Detection and Spatial Classification of Polar Stratospheric Clouds in SAGE III Data

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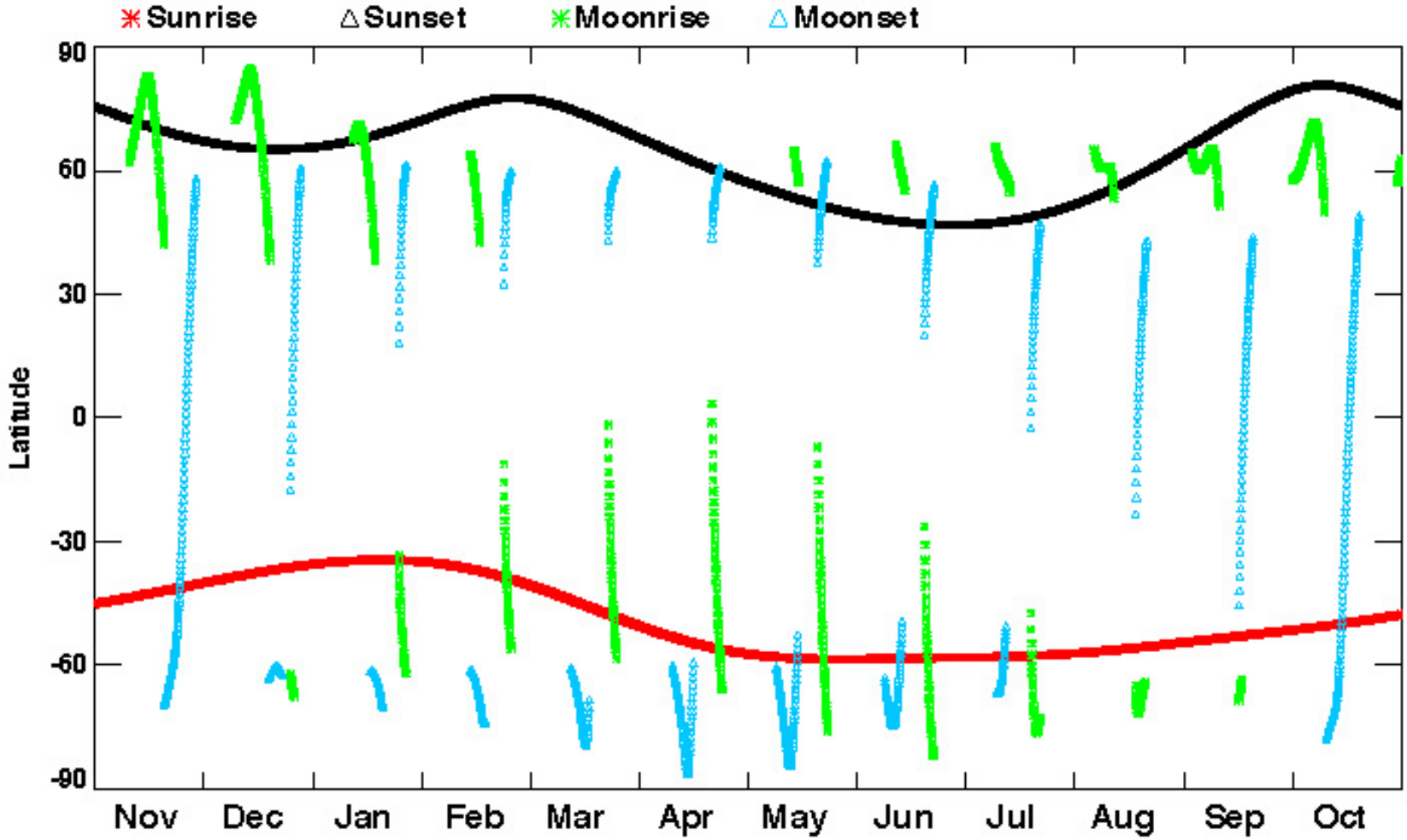
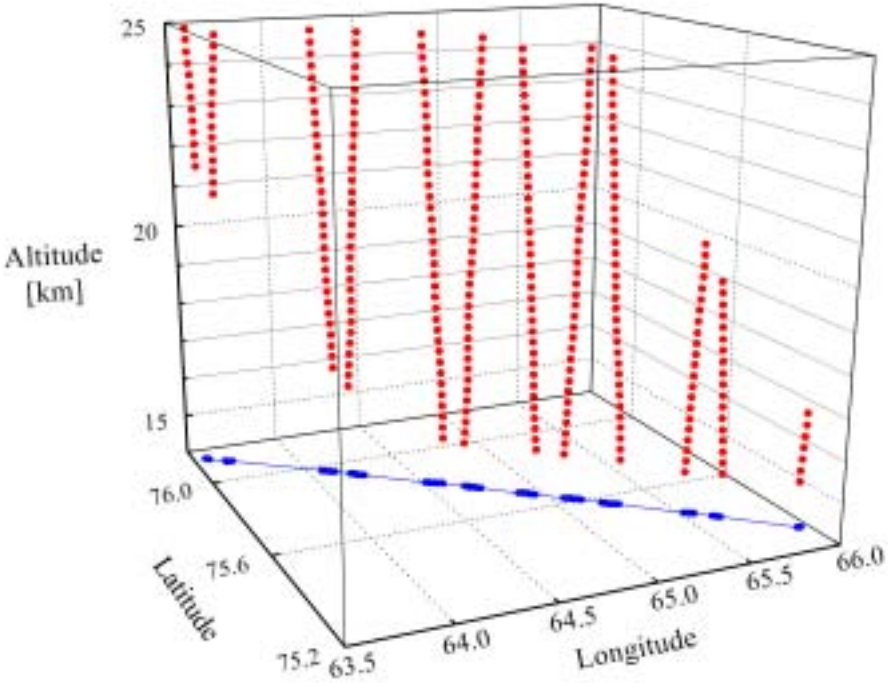
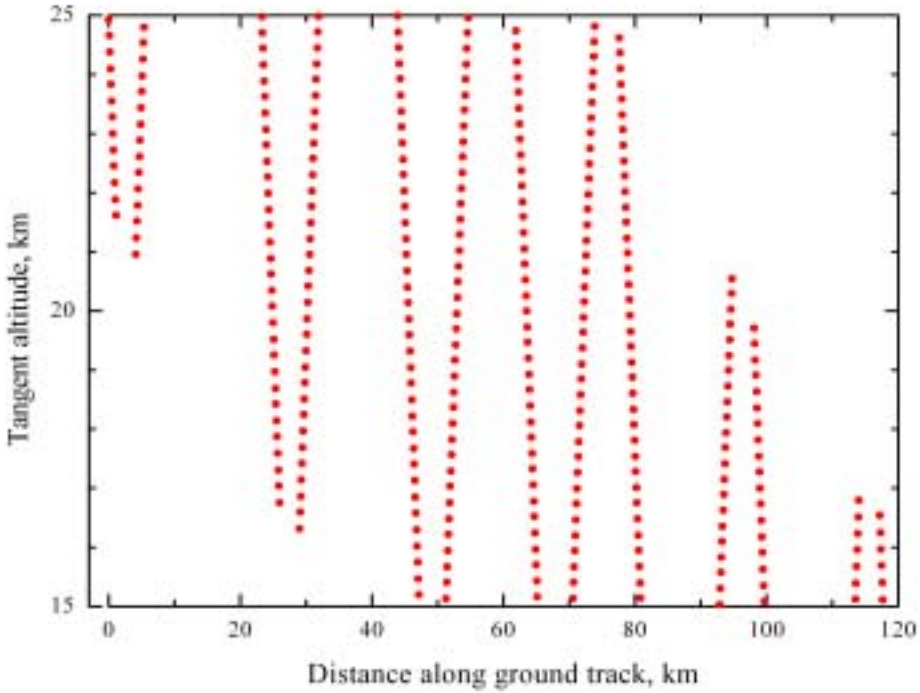
Predicted SAGE III Measurement Latitudes



