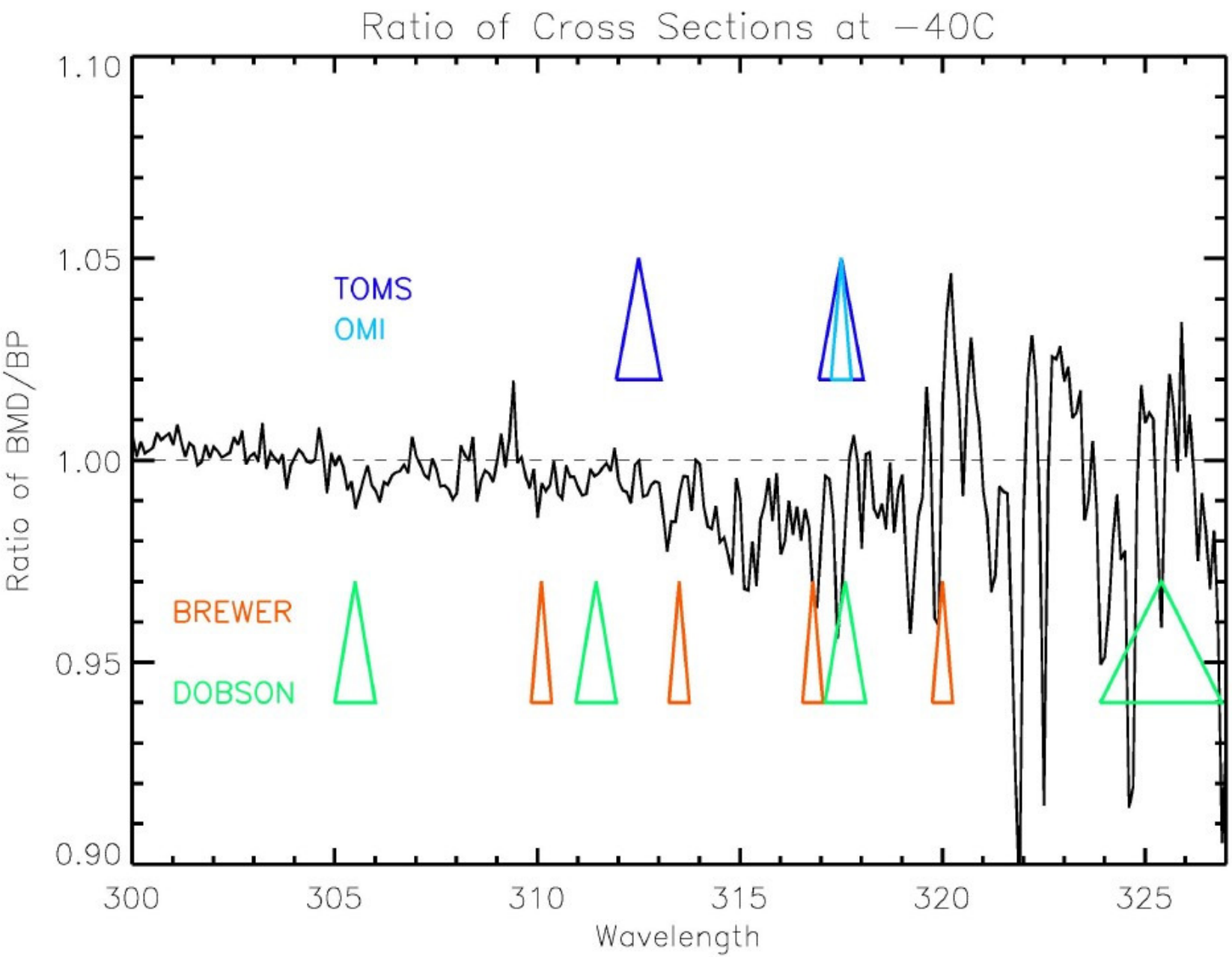
Effect of Daumont Cross Sections on OMI & GOME 2 Ozone Retrievals

(Plus a new method to measure this effect on ground-based instruments)

