Atmosphere parameters and Atmosphere Transmission at OHP in 2018 : application to Stardice analysis

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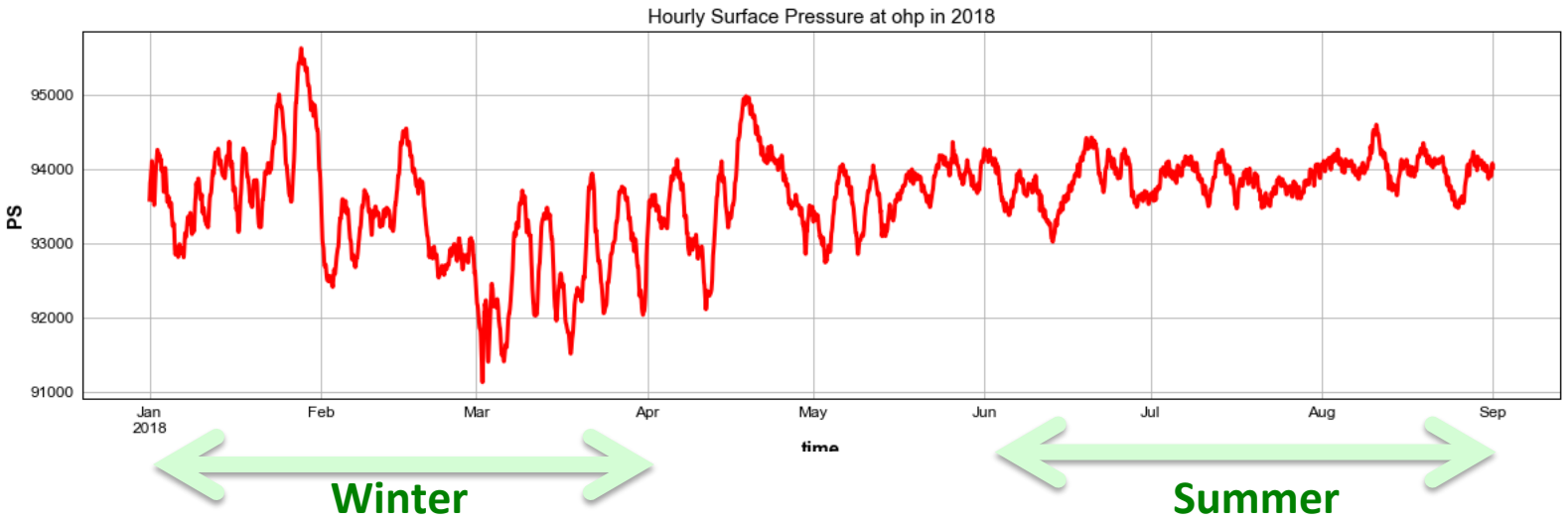
Goal

- **Provide typical OHP atmospheric transmission**
- **Distinguish typical winter/summer**

➔Need to collect relevant atmospheric parameters

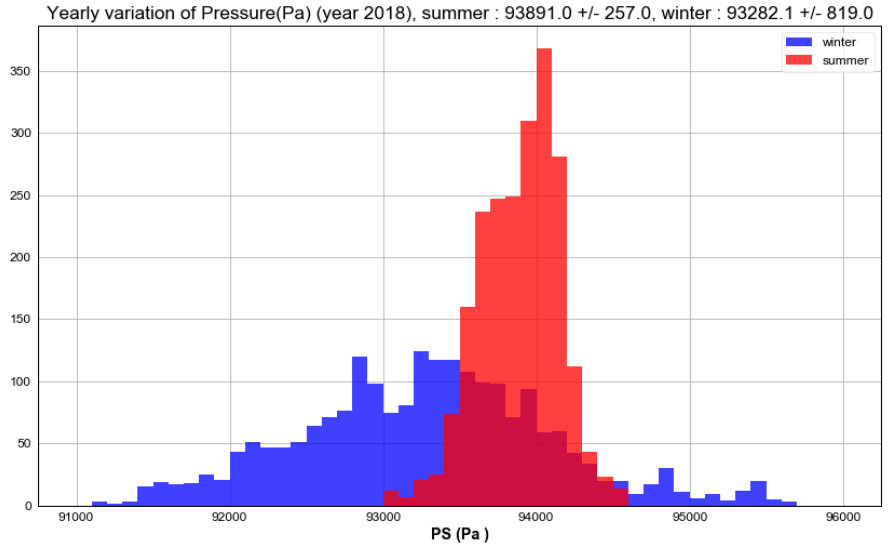
➔Use MERRA2 data in 2018 (January-August)

