

# The effect of new ozone cross sections on TOMS and SBUV processing

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# TOMS / SBUV Processing

## ■ Version 8

### • Test processing

- Bass & Paur tables (no Raman correction)
- Daumont (identical table generation)
- Daumont with OMI-based cloud height

### • Production processing (*summer 2010*)

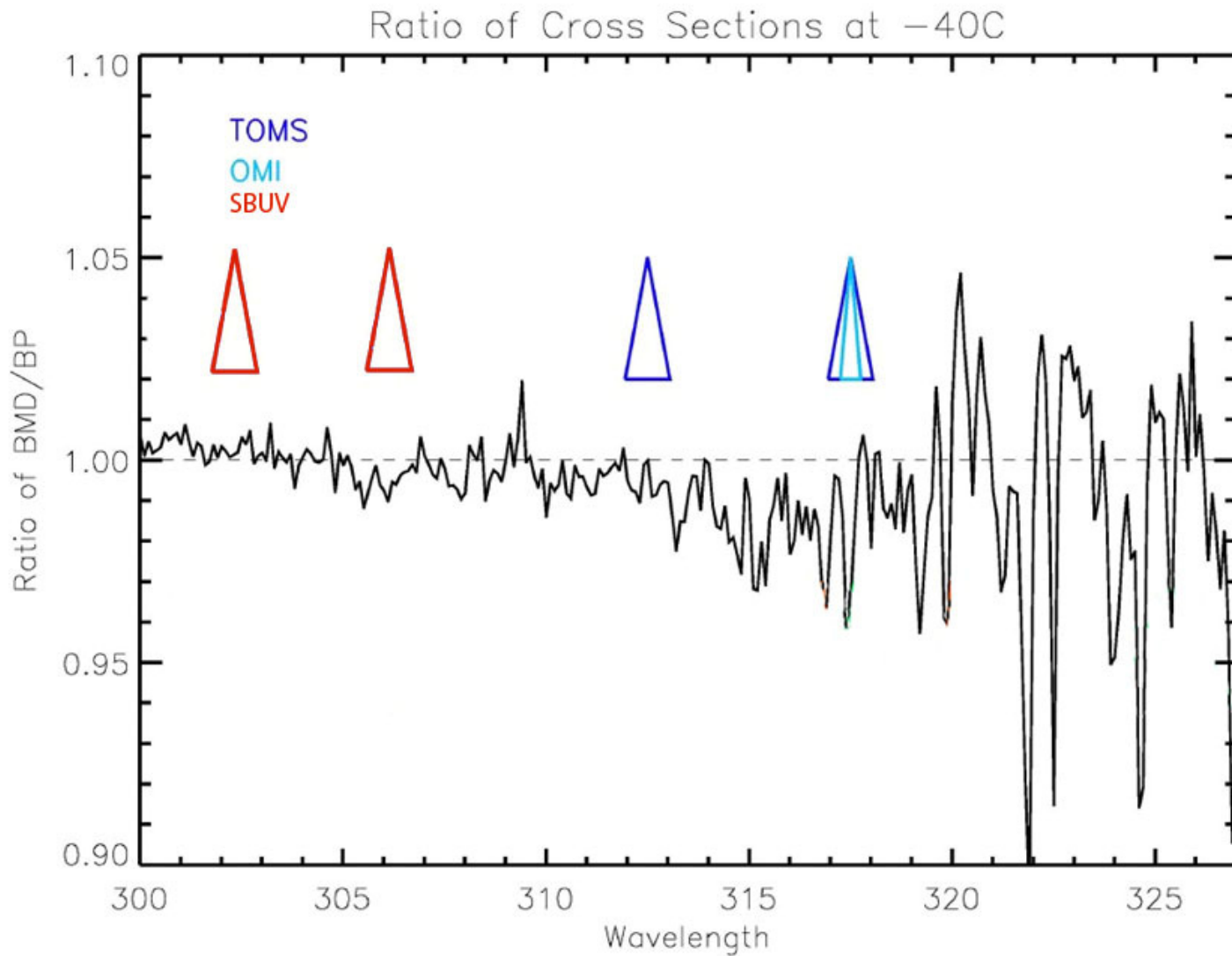
- Nimbus 7 TOMS (1978-1993)
- Nimbus 7 SBUV (1978-1990)
- NOAA 9,11,16,17,18 SBUV/2
- Earth Probe TOMS (1996-2000/2005)
- OMI (2004-2010)

