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Current activities of ozone measurements in Australia

Matt Tully – Australian Bureau of Meteorology

ATMOZ Project Meeting PM3
Prague October 2015



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Outline

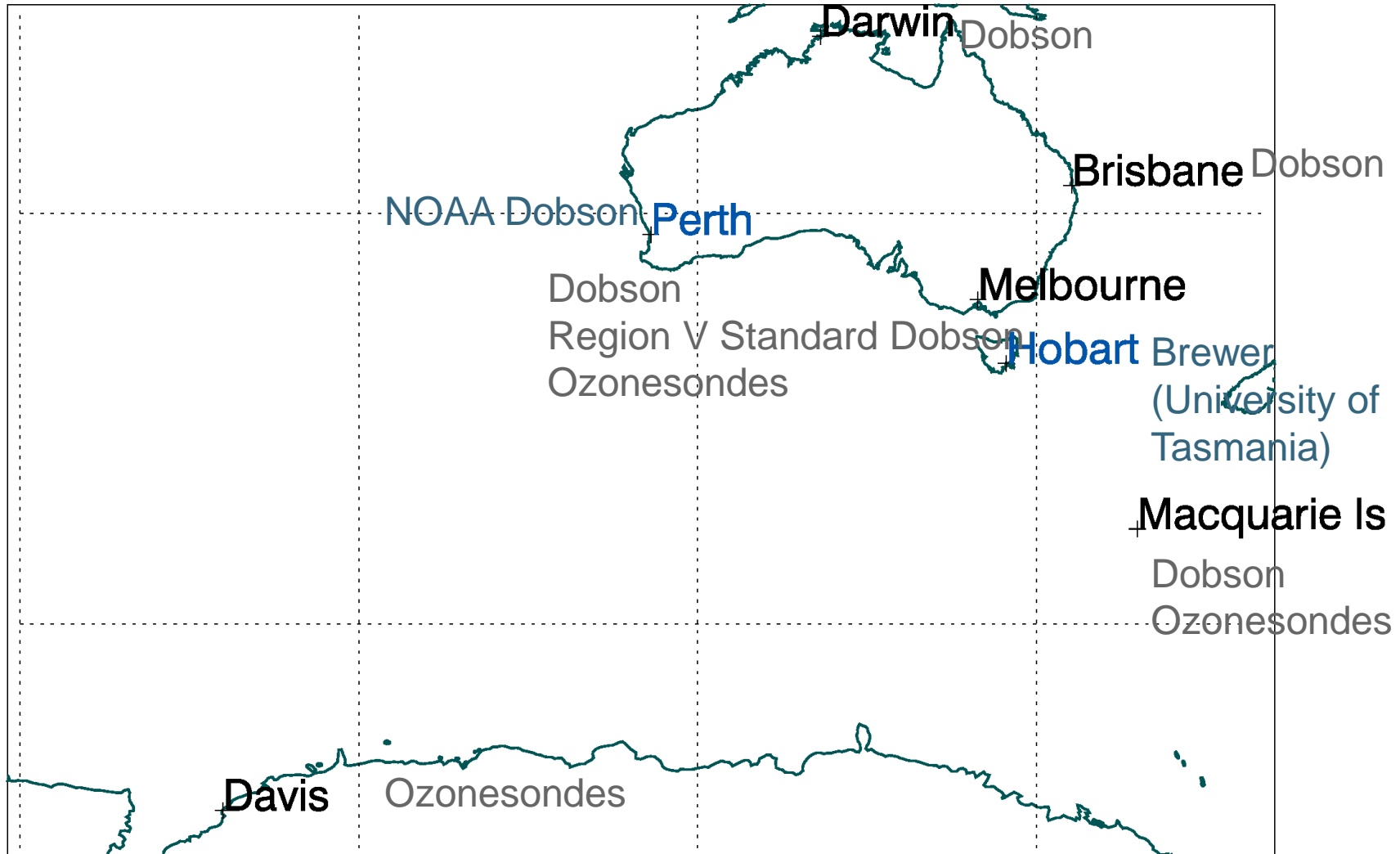
- Overview of Australian ozone monitoring
- History of Dobsons
- Dobson issues
- Some new instruments purchased and under development
- Effect of ozone height and temperature on Dobson total ozone derived values at Australian sites



