

# In Situ Measurements of Aerosol Size Distributions: Comparisons of Estimated Extinction with SAGE III/ISS Measurements



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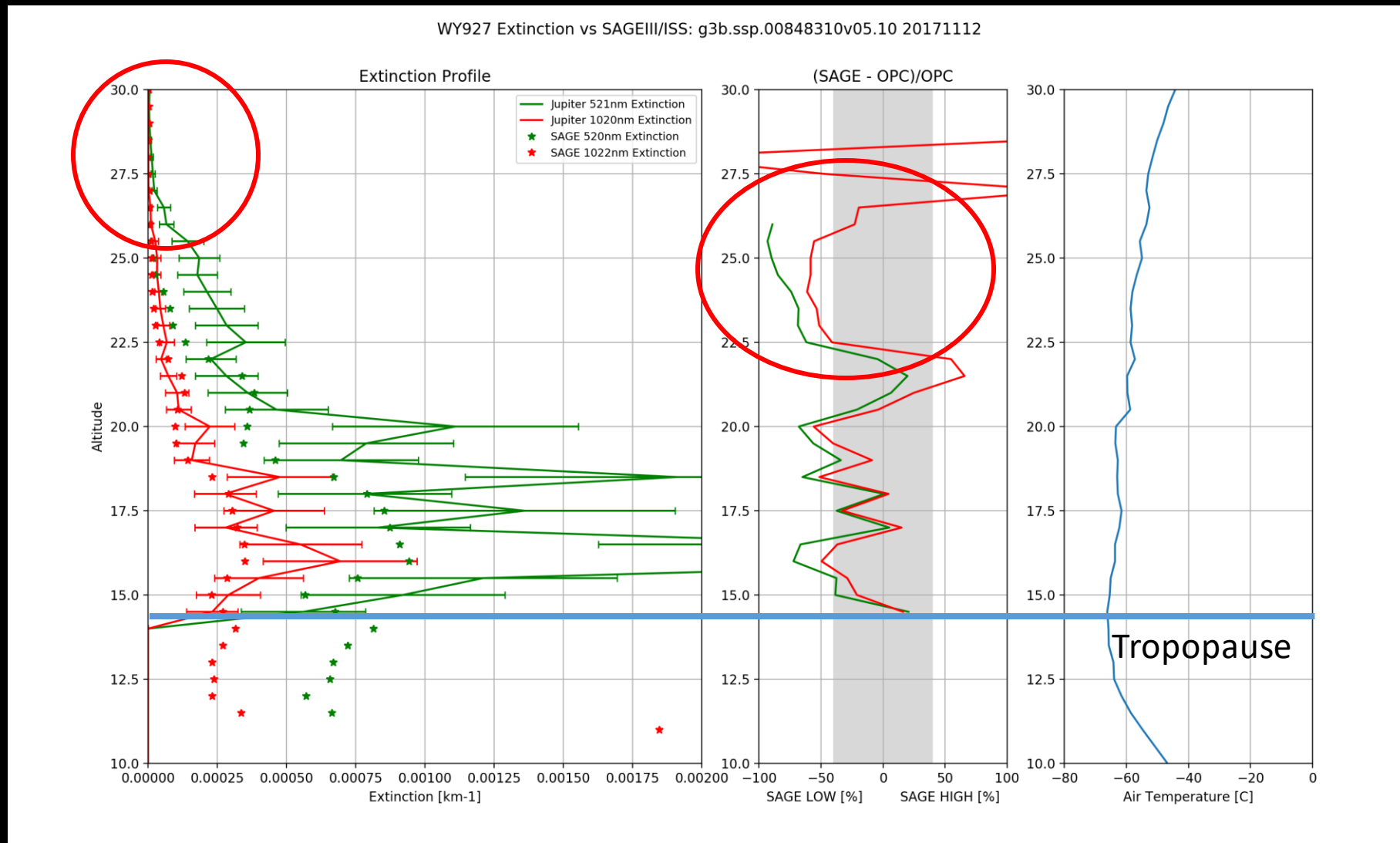
**LASP**

Laboratory for Atmospheric and Space Physics  
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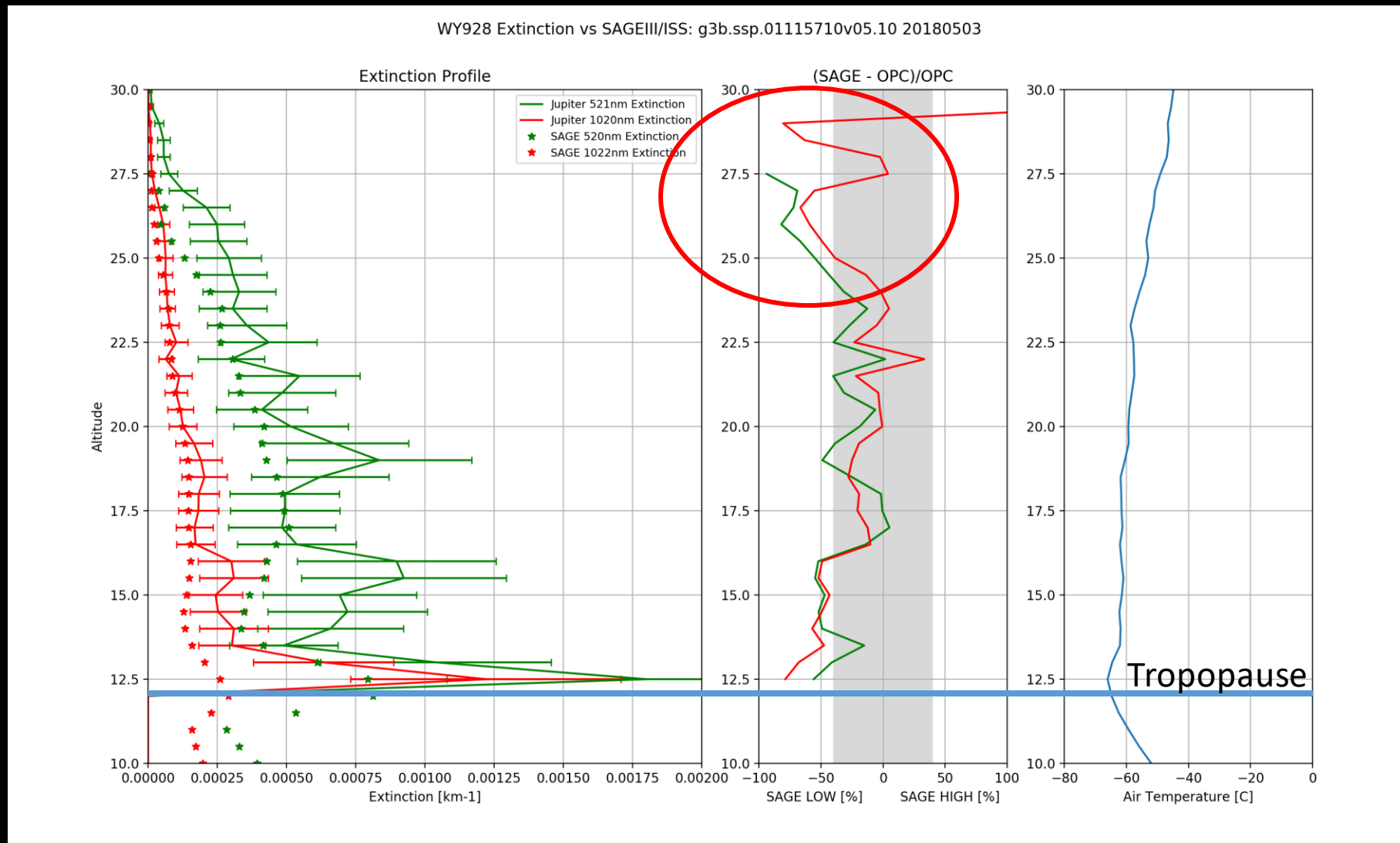


