

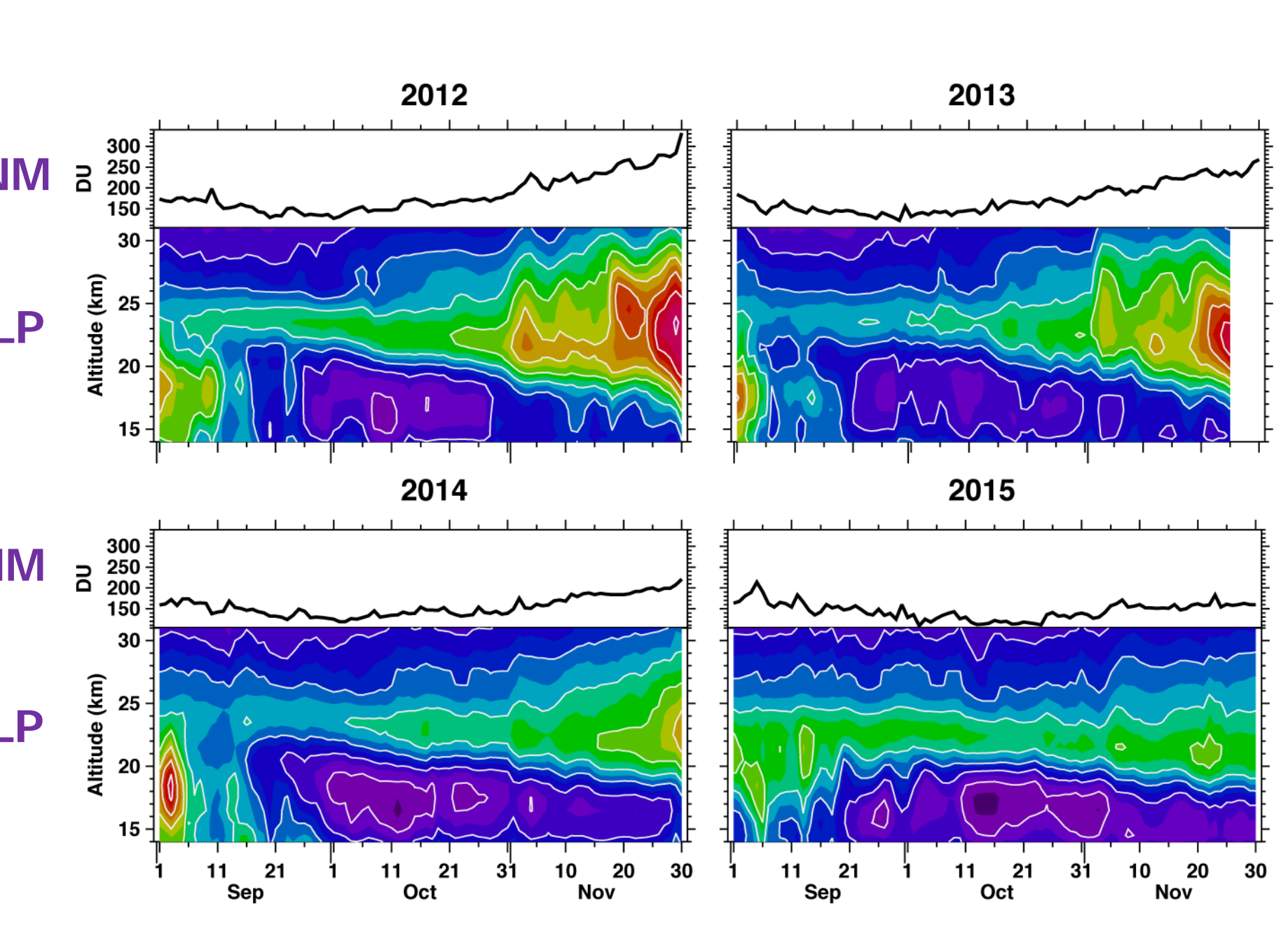
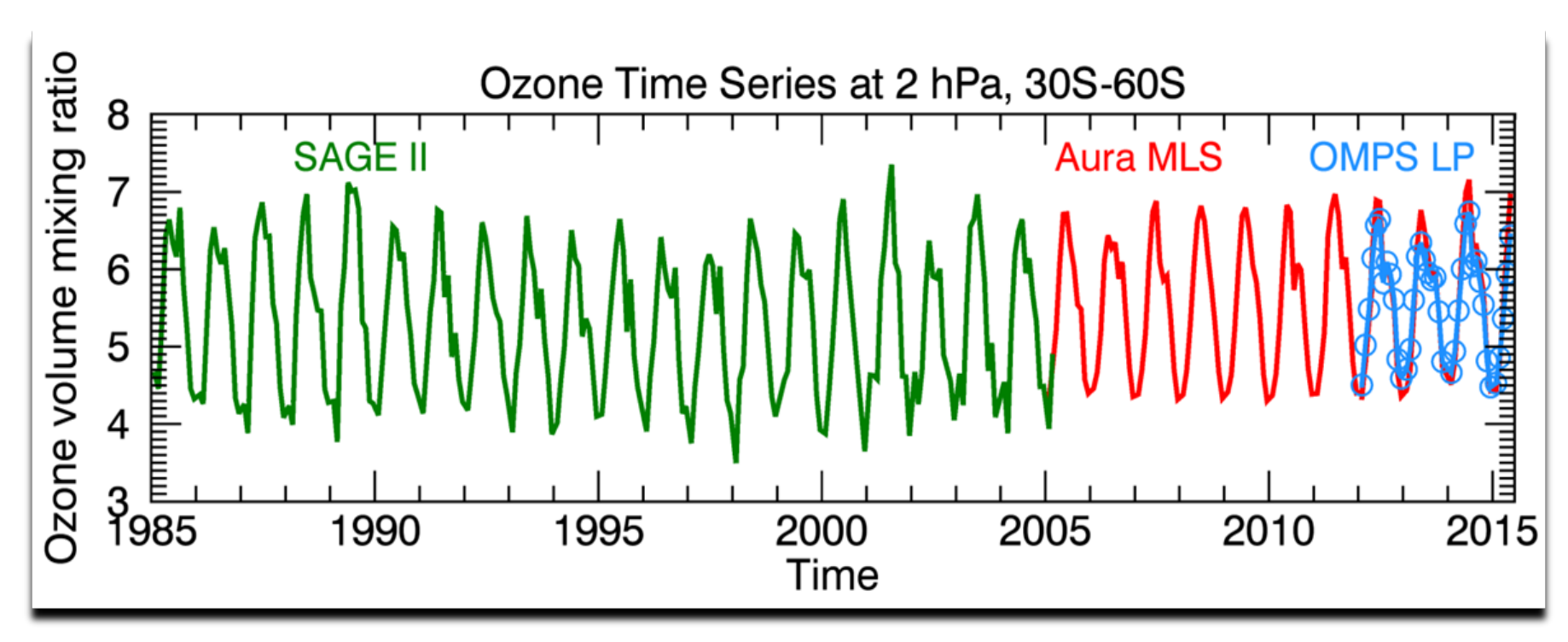
Suomi NPP OMPS Limb Profiler Data Products