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Ozone Monitoring





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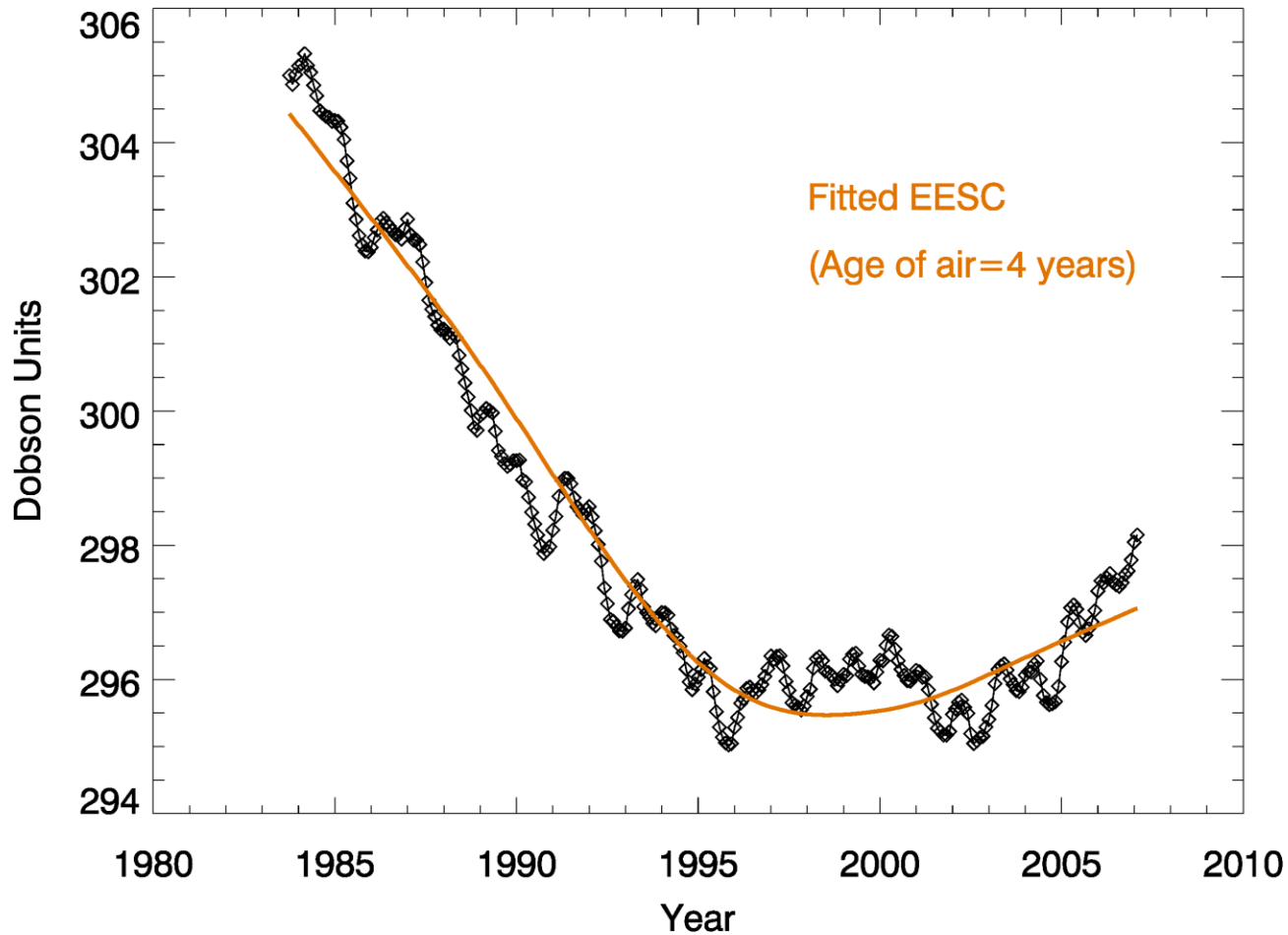
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Australian Dobson History

- The Bureau of Meteorology ordered its first Dobson in 1936
- D006 and D012 are still in the network
- Brisbane, Melbourne and Macquarie Island have operated since 1957, Darwin 1966-1974, 1990 - present



Melbourne Dobson timeseries (132-month smoothing)





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Dobson pros and cons

- Mechanically very robust and reliable
- Stability of calibration
- Preserves historic time-series
- Global calibration system
- Low frequency of observations (manual)
- Dependent on properly trained observers
- Only measures ozone
- Umkehrs very time consuming
- Minimal scientific support (eg algorithm development)
- No longer manufactured

No central processing – raw data not archived



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2014-15 Purchased instruments