1. Current OPC vs SAGE III-ISS comparisons
2. OPC vs OPC vs OPC vs CPC (vs SAGE III/ISS)
3. Comparisons in the Tropical Tropopause Layer from long duration balloons

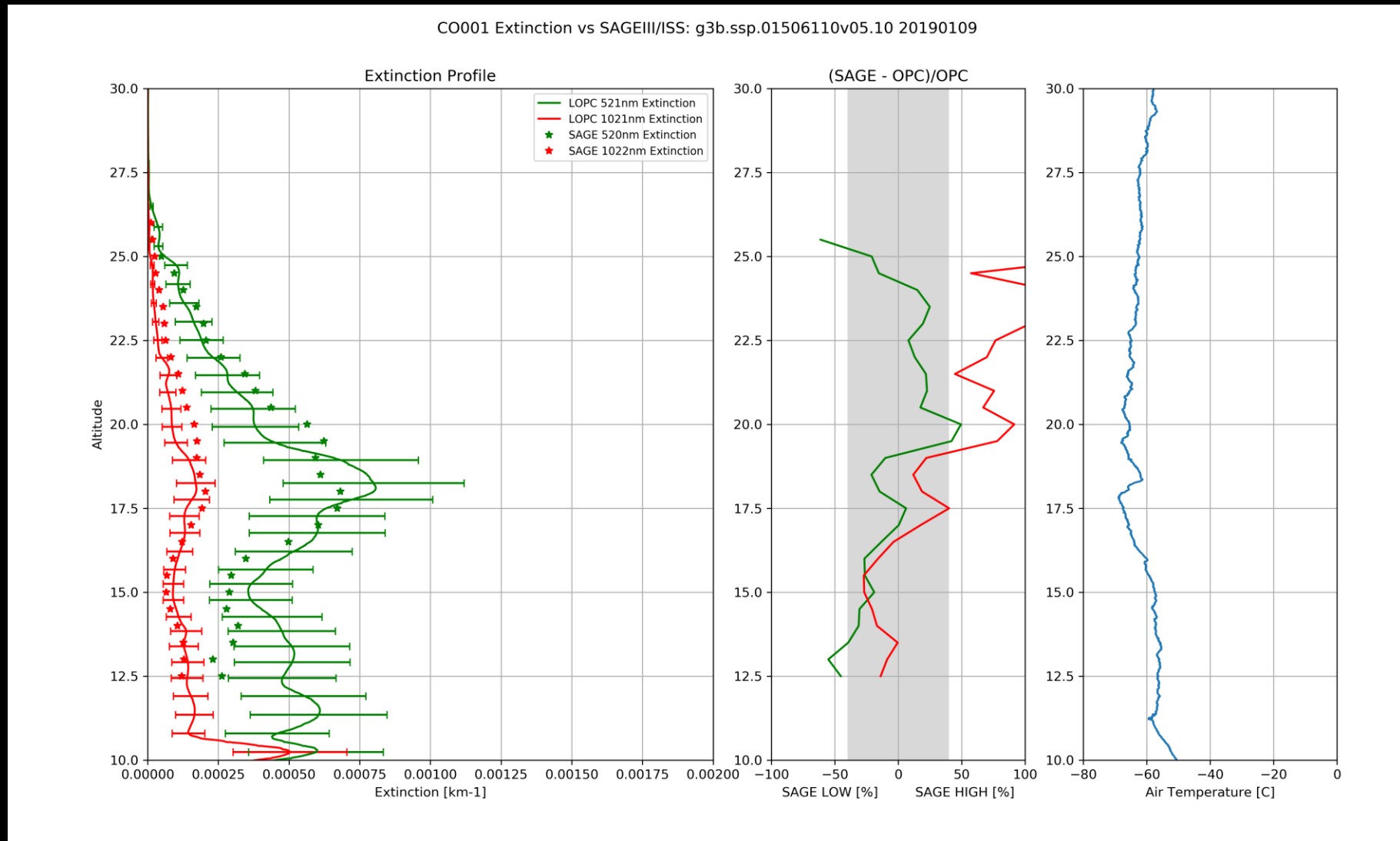
# 1. SAGE III/ISS vs OPC



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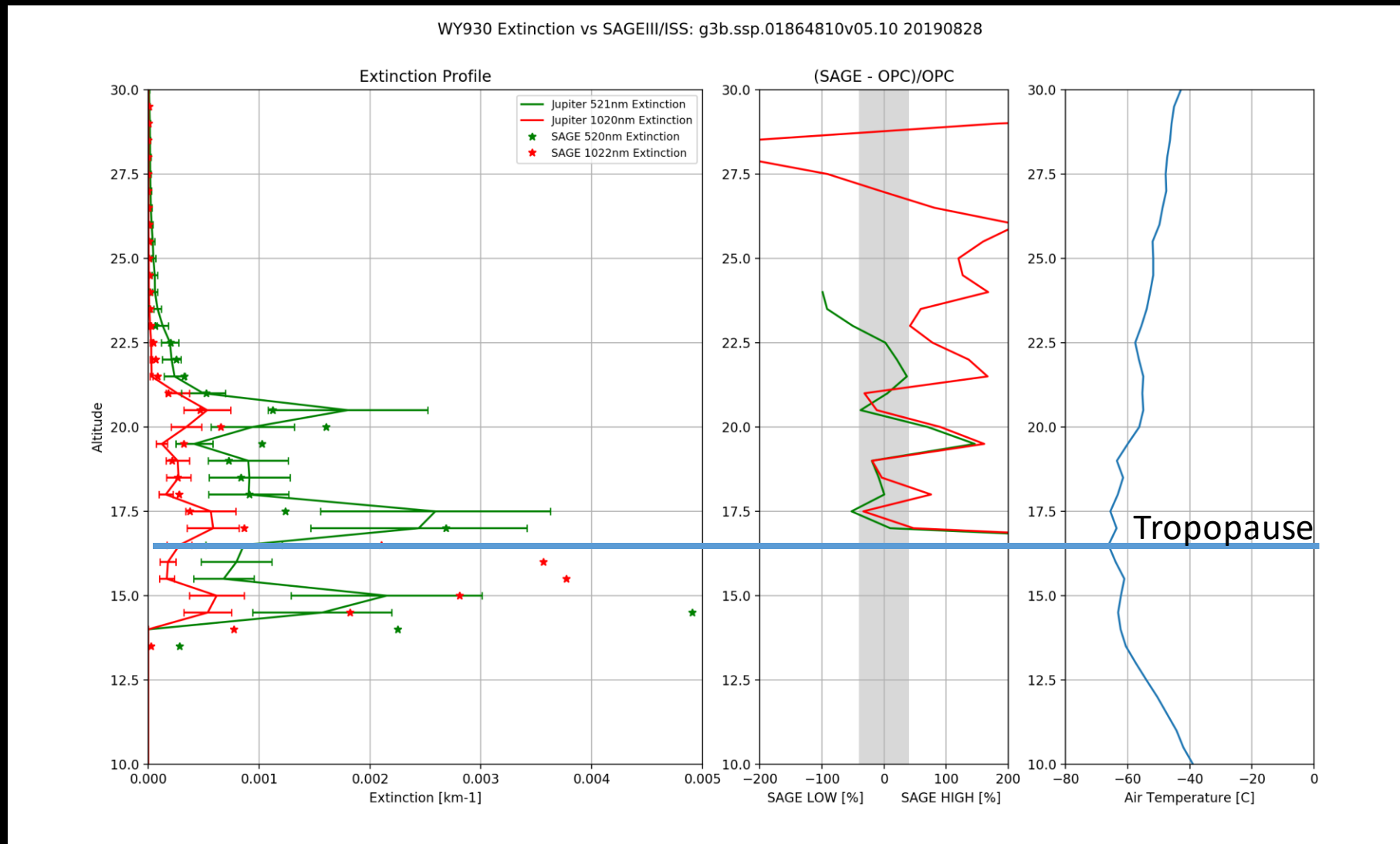