## ■ Version 9 (*winter 2010 - 2011?*)

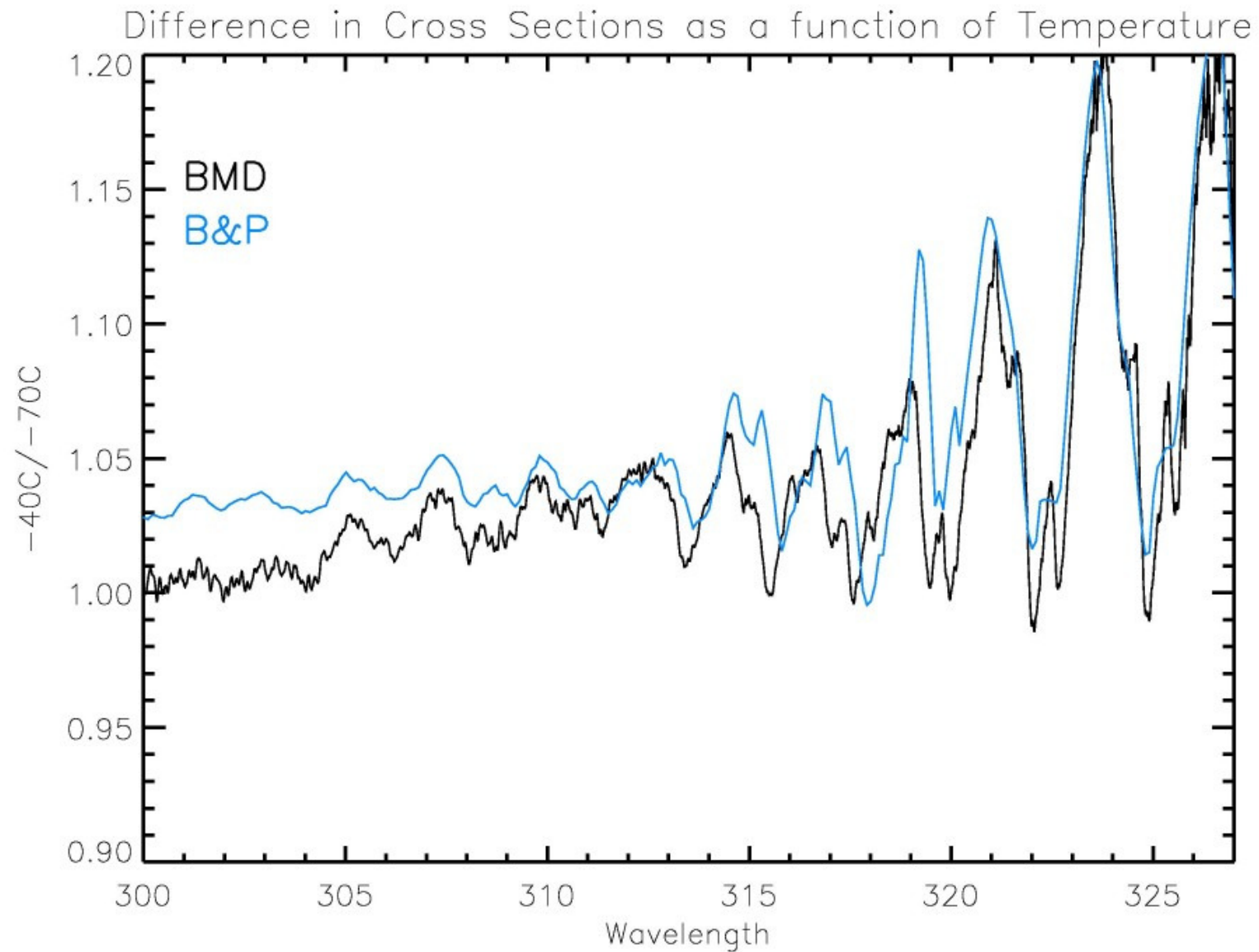
# TOMS / SBUV Processing

(cont.)

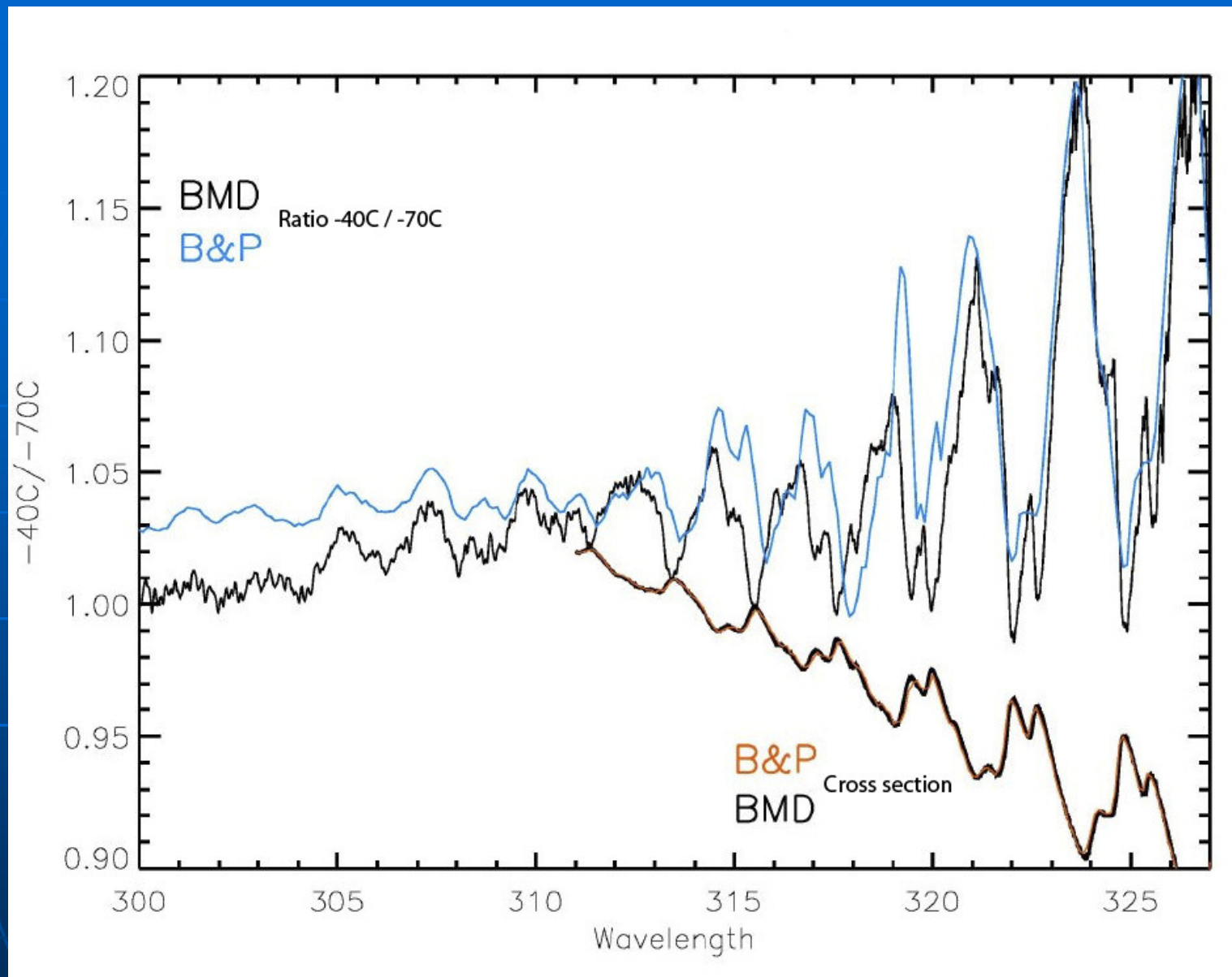
- Version 8
- Version 9 (*winter 2010 - 2011?*)
  - SBUV V9 algorithm designed to process all buv data collected since 1970 including OMI, SBUV/2, and OMPS.
  - Use optical centroid pressure (OCP) derived from Rotational Raman scattering to locate the cloud vertically.
  - Use an atmospheric opacity parameter (currently called radiative cloud fraction) derived from 340/380 nm reflectance ratios to estimate O<sub>3</sub> absorption in the atmosphere below clouds.
  - Derive spectrally varying (Lambert-equivalent) reflectance to account for ocean color and glint, and effects of absorbing aerosols and clouds.