Pressure



Winter

P = 933 hPa

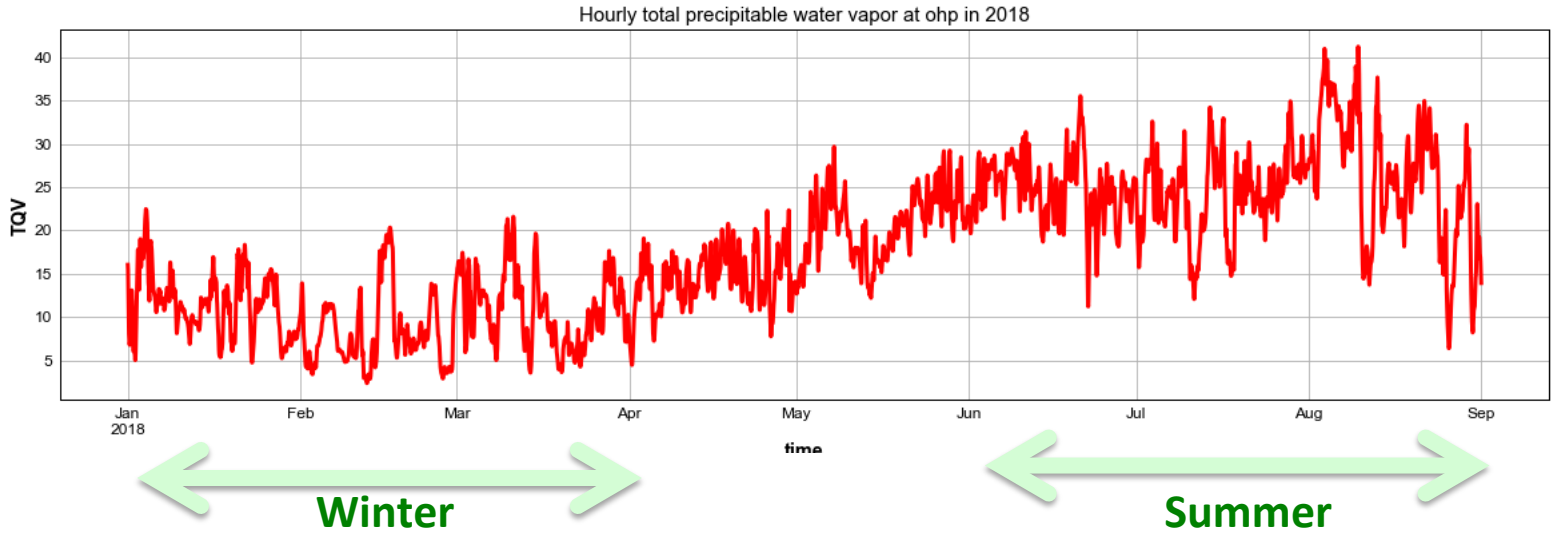


Summer

P = 939 hPa

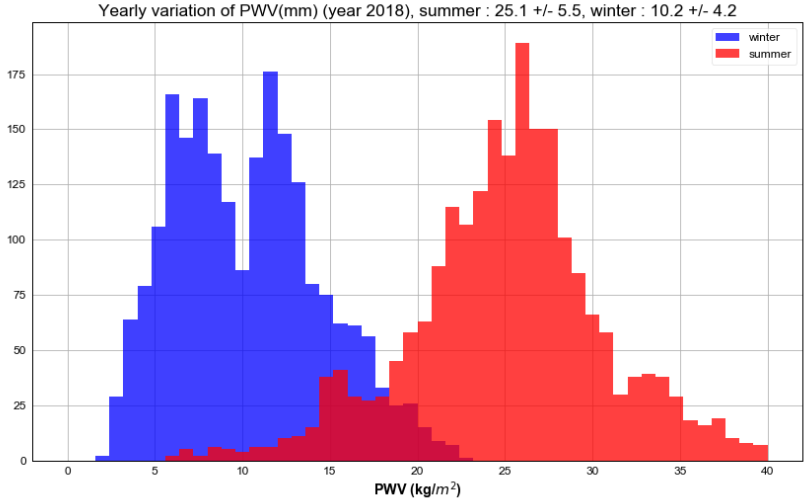
Higher pressure
In summer

Precipitable water vapor



Winter

PWV = 10mm

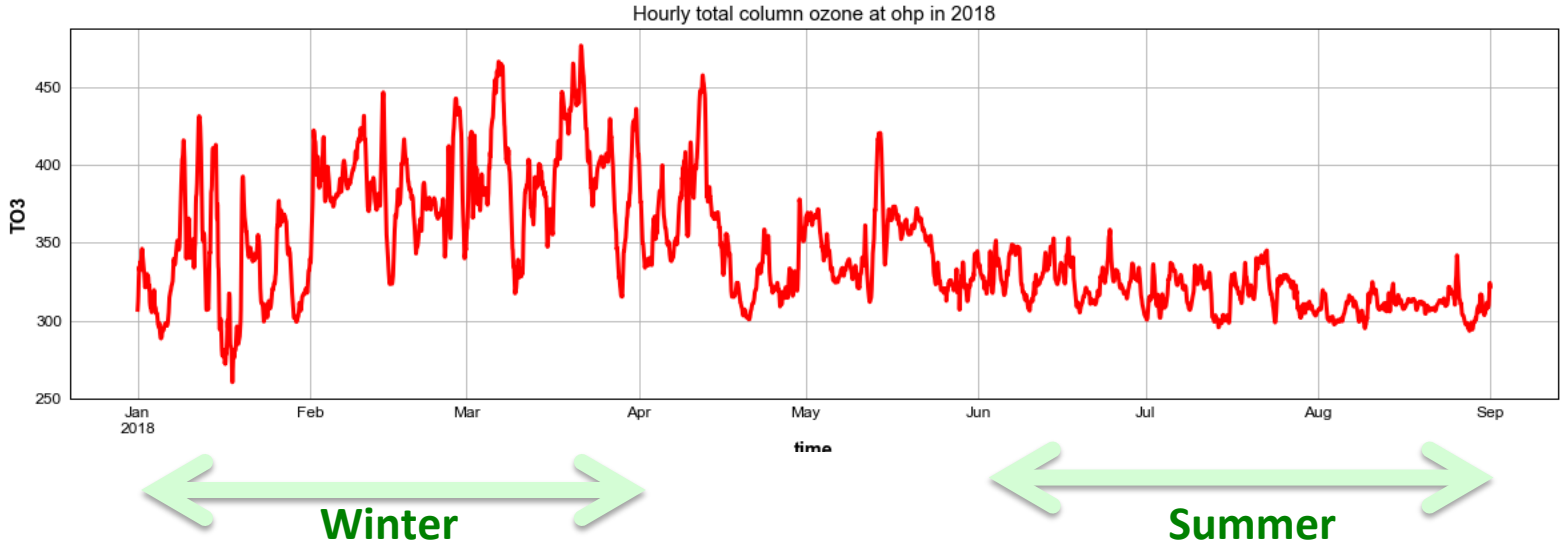


Summer

PWV = 25mm

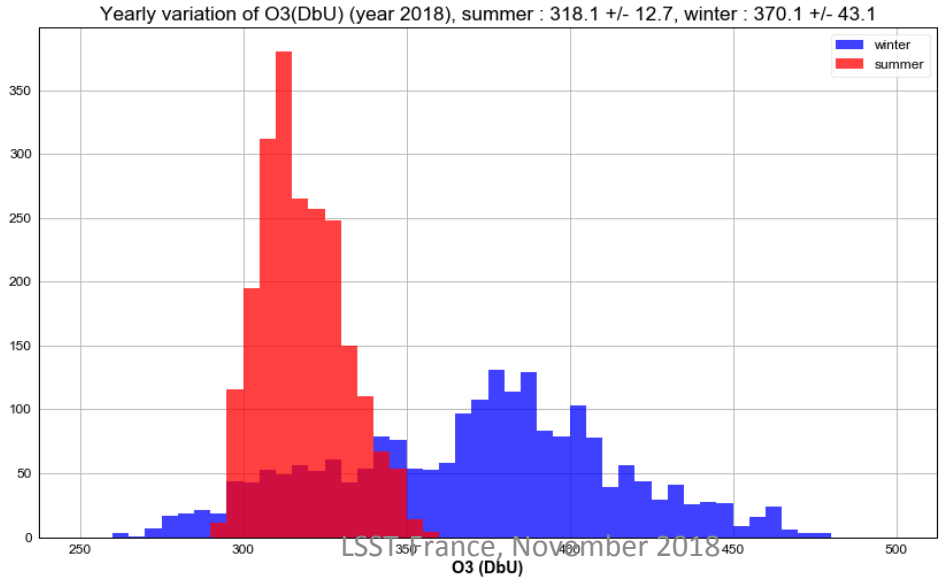
