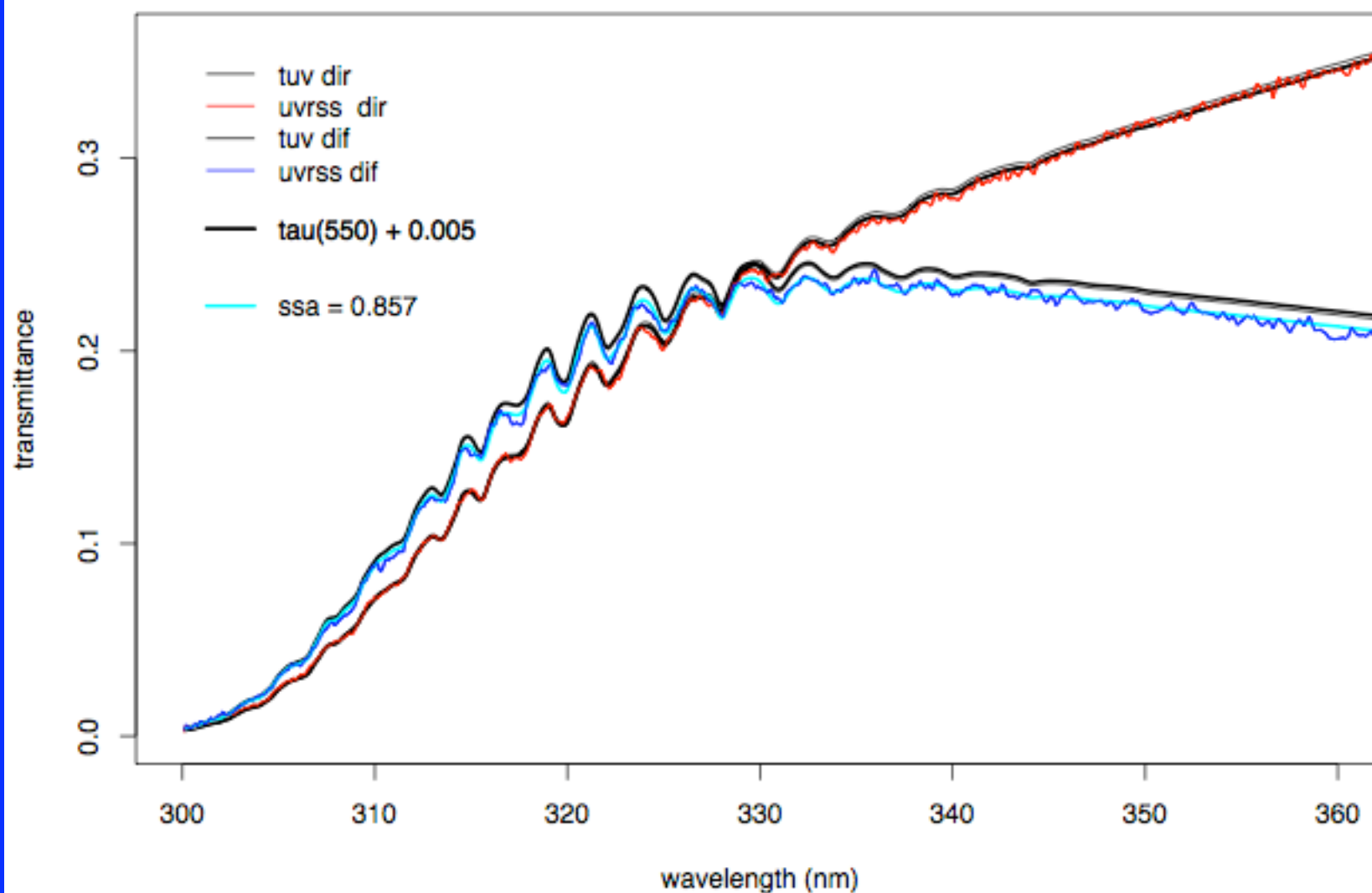
Same as Figure 2 except Asymmetry Parameter Higher by 0.04



