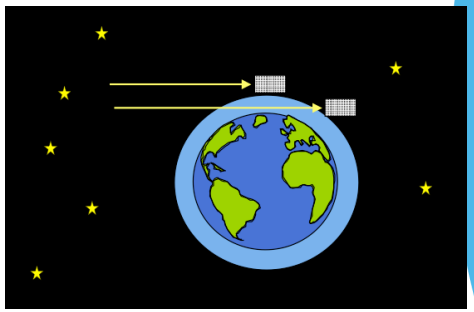
Impact of the uncertainty of cross sections in GOMOS retrievals



Erkki Kyrölä and Johanna Tamminen
Finnish Meteorological Institute

Ozone Theme Meeting 2010 on Absorption Cross Sections of Ozone
WMO, Geneva, March 23-25 2010

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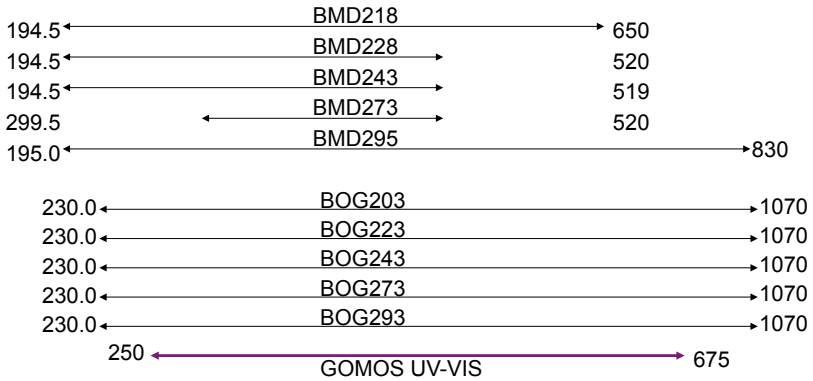
BMD and Bogumil et al. V3 cross sections

200 250 300 350 400 450 500 550 600 650 700nm



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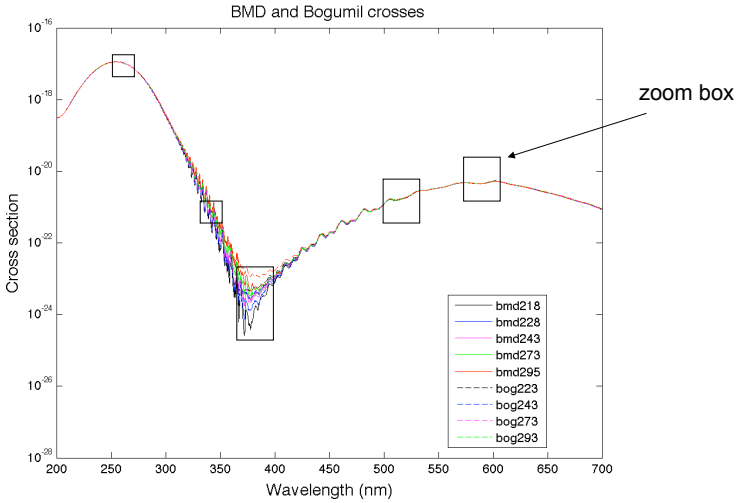

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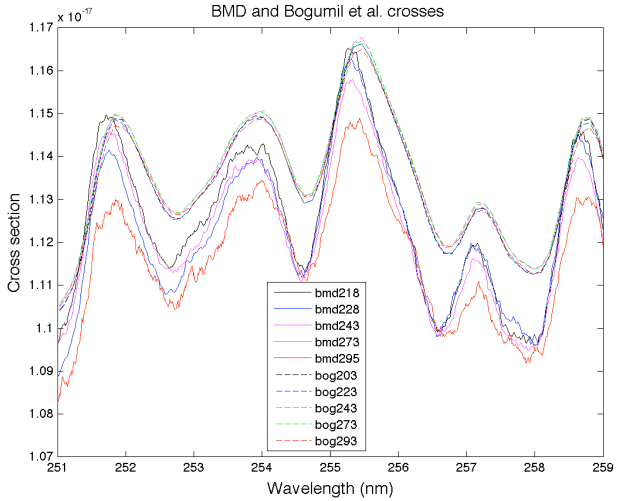