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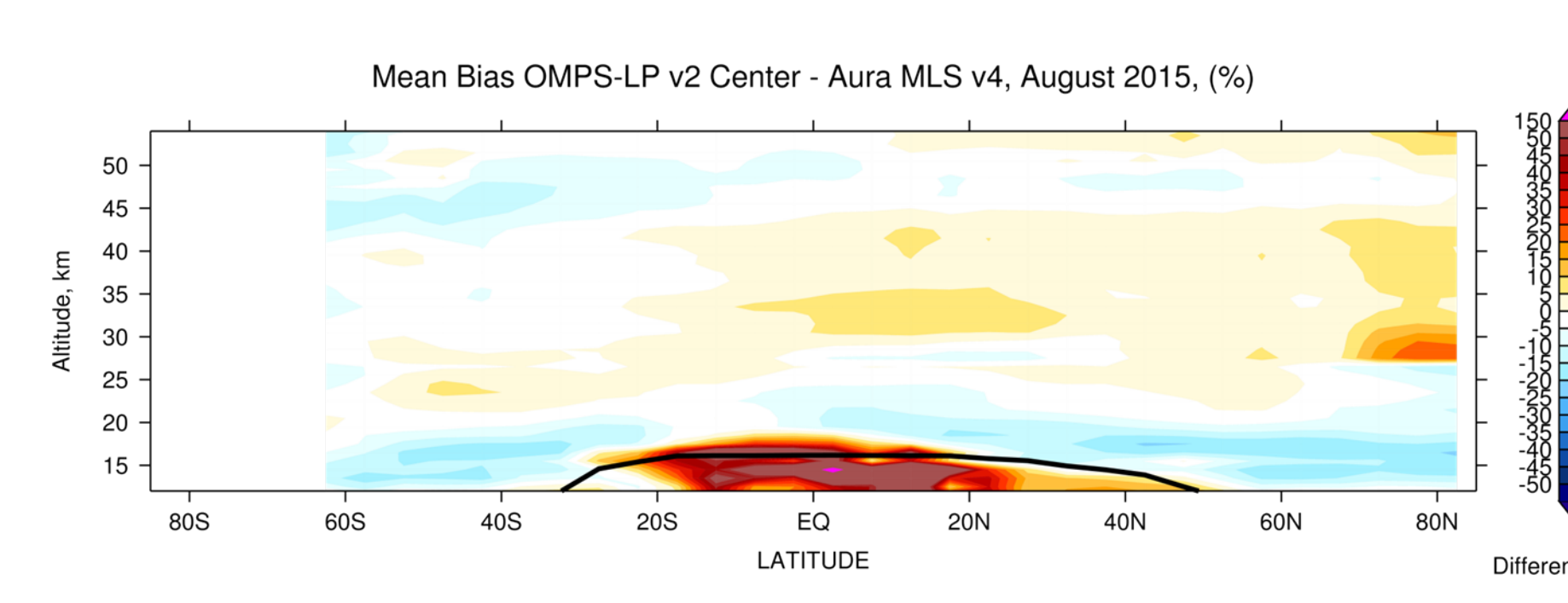
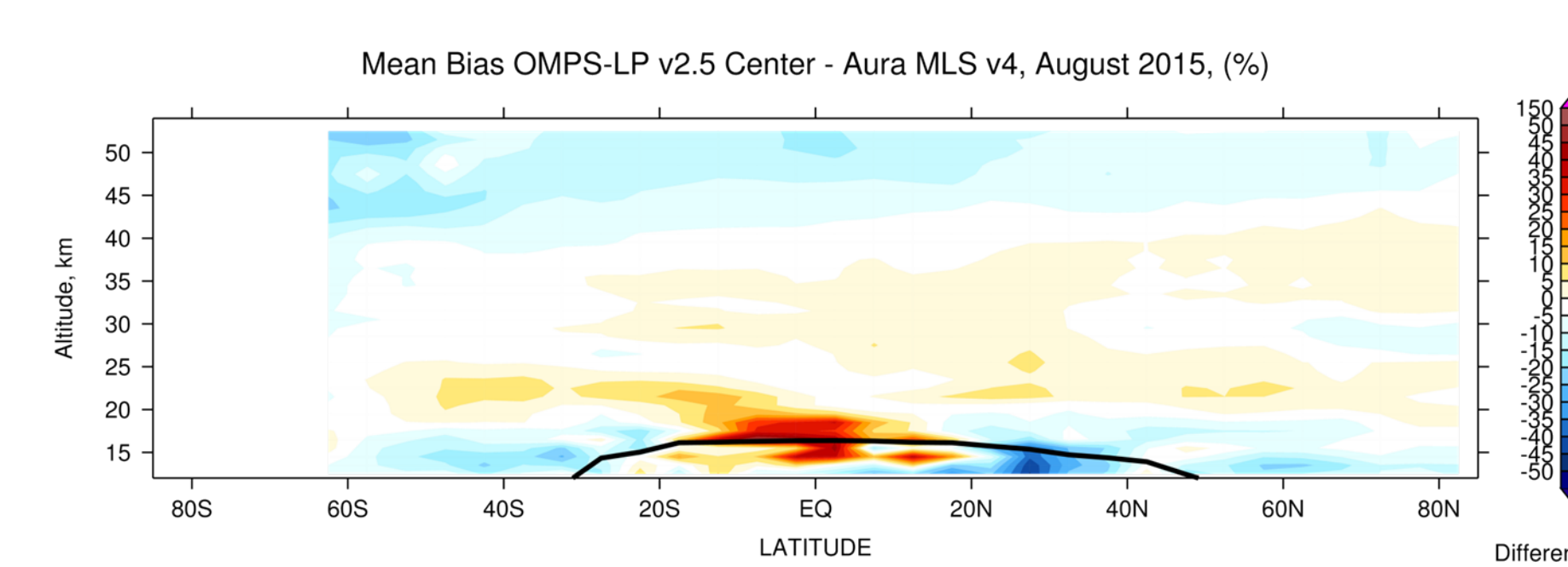
Poster P219 (QOS2016-178)
 Quadrennial Ozone Symposium, Edinburgh, SCOTLAND
 4-9 September 2016