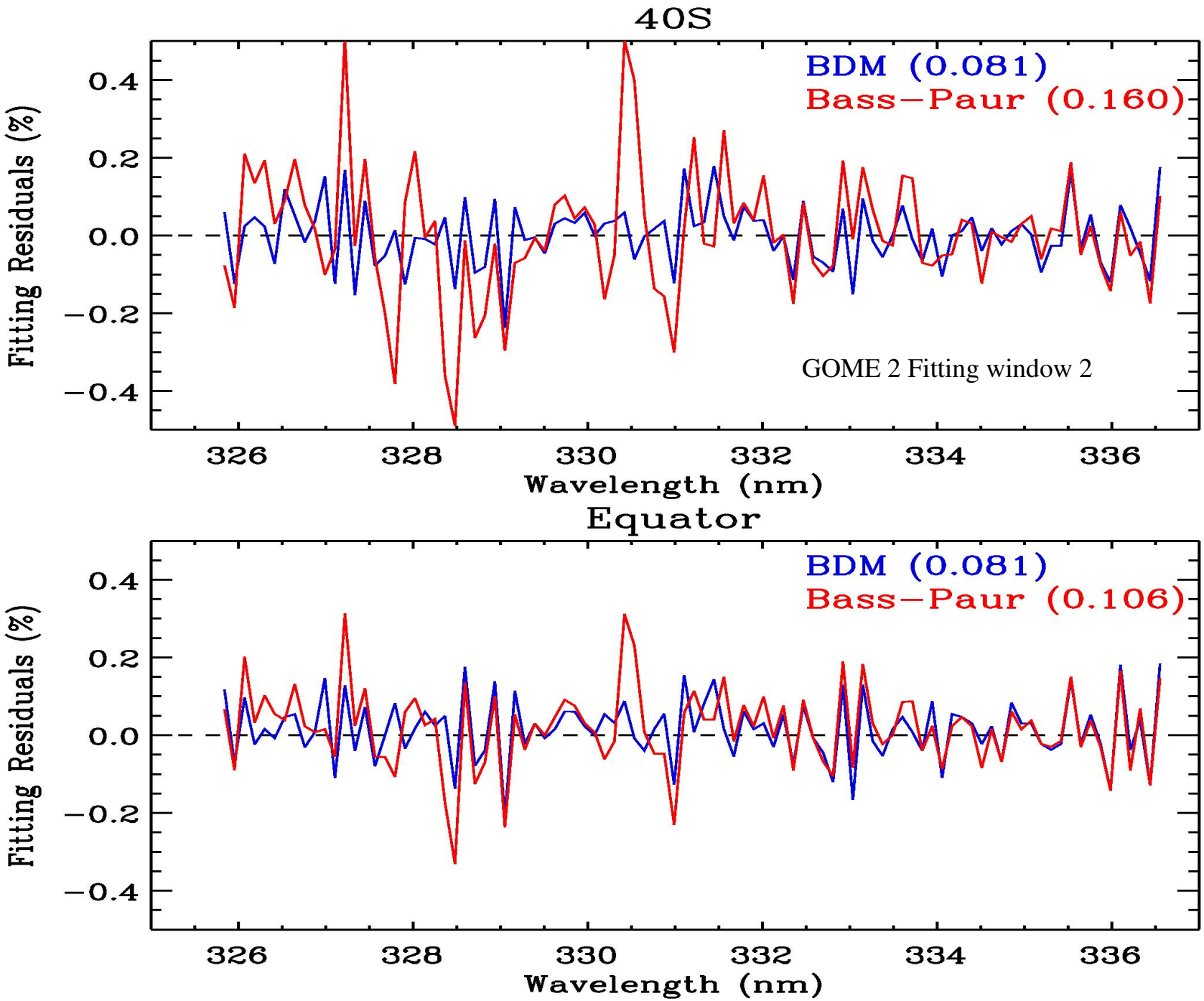
Gordon Labow

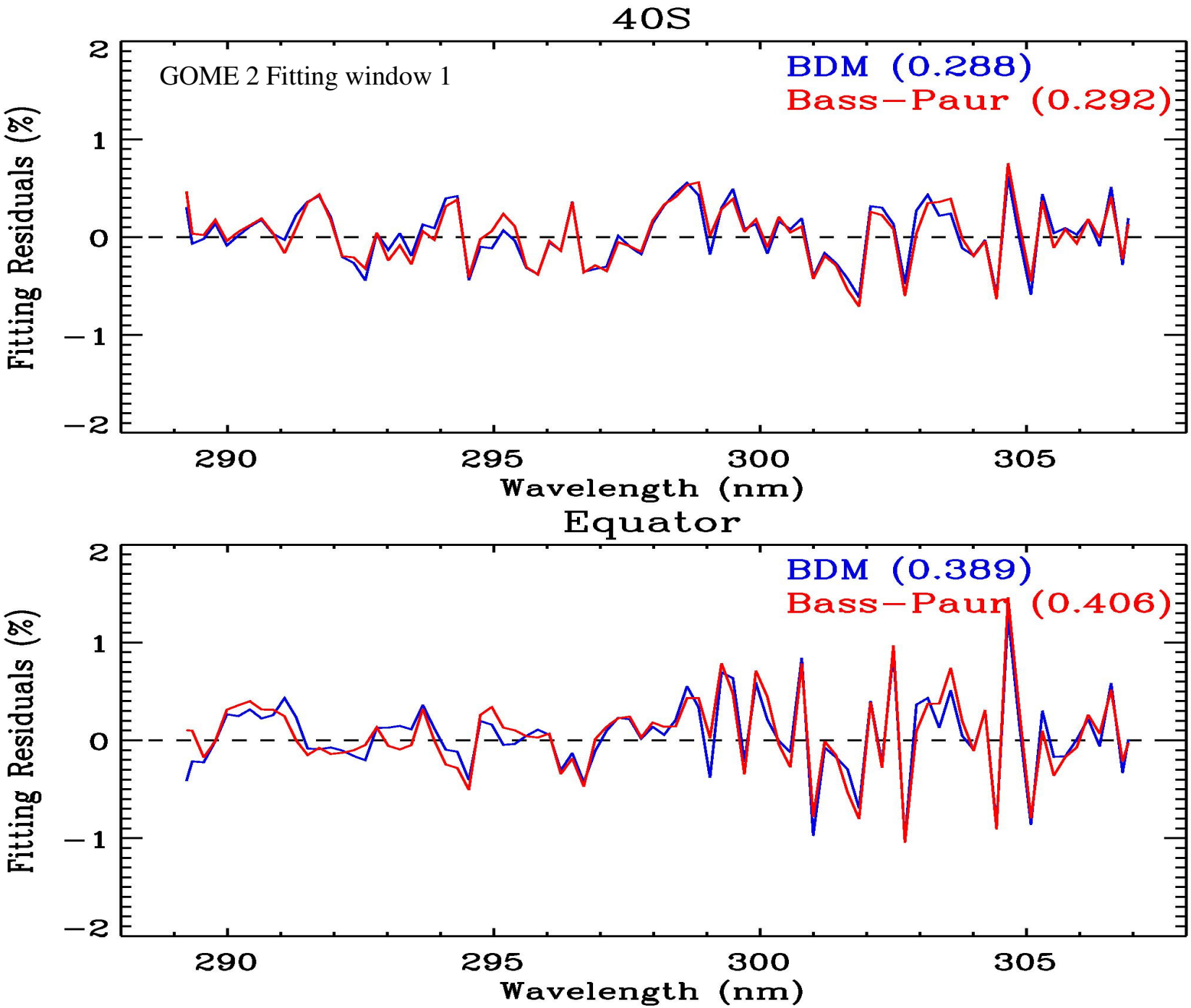

Ratio of Cross Sections at −40C
1.10
1.05
1.00
0.95
0.90
Ratio of BMD/BP
TOMS
OMI
BREWER
DOBSON
300
305
310
315
320
325
Wavelength