Higher PWV in summer

Ozone



Summer

O3 = 318 DbU



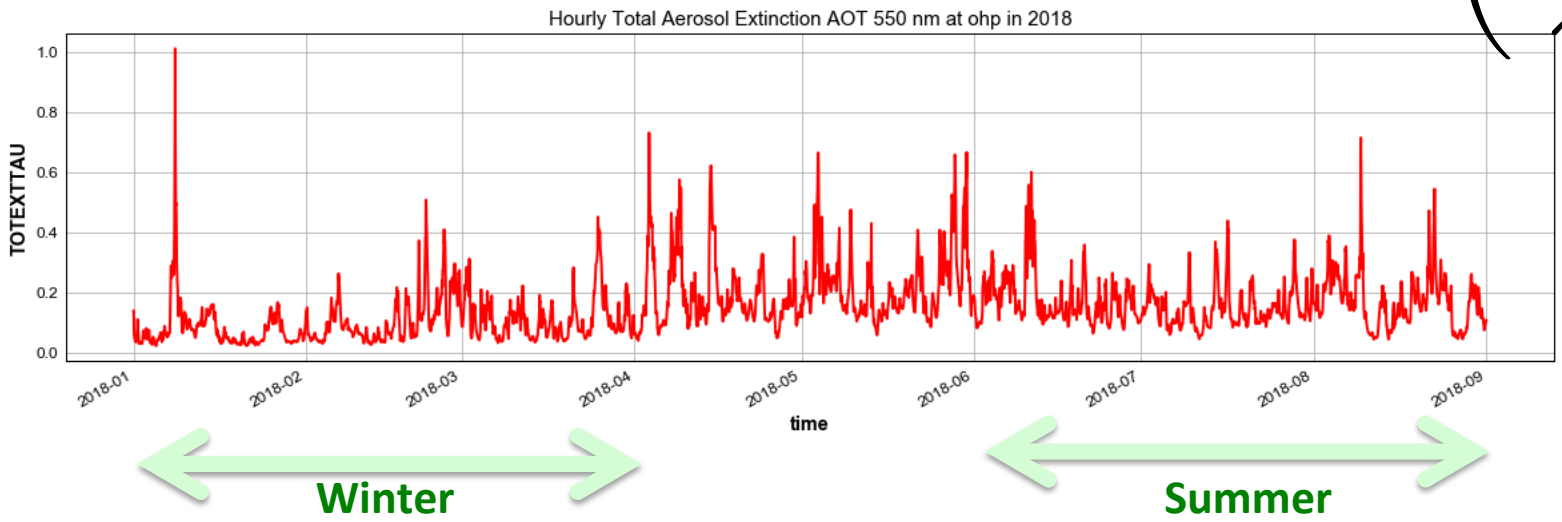
Winter

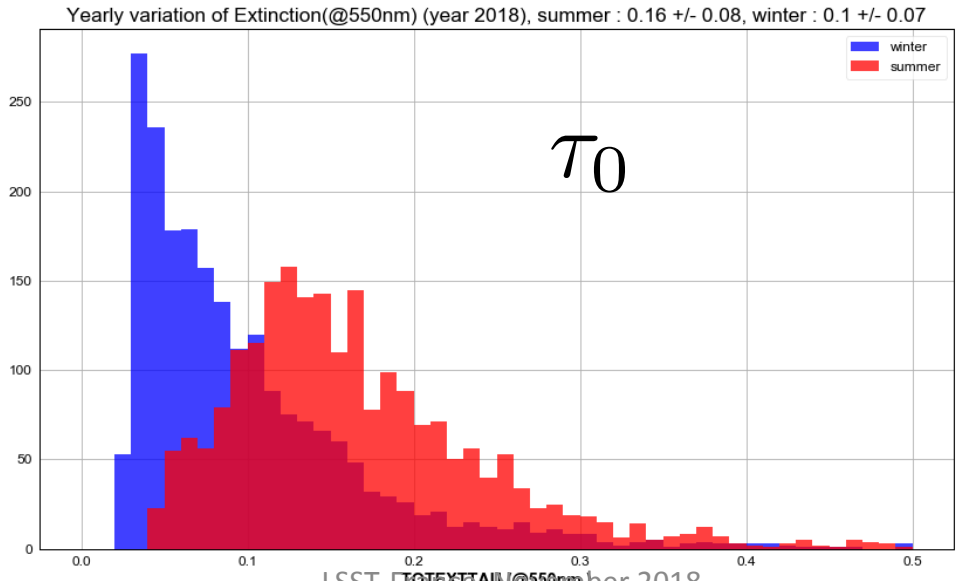
O3 = 370 DbU

Higher Ozone in winter

Aerosols optical depth

$$\tau(\lambda) = \tau_0 \times \left(\frac{\lambda_0}{\lambda}\right)^a$$





Winter

