SAGE III Lunar Algorithm Status

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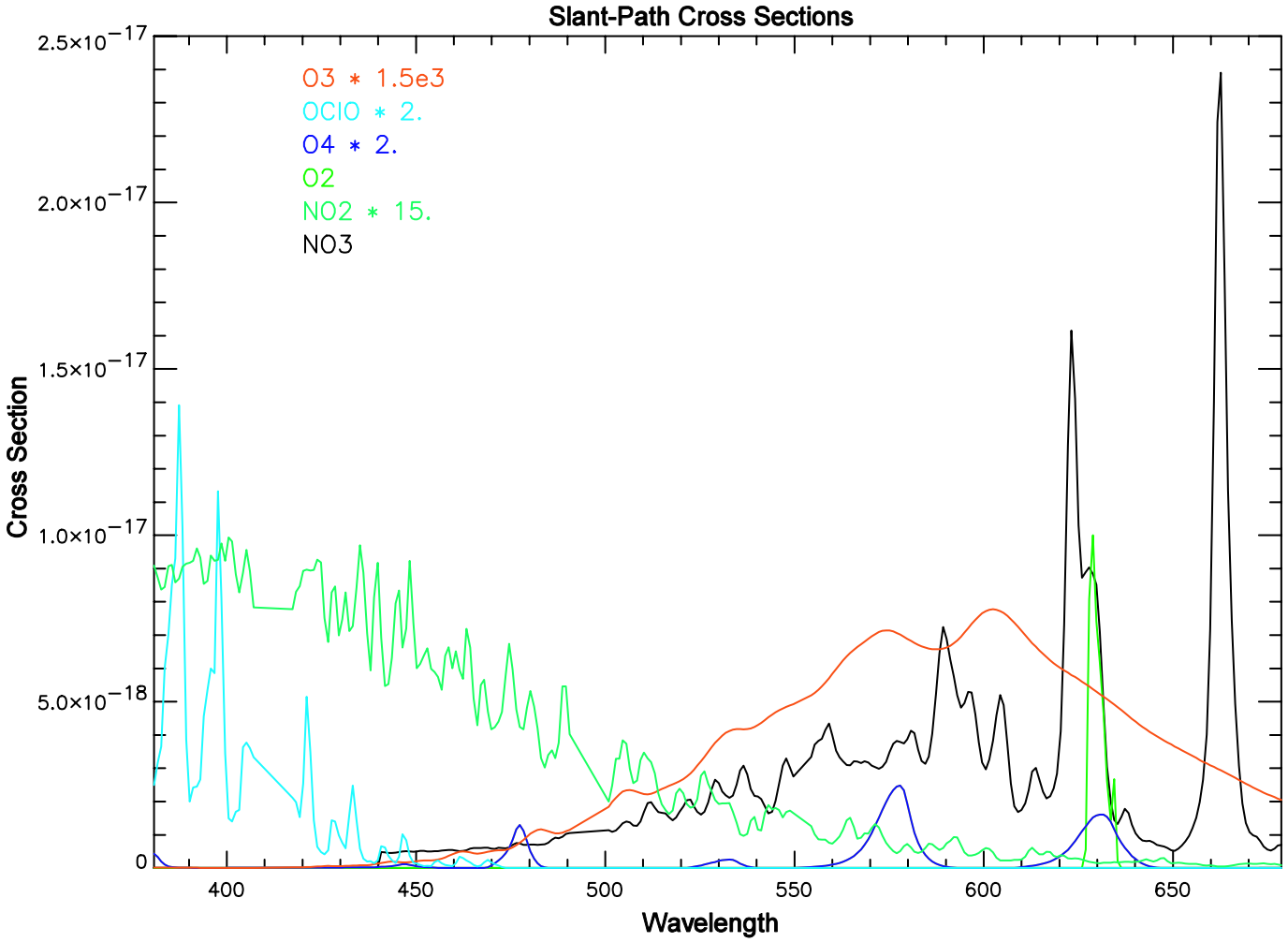
Overview

- Lunar and Solar Comparison
- Inversion Algorithm Status
- Event Data and Results
- Altitude Registration Status
- Improved Altitude Registration
- Future Algorithm Development

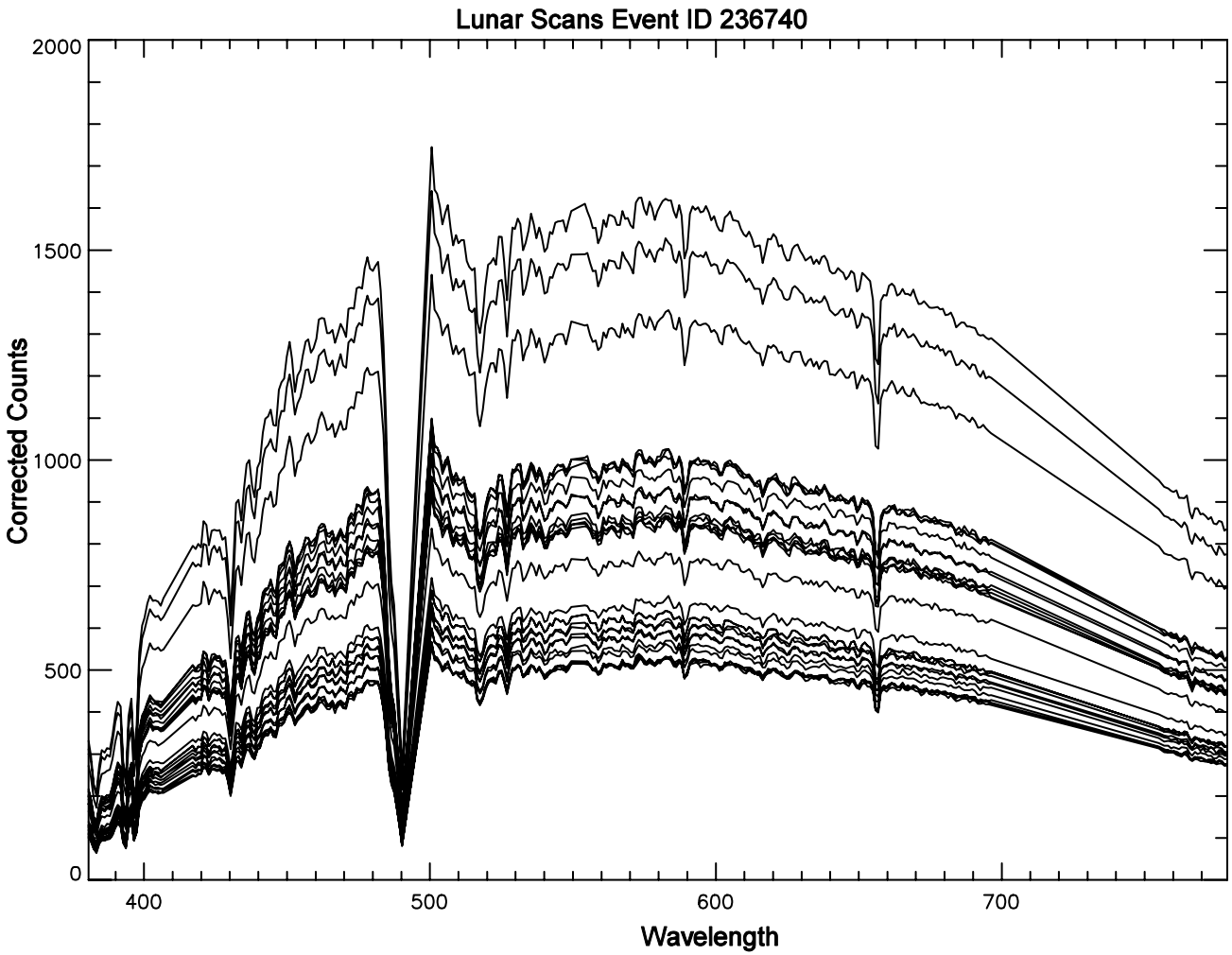
Lunar vs Solar

- Low Signal Strength (10^{-6} solar)
  - Integration Time 62.5ms vs 15.6ms
  - Increase FOV width
  - Process 294 pixels simultaneously
- Non-uniform albedo
- No baseline I_0
  - No ratio I/I_0
  - Use differential MLR for O_3, NO_2, NO_3, OClO