The ratio of BDM to B&P increasingly different  $>315$  nm



Temperature dependence is significantly different



BDM temperature dependence is consistent with spectrum

# Earth Probe TOMS ozone cross sections

wavelength	Bass & Paur	BDM	% diff
308.65	2.965	2.964	+0.0%
312.56	1.644	1.634	-0.6%
<b>317.57</b>	<b>0.8752</b>	<b>0.8640</b>	-1.3%
322.37	0.4808	0.4762	-1.0%
<b>331.29</b>	<b>0.1410</b>	<b>0.1395</b>	-1.1%
360.40	-	-	-
<b>B pair</b>	<b>0.7342</b>	<b>0.7245</b>	<b>-1.3%</b>

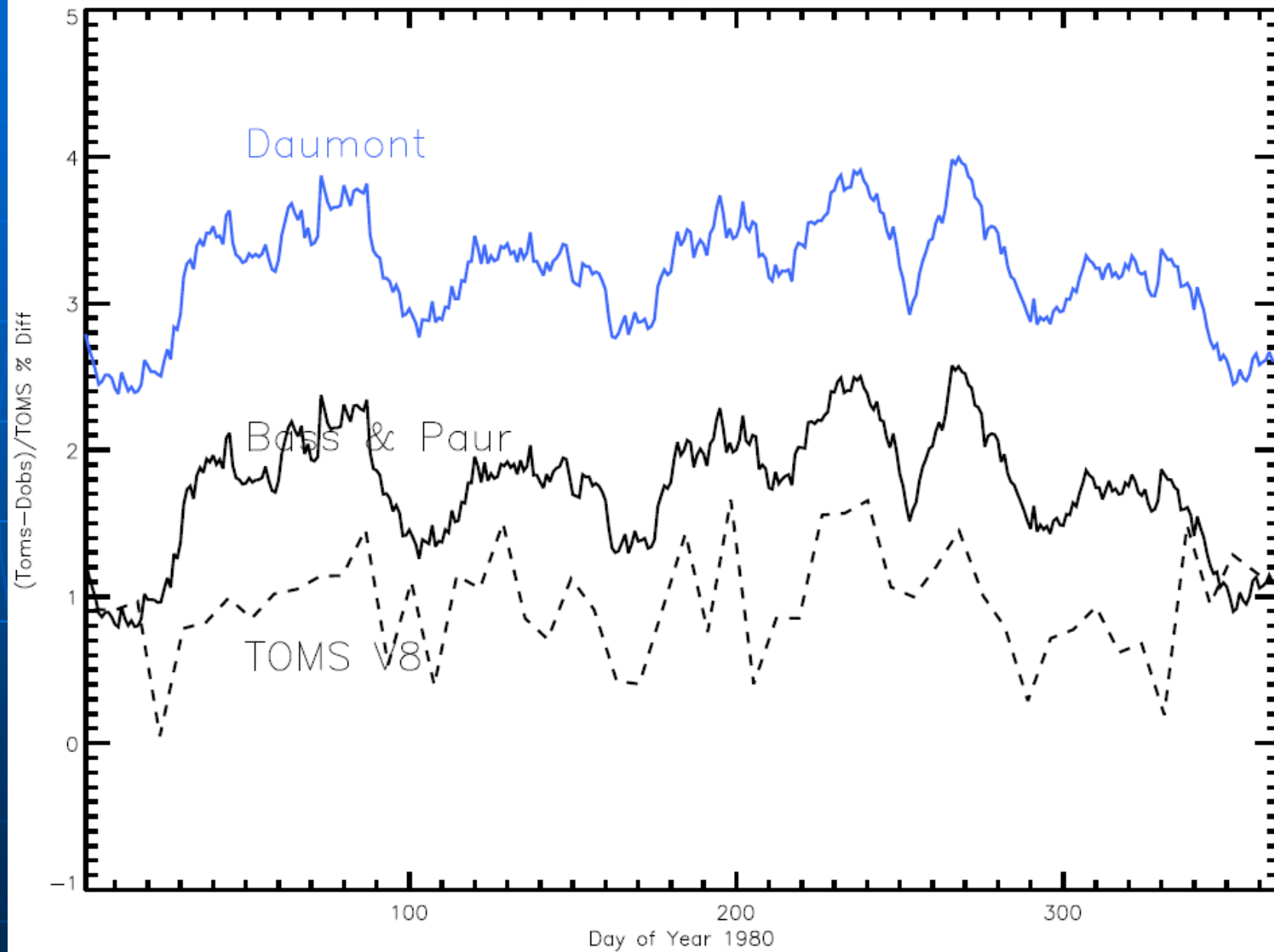
B pair ozone used at most latitudes for all v8 TOMS and OMI processing