AEROSOL

- Prede Sky Radiometer
- PMOD PSR (Precision Spectral Radiometer)

OZONE

- Pandora
- UV MAX-DOAS (EnivMeS Denis Pöhler)
- Possibilities for 2016-17 – Brewer, SAOZ



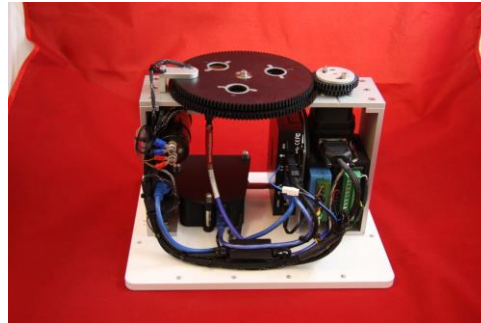


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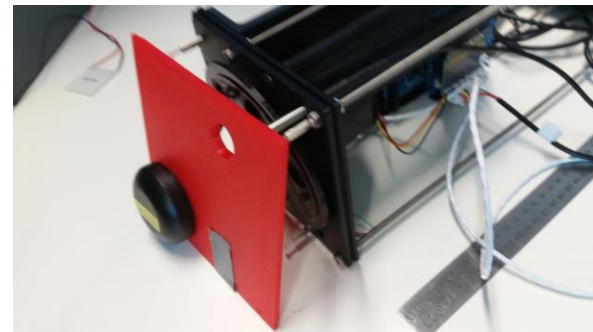
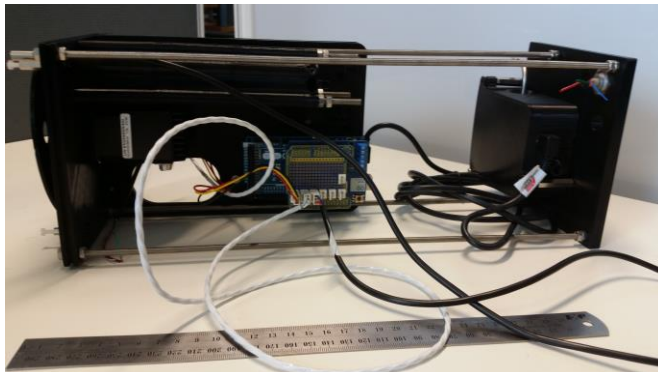
Instruments under development

- "Pi – Radiometer"

Global, UV



- Ozone CCD Spectrometer (Direct UV)