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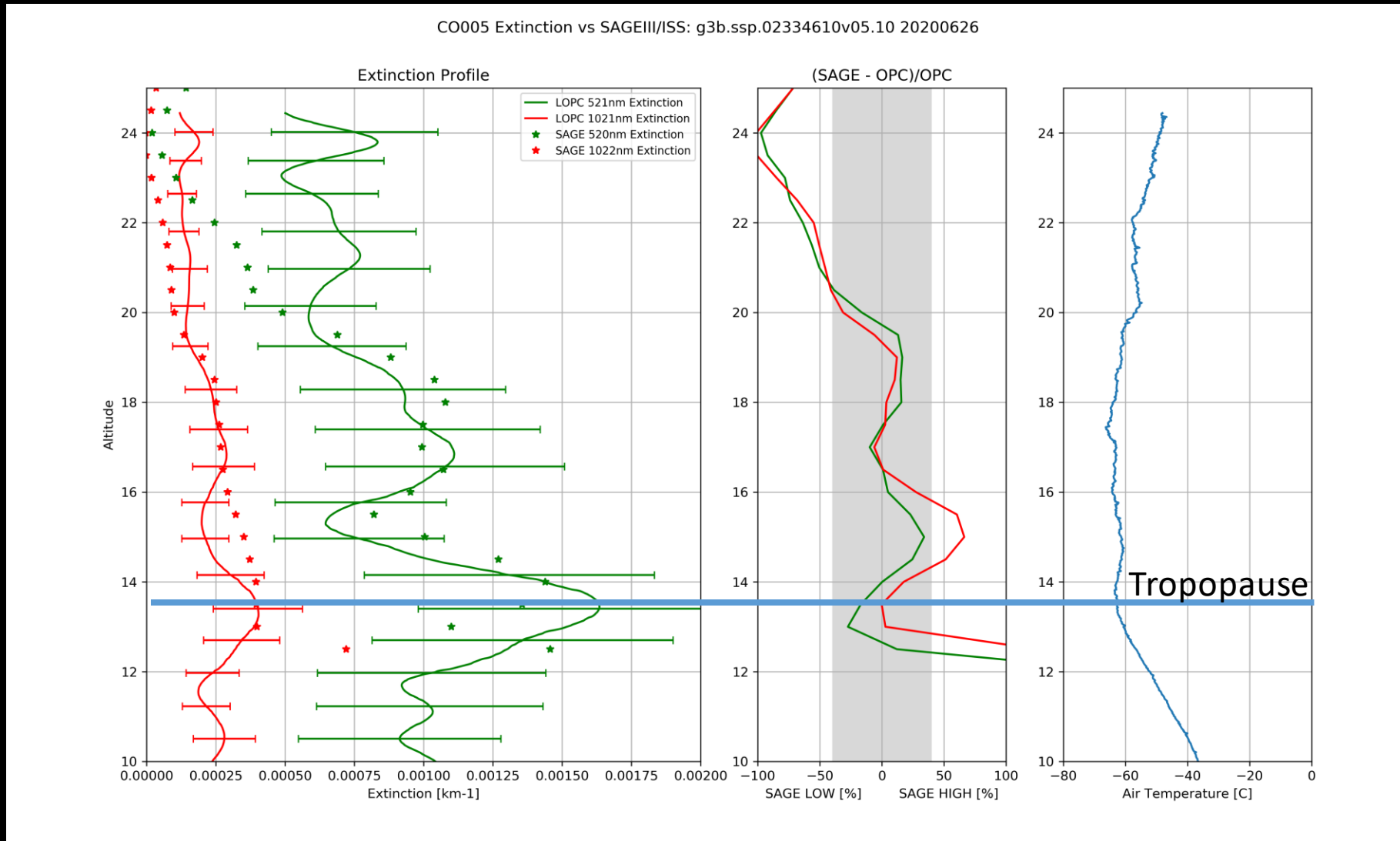
# 1. SAGE III/ISS vs OPC

Raikoke Eruption - Note Scale Change!