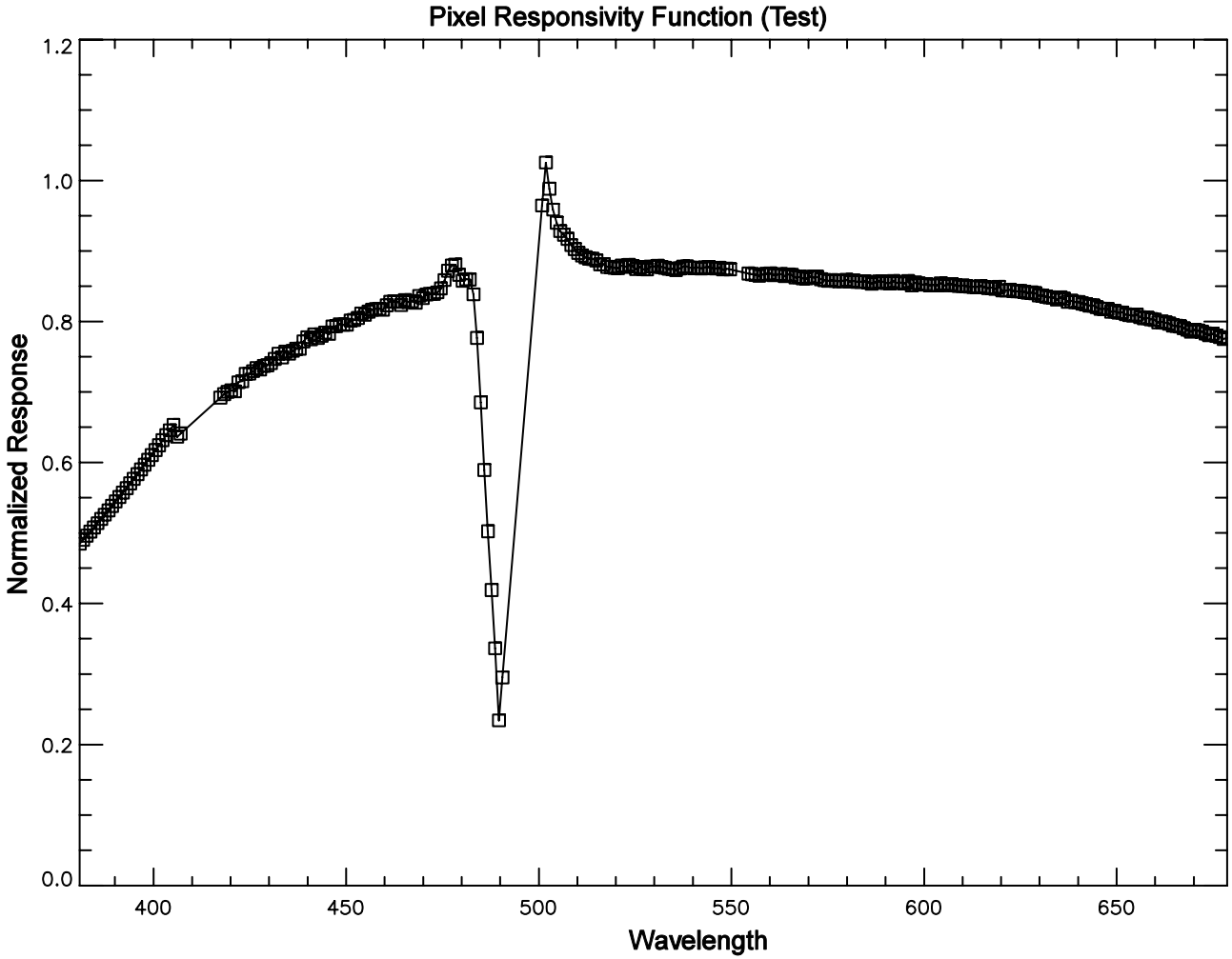
Slant-Path Cross Sections



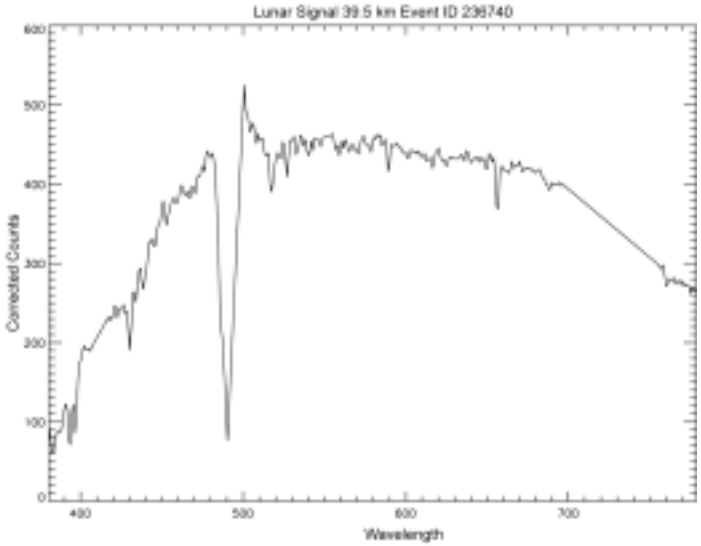
Lunar Scans

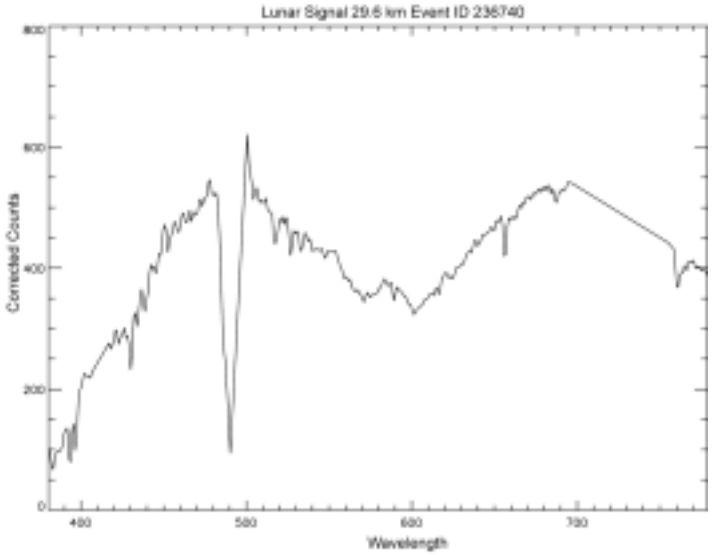

Lunar Scans Event ID 236740
Corrected Counts
Wavelength
2000
1500
1000
500
0
400
500
600
700

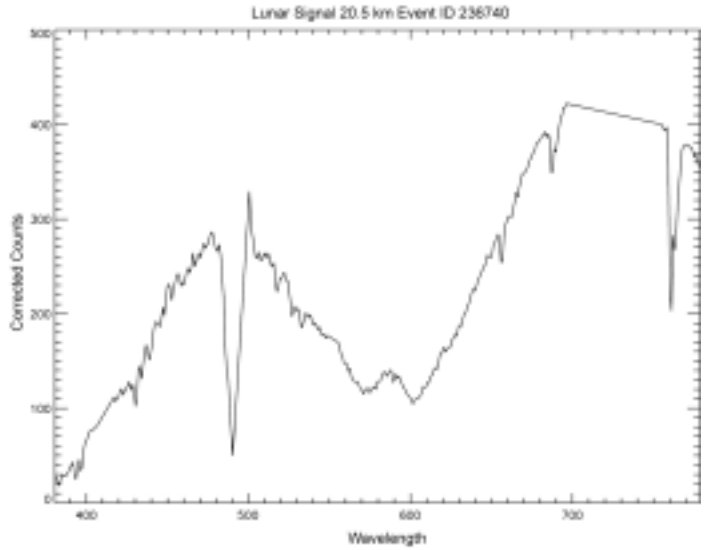
Pixel Responsivity Function (Test)