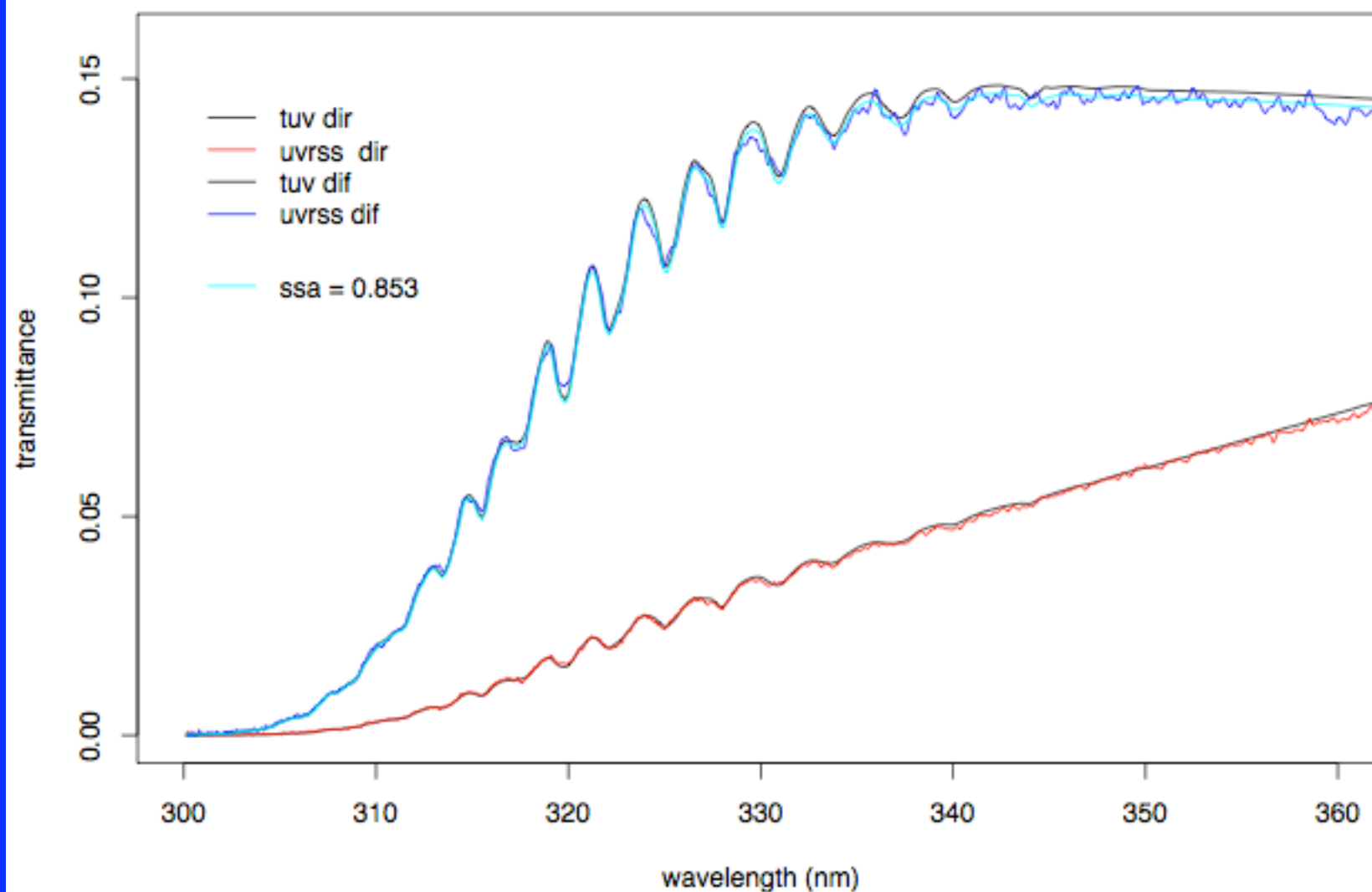
Same as Figure 2 except SSA = 0.901, 0.871, 0.841