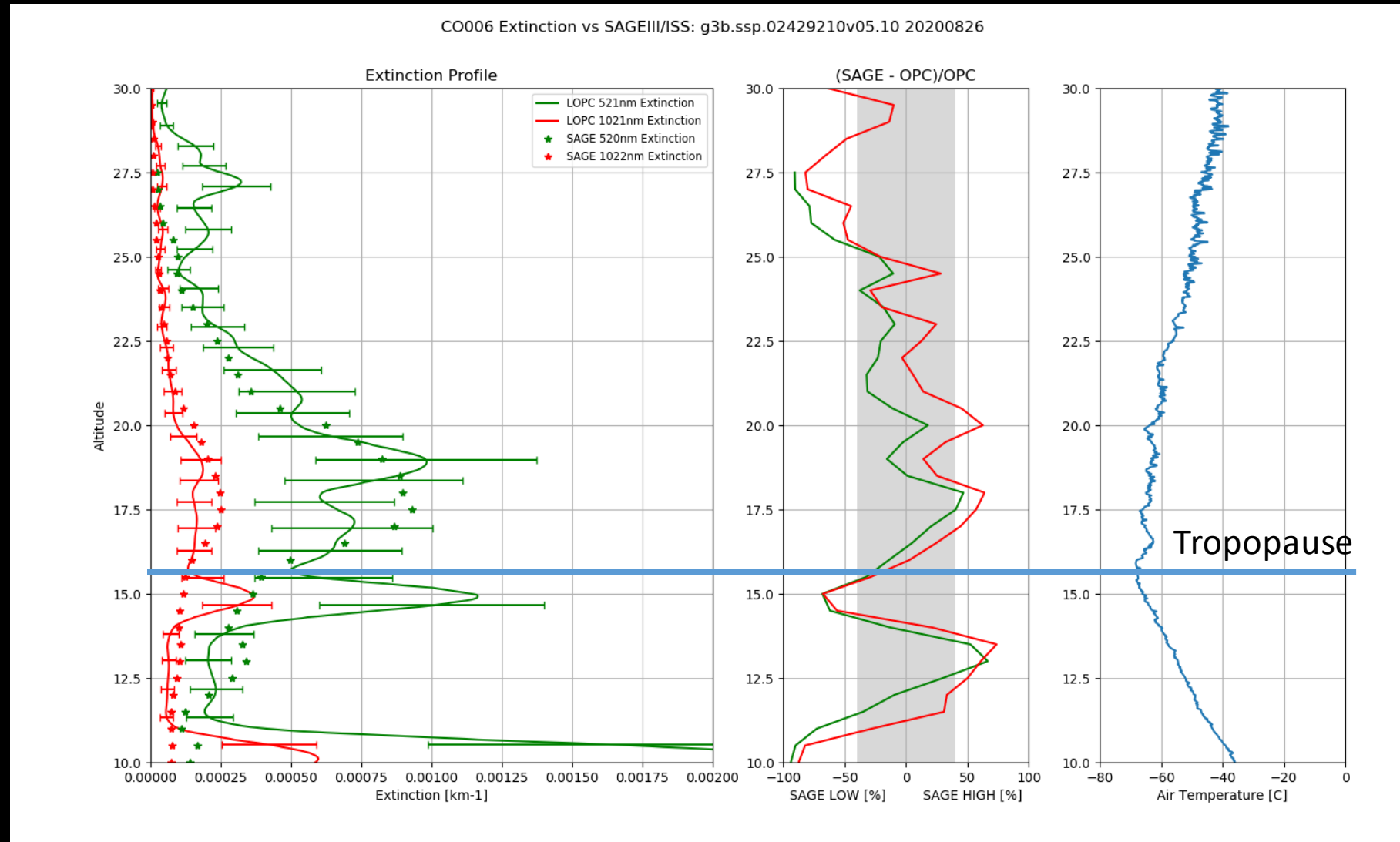




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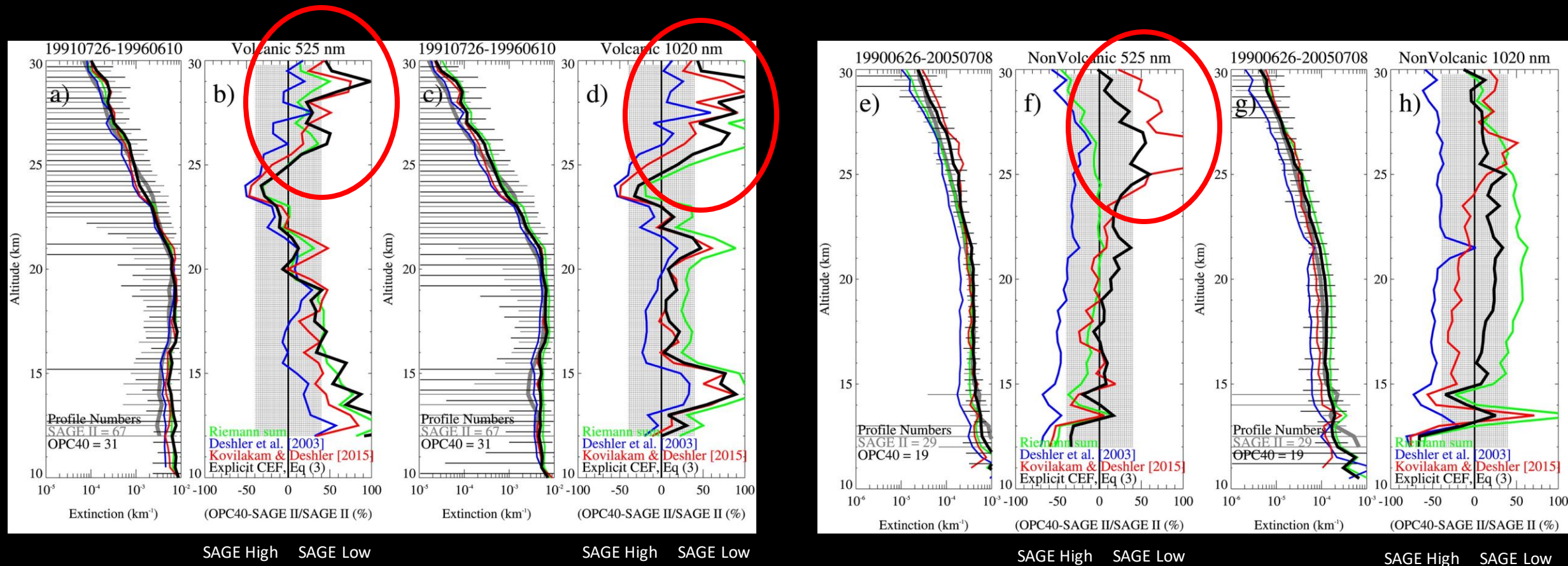