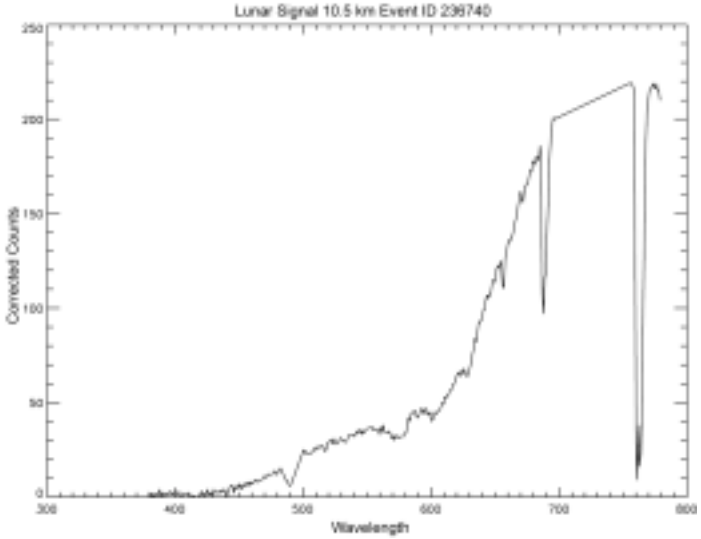


Lunar Signal

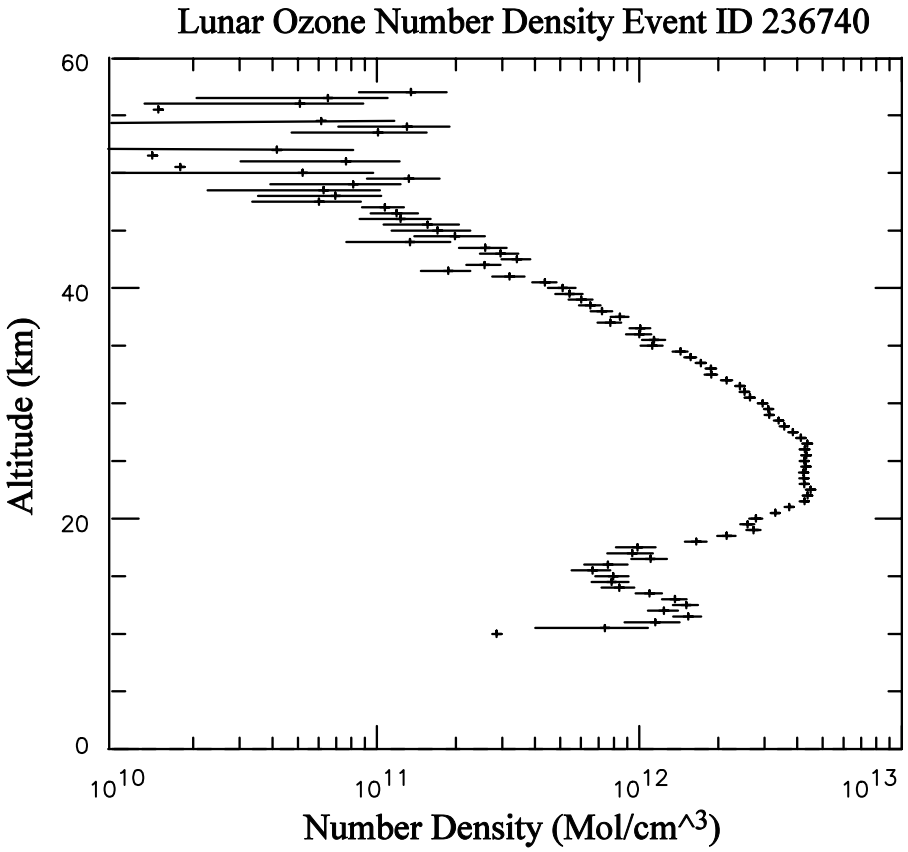




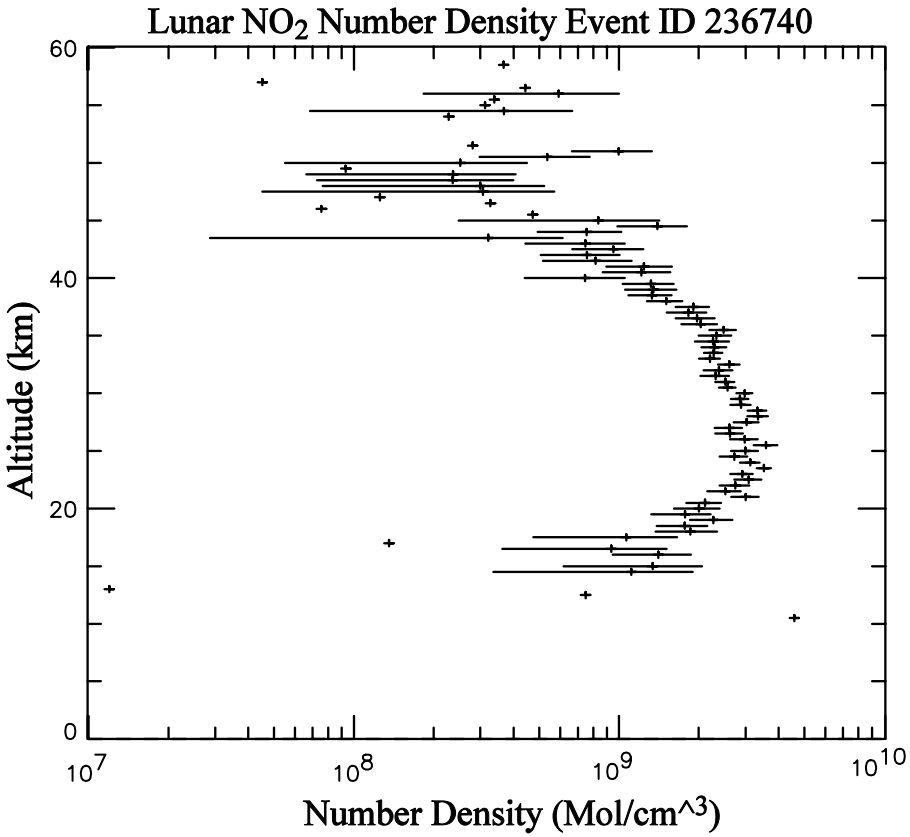




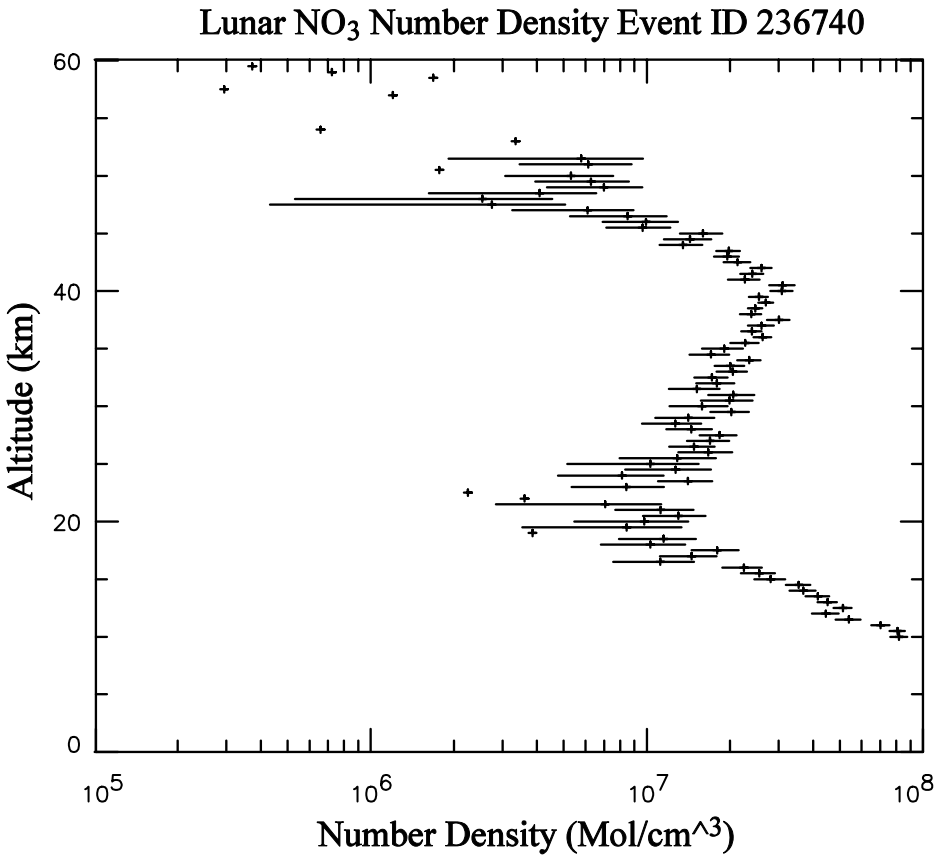
Ozone Number Density



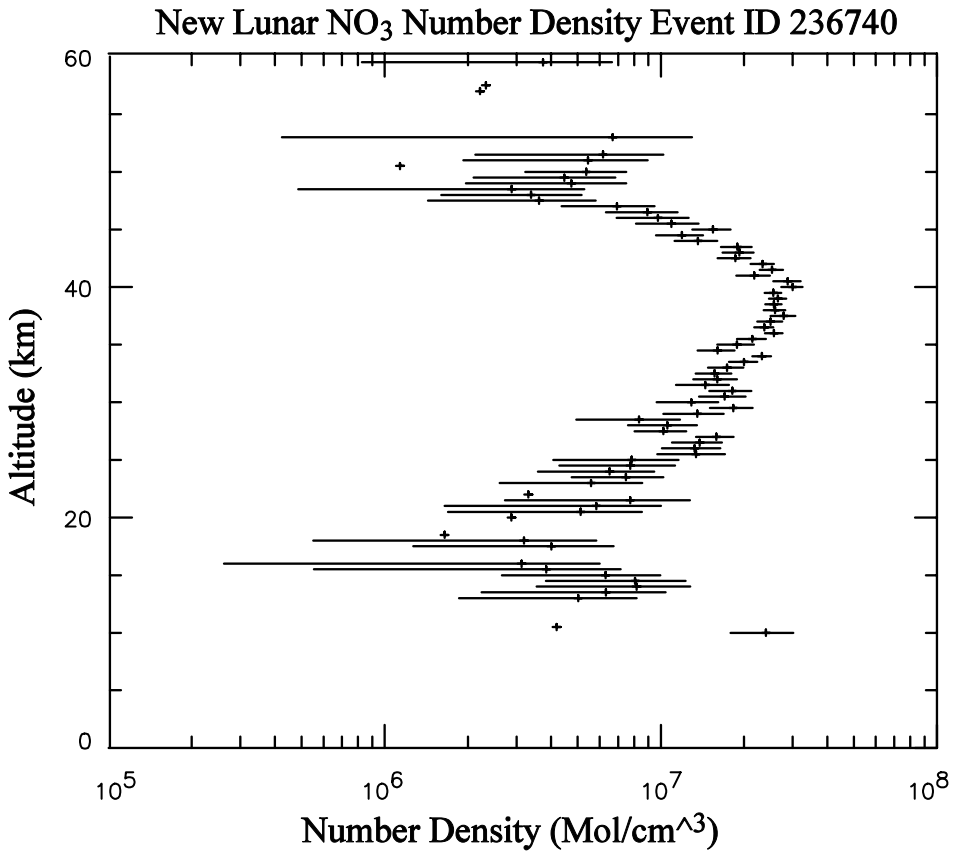
NO2 Number Density



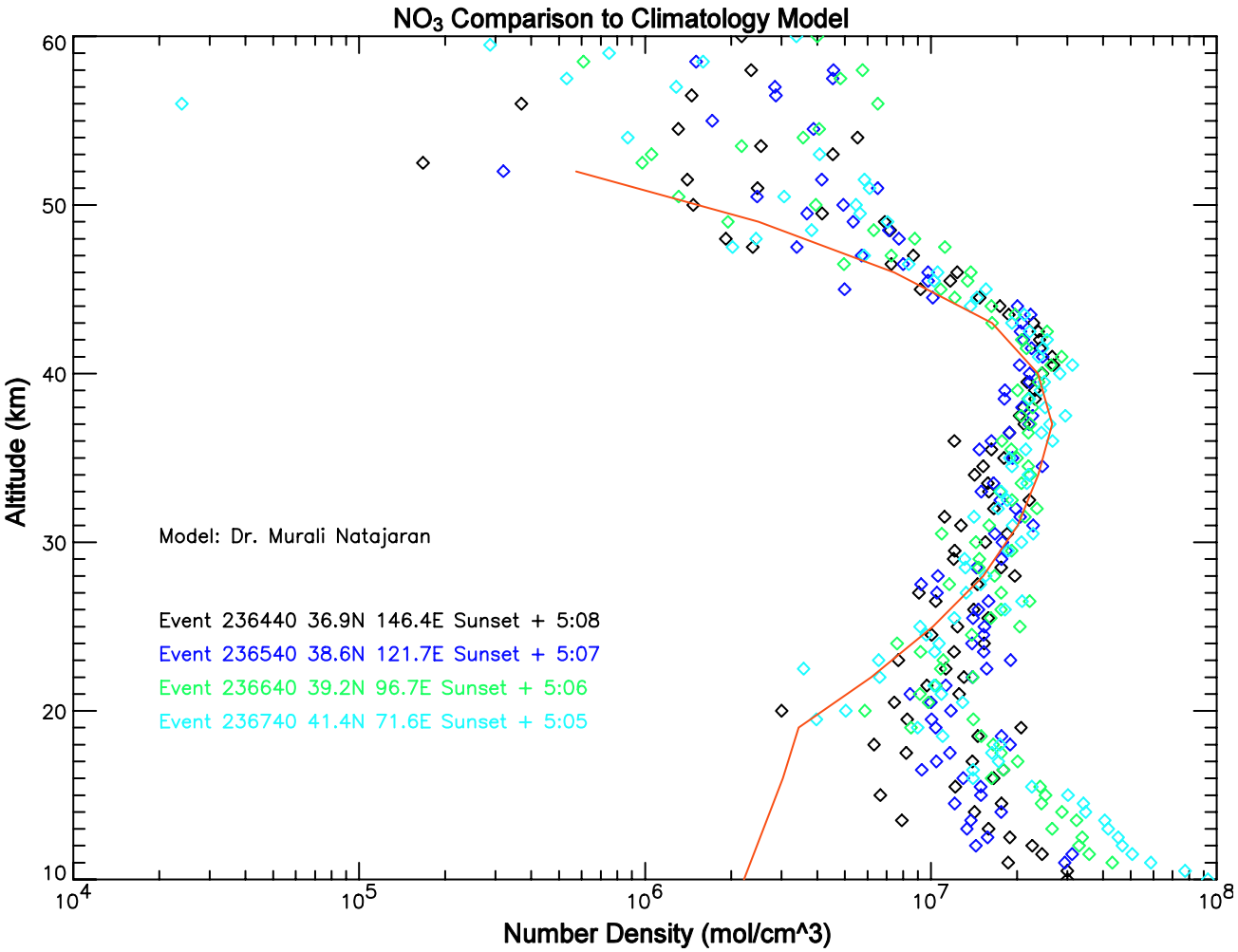
NO3 Number Density



