



SAGE III
/ISS

Stratospheric Aerosol and Gas Experiment

An Earth Science Mission on the International Space Station

SAGE III/ISS Future Algorithm Development

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Solar Algorithm Breakdown



➤ Ephemeris

- Mostly SDP Toolkit routines

➤ Meteorological Processing

- MERRA-2 Reanalysis

➤ Refraction

- Fairly straightforward but slightly different from SAGE II

➤ Transmission

- The “meat” of the algorithm; also the trickiest

➤ Inversion

- Fairly straightforward with good transmission profiles



Priorities for Next Version



- **General algorithm scrub to flush out remaining “surprises” in the inherited code**
- **Make it “Version 7” (i.e., standardize across platforms to extent possible and reasonable)**
- **Improve robustness of water vapor algorithm for normal release**
- **Incorporate DMP data for better pointing knowledge and to mitigate anomalous influences ... Pointing Knowledge is Critical!**



Future Development



- In no particular order ...
- Revisit spectral stray light correction for mesospheric ozone
- Investigate and compare internal aerosol products (MLR vs. AO3)
- Incorporate ancillary aerosol products (e.g., SAD or R_{eff})
- Use Wulf band retrieval to investigate fidelity of ozone cross-sections (could be used to improve SAGE II H₂O)
- Optimize channel locations to perhaps free up channels for new species retrievals or increased SNR
- Implement temperature and pressure retrievals ...



SAGE III/ISS Temperature and Pressure Research Products



- **Strategy**

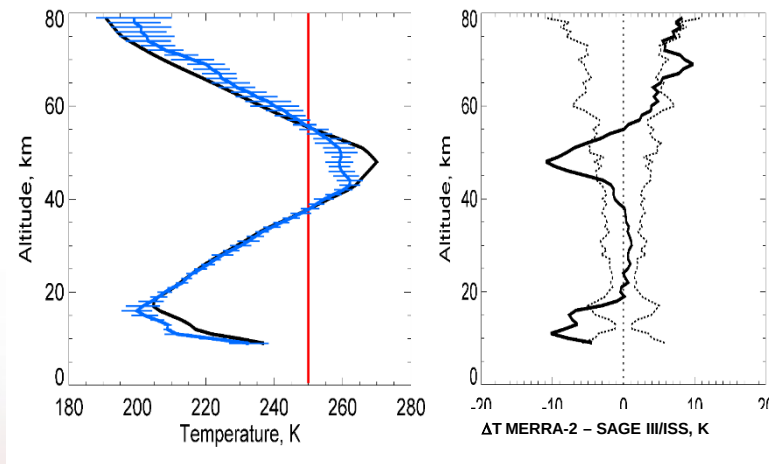
- SAGE III/ISS retrieves profiles of T/p from multi-spectral measurements of the O₂ A-band absorption feature near 762 nm
- T/p products from the METEOR/3M mission were of limited science value due to instrument issues

- **Preliminary assessment:**

- SAGE III/ISS O₂ A-band measurements are of higher fidelity than SAGE III/Meteor 3-M's with no apparent instrument issues
- Sensitivity tests indicate an apparent small wavelength shift in A-band channels relative to nominal registration (approximately 0.03-0.04 nm for sunset and 0.04-0.05 nm for sunrise)
- Preliminary retrievals look encouraging with near science quality products, but some issues remain

See poster for more details

Composite of 15 Sunset Events on 2017-11-14 (~27.5° S)



- **Future work:**

- Refine wavelength registration
- Examine sensitivity to forward model parameters
 - Bandpass (width, wings, etc.)
 - Spectroscopy (line intensities, line shape)
 - Solar spectrum
- Exclude weaker channels and/or solar feature



Lunar and Limb



➤ **Focus so far has been on solar**

➤ **Lunar**

- Similar algorithm scrub to look for areas to improve
- Are we fundamentally limited by SNR or algorithm?

➤ **Limb:**

- Looking to implement Level 1B retrieval algorithm
- Community supported effort to develop L2 products



Questions?