# 1. SAGE III/ISS vs OPC





# 1. SAGE II vs OPC

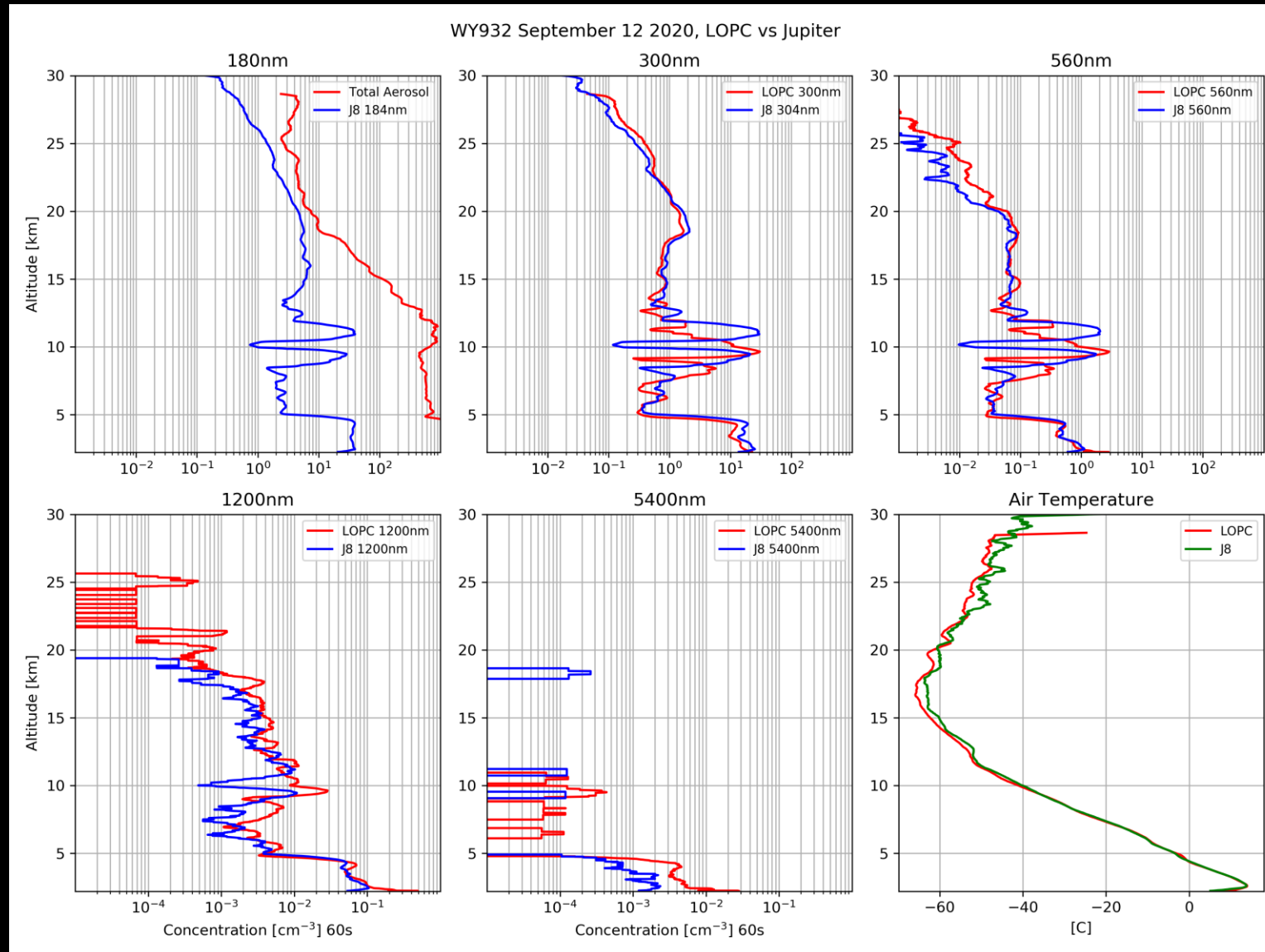


Deshler, T., Luo, B., Kovilakam, M., Peter, T., & Kalnajs, L. E. (2019). Retrieval of aerosol size distributions from in situ particle counter measurements: Instrument counting efficiency and comparisons with satellite measurements. *Journal of Geophysical Research: Atmospheres*, 124, 5058–5087. <https://doi.org/10.1029/2018JD029558>

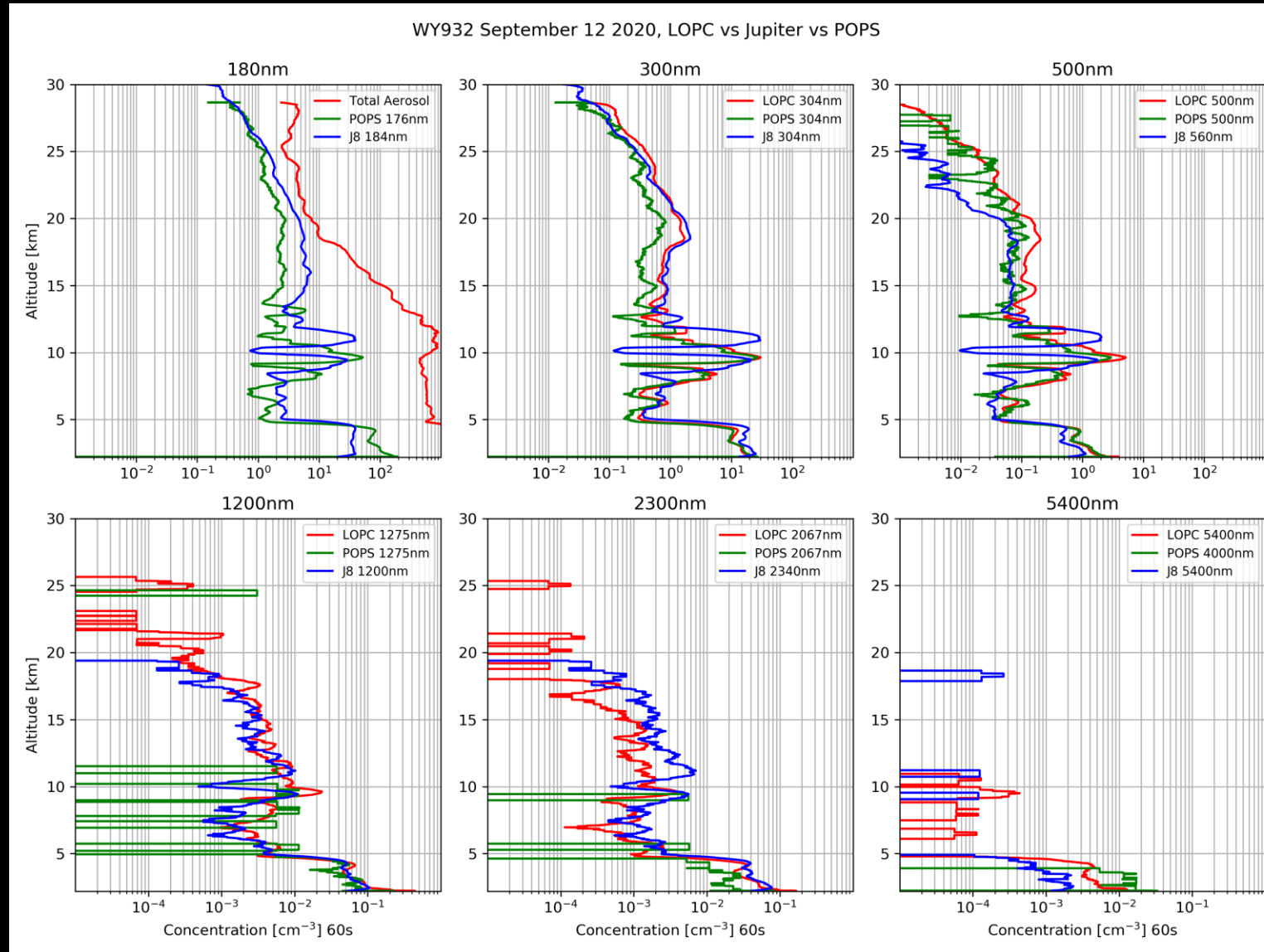
# 1. SAGE III/ISS OPC Conclusions

- **From the tropopause up to 25km SAGE III/ISS Extinctions agree with OPC measurements**
- Above 22-25km SAGE III/ISS is underestimating extinction
- This was also observed with SAGE II
- During anomalous events (i.e. Raikoke eruption and smoke plumes) with fine vertical structures, significant differences between SAGE III/ISS and OPC are observed