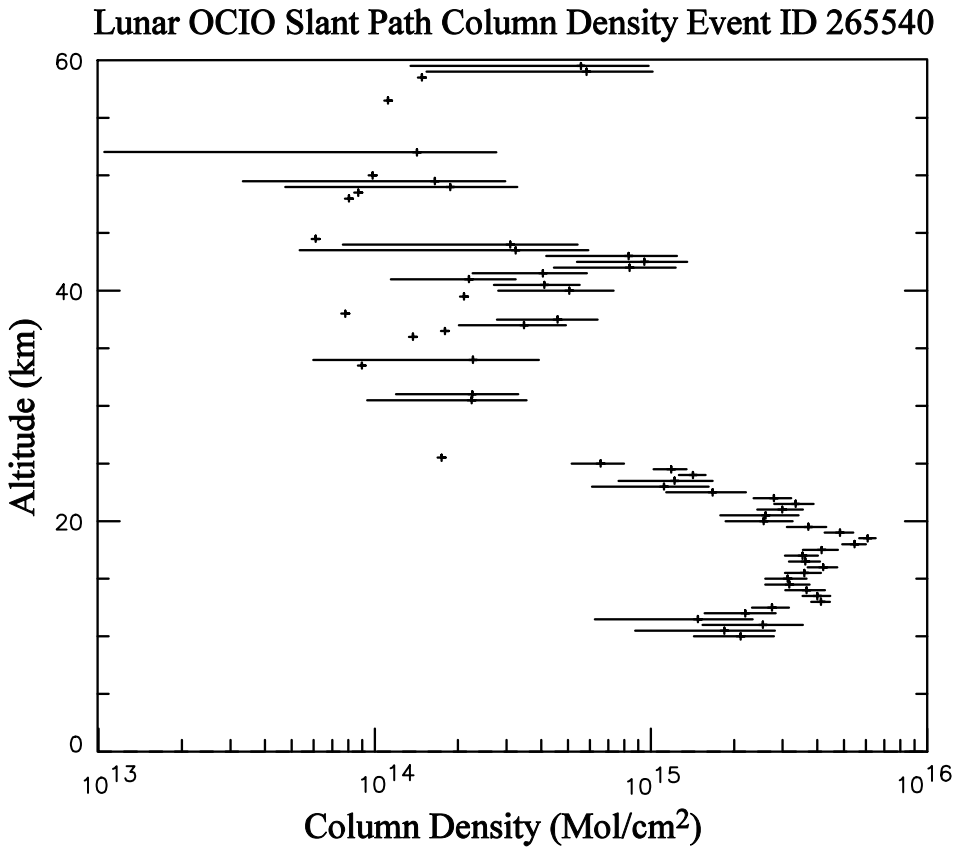
New NO3 Number Density



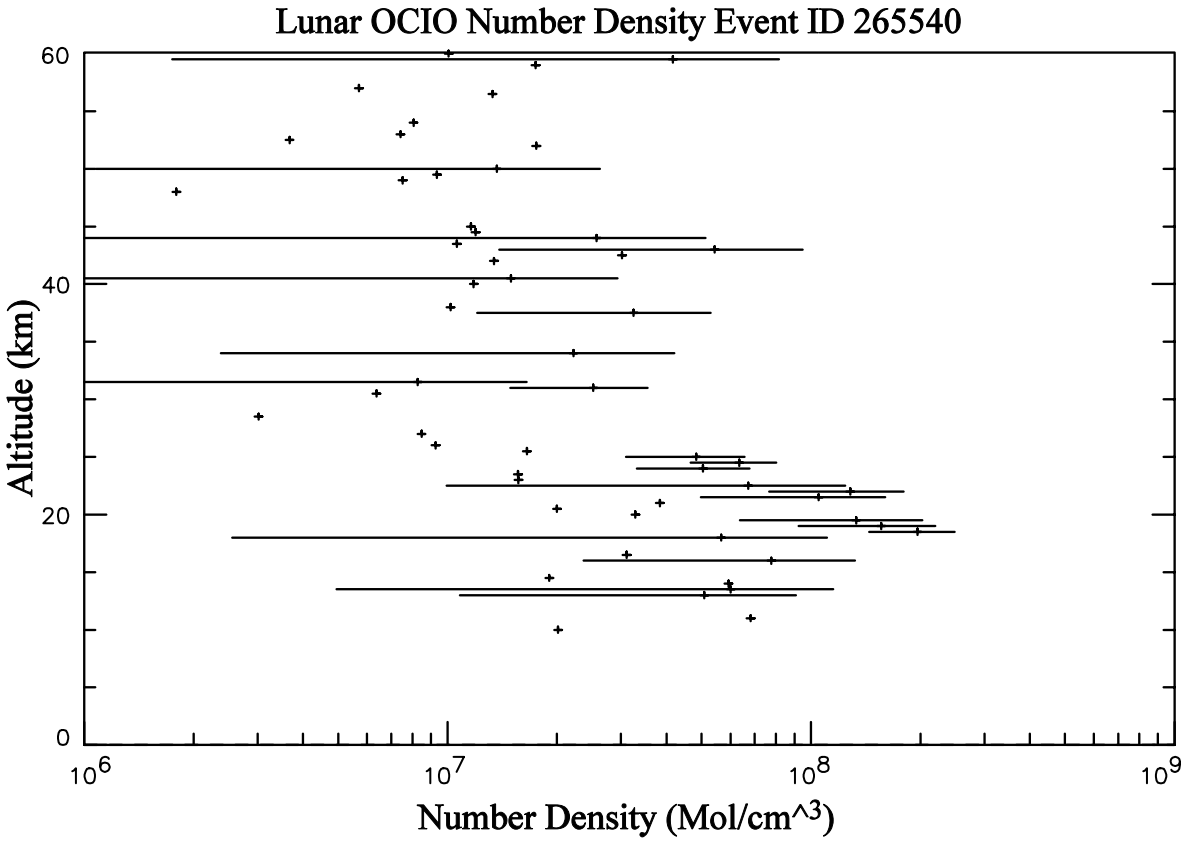
NO_3 Comparison to Climatology Model



OClO Slant Path Column Density



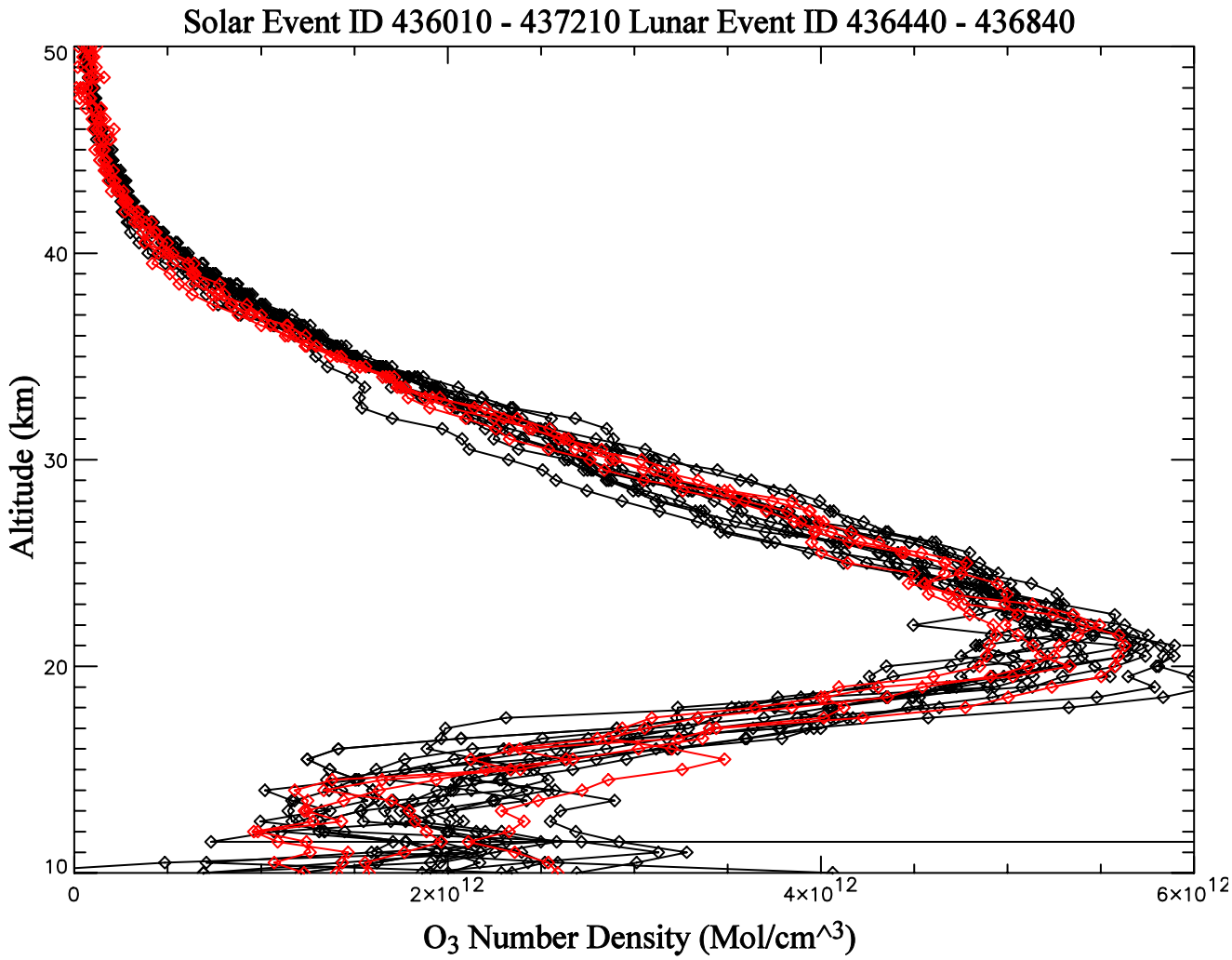
OClO Number Density



Altitude Registration Procedure

- Use simple lunar model for centroid, terminator location
- Obtain scan azimuth angle from instrument data and ephemeris
- Use edge crossing time to position first observation in each scan on lunar disk
- Compute geometric height correction based on centroid offset
- Apply geometric height correction to first observation
- Place subsequent points by mirror position
- Calculate refracted sub-tangent altitude at each point