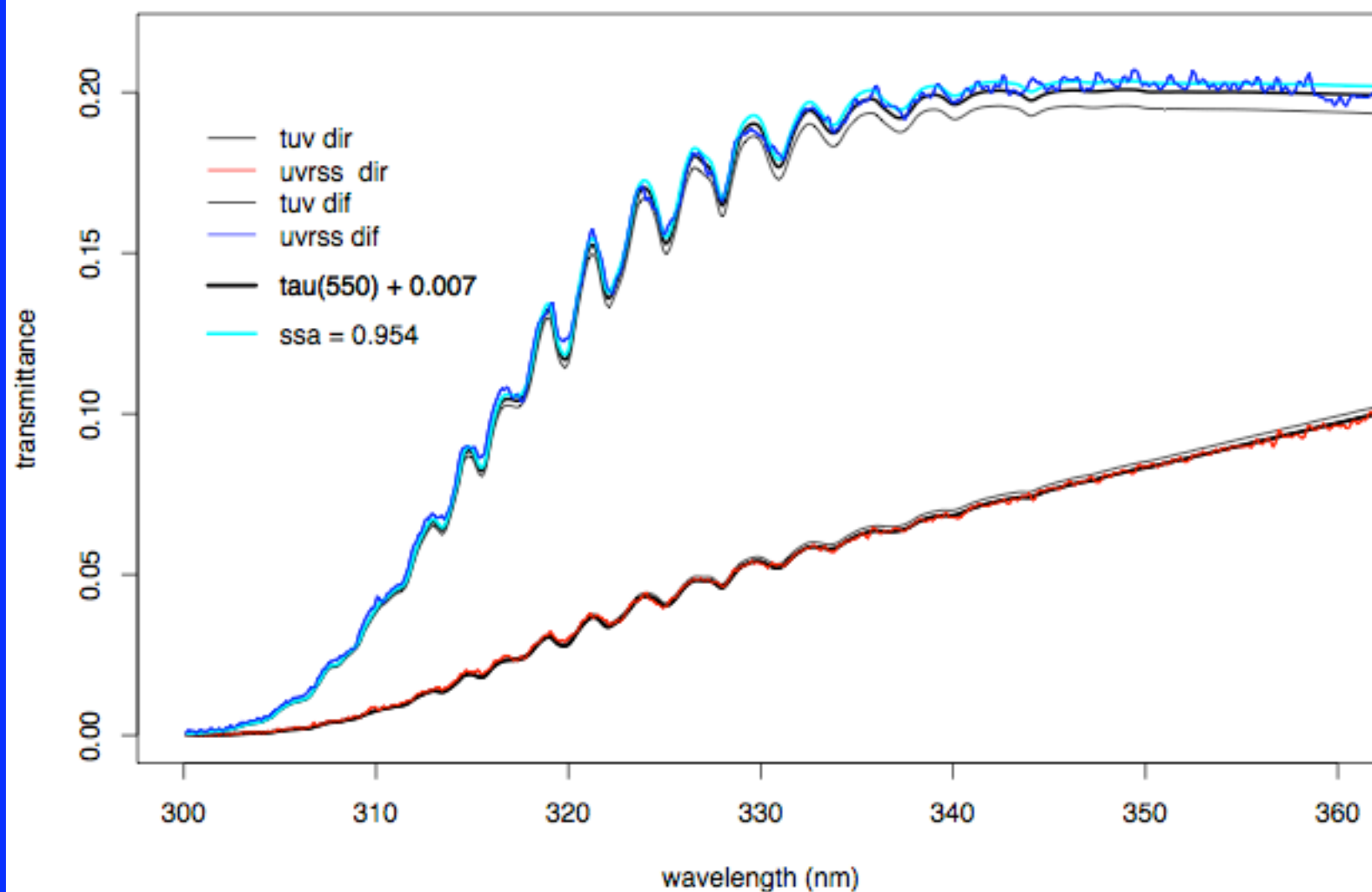
11 May 2003 @ 15:00; AOD(550 nm) = 0.07; SZA = 38.5 degs; SSA = 0.957



