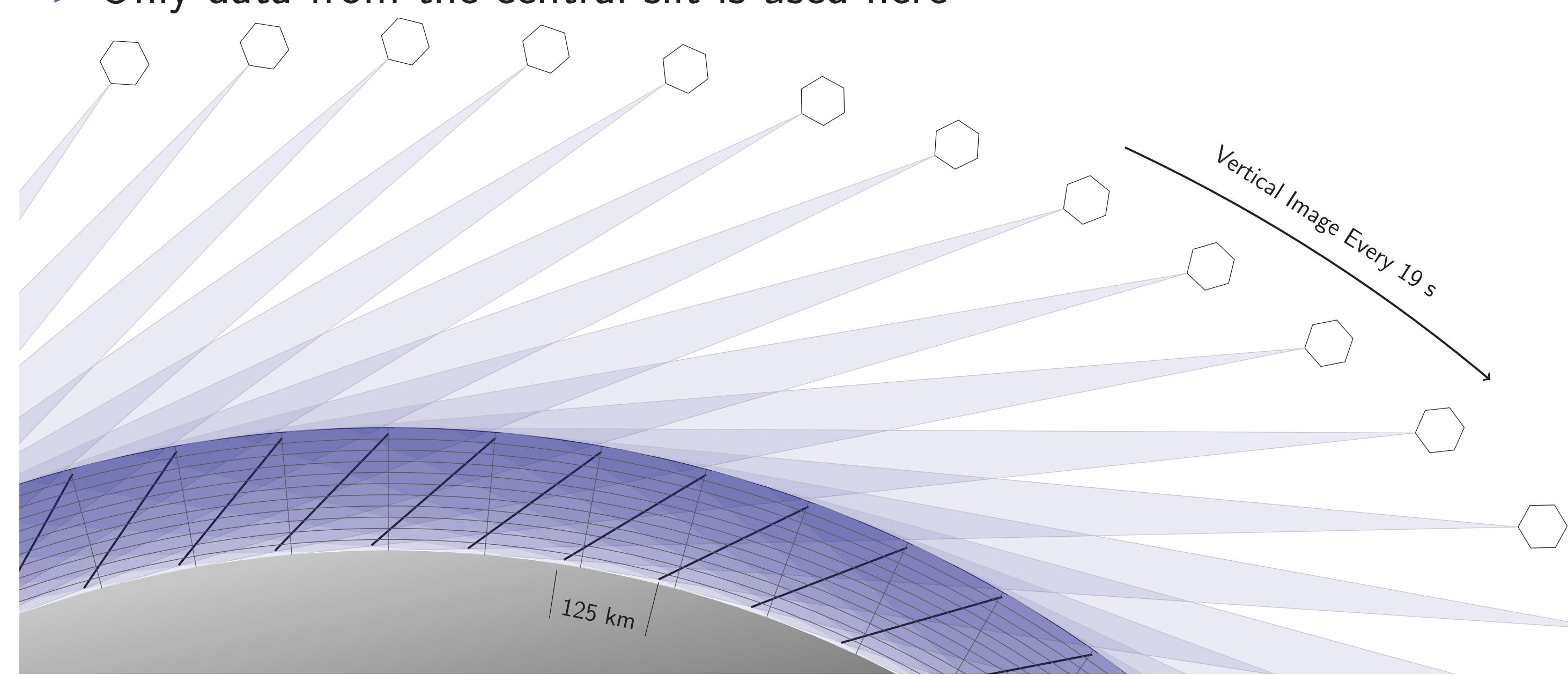


OMPS-LP Tomography

Ozone Mapping and Profiler Suite Limb Profiler

- Launched onboard Suomi NPP in 2011
- Measures scattered sunlight in the $\sim 280 - 1000$ nm spectral region
- Only data from the central slit is used here



Each orbit is retrieved separately on a two dimensional grid in altitude and angle along orbital track