Solar – Lunar Events



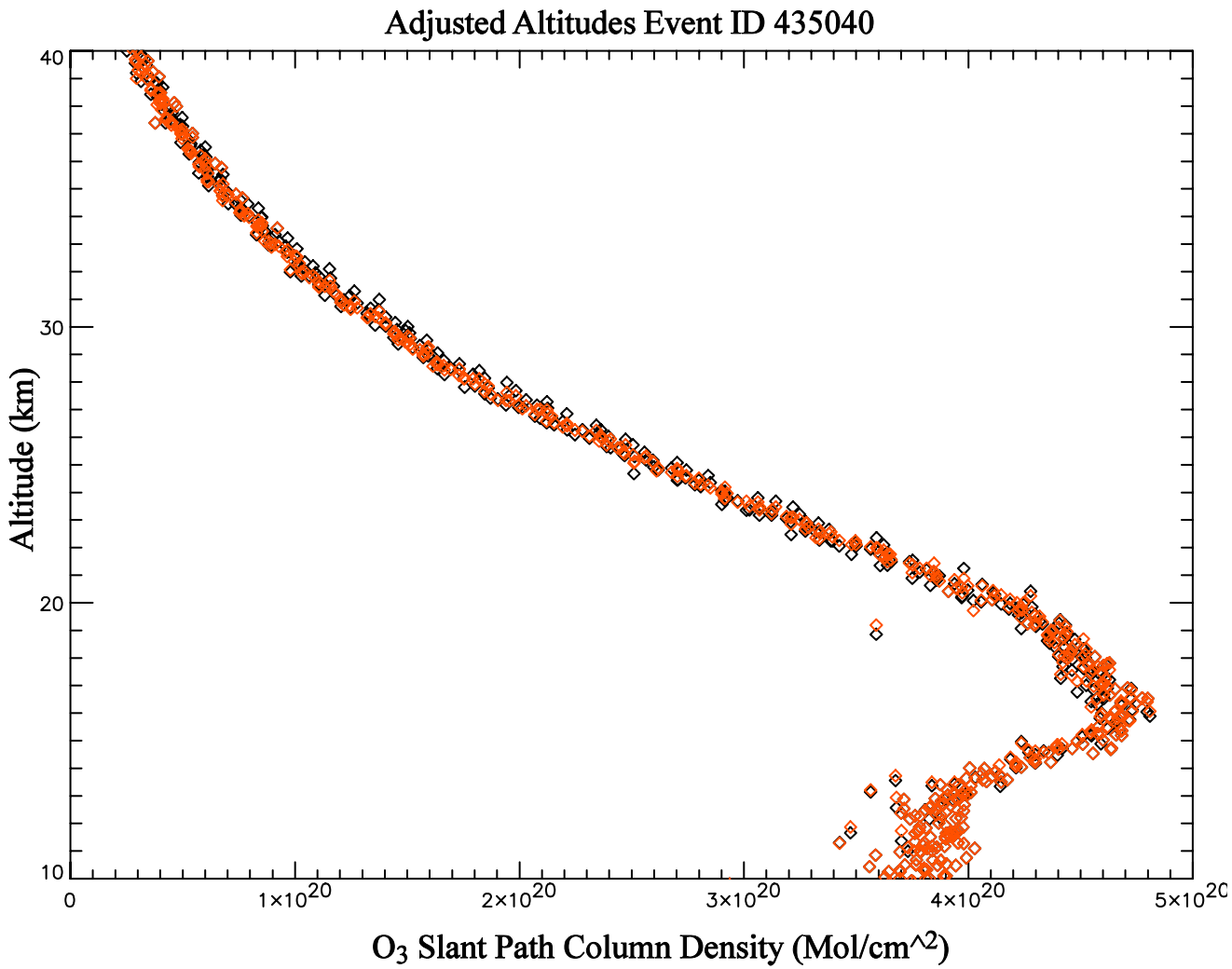
Altitude Registration Issues

- Lunar phase affects geometric calculations
- Albedo affects edge time calculation

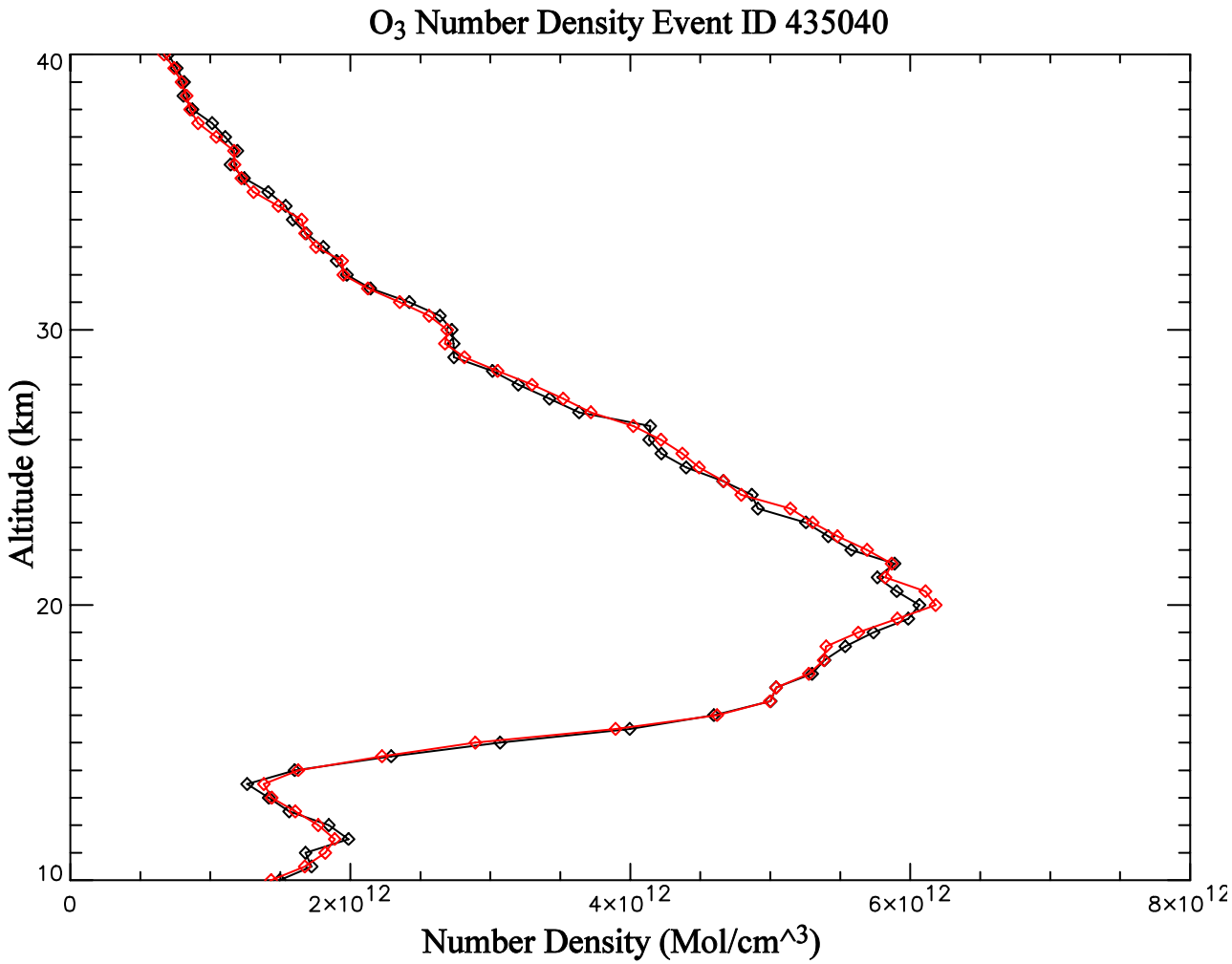
Altitude Registration Improvements

- Altitude Optimization
  - Shift/Stretch Ozone Profile
  - Shift/Stretch Oxygen A and B Band
- Model A-band Registration
- Lunar Image Model