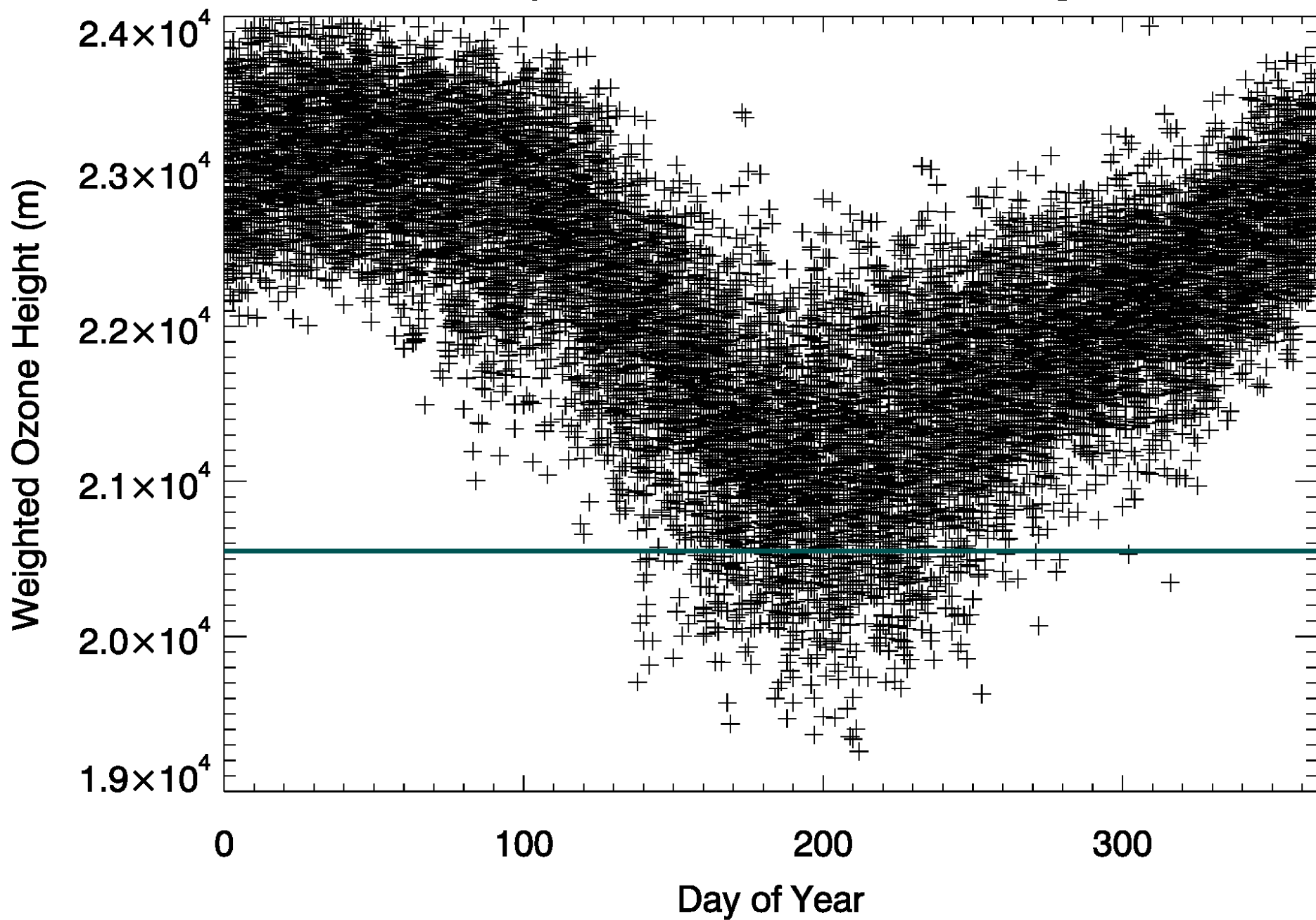


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