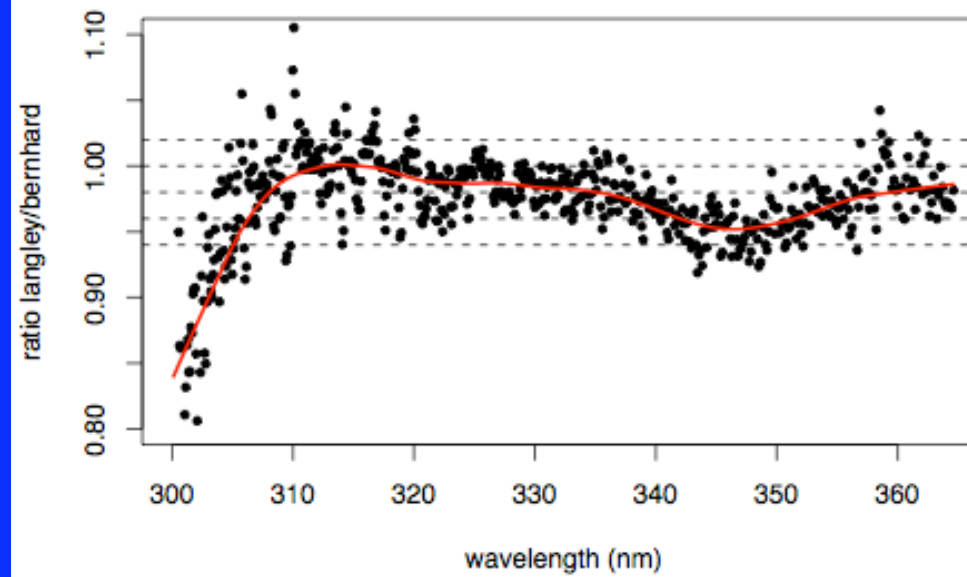
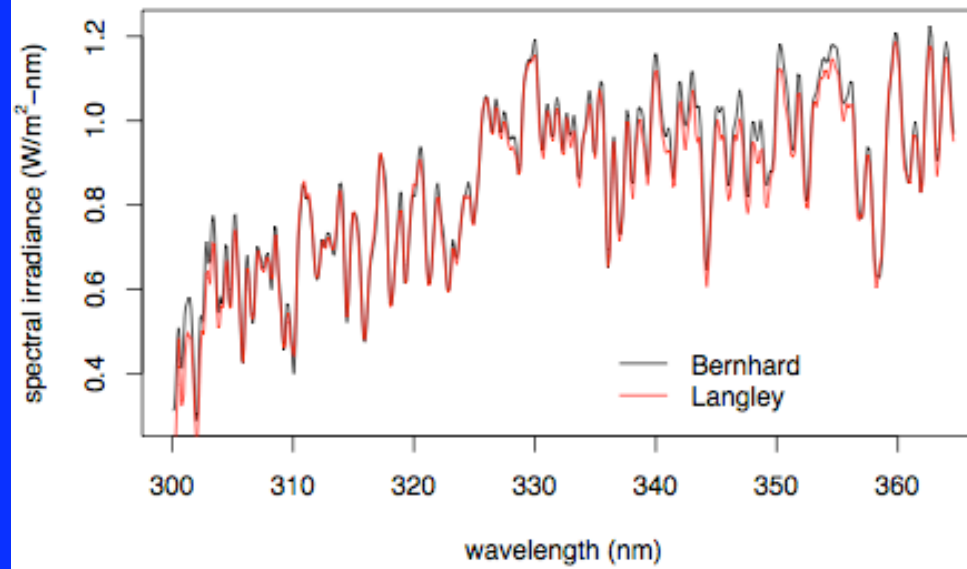
12 May 2003; 07:30 LST; AOD(550 nm) = 0.074; SZA = 66.7 Degs; SSA = 0.883



22 May 2003; 08:00 LST; AOD = 0.18; SZA = 59.6 Degs; SSA = 0.939



ET Spectra at UV-RSS Resolution from Langleys and Bernhard



Future Efforts

- Check slit functions over UV spectrum
- Exploit retrieval potential, specifically, ozone retrievals with 3 available x-sections
- ϖ_0 (ssa) retrievals in UV
- Validate models with UV inputs