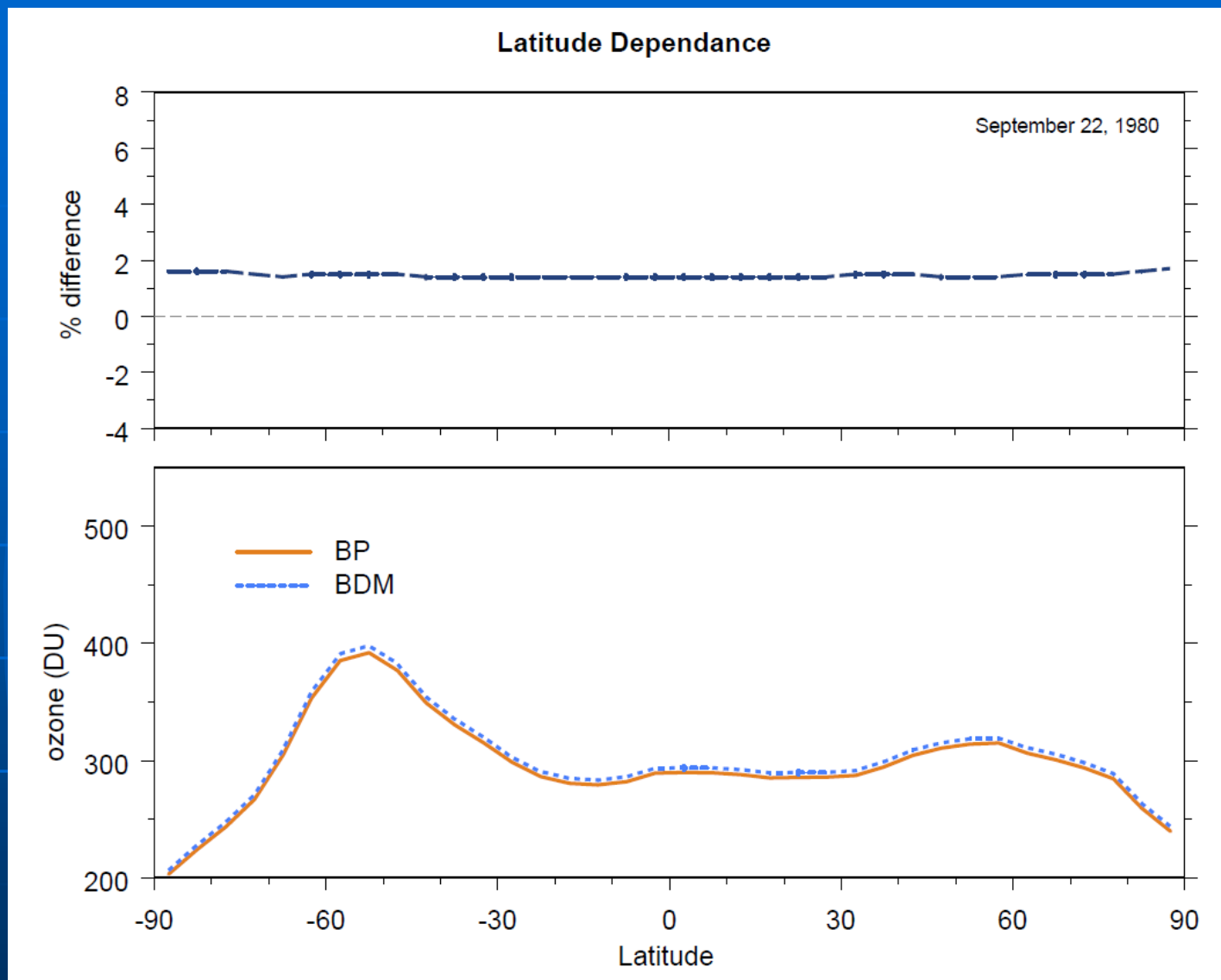
*Note: T = -45° C*

Test Processing:  
one full year of data from Nimbus 7 TOMS  
(1980)