- ## LP Ozone Product (Version 2)
- Separate retrievals performed with UV, visible wavelengths to cover ~10-60 km altitude range.
 - Primary product is ozone density profile on altitude scale. Mixing ratio product created using GMAO temperature data.
 - V2 product released in June 2014, operational processing continues to present. No aerosol correction, no merging performed for combined profile.
 - These data continue the long-term record of stratospheric ozone, and show the evolution of vertical structure of Antarctic ozone hole.



Version 2.5 Ozone Product (V2.5)

- Use improved L1B data (altitude registration, stray light correction, sun-normalized radiances). See Jaross et al., poster P243.
- Simplify wavelength selection in retrieval: 3 pairs in UV (302, 312, 322 nm with 353 nm), 1 triplet in VIS (602 nm with 510, 675 nm).
- Lower UV normalization altitude to 55 km to address stray light effects, PMC contamination.
- Calculate aerosol correction using LP V1.0 profiles.
- Apply smooth merging between UV, VIS retrievals to create combined density profile.



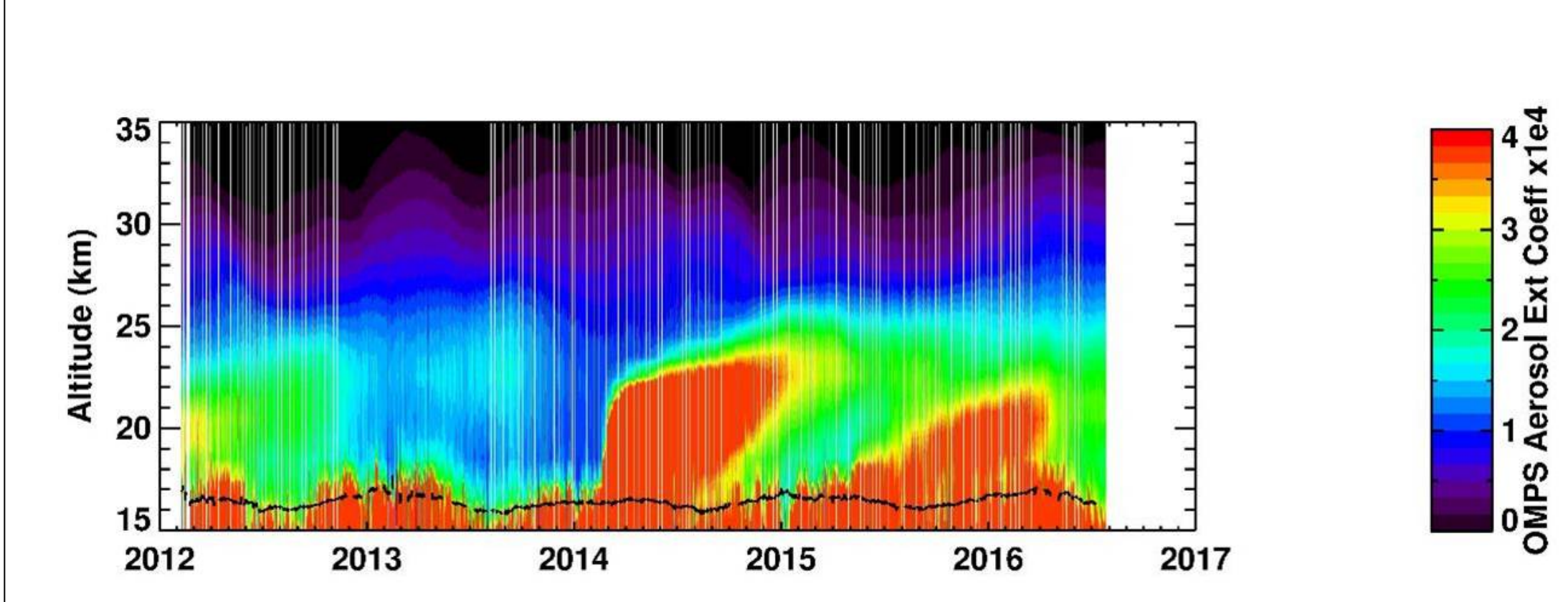
- Sample data processed for August 2015, October 2015 to evaluate performance with Calbuco aerosols, ozone hole conditions. See Kramarova et al. presentation, Thursday 14:15.
- V2.5 data show improvement in tropical UT/LS bias, NH discontinuity vs. MLS data.
- Full reprocessing will take place in Fall 2016.

Overview

- Ozone Mapping and Profiler Suite (OMPS) is currently flying on Suomi National Polar-orbiting Partnership (NPP) satellite to measure profile ozone and aerosol extinction.
- Limb Profiler (LP)** instrument views Earth's limb looking backwards along orbit using 3 slits (along track, 4.25° to each side).
- Hyperspectral measurements simultaneously cover 290-1000 nm in wavelength and 0-80 km in altitude every 19 seconds.
- Spectral resolution varies from 1 nm (UV) to 30 nm (IR). Altitude sampling is 1 km, vertical resolution is ~1.8 km.
- Next LP instrument is scheduled to fly on Joint Polar Satellite System (JPSS-2) satellite in 2022.