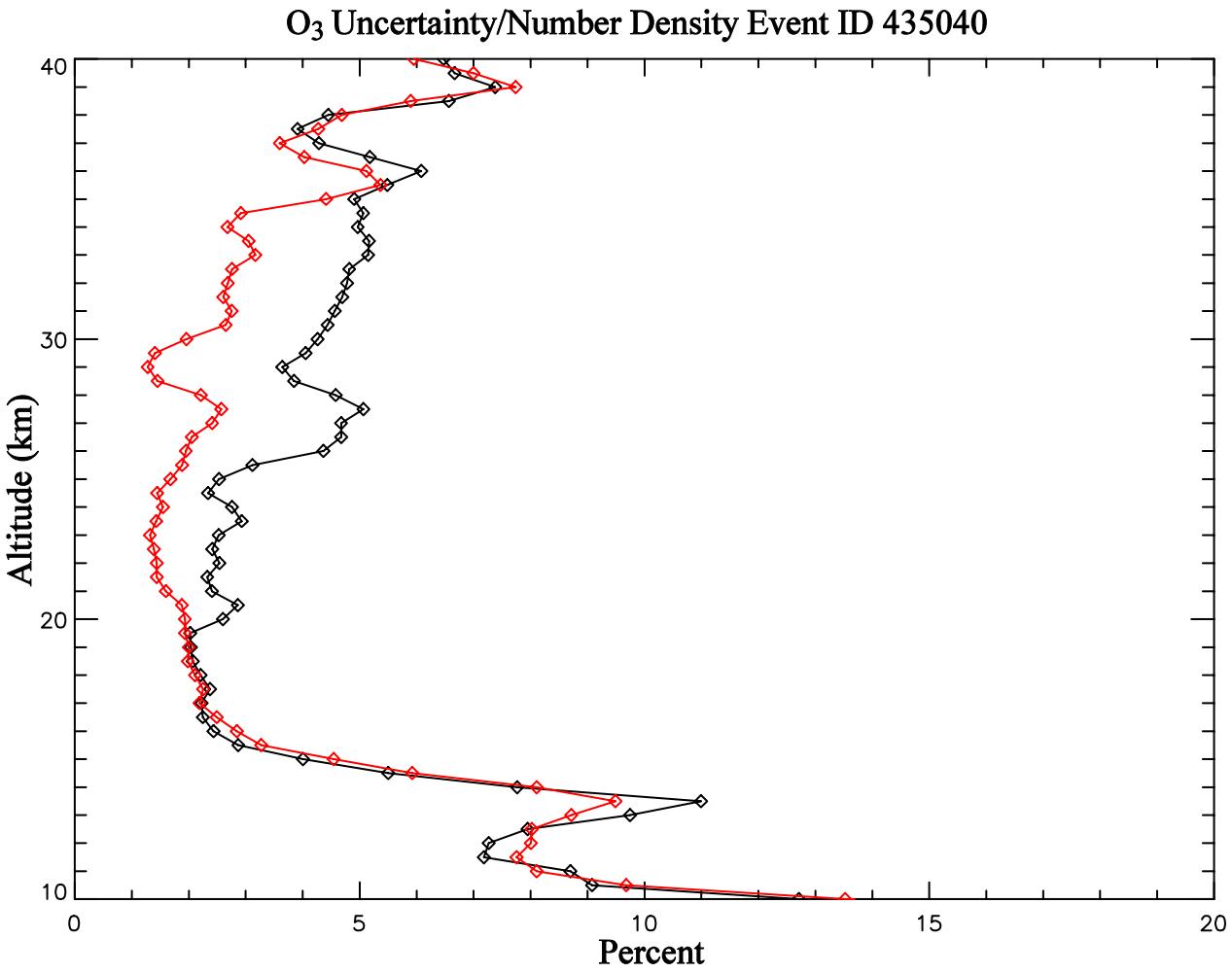
Adjusted Altitudes



Ozone Number Density



O3 Percent Uncertainty



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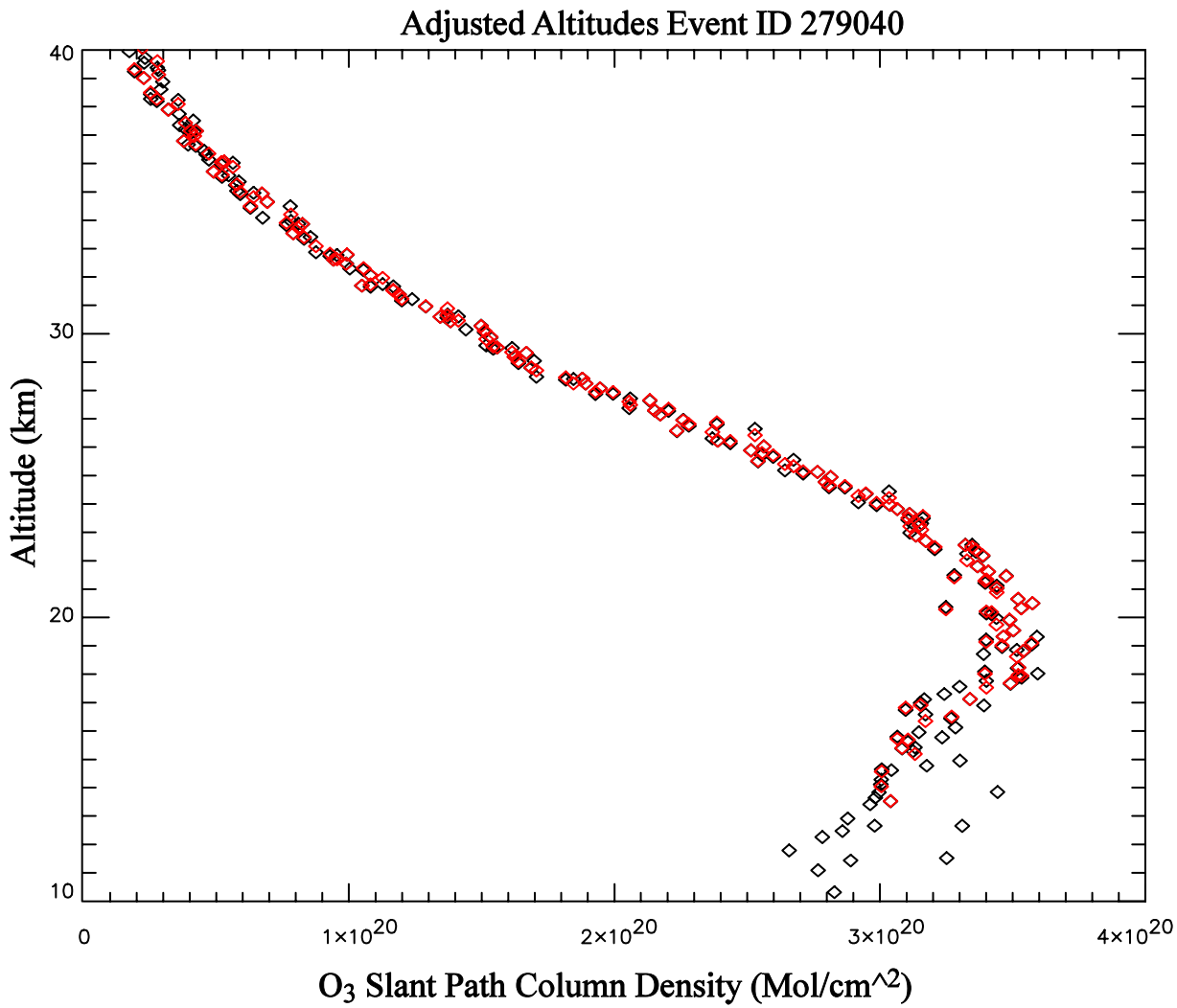