$tau_0 = 0.10$

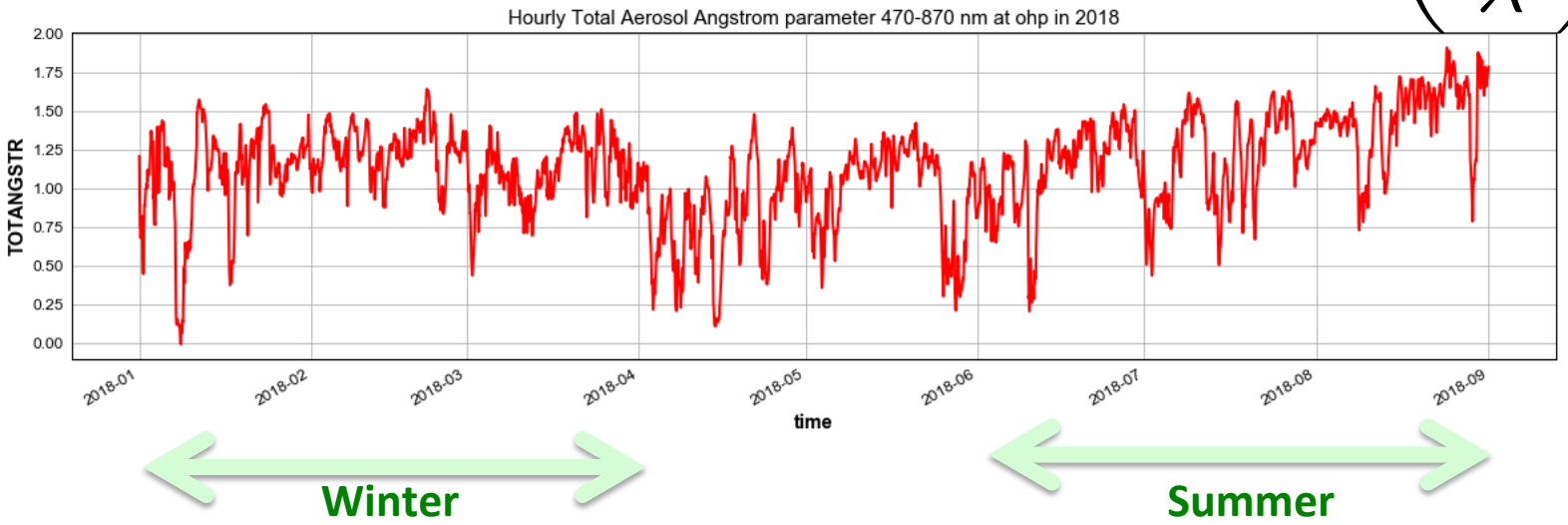
Summer

$tau_0 = 0.16$

τ_0 Higher in summer

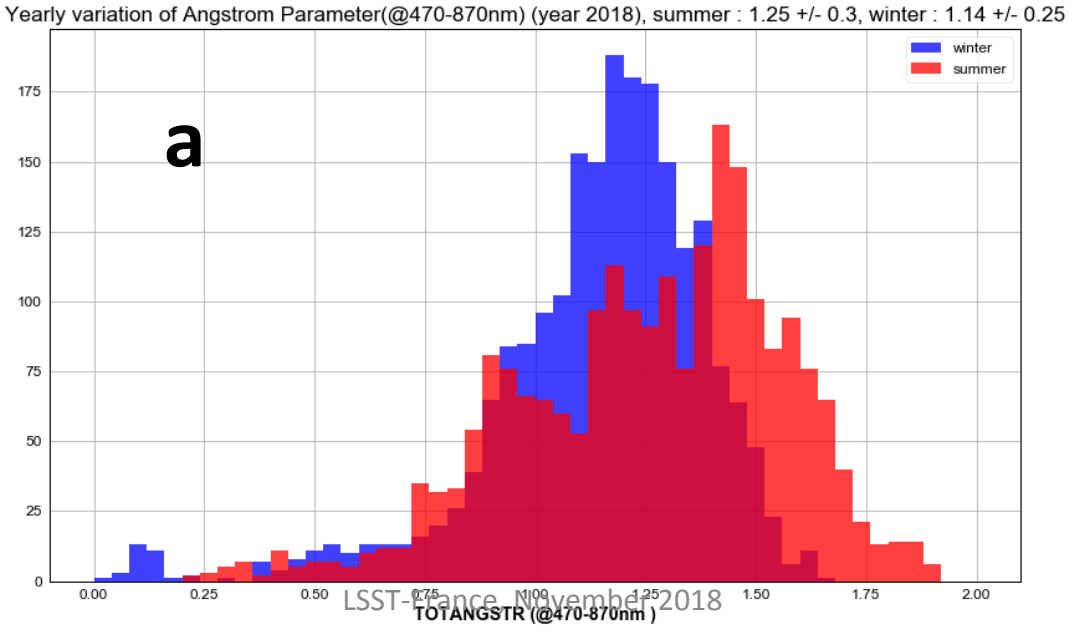
Angstrom coefficient

$$\tau(\lambda) = \tau_0 \times \left(\frac{\lambda_0}{\lambda}\right)^{a}$$



Winter

a = 1.14



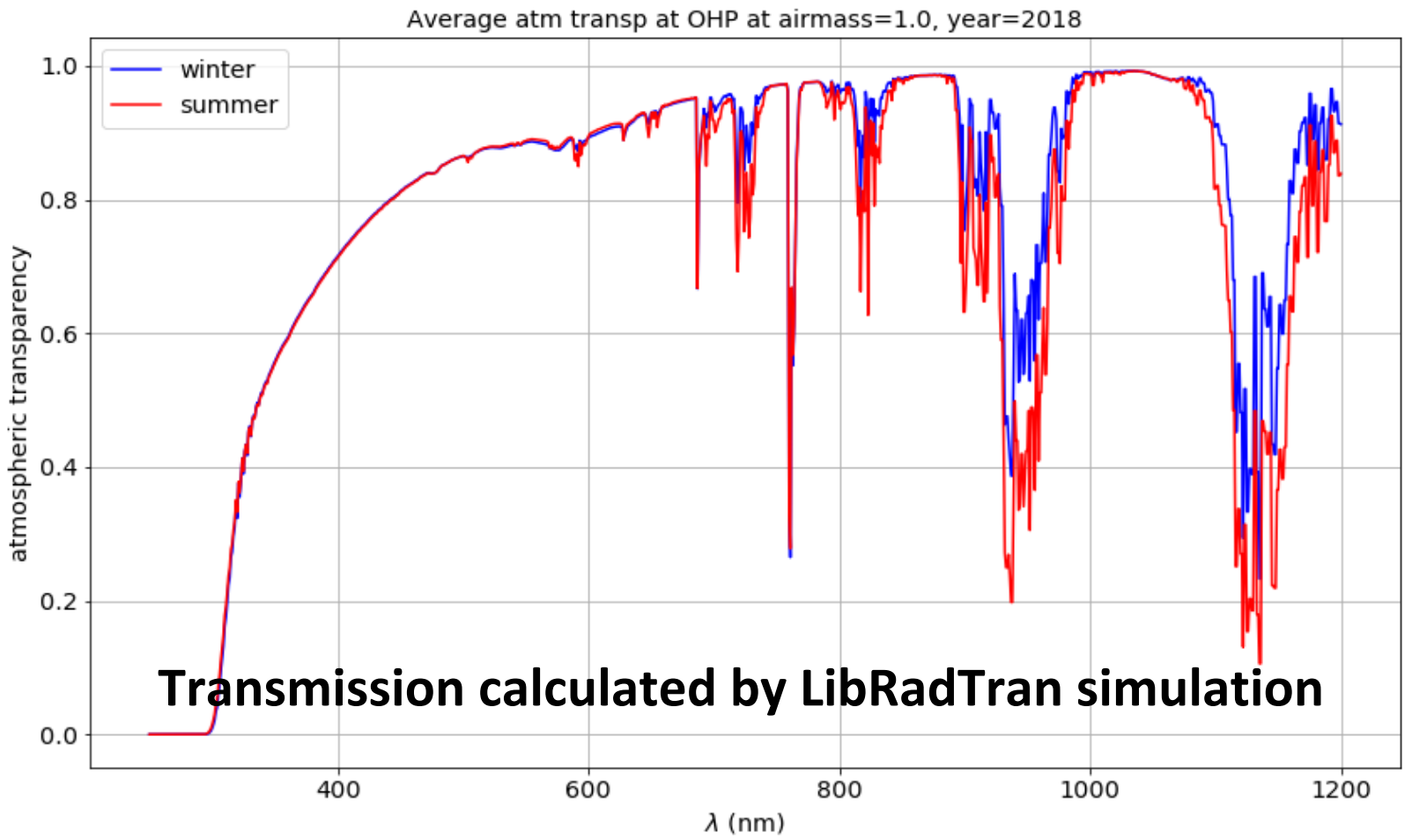