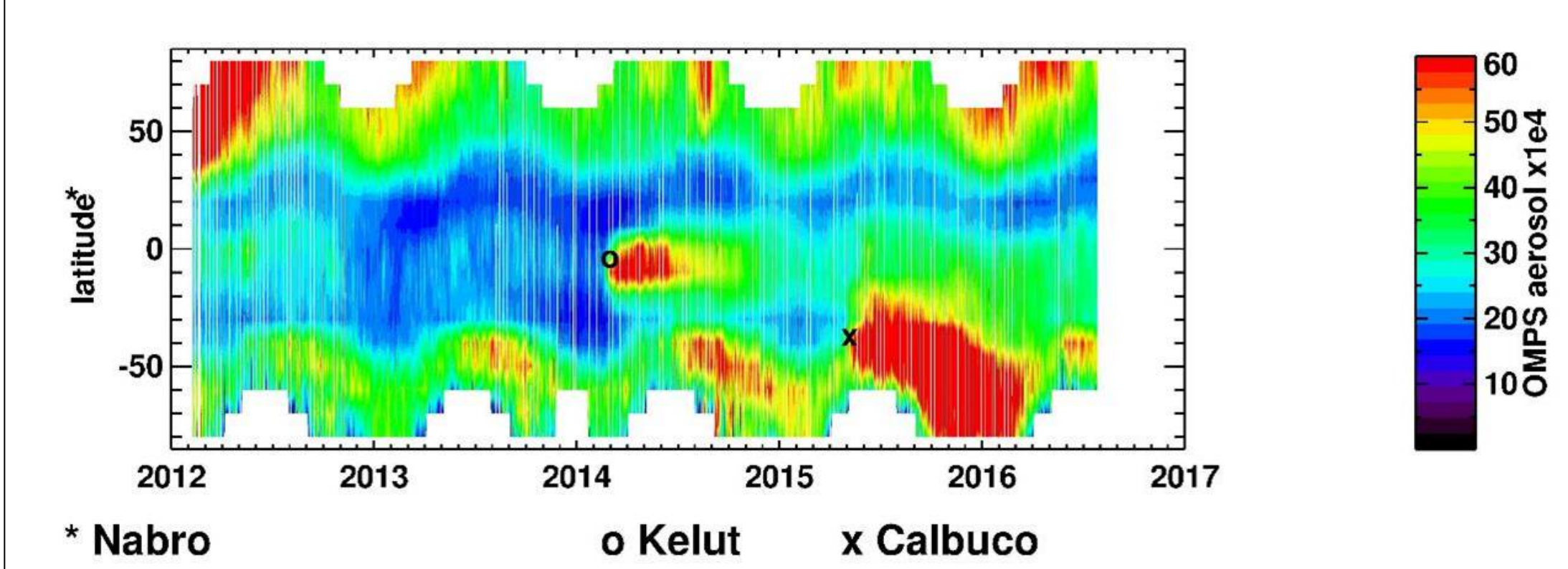
V1.0 Aerosol Product

- Retrieve aerosol extinction at single wavelength (675 nm) using Chahine non-linear relaxation algorithm.
- Use specified bimodal size distribution, fixed Angstrom exponent for retrieval.
- Altitude coverage is ~10-35 km.
- Minimum extinction threshold is $\sim 1 \times 10^{-5} \text{ km}^{-1}$.