Note – **green** and **magenta** in same temperature.
Difference about -1%

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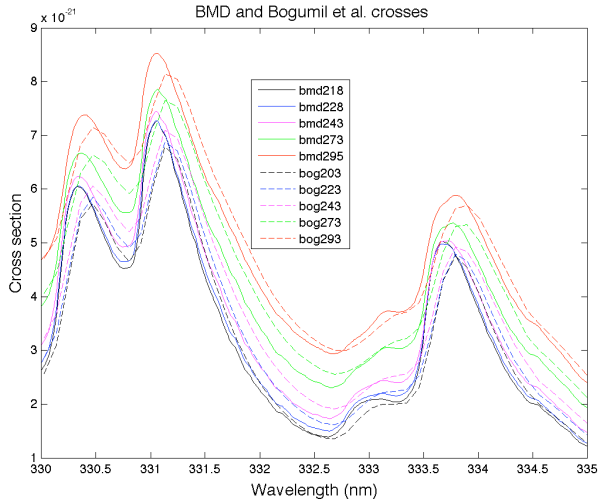

Note – **green** and **magenta** in same temperature
Difference mixed, even 10%. Shift?

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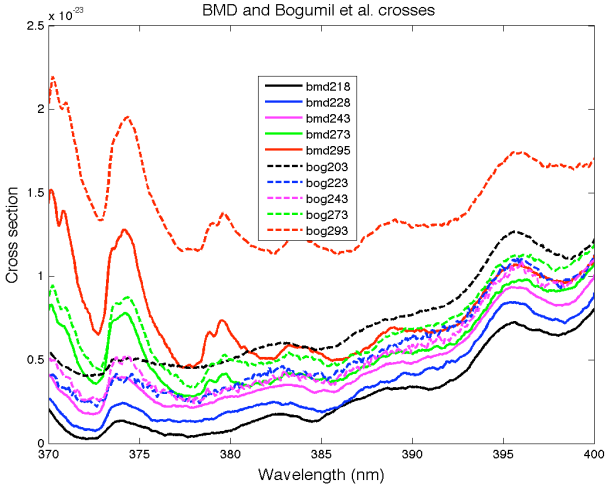

Note – **green** and **magenta** in same temperature
Difference about -10%

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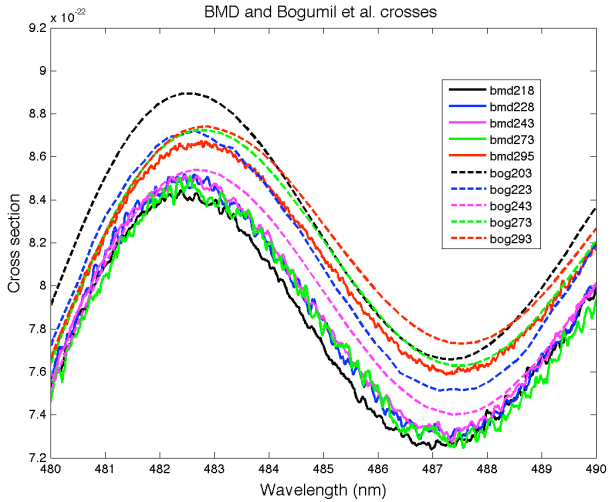
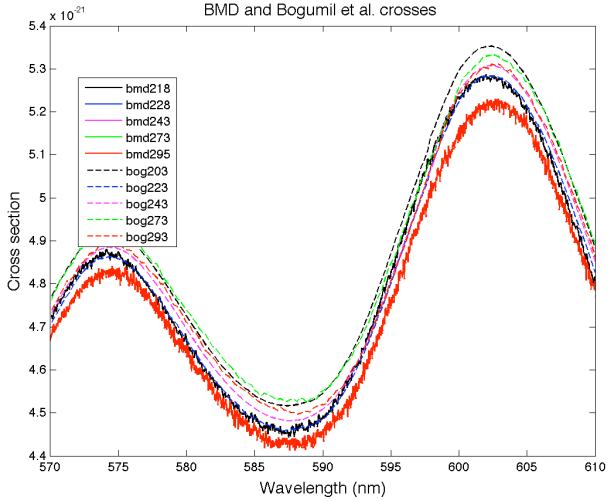
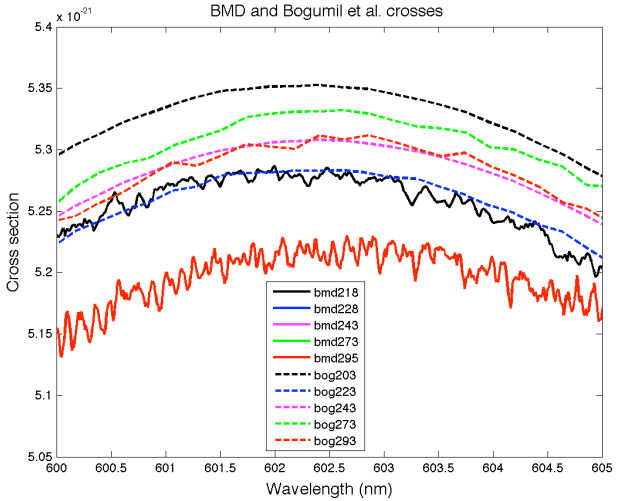