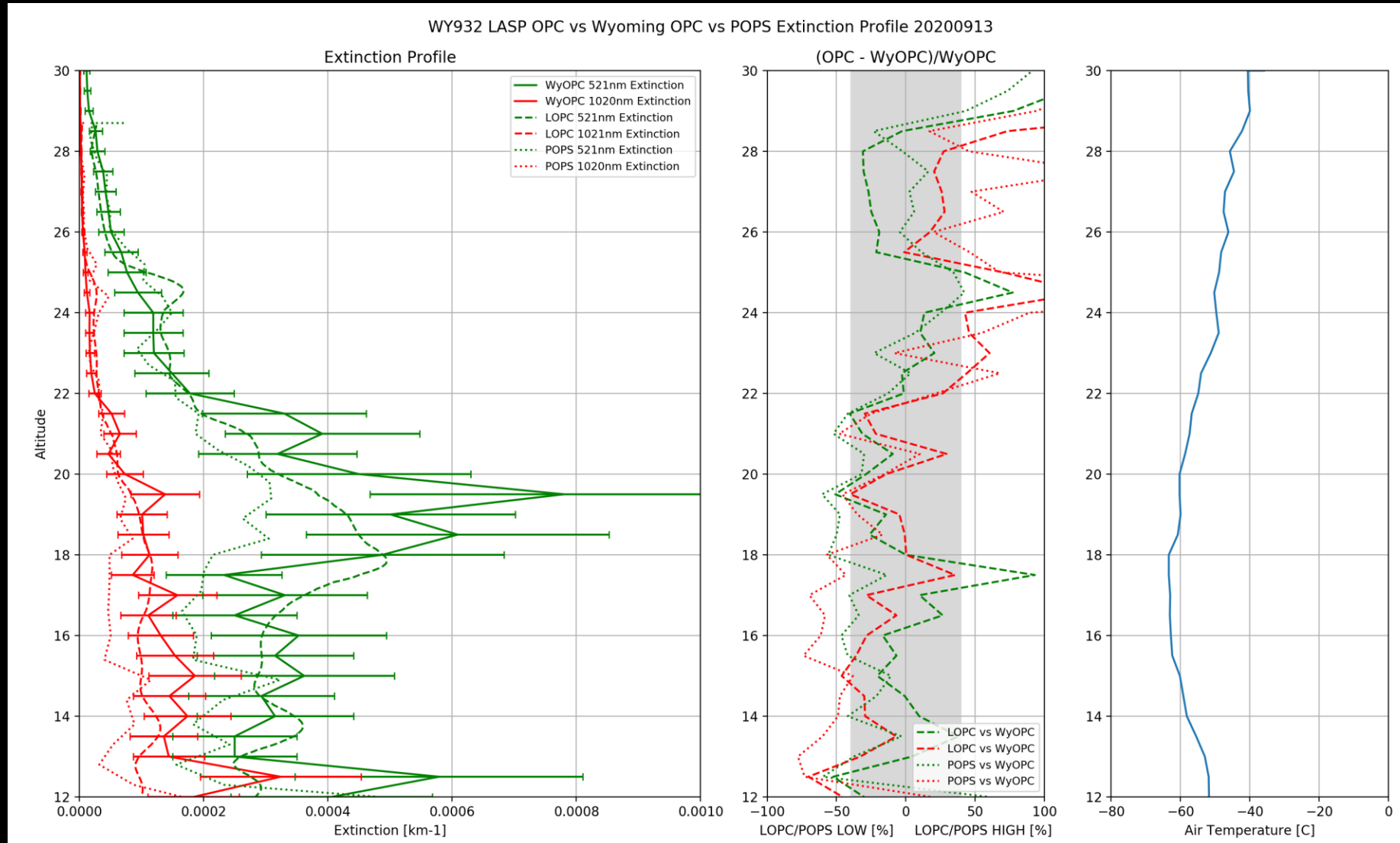
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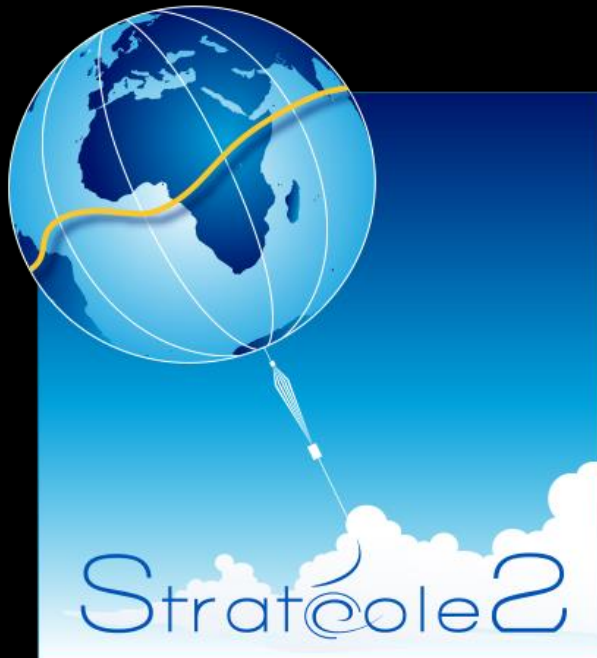
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## 2. OPC vs OPC Conclusions

- New LASP OPC (LOPC) aerosol concentrations agree well with heritage Wyoming OPC measurements (Jupiter)
- Comparison of extinction profiles using different instruments and different/independent extinction algorithms agree to within instrument and algorithmic uncertainty

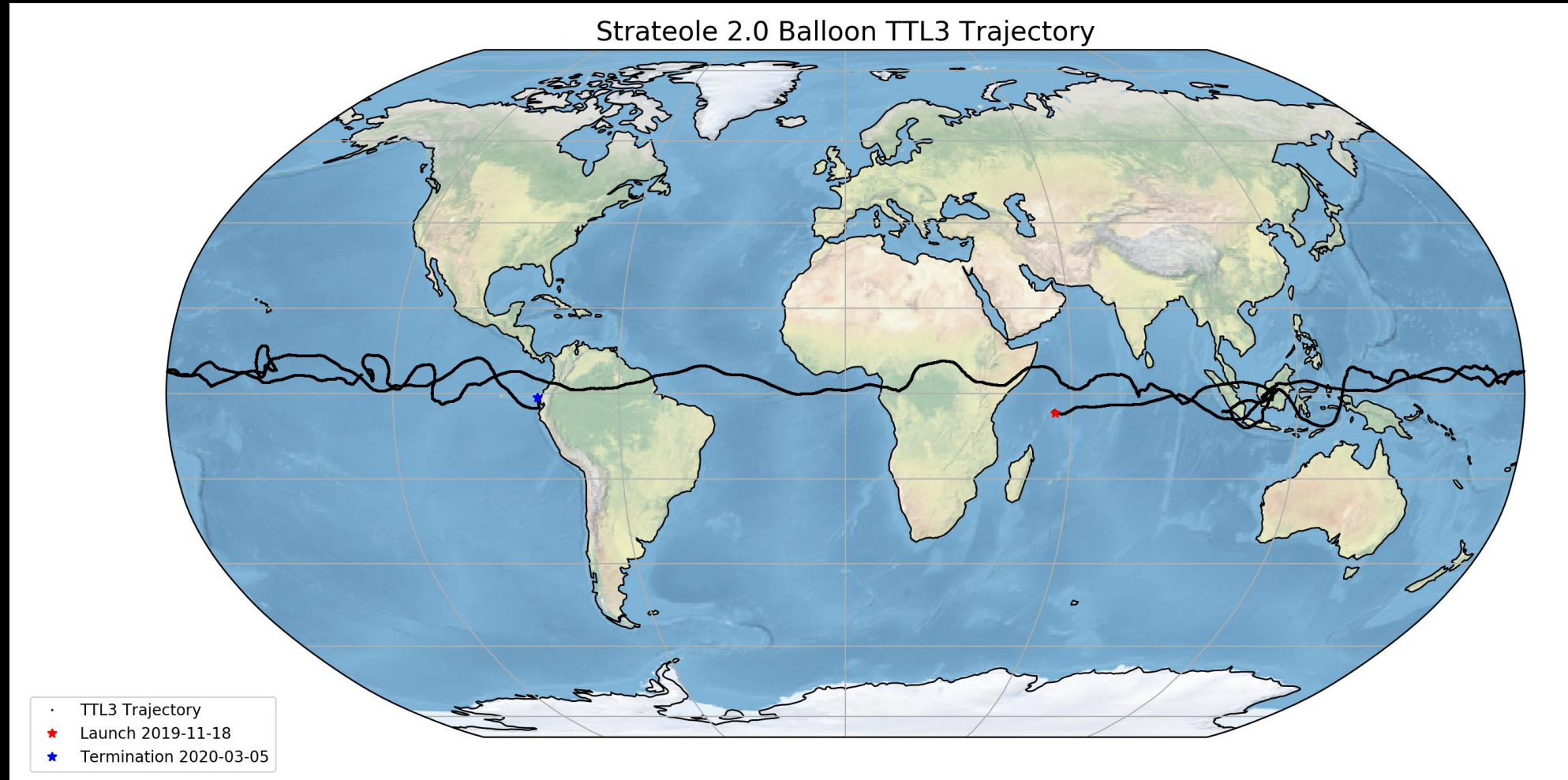
### 3. Long duration TTL measurements to validate SAGE III/ISS