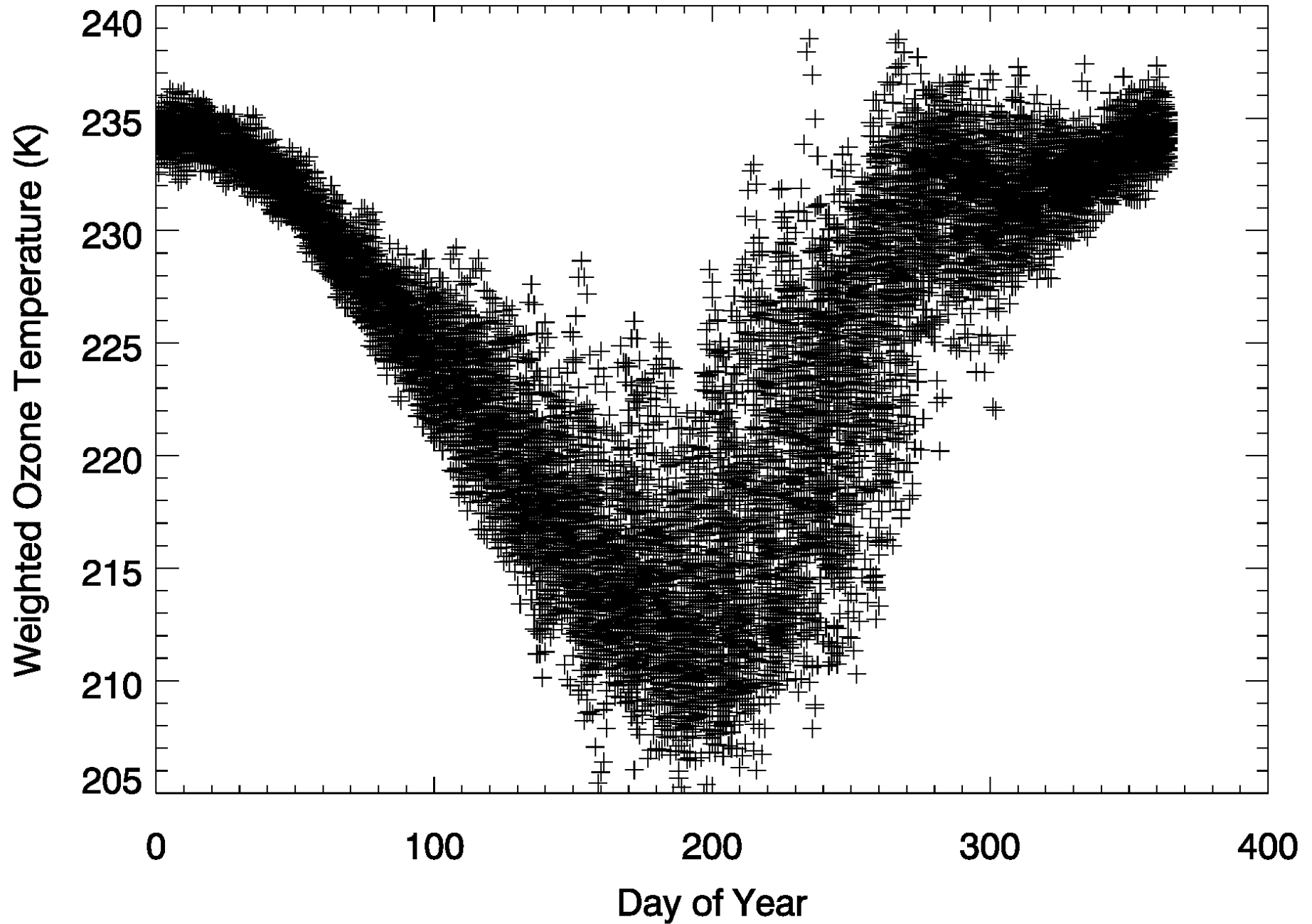
Sensitivity of Total Ozone Value to Ozone Height and Temperature