Summer

a = 1.25

Steeper Wavelength Attenuation in summer

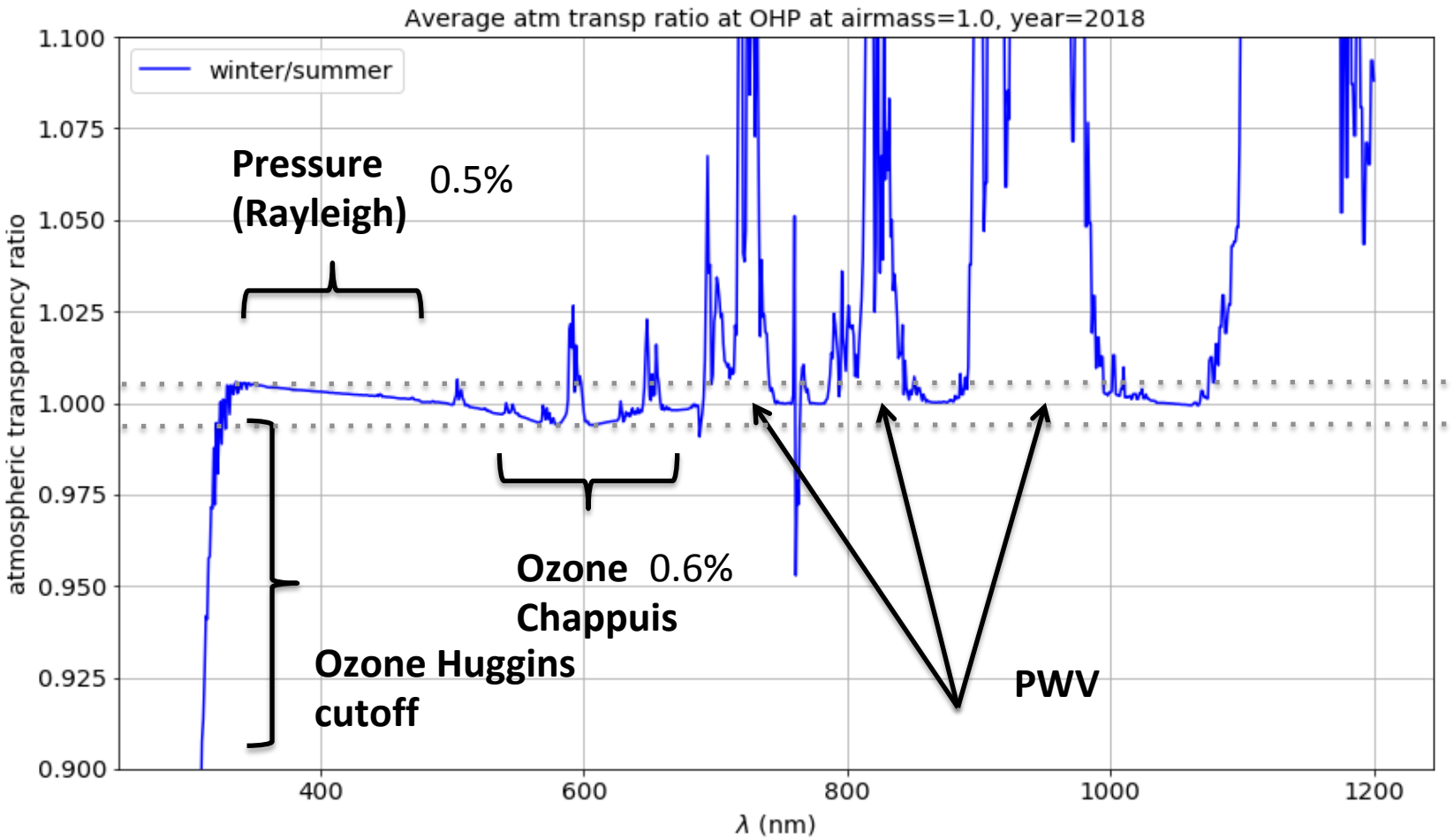
Average transmission Summer & Winter

Airmass = 1

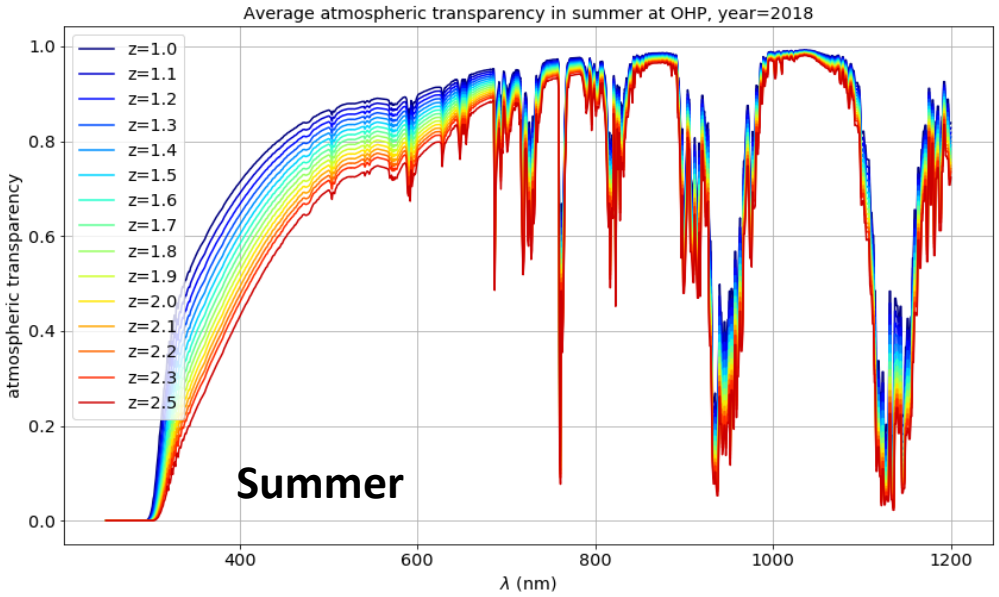


Average Transmission **Winter/Summer ratio**

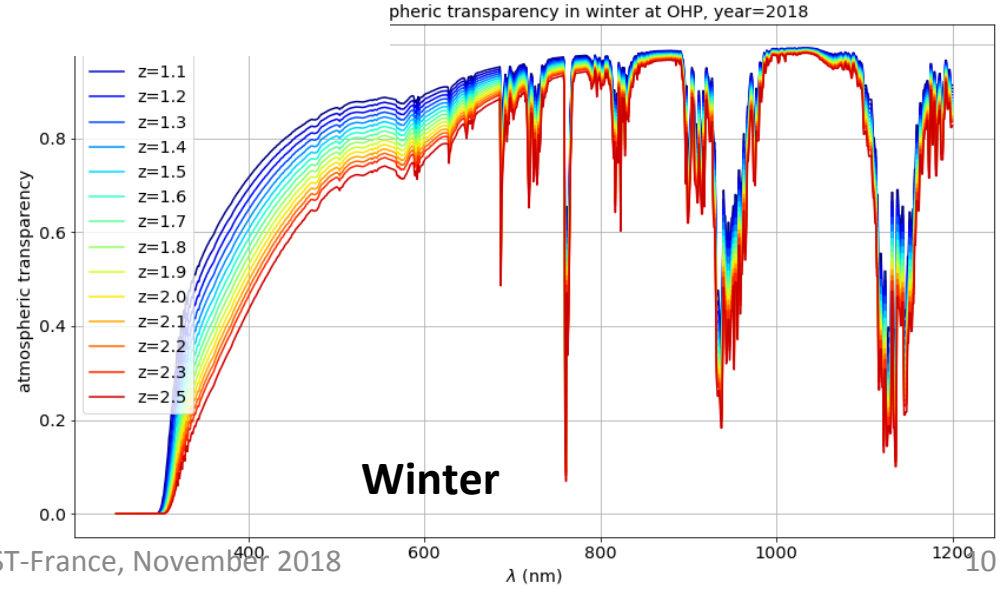
Airmass = 1