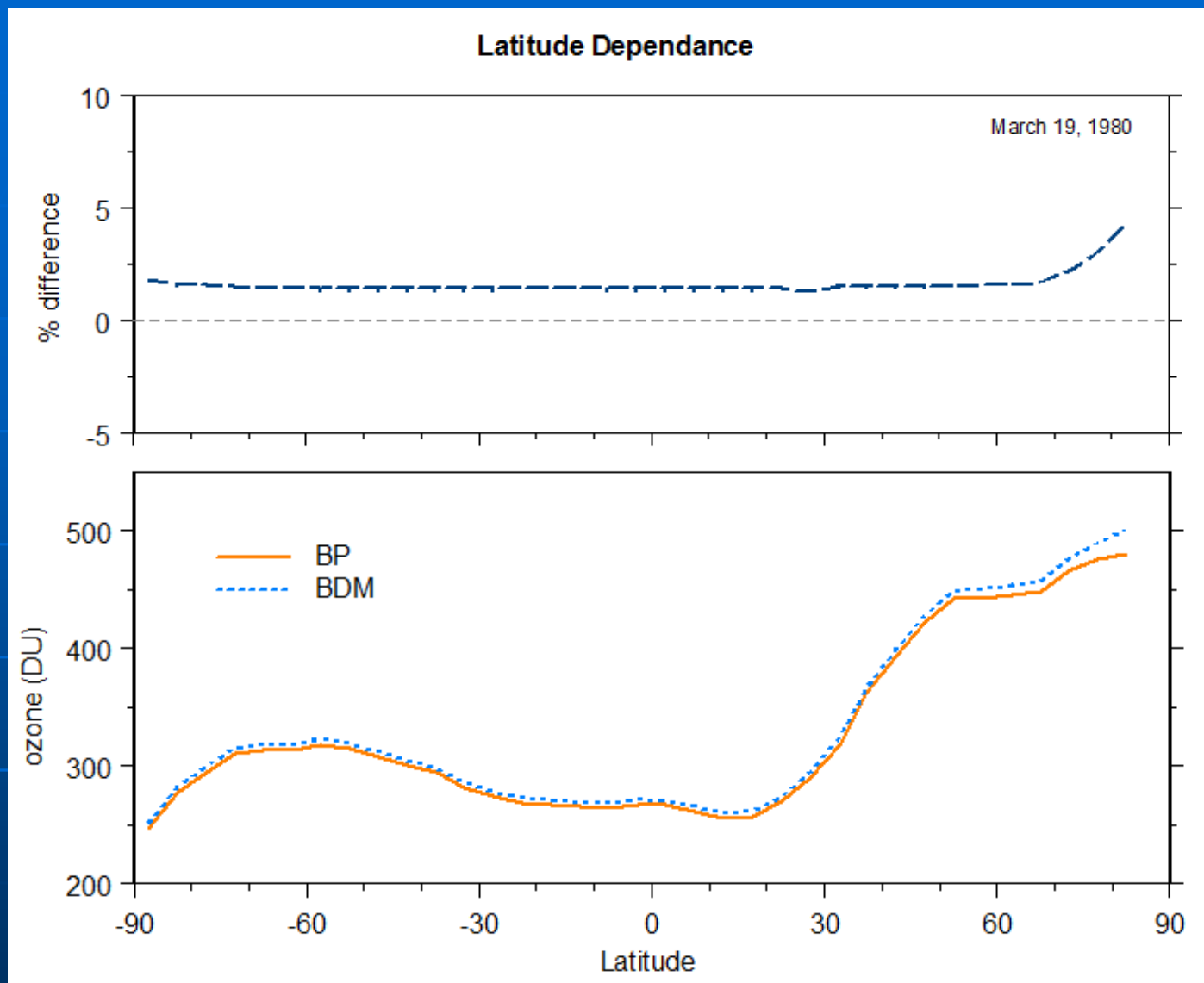


Nimbus 7 TOMS vs 30 N. Hemi Stations

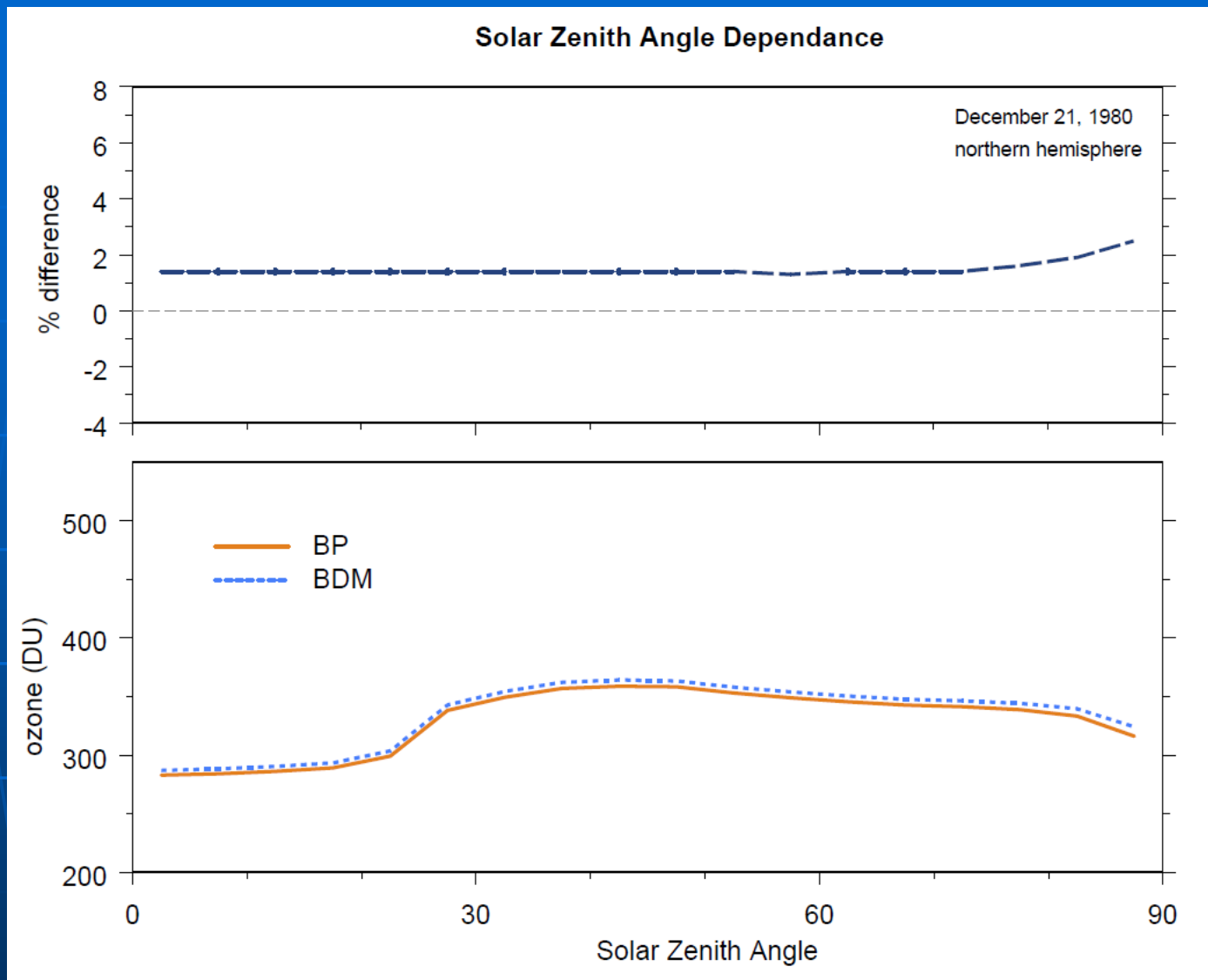




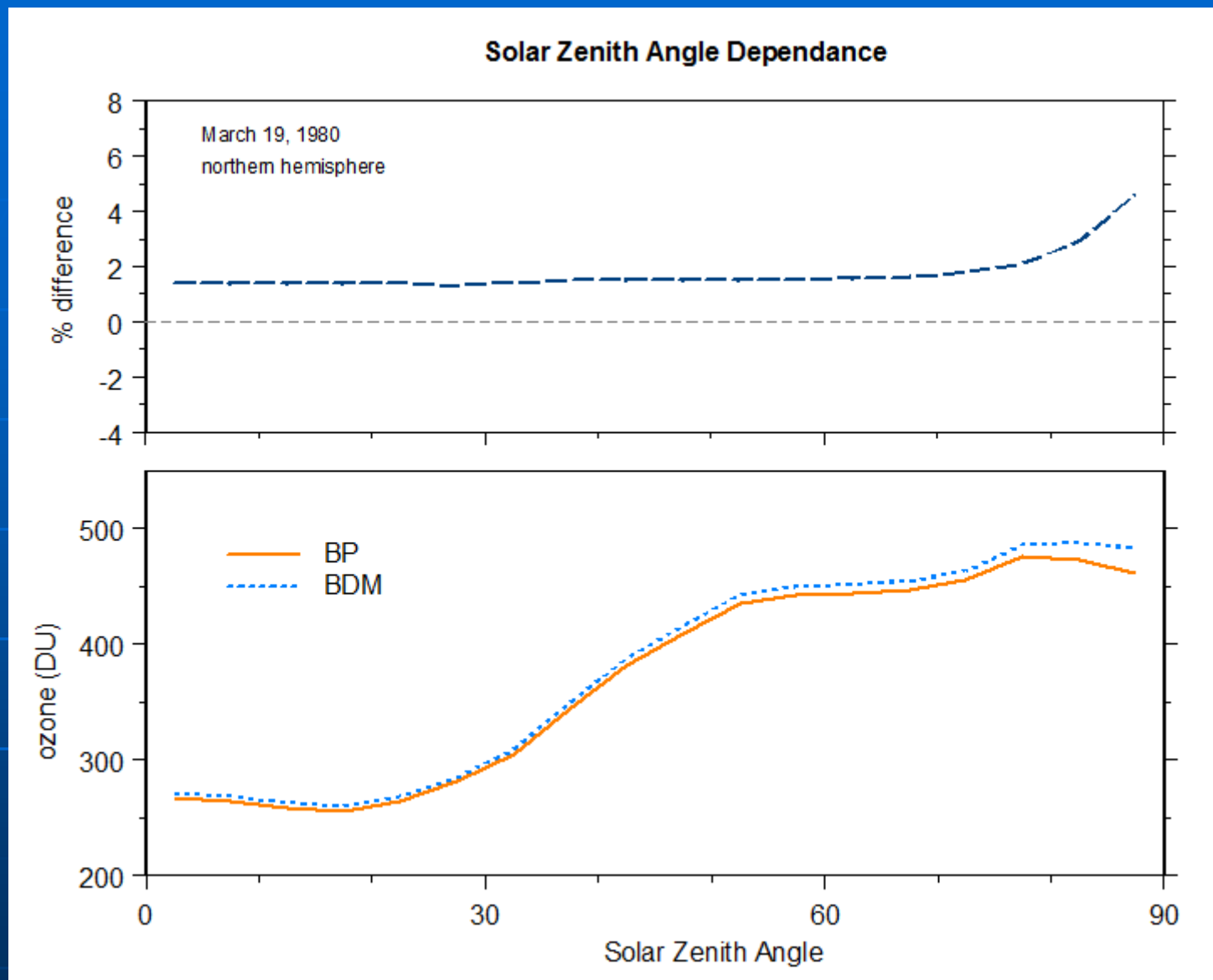
Effect of using BDM cross sections on N7 TOMS retrievals for data from September 22, 1980. Average offset +1.5%.



In northern hemisphere March differences as high as 4% at high latitudes.