- The Dobson algorithm uses fixed temperature and crudely parameterised ozone height
- MERRA reanalysis data for Darwin, Brisbane, Melbourne and Macquarie Island at 42 levels (surface to 0.1 hPa) used to calculate effective (weighted) ozone height and temperature for each individual day 1979-2014
- Bremen cross-sections (Serdyuchenko et al)
- Redondas et al Dobson slit functions (?)

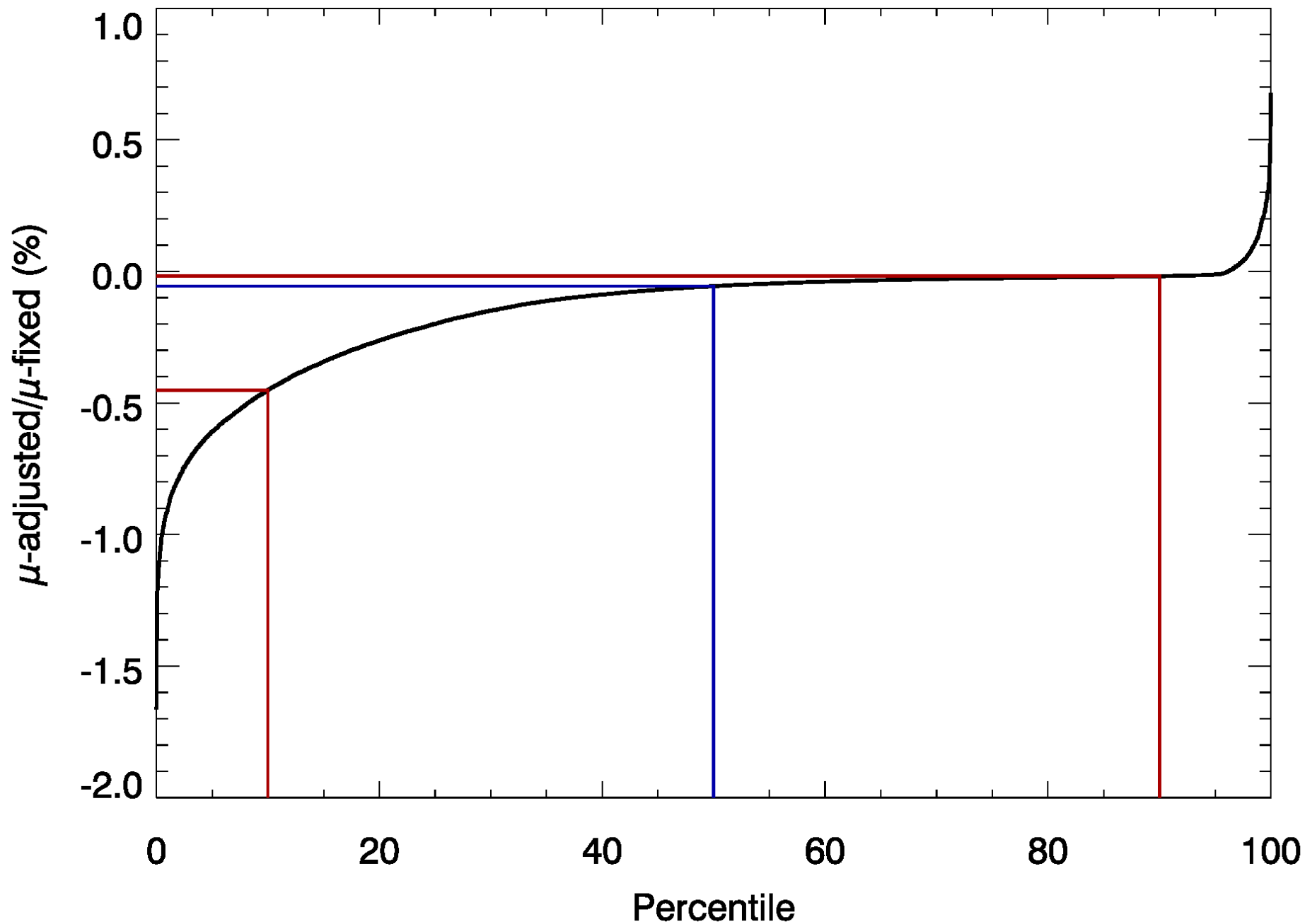
Macquarie Effective Ozone Height



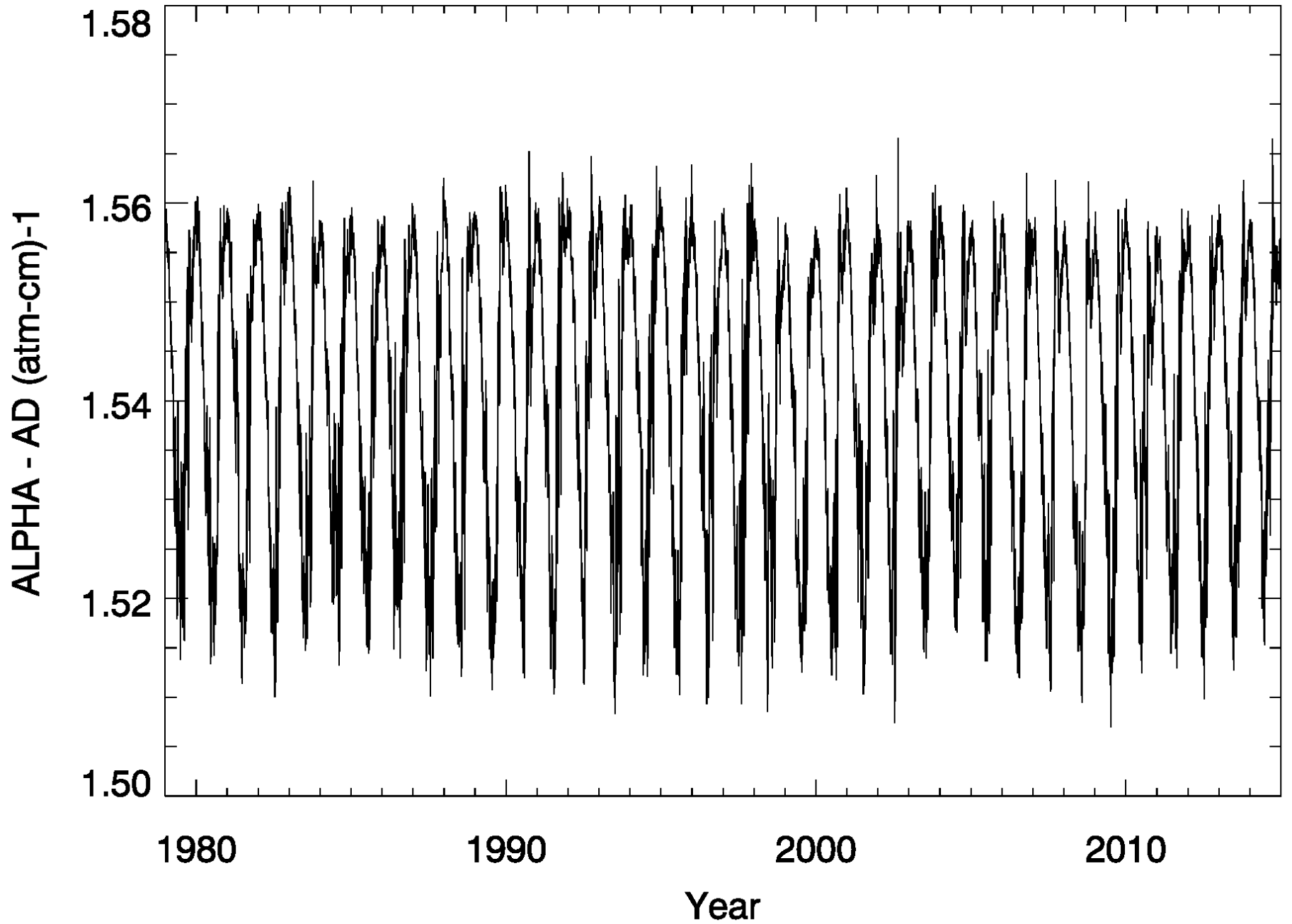
Macquarie Ozone Temperature



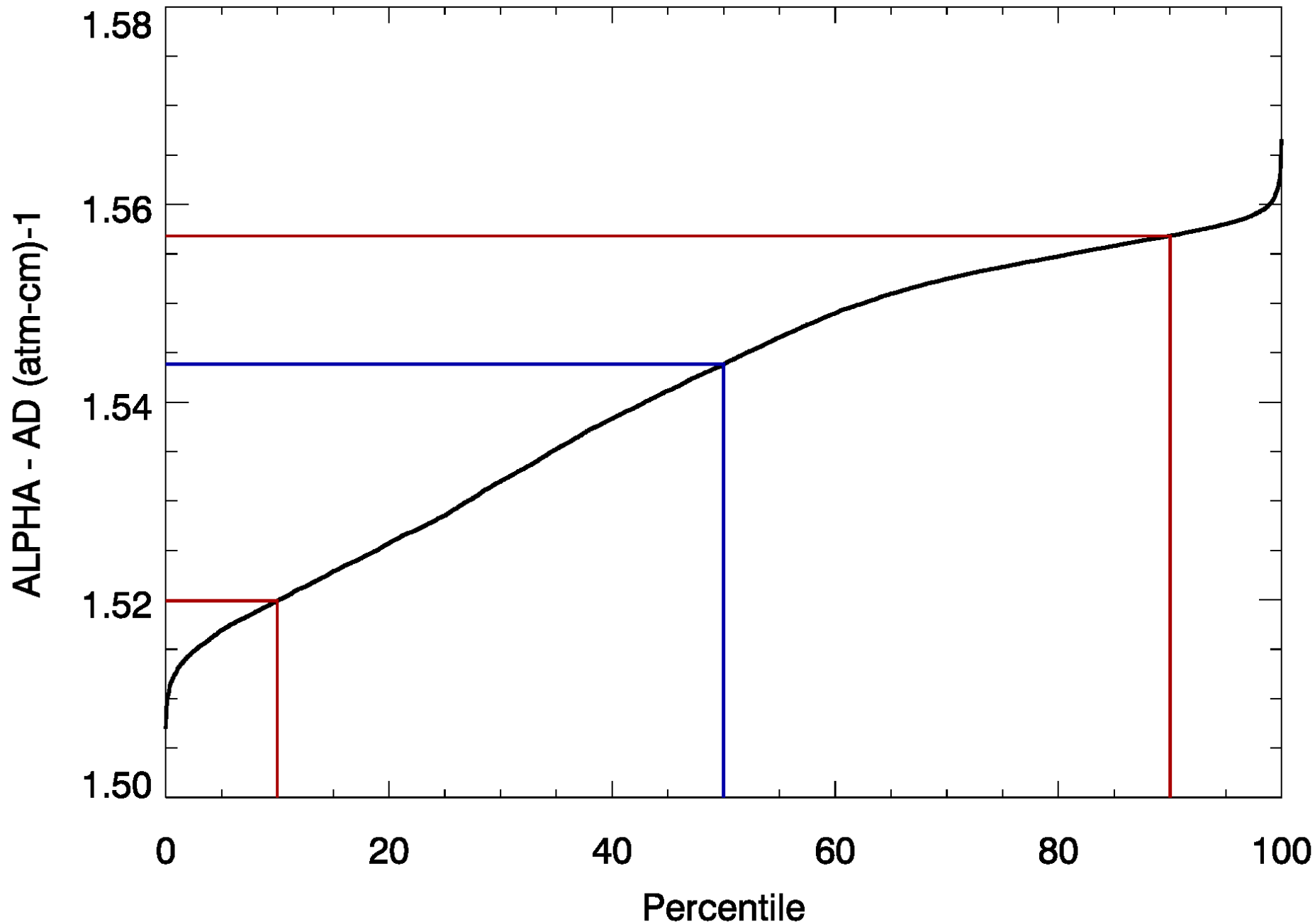
Distribution of μ Ratio (2 hours from local noon)