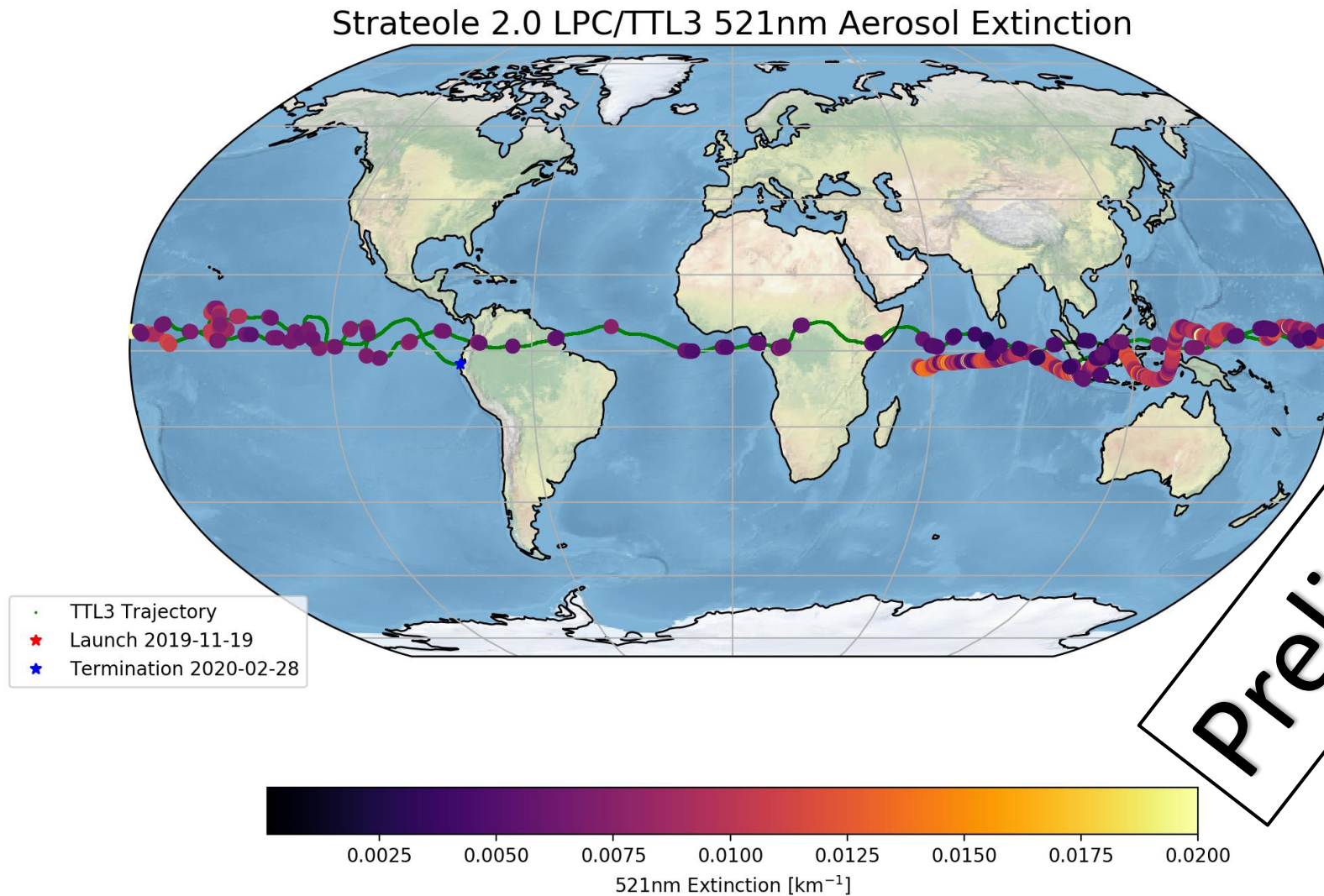
- Series of long duration super pressure balloon missions to study the Tropical Tropopause Layer
- Three balloon missions with a total of 50 balloons flying at ~19 – 21km in the tropics for 3-4 months each
- LASP built instruments for measuring aerosol (LOPC), and profiles of aerosol and water vapor
- Test mission complete in 2019/2020, main missions in 2021 and 2024
- Many opportunities to validate SAGE III aerosol, water vapor and ozone in the tropics