Differences of +2.5% at high SZA with ozone  $\sim$ 300 DU



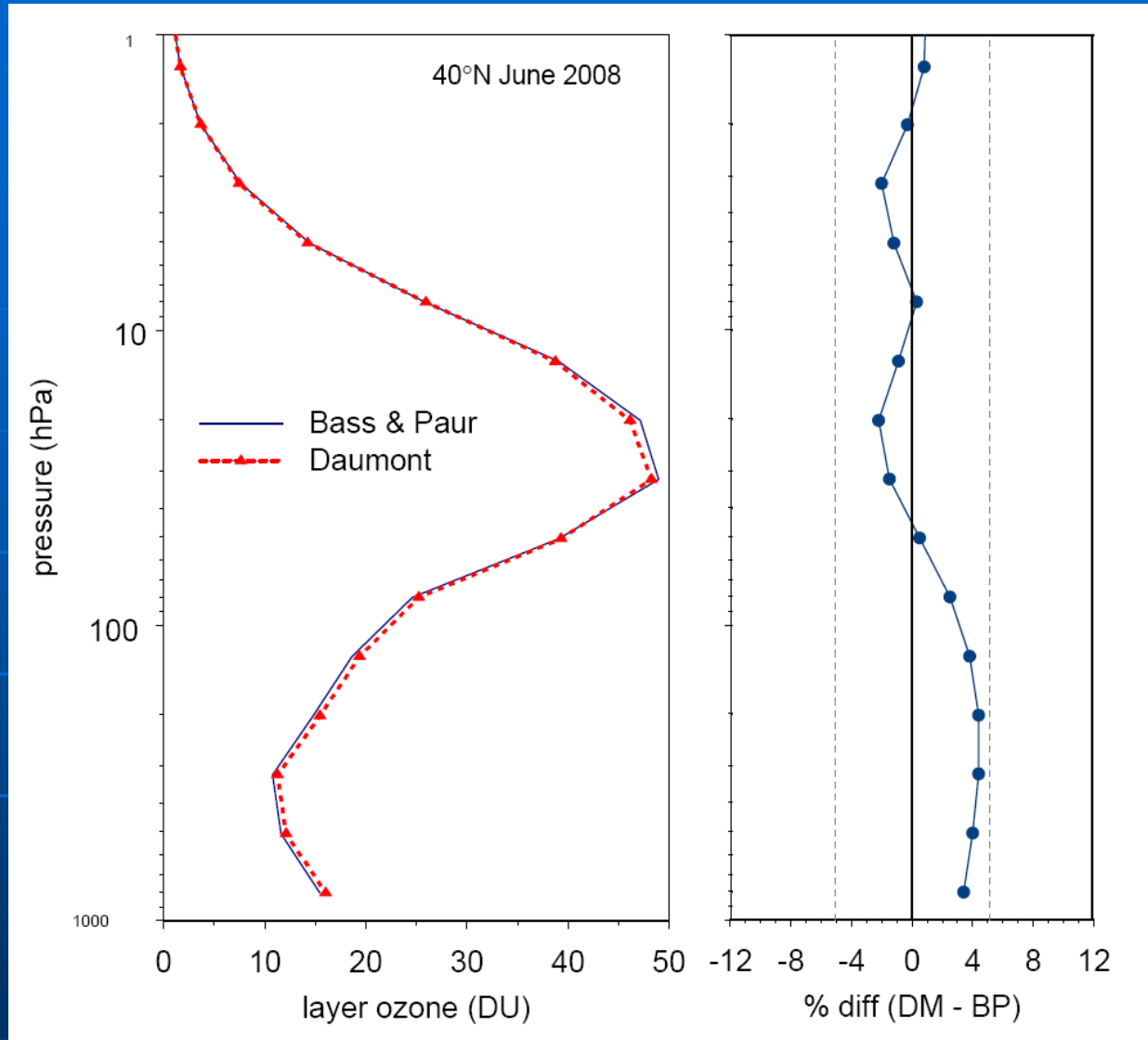
Differences of up to 4.0% at high SZA with ozone  $\sim$ 500 DU

# SBUV ozone cross sections

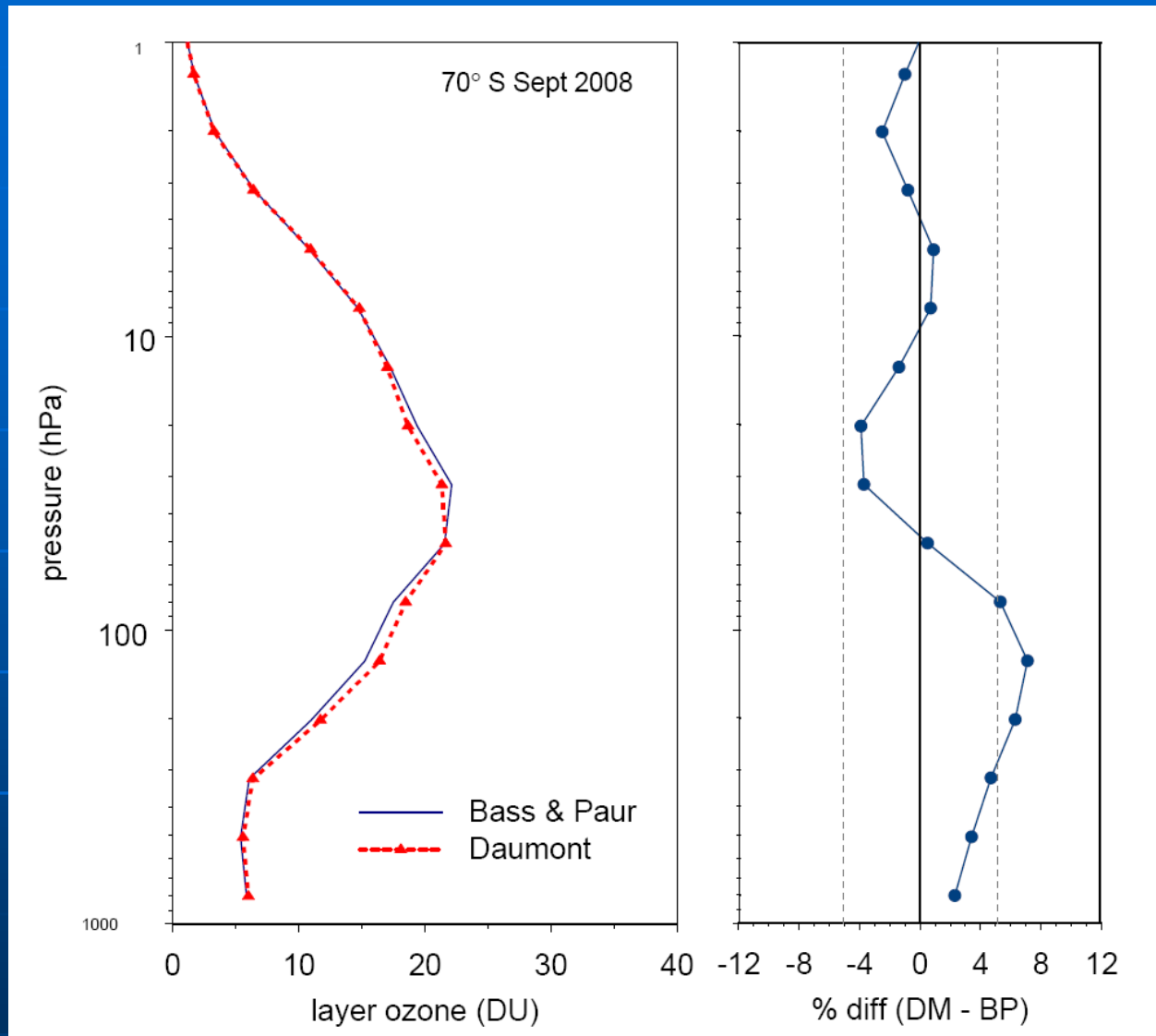
wavelength	Bass & Paur	Daumont	% diff
255.65	309.8	304.9	-1.6%
273.61	169.8	169.3	-0.3%
283.10	79.78	79.49	-0.4%
287.70	48.31	48.61	+0.6%
292.29	27.77	27.91	+0.5%
297.59	13.63	13.76	+1.0%
301.97	7.346	7.384	+0.5%
305.87	4.247	4.239	-0.2%
312.56	1.804	1.794	-0.6%
317.56	0.9678	0.9532	-1.5%
331.26	0.1668	0.1642	-1.5%
339.89	0.0366	0.0366	+0.0%