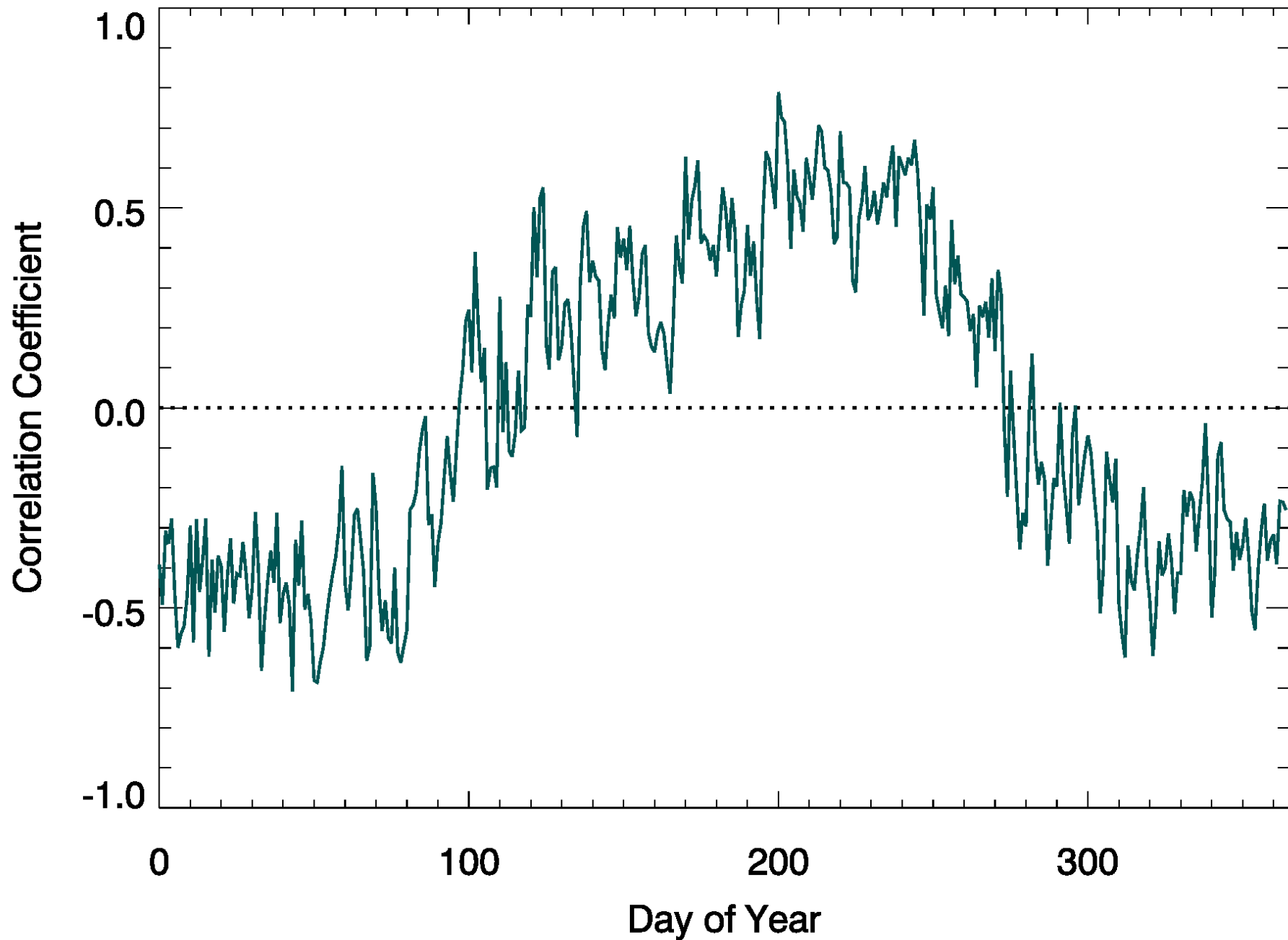
Ozone Cross Section Timeseries



Ozone Cross Section Distribution



Correlation of Temperature and Height





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Conclusion

- Reanalysis data should be used in the Dobson algorithm to account for variations in ozone effective height and temperature variations that make a significant difference to the derived value for total column ozone
- Centralised processing of Dobson observations?



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Thank you...

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