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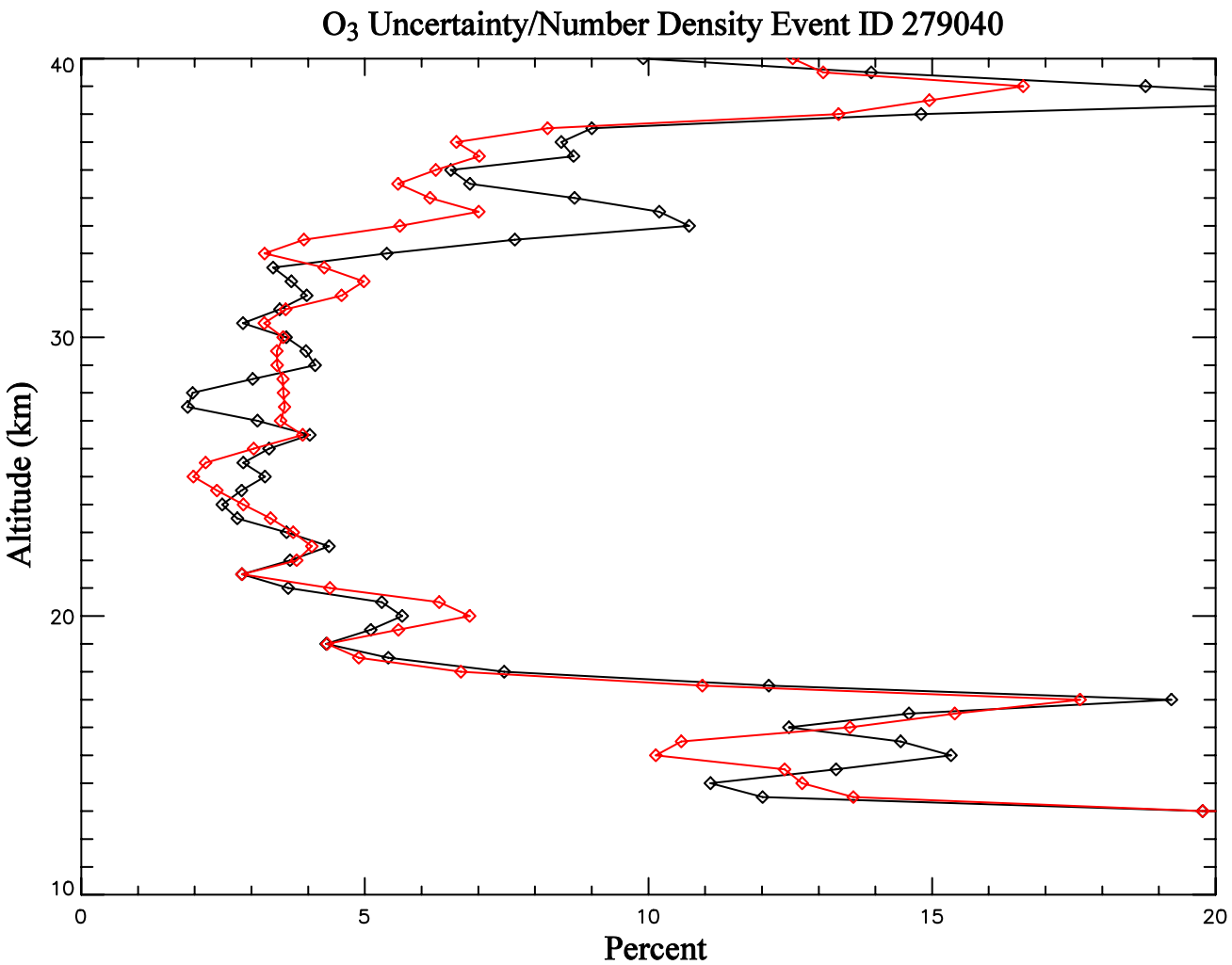

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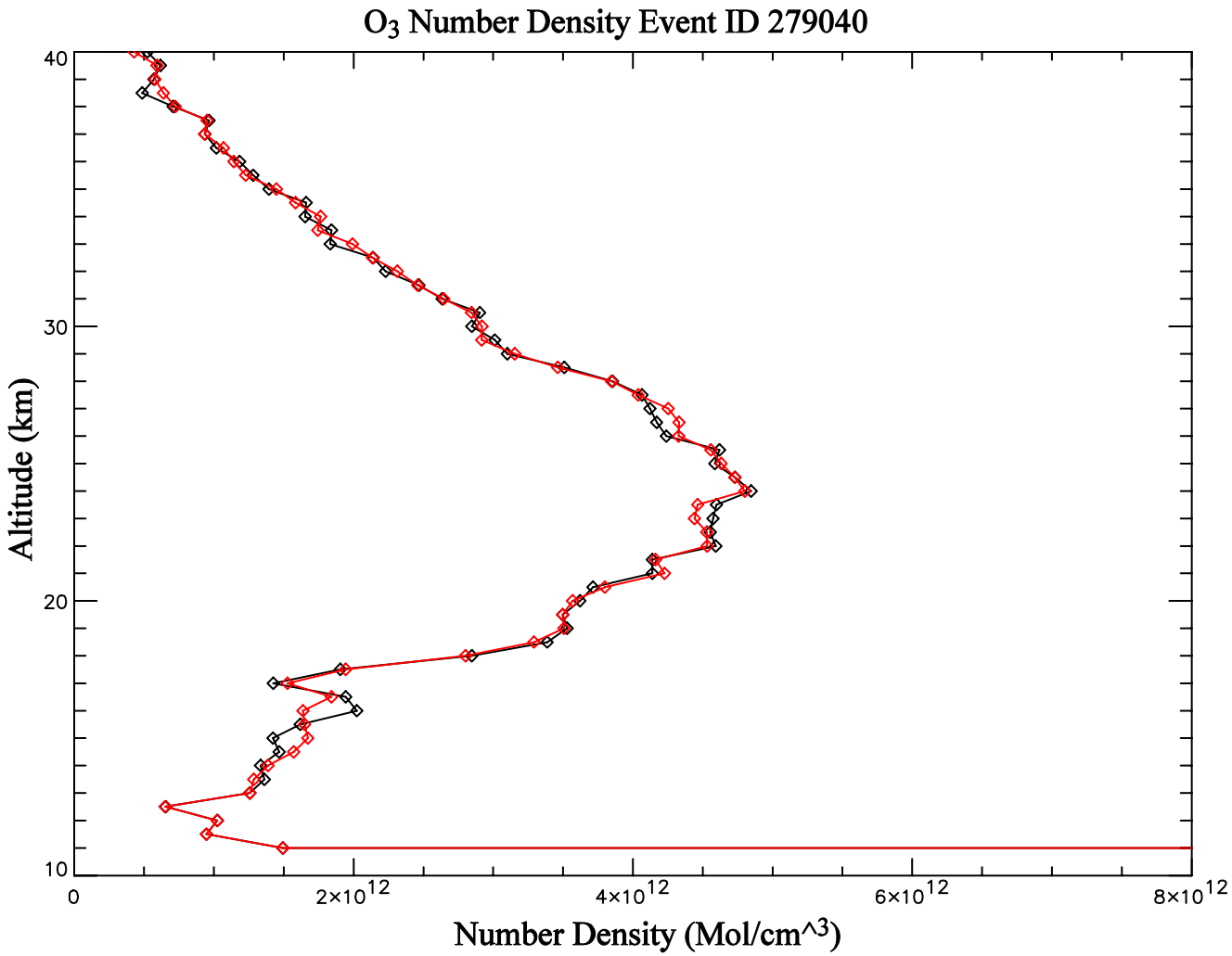

Future Algorithm Development

- Altitude registration
- Transmission profile
- Lunar spectral calibration
- Alternate inversion techniques -- GAMS
- New products -- aerosol, PSCs, BrO