*Note: includes altitude dependent temperature*



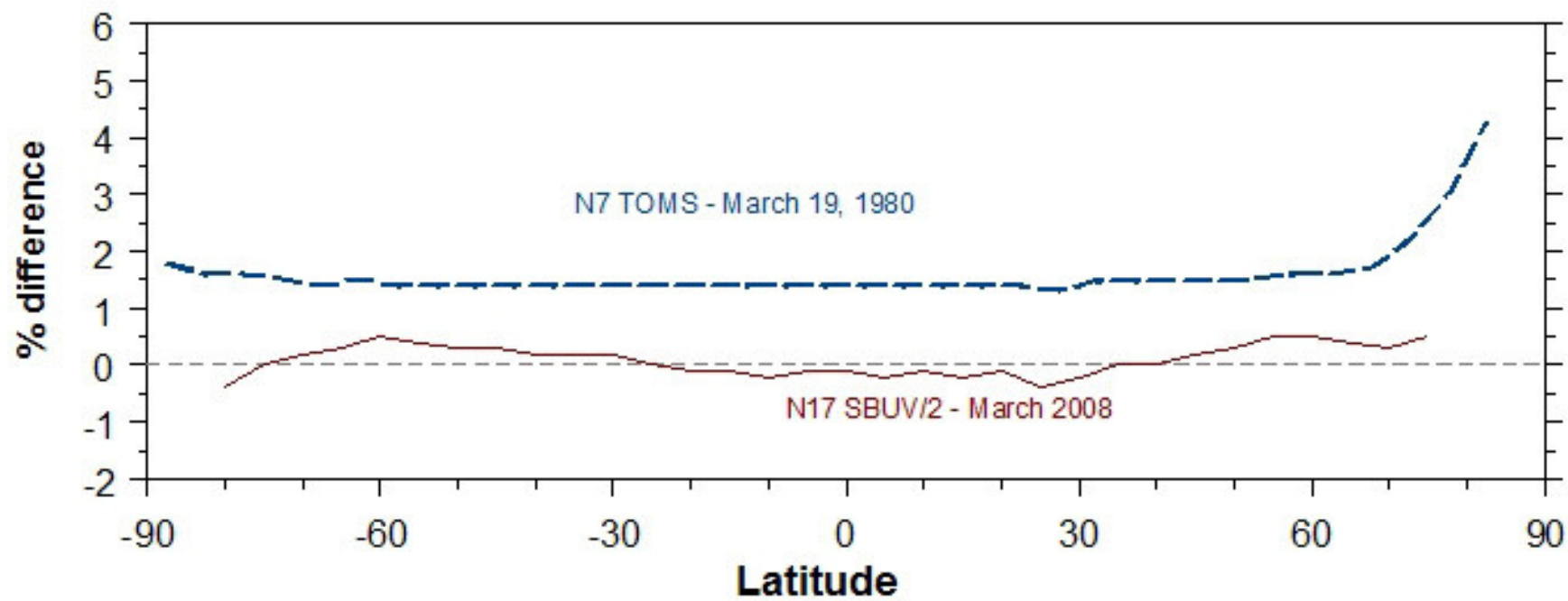
SBUV profile retrieval using BDM cross sections produces lower ozone near the peak and larger ozone in the troposphere.



The largest differences are seen at high latitudes in the troposphere.



### Latitude Dependence



# Conclusion

- Our current plan is to use BDM cross sections for version 9 TOMS/OMI and SBUV processing
  - Initial processing of all with Vsn 8 + BDM + OMI cloud height
- Total column ozone will increase  $\sim 1.5\%$
- Profile ozone column change near 0%
  - Question of absolute agreement of TOMS/OMI vs SBUV