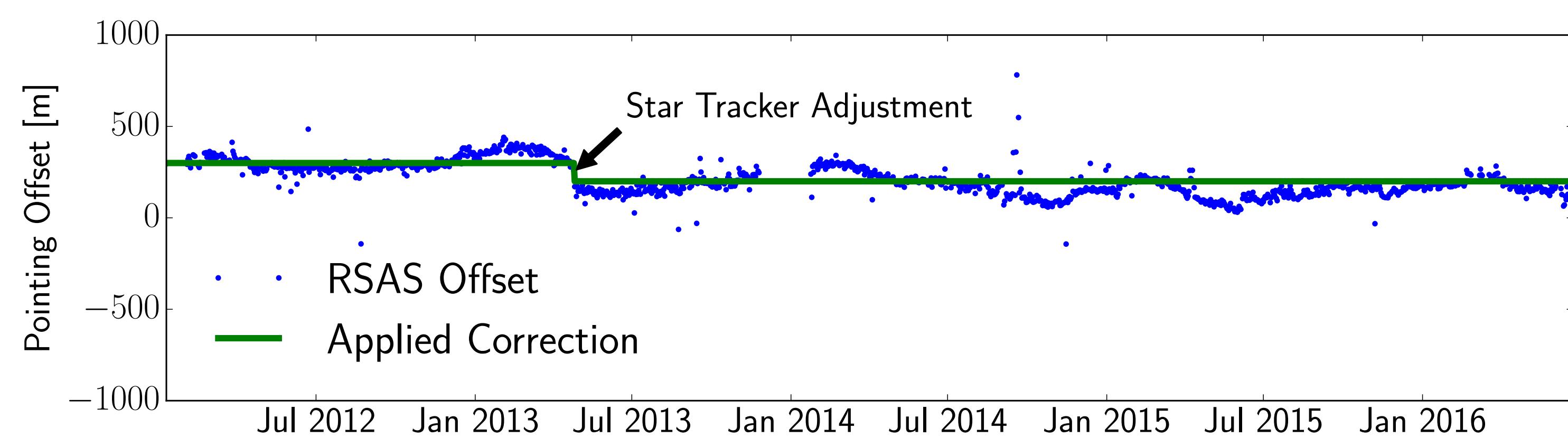
Iterative Method

- $$\mathbf{x}_{i+1} = \mathbf{x}_i + (J^T S_y^{-1} J + \Gamma^T \Gamma + \lambda I)^{-1} (J^T S_y^{-1} (\mathbf{y} - F(\mathbf{x})) + \Gamma^T \Gamma (\mathbf{x}_a - \mathbf{x}))$$
- \mathbf{x} is the ozone number density on the two dimensional grid (Length ~ 10000)
 - \mathbf{y} is the set of relevant measurements for an entire orbit (Length ~ 100000)
 - The forward model, F , is SASKTRAN-HR which simultaneously calculates the Jacobian, J
 - Γ is a second order central difference operator in the horizontal direction
 - The solution covariance is found by propagating the measurement covariance, S_y ,