Zonal mean extinction coefficient time series at 0° -10° S

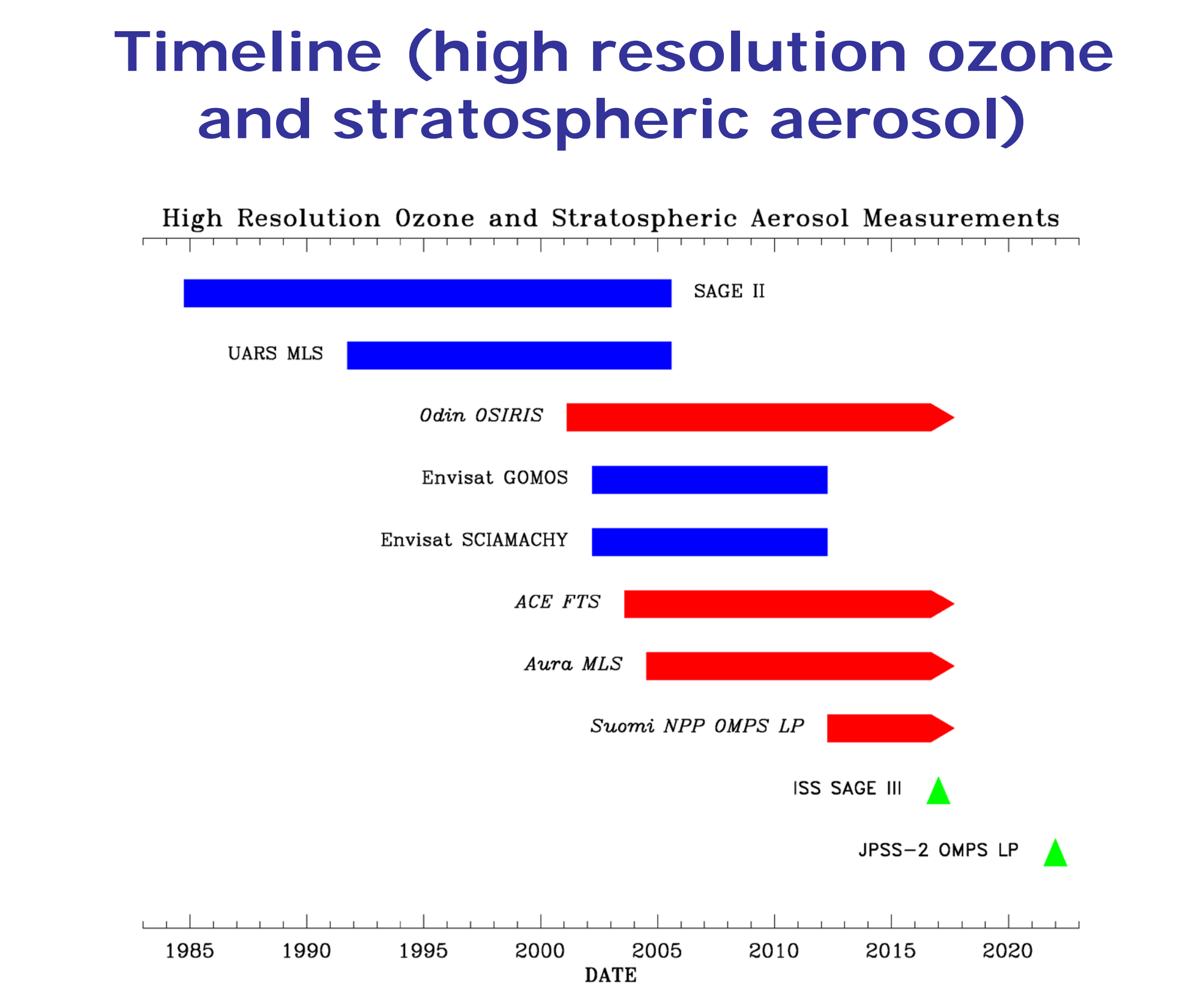
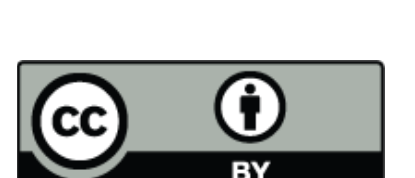
- Preliminary version of product shows good ability to observe and track volcanic eruption plumes. See Taha et al., poster P225.
- Seasonal variations in extinction are also evident.
- Reprocessing of full data record will be completed in September 2016.