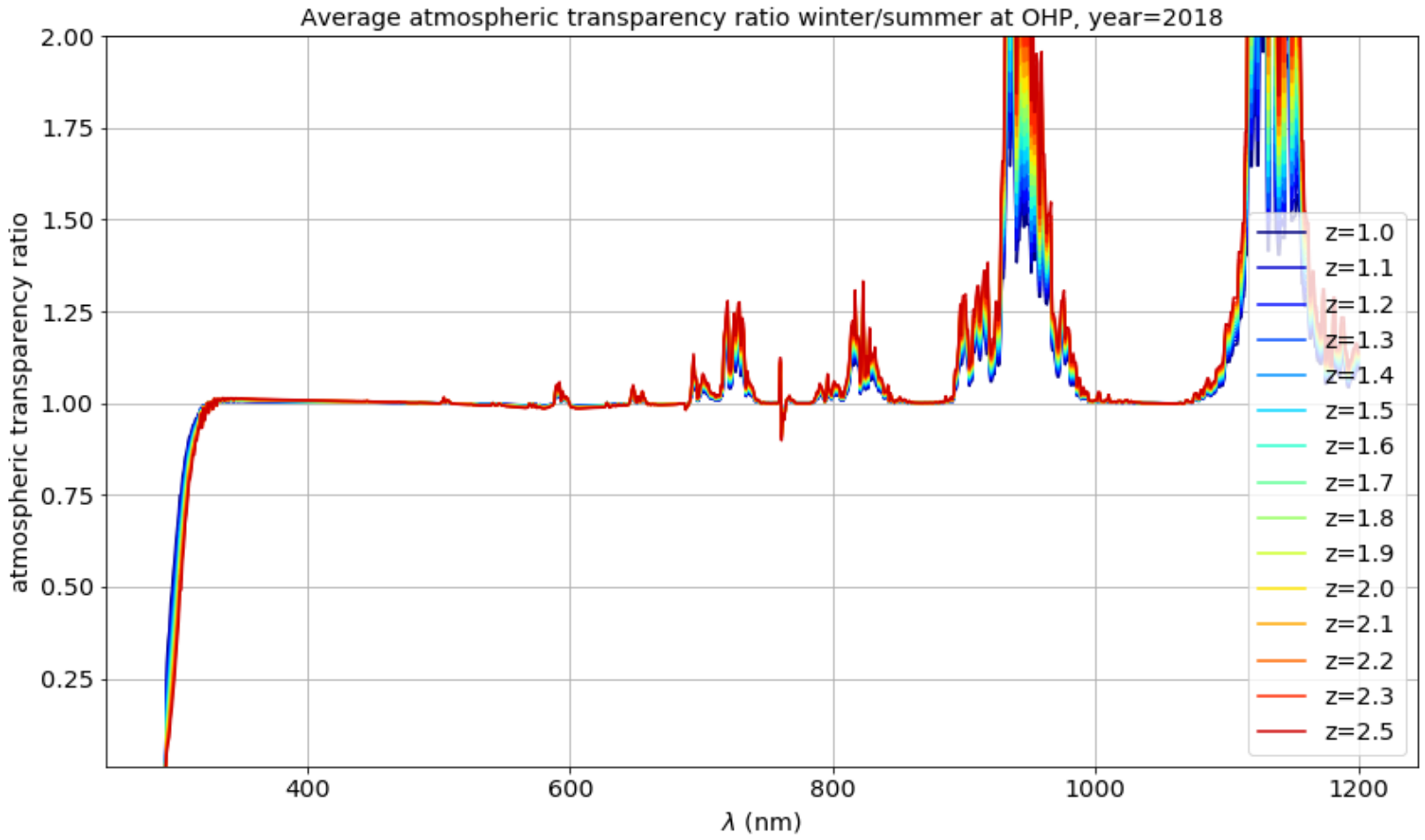
Winter/Summer Libradtran Profiles generated for Stardice analysis at several airmass



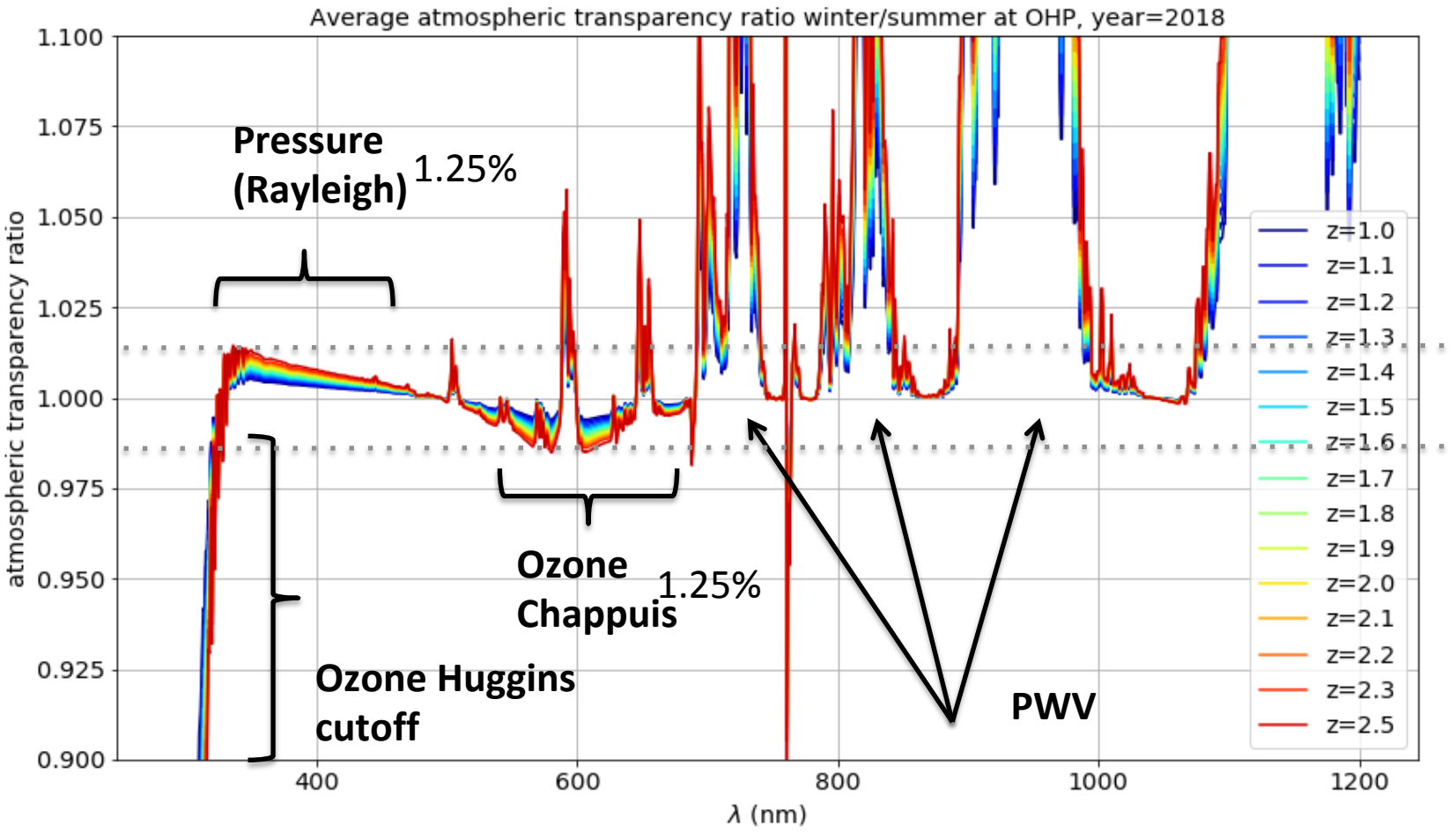
Simulations Required for Data analysis



Winter/Summer Libradtran transmission ratio
generated for Stardice analysis at several airmass