$$S_x = (J^T S_y^{-1} J + \Gamma^T \Gamma)^{-1}$$

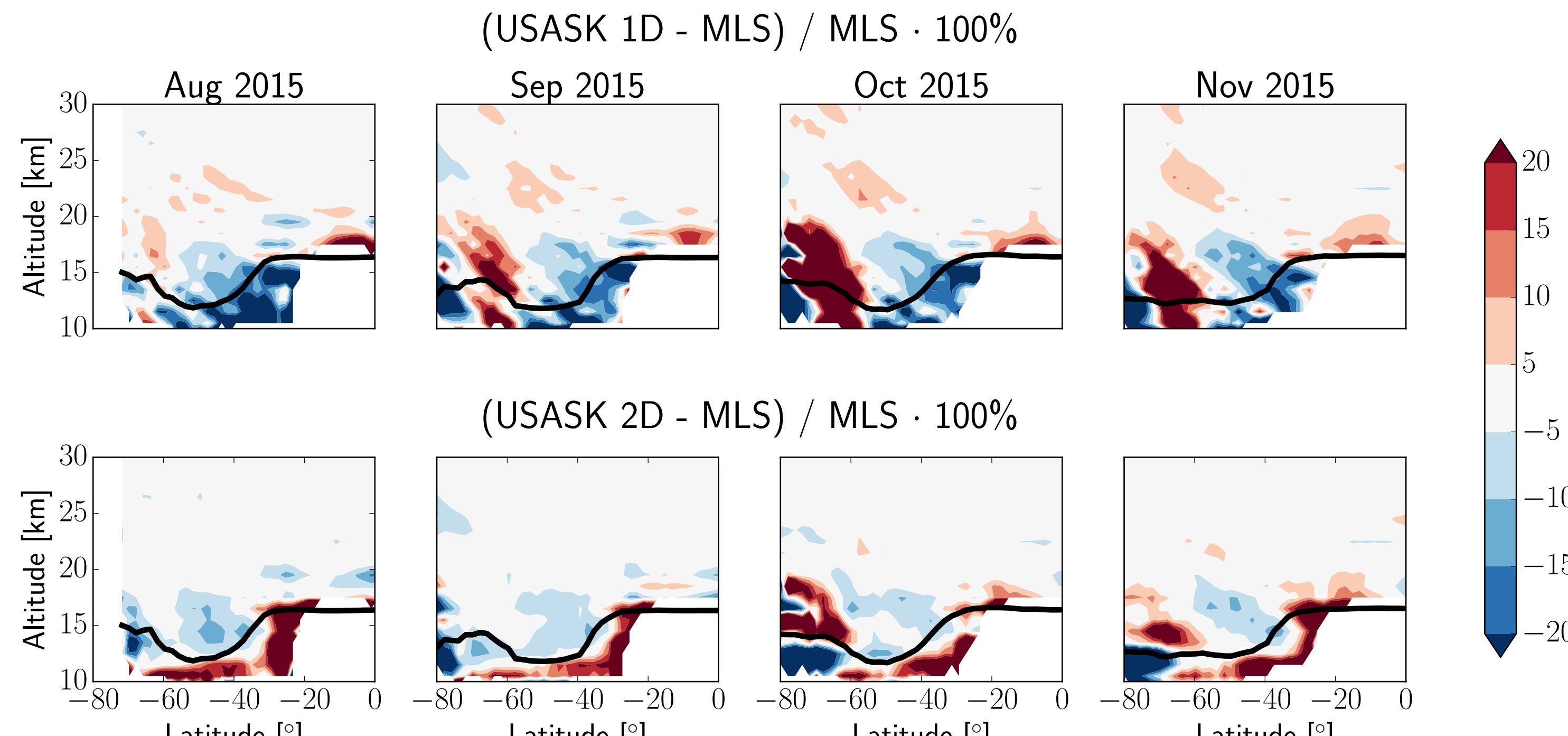
Pointing Correction

Rayleigh Scattering Attitude Sensor (RSAS) values are calculated and averaged over the southern hemisphere for each orbit

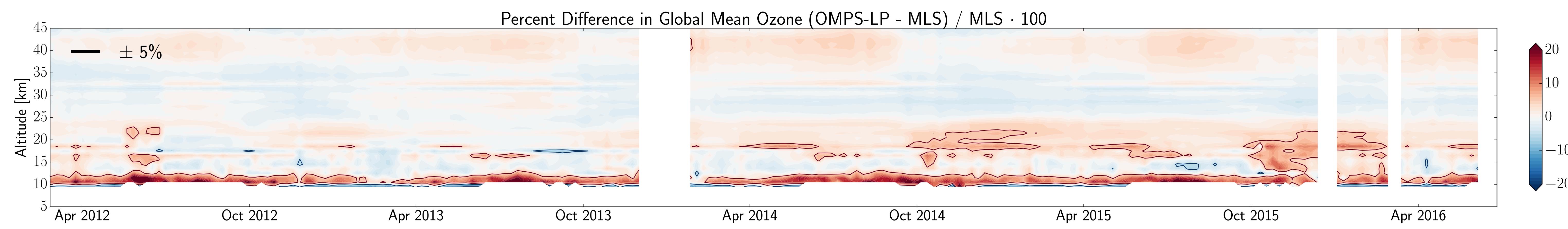


- Possible ~ 100 m pointing drift over the entire mission
- Piecewise constant correction applied to retrieved profiles
- Orbital pointing dependence not corrected for