### 3. Long duration TTL measurements to validate SAGE III/ISS

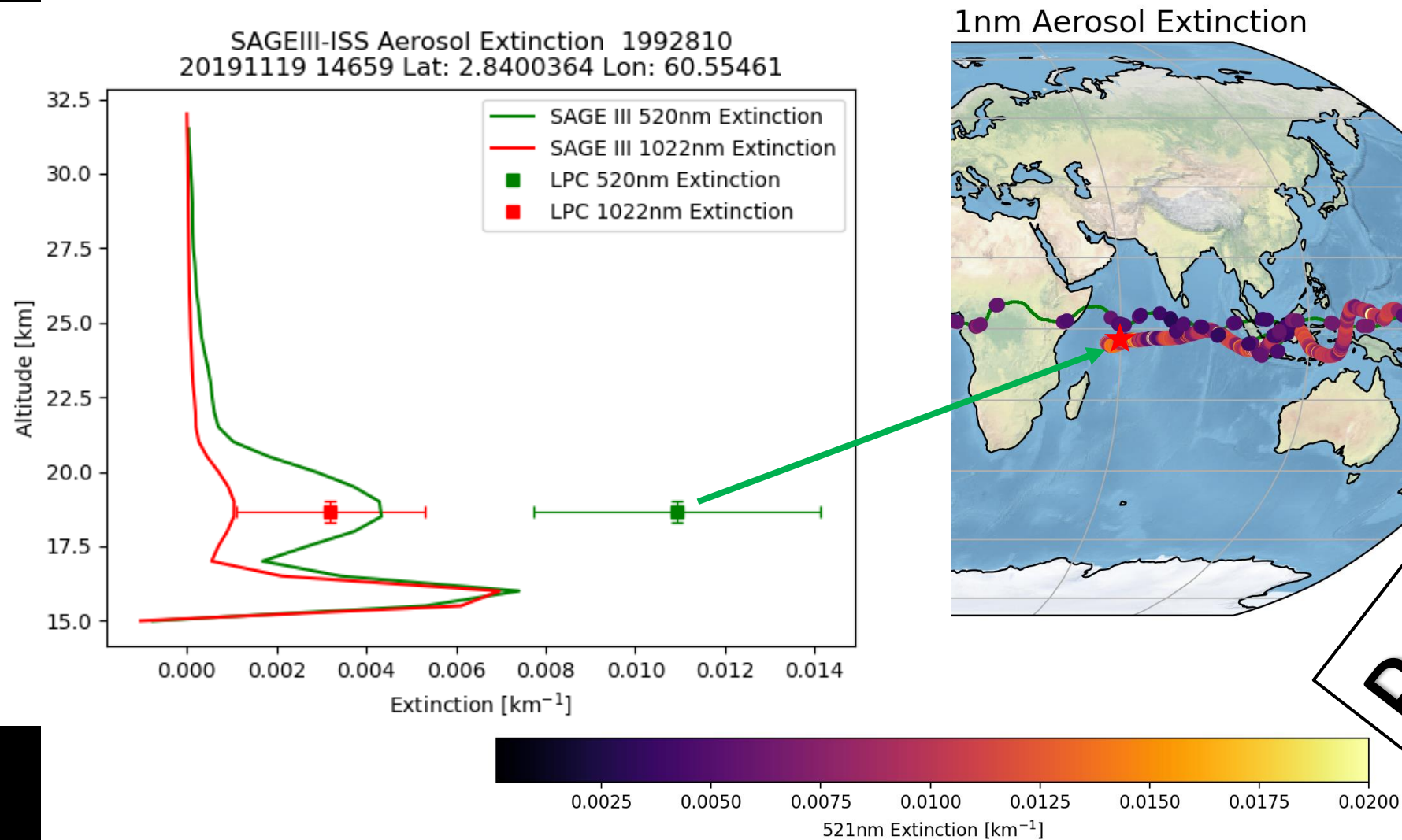


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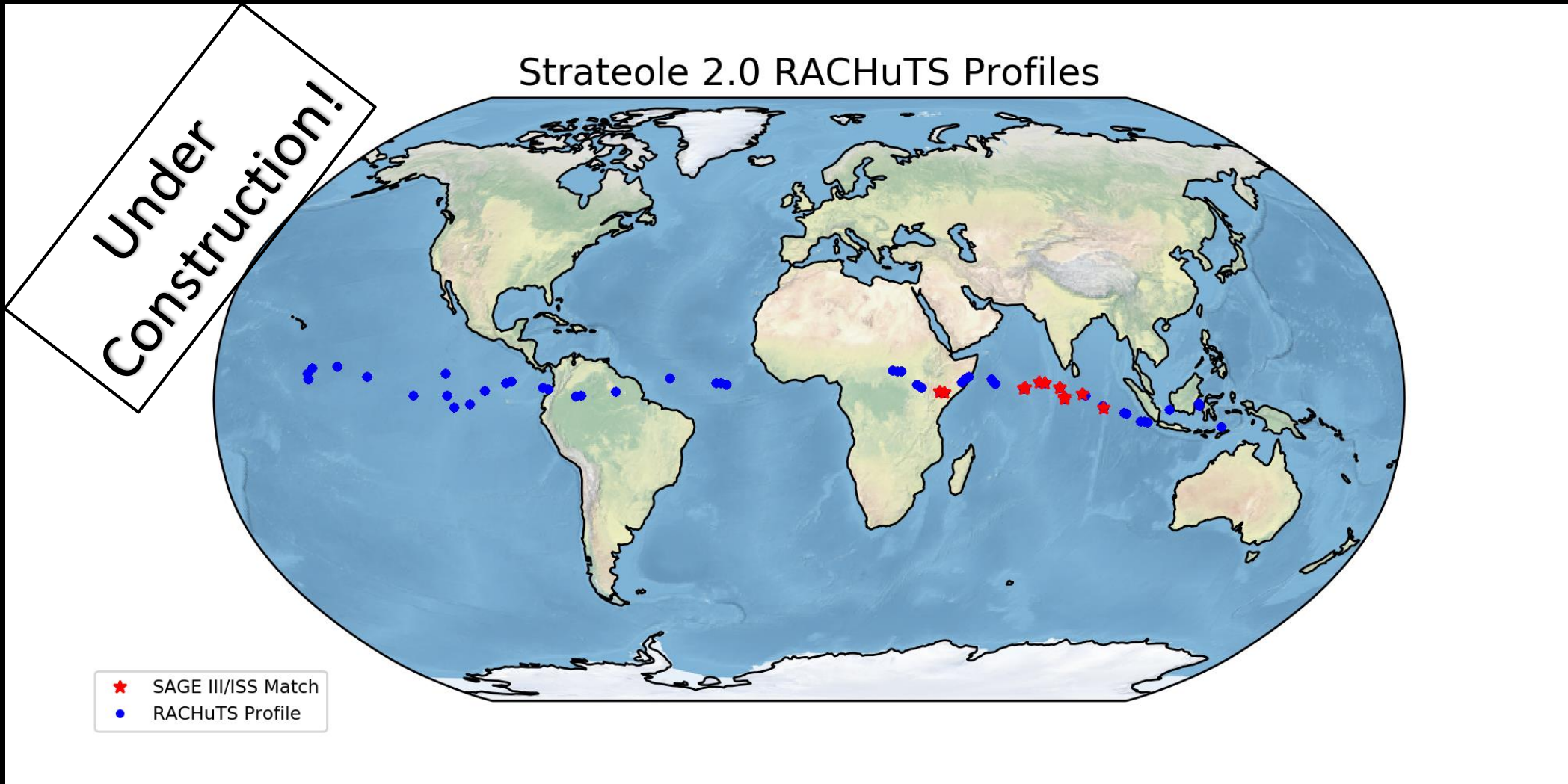
Preliminary!

### 3. Long duration TTL measurements to validate SAGE III/ISS





### 3. Long duration TTL measurements to validate SAGE III/ISS



RACHuTS Provides vertical profiles (16.5 – 18.5km) of Aerosol, Water Vapor and Temperature

### 3. Strateole 2 for comparisons near the TTL

- Flight level and reel down profile measurements of aerosol from Strateole 2 campaigns will provide numerous tropical comparisons to SAGE III/ISS
- The TTL and lower Tropical Stratosphere are a particularly interesting region, but pose unique challenges for satellite retrievals
- Future campaigns (2021, 2024) will fly ~ 50 balloons and provide many more measurements including profiles of aerosol and water vapor as well as flight level aerosol, water vapor and ozone

# Conclusions

- SAGE III/ISS agrees within uncertainty with In Situ measurements below 25km
- New Colorado OPC agrees with Wyoming OPCs within uncertainty
- Stratéole 2 Campaigns will provide many opportunities for tropical validation