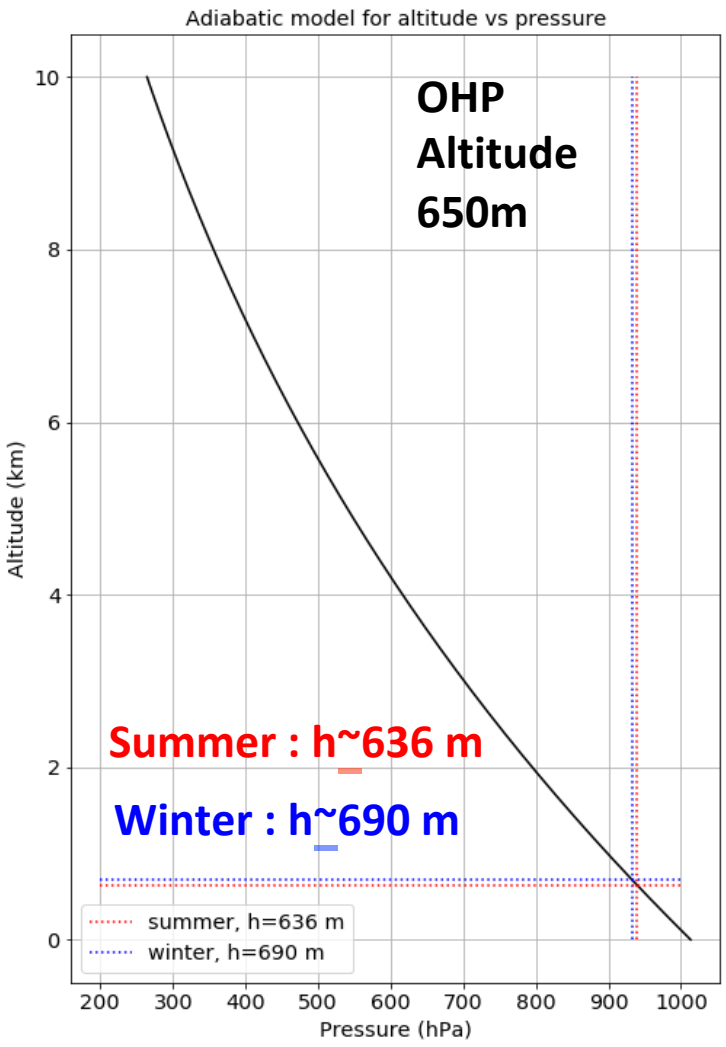


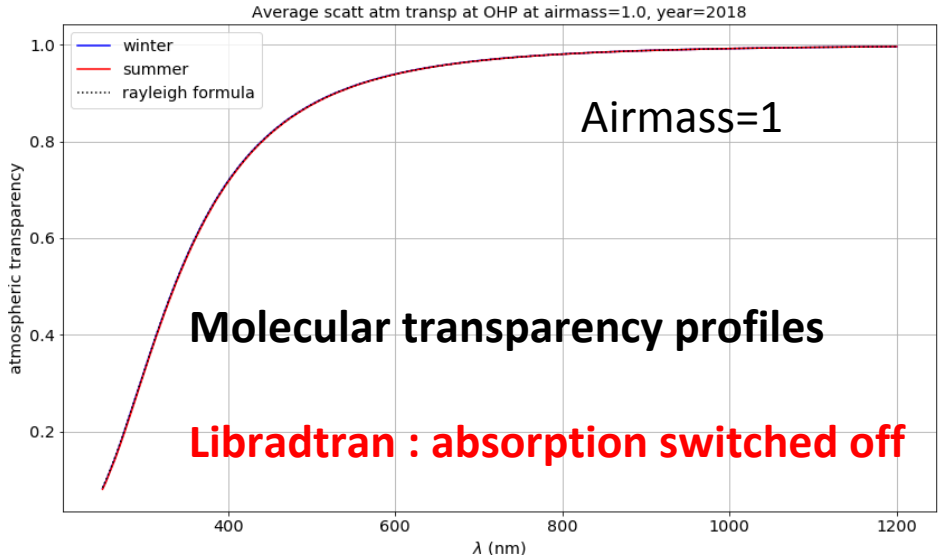
Zoom on Winter/Summer Profiles **ratio** generated for Stardice analysis at several airmass

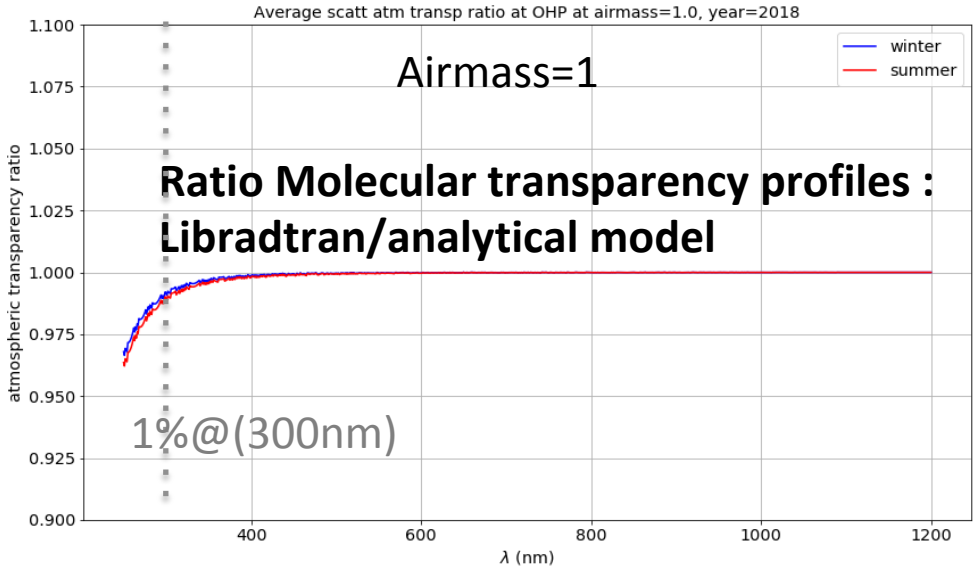


Analytical model for Molecular scattering

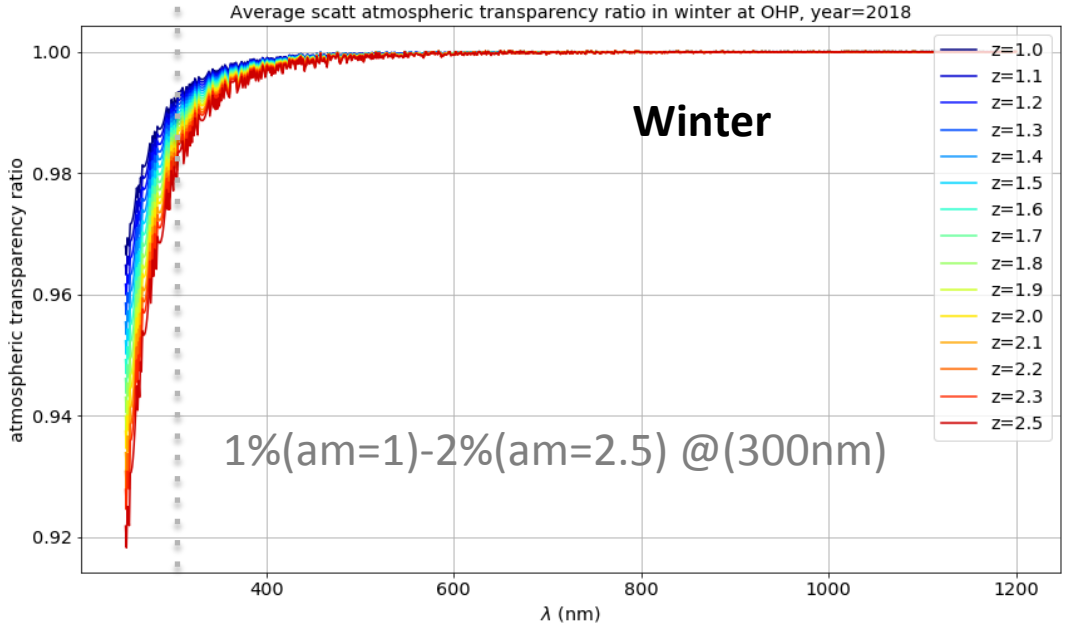
Analytic model : altitude vs pressure :