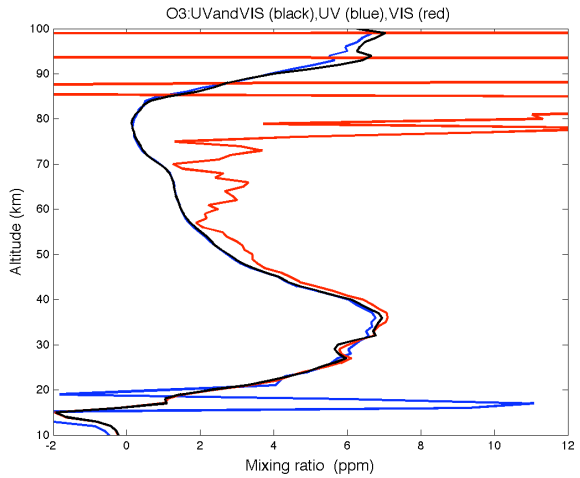
Note – **green** and **magenta** in same temperature
Difference 0-5%





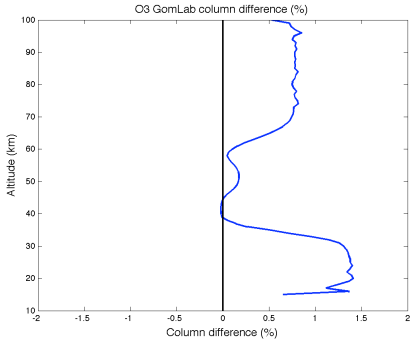
GOMOS retrieval and spectral ranges

- GOMOS retrieval algorithm uses 250-675 nm at all altitudes
- **VIS** – effective at lower statosphere
- **UV** – effective at higher

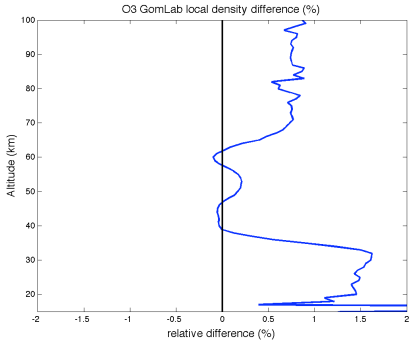


Retrieval with BMD and Bogumil at 293/295 K

- BMD vs Bogumil relative difference.
- Statistics of 10 occultations (Star number 2, Mv=-0.7, T=7000K)



Horizontal columns



Vertical densities

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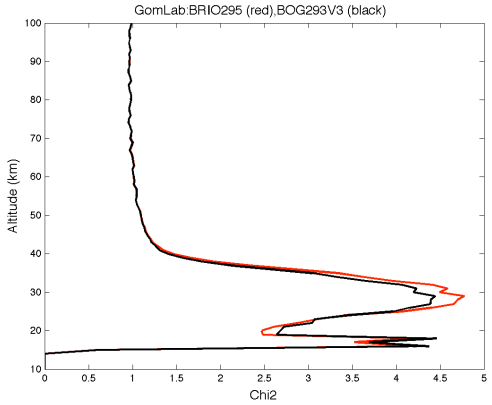
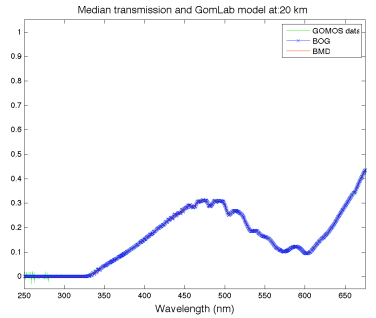
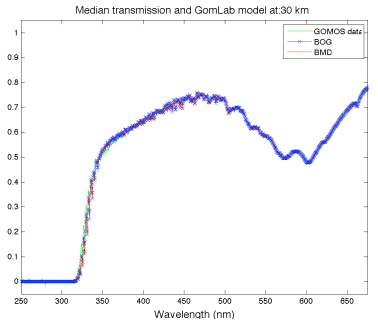
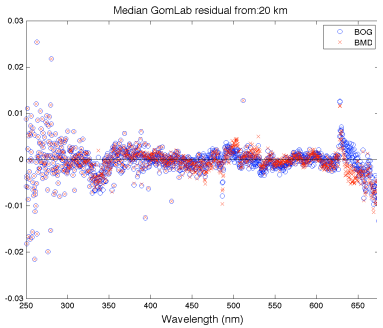
Goodness of fit: Chi2 values