Residual Analysis

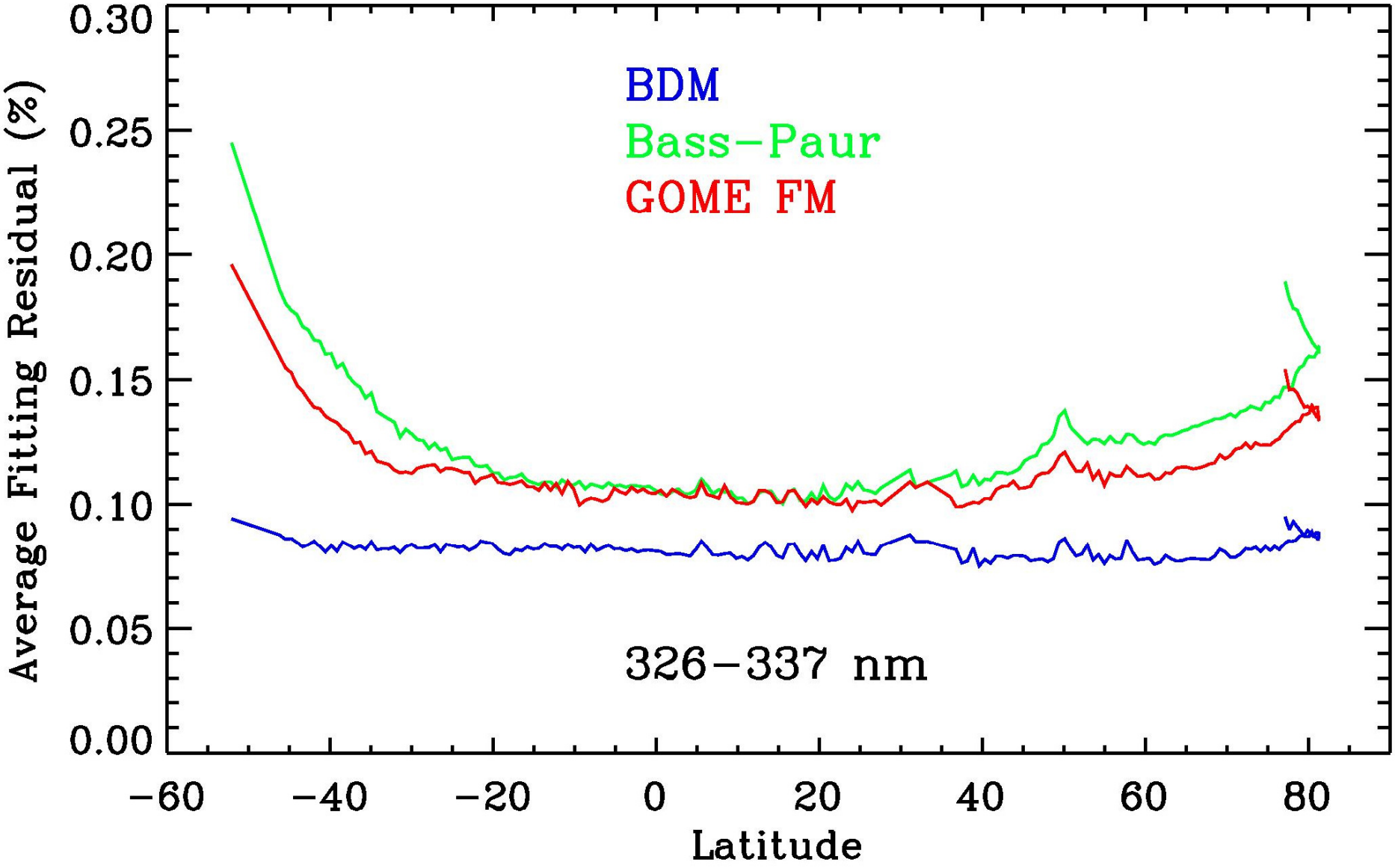
- Take clear sky spectra
- Remove all known signals