LP stratospheric aerosol column

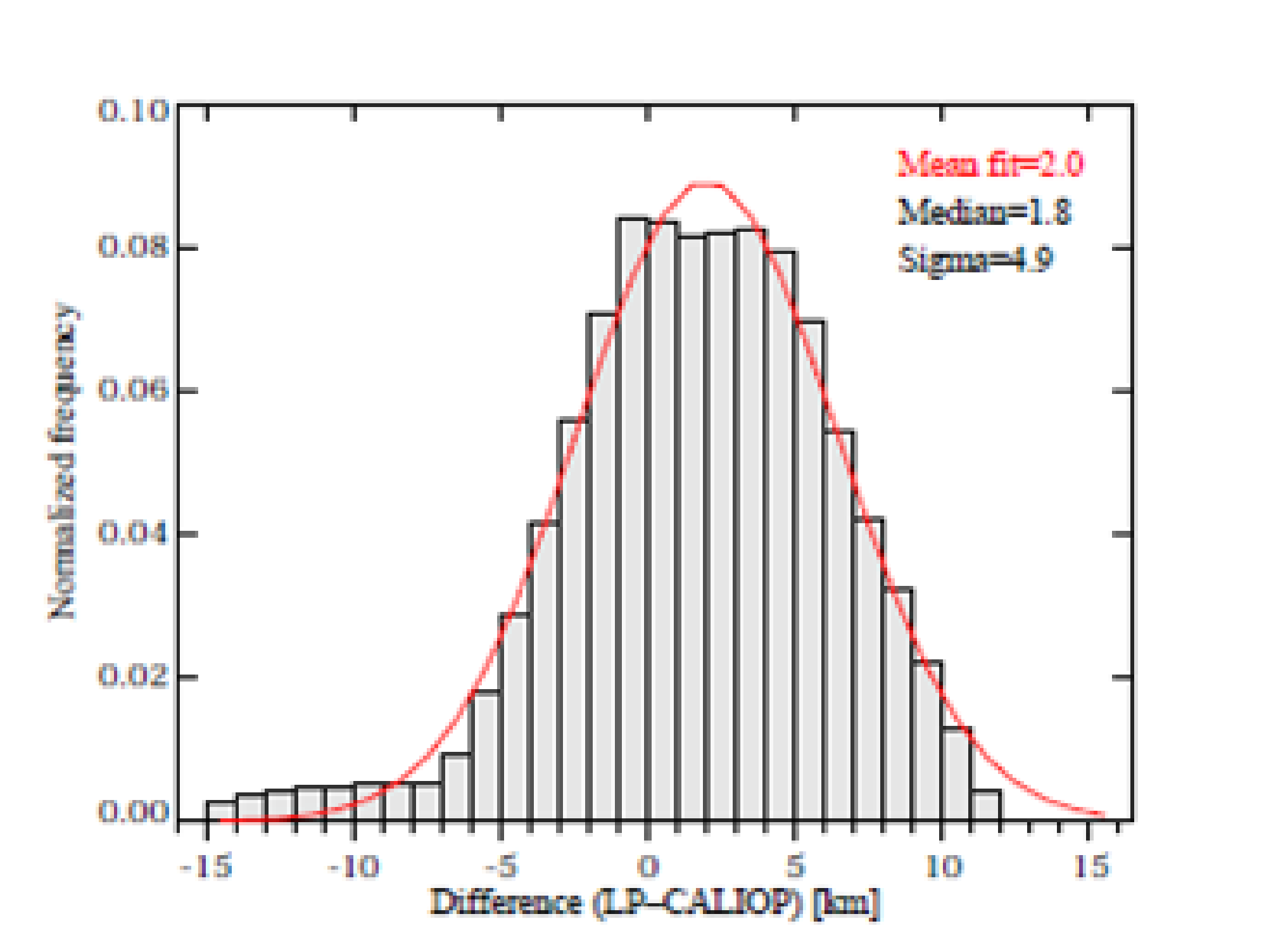
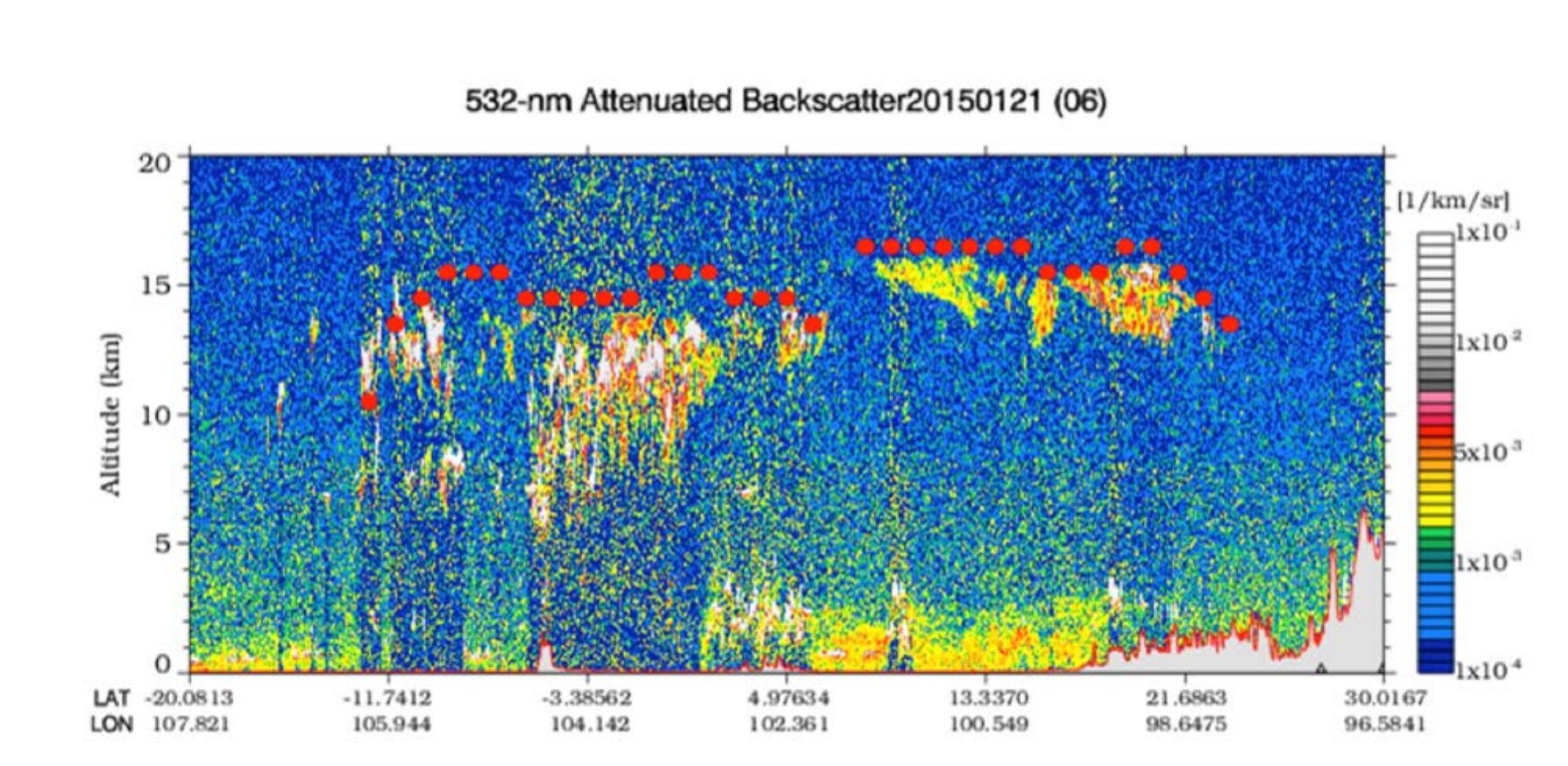
Future Plans

- Develop 2-D retrieval algorithm that accounts for line-of-sight variations in aerosols, ozone, pressure and temperature profiles.
- Use limb retrievals to constrain nadir retrievals.
 - Extend ozone profiles to surface.
 - Correct for dynamical features (e.g. QBO) that are not resolved by nadir-viewing instrument.
- Simultaneously derive ozone and temperature profiles between 40-65 km with ~2 km vertical resolution.
- Retrieve aerosol Ångström exponent from LP data and validate using solar occultation measurements from SAGE III on ISS. See Roell et al., poster P263.