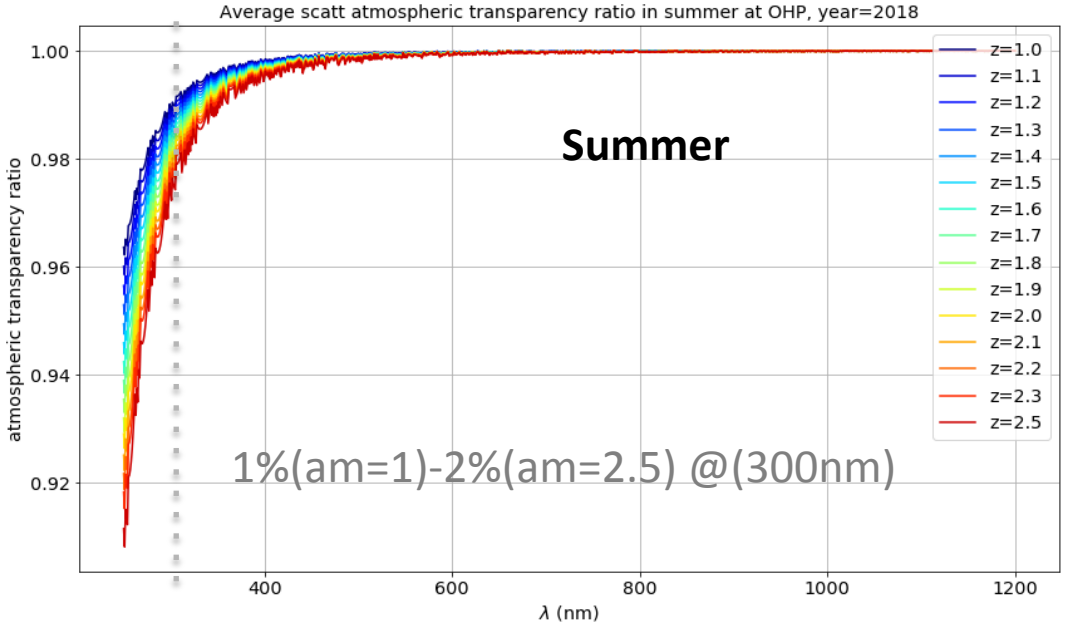




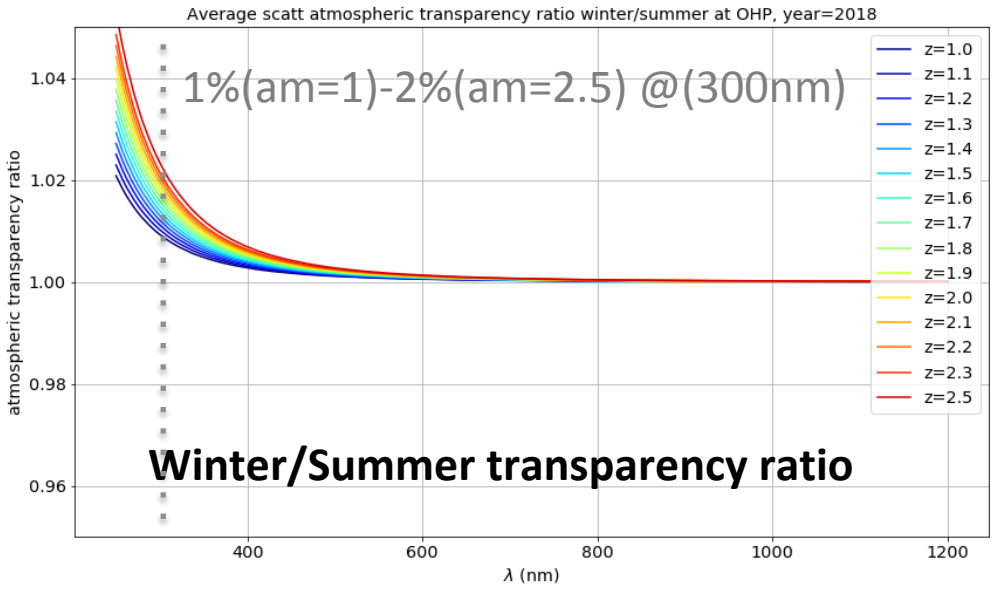


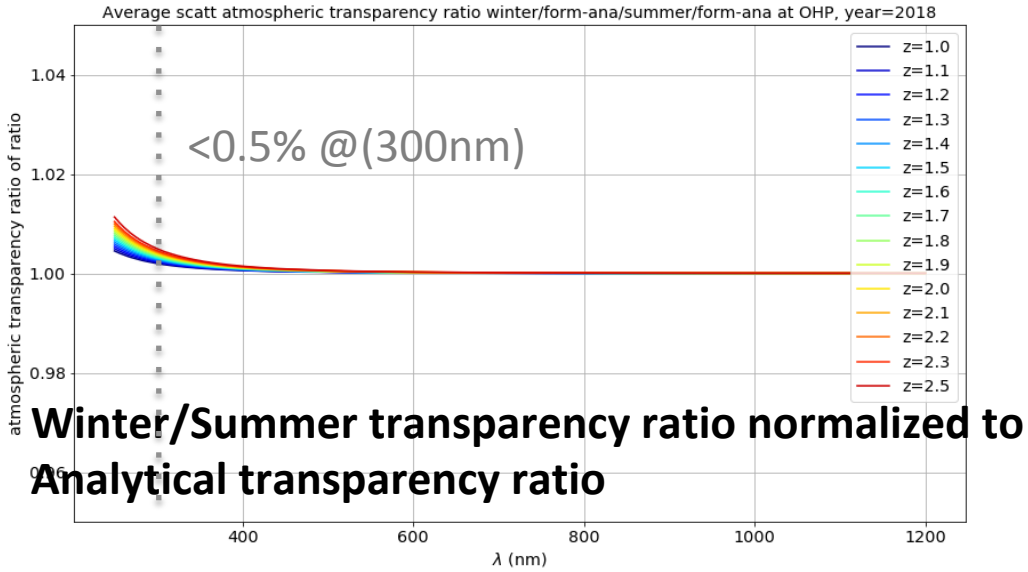
Libradtran/ analytical-formula transparency ratio at all airmass





Winter/Summer transparency ratio at all airmass



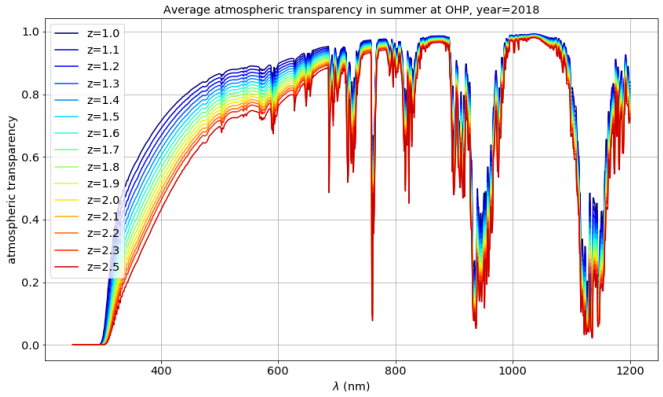


Conclusion:

Better use analytical formula to correct profile for Pressure variation

Take home message

- Typical winter/summer atmospheric profiles at various airmass are provided for Stardice.
  - Average pressure, precipitable water vapor,ozone.
  - Simulated transparency data



- A numerical-analytical formula for atmospheric transparency to correct for daily pressure variation (auxiliary data) lead to an accuracy better than 0.5% for λ>300 nm