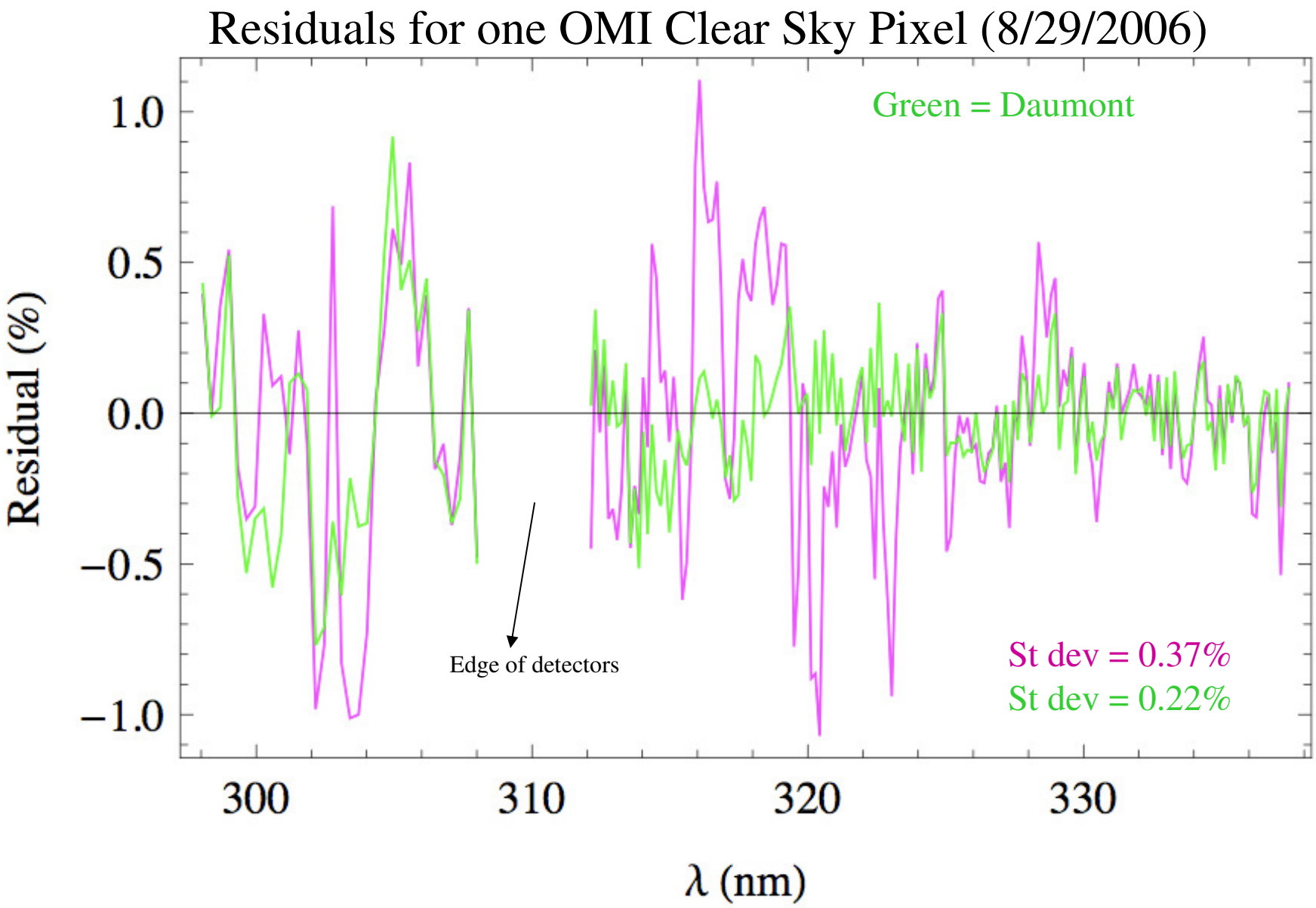
  -Ozone, trace gases (SO_2,BrO, CHCO, NO_2) aerosols, Rayleigh, clouds, adjust for *temperature*, surface albedo
- Analyze remaining signal (or noise)
- Switch cross sections (& change nothing else)
- Method applied to GOME 2 and OMI


40S
BDM (0.081)
Bass−Paur (0.160)
GOME 2 Fitting window 2
Fitting Residuals (%)
0.4
0.2
0.0
−0.2
−0.4
326
328
330
332
334
336
Wavelength (nm)
Equator
BDM (0.081)
Bass−Paur (0.106)
Fitting Residuals (%)
0.4
0.2
0.0
−0.2
−0.4
326
328
330
332
334
336
Wavelength (nm)


40S
GOME 2 Fitting window 1
BDM (0.288)
Bass−Paur (0.292)
Fitting Residuals (%)
2
1
0
−1
−2
290
295
300
305
Wavelength (nm)
Equator
BDM (0.389)
Bass−Paur (0.406)
Fitting Residuals (%)
2
1
0
−1
−2
290
295
300
305
Wavelength (nm)

24 June, 1997 GOME 2 – One Orbit




Residuals for one OMI Clear Sky Pixel (8/29/2006)
Green = Daumont
St dev = 0.37%
St dev = 0.22%
Edge of detectors
Residual (%)
1.0
0.5
0.0
−0.5
−1.0
300
310
320
330
λ (nm)

"New" Ground-based Analysis

- Residual analysis analogous to Satellite Method
- Ratio of DS signal taken at high sun & at low sun
- Apply to Beer's Law:

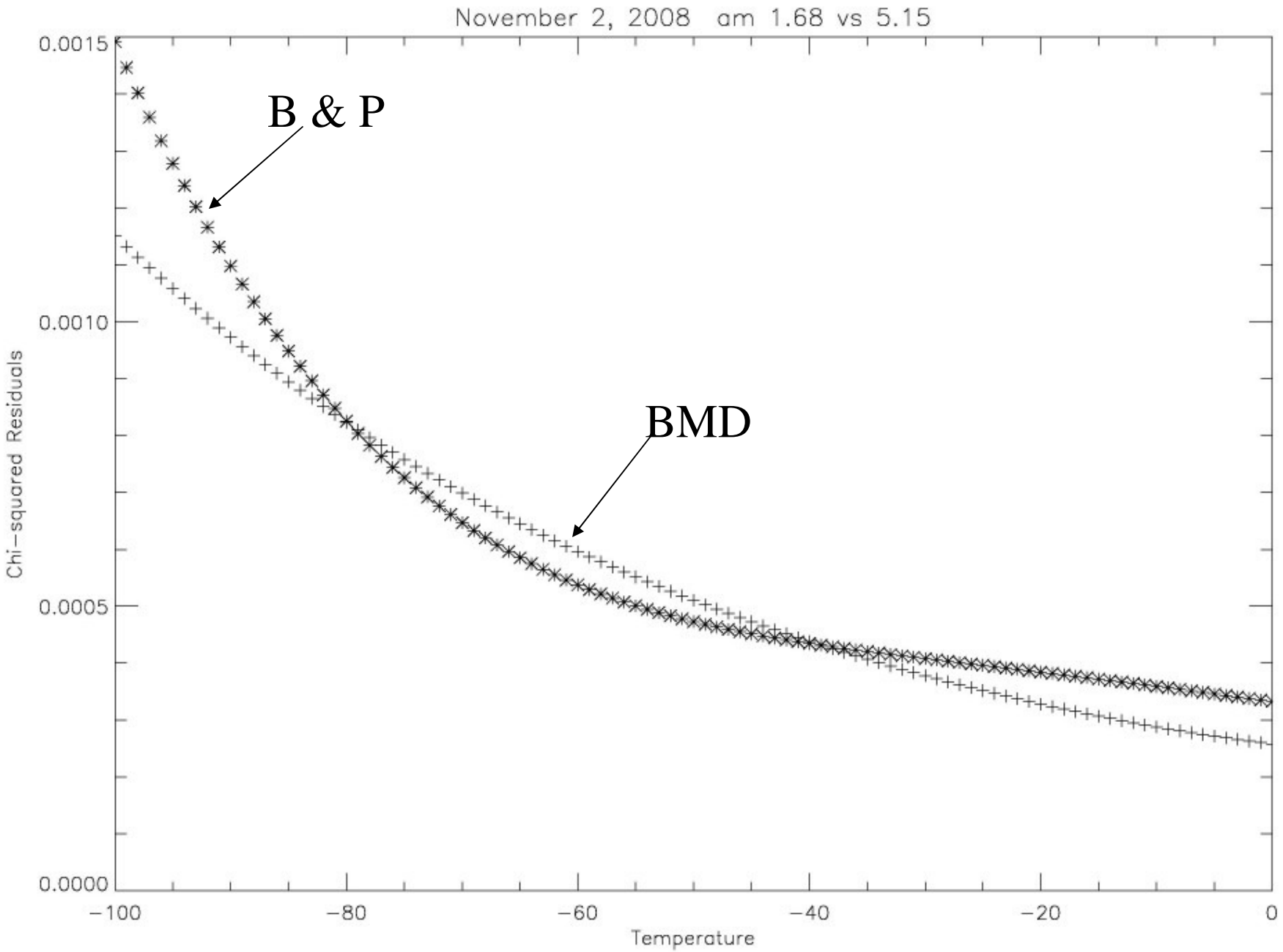
Aerosol term

Ozone term

$$\log(counts_{noon}/counts_{hza}) + \beta\,(press_{noon} \bullet m_{noon} - press_{hza} \bullet m_{hza}) = A \bullet (\lambda/\lambda_o)^b + \alpha \bullet K$$

β=Rayleigh b=aerosol angstrom coefficient α=ozone cross section

-Assume value for b and solve for A & K by least squares regression
-Regress using B&P and DBM cross sections at various temperatures
-Analyze fitting residuals


November 2, 2008 am 1.68 vs 5.15
B & P
BMD
Chi-squared Residuals
0.0015
0.0010
0.0005
0.0000
−100
−80
−60
−40
−20
0
Temperature

Conclusions:

- Satellite residuals favor DBM cross sections
- Temperature dependence is clearly better

- Ground-based analysis shows less temperature dependence
- Need better (more stable) ground-based DS measurements (G. Mount's MF DOAS??)