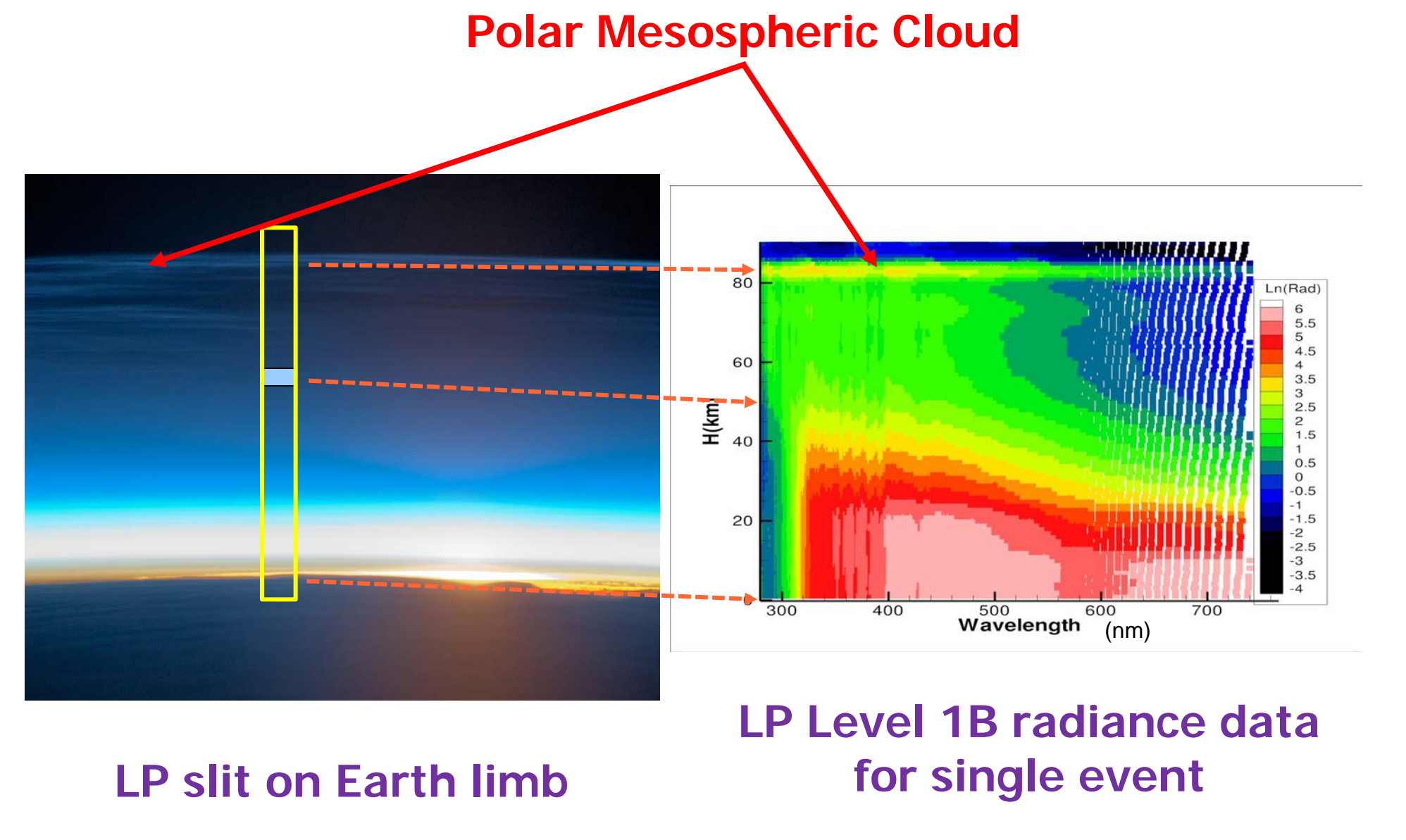
Cloud Height Product

- LP profile retrievals assume cloud-free scene → Need to identify any cloud in field of view to set appropriate lower limit retrieval.
- Difference in vertical gradient of radiance between two wavelengths (674 nm, 868 nm) can distinguish top of cloud from background aerosol layer.
- LP cloud detection results are consistent with CALIPSO data for zonal mean coincidences.



Z. Chen et al., Atmos. Meas. Tech., 9, 1239-1246 [2016]

Polar Mesospheric Clouds (PMCs)



LP slit on Earth limb

- PMCs are observed at 80-85 km in polar regions (>50° latitude) during summer months.
- Enhancement of radiance signal by PMC in foreground can affect LP measurements at tangent point down to 45-50 km.
- PMCs are much brighter in Northern Hemisphere for LP due to phase function of small ice particles.
- LP measurements have synergy with Nadir Profiler PMC data due to 7-minute separation between observations.