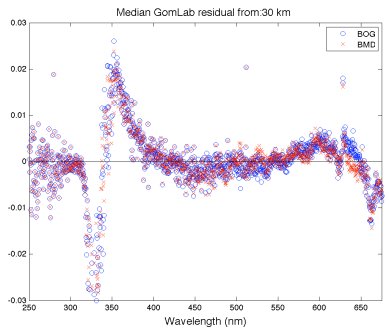
- Mixed results:
  - **Bogumil** slightly better at 30 km
  - **BMD** slightly better at lower altitudes
- Due to the strong impact of un-modelled scintillation error (below 40 km) and the fact that fixed T was used these differences are not significant











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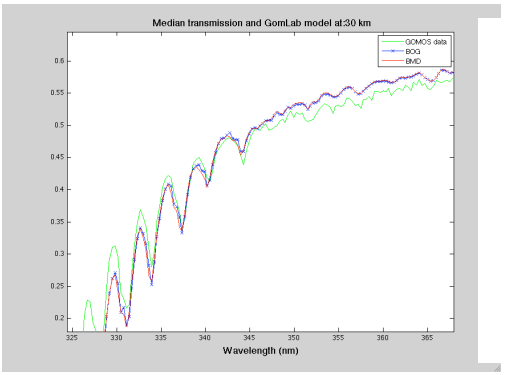
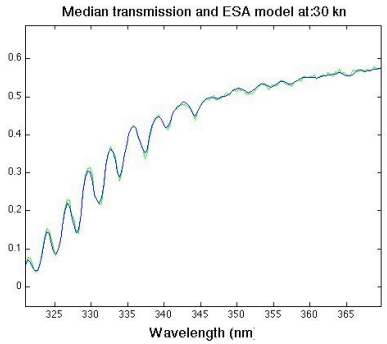
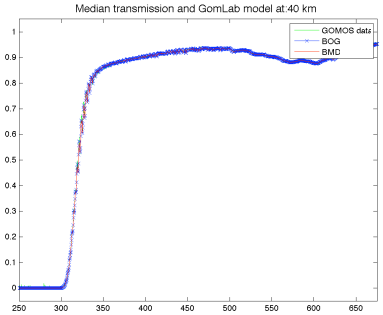
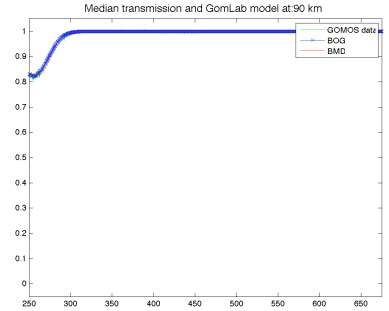
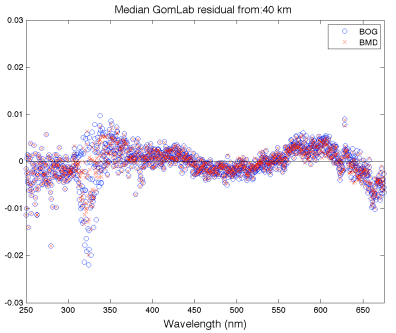


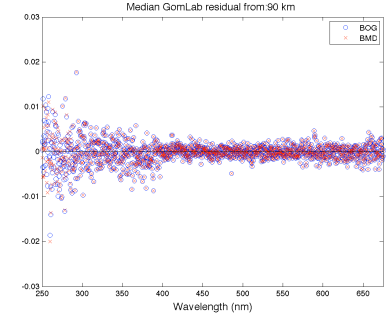


- No clear difference in the residuals
- Due to fixed T (293/295K) used in the test the fit is not optimal
- Operational GOMOS algorithm shows better fit when eff T is computed from ECMWF T.









Conclusions

- For GOMOS retrieval needs the BMD data set is incomplete in spectral and temperature coverage.
- BMD and Bogumil et. al differ considerably. BMD values are on average smaller than Bogumil values.
- GOMOS retrievals with BMD cross section show 1-1.5% higher ozone values than Bogumil except in 40-60 km where the results are close to each other.
- Fitting capabilities are similar.

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Recommendations

1. GOMOS: BDM measurements should be extended to 250-700 nm with all temperatures.
2. Temperature coverage of ozone cross sections should be extended below 200K.
3. GOMOS data together with measurements independent of UV-visible cross sections could be used to “decide” which cross sections are closer the ones used by nature.