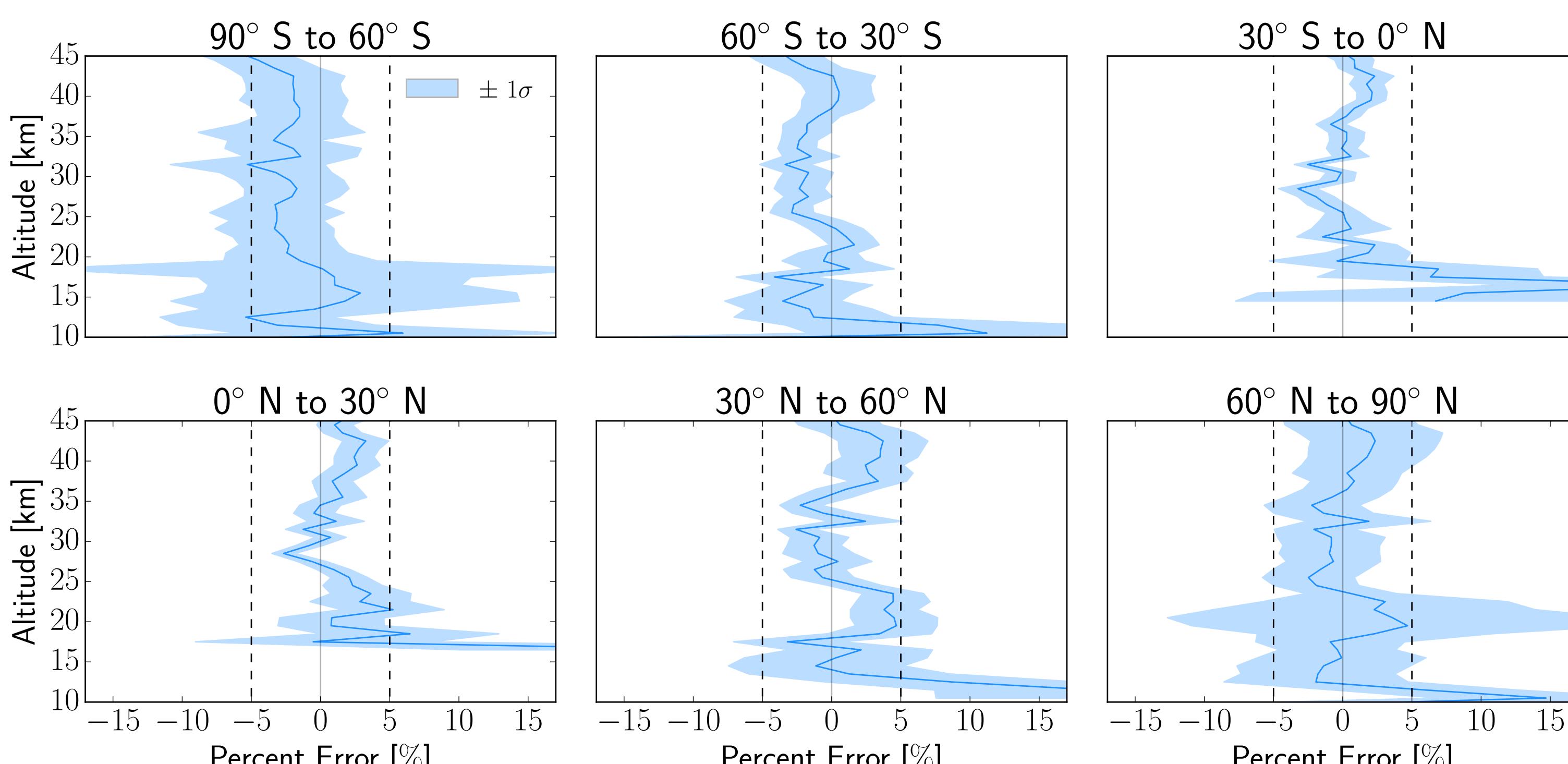
Improvements Over a 1D Retrieval



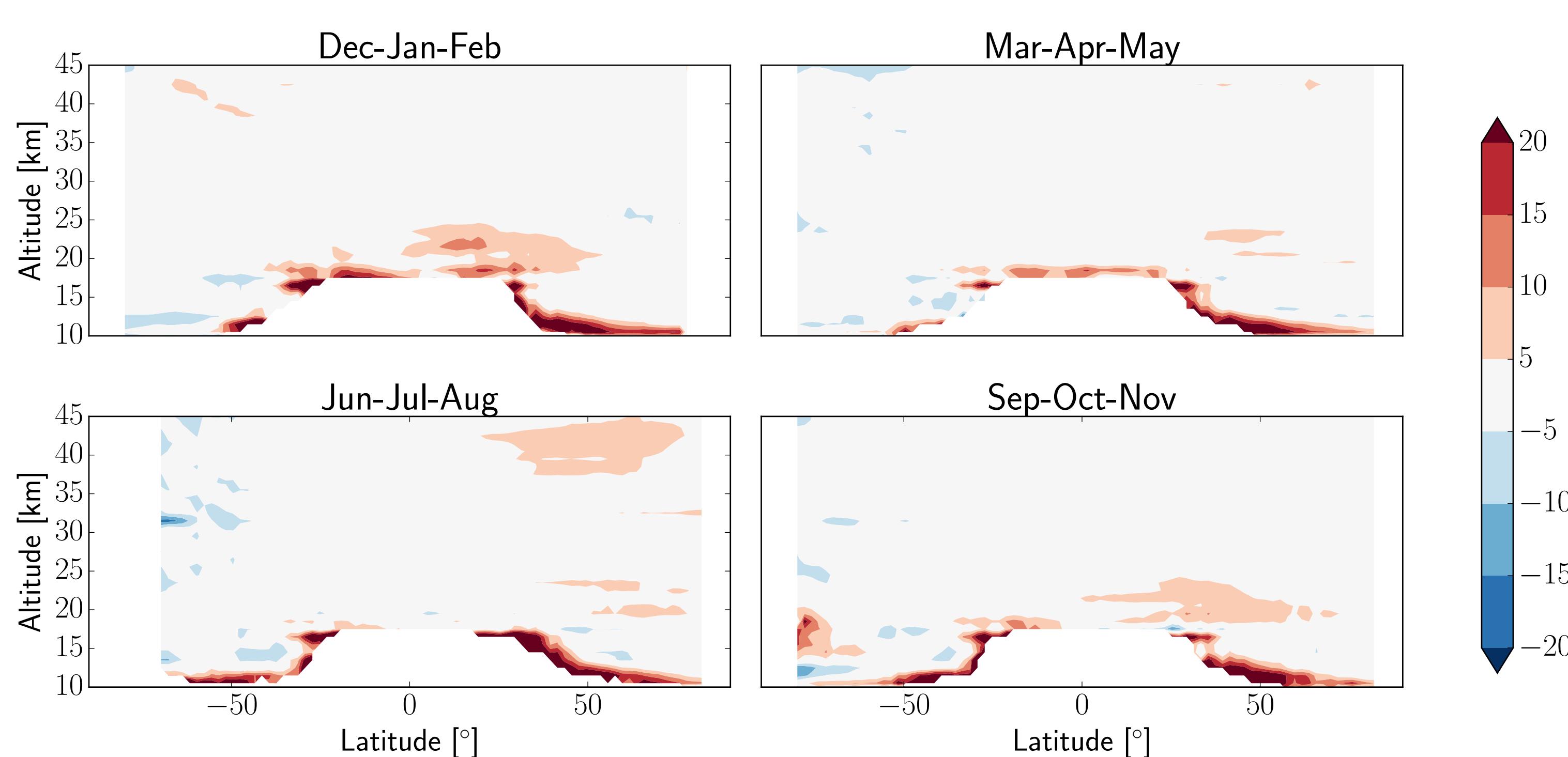
Preliminary Comparisons with MLS v4.2



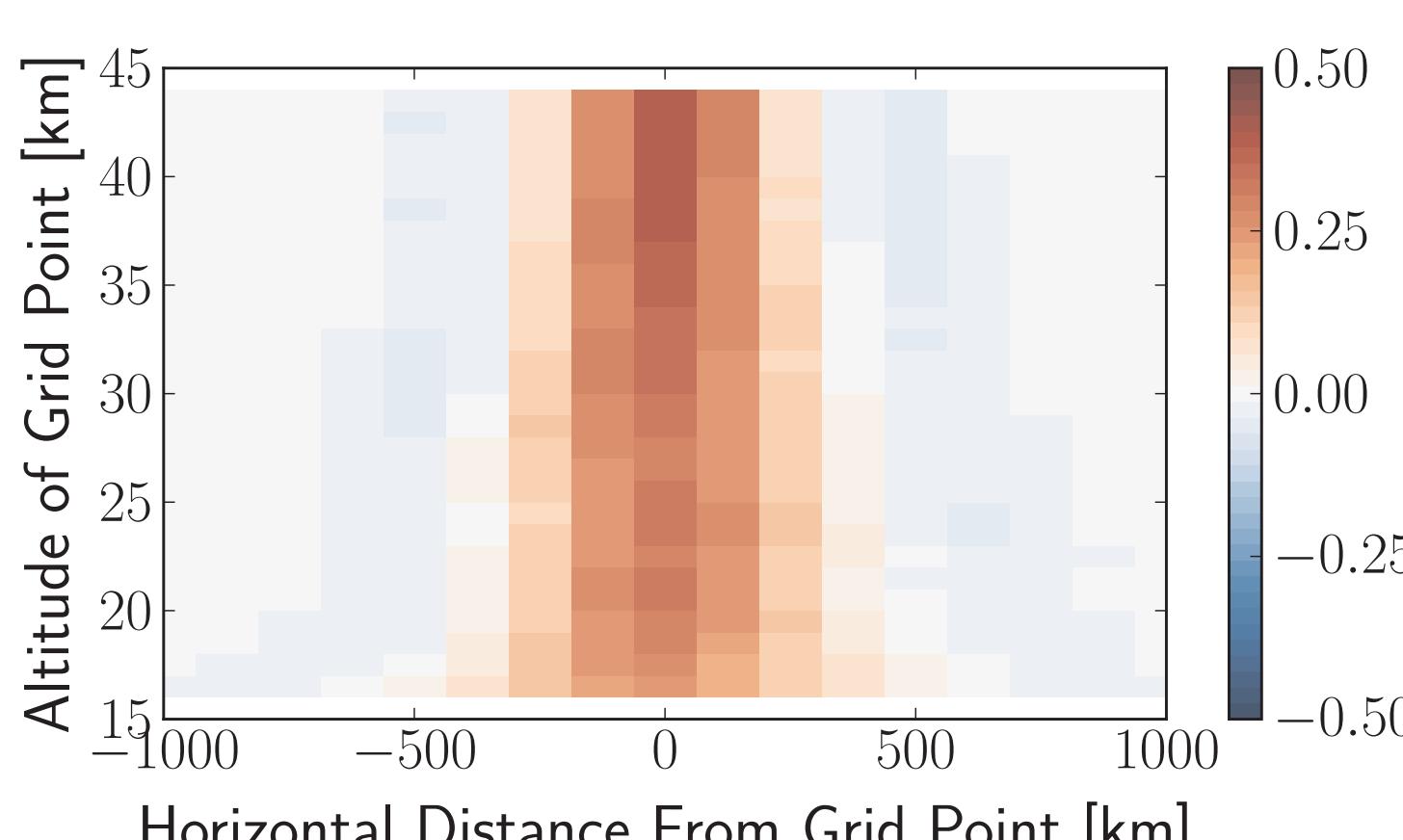
Mean Vertical Profile Percent Differences



Seasonal Zonal Percent Differences



Horizontal Averaging Kernels



$$A = (J^T S_y^{-1} J + \Gamma^T \Gamma)^{-1} J^T S_y^{-1} J$$

- Horizontal averaging kernel for the vertical profile at 60° N
- Horizontal FWHM of 300-400 km

Summary

- Limb scatter tomographic retrieval technique developed
- Used to retrieve ozone for the entire OMPS-LP mission
 - Global coverage from tropopause to 58 km
 - ~ 2 km vertical resolution with 1 km sampling
 - ~ 300 -400 km horizontal resolution with 125 km sampling
- Zonal mean biases with MLS v4.2 of less than 5% in almost all places and times
- Corrects biases in a one dimensional retrieval