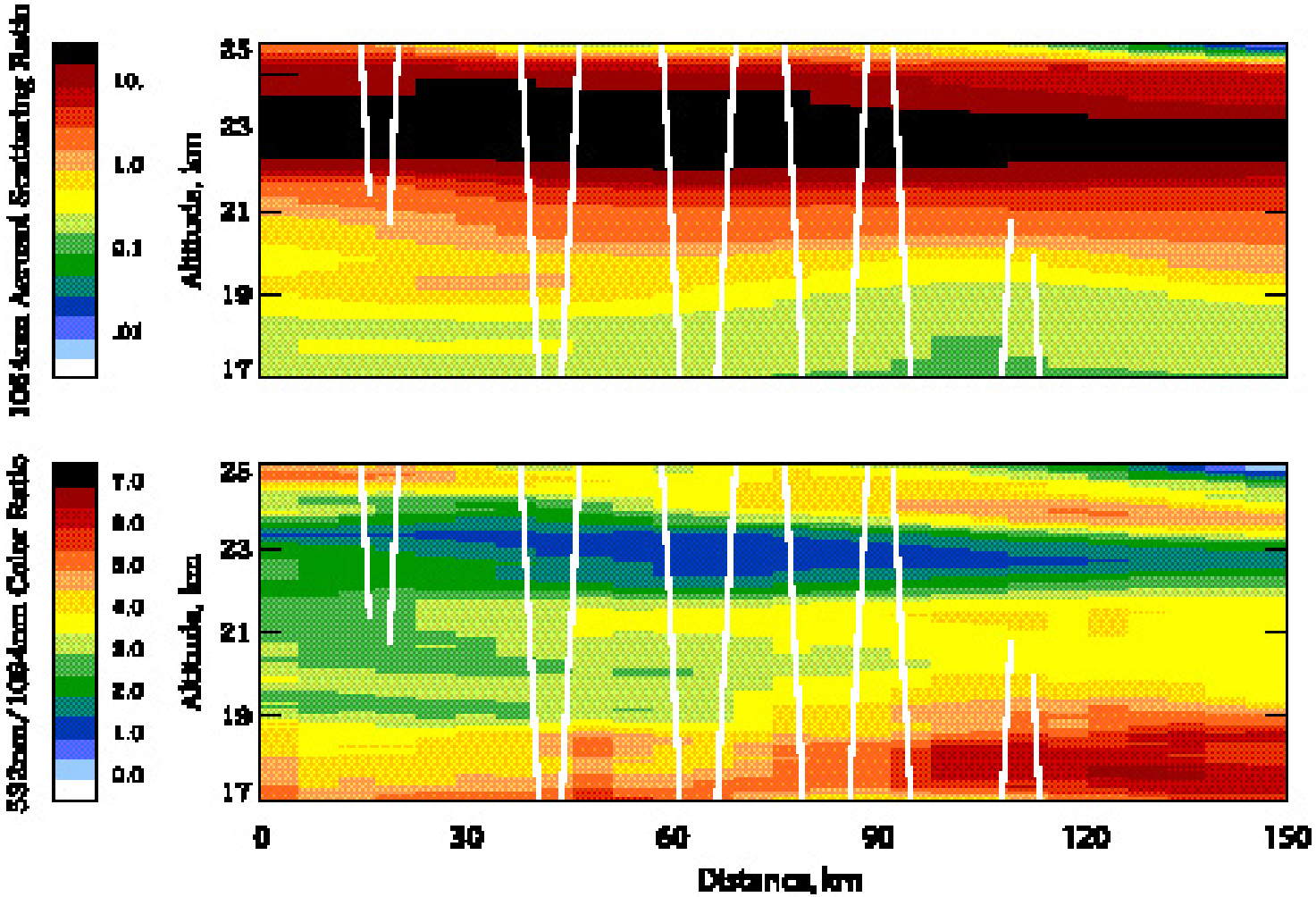
Example SAGE III Solar Occultation Tangent Point Geometry

SAGE III sunset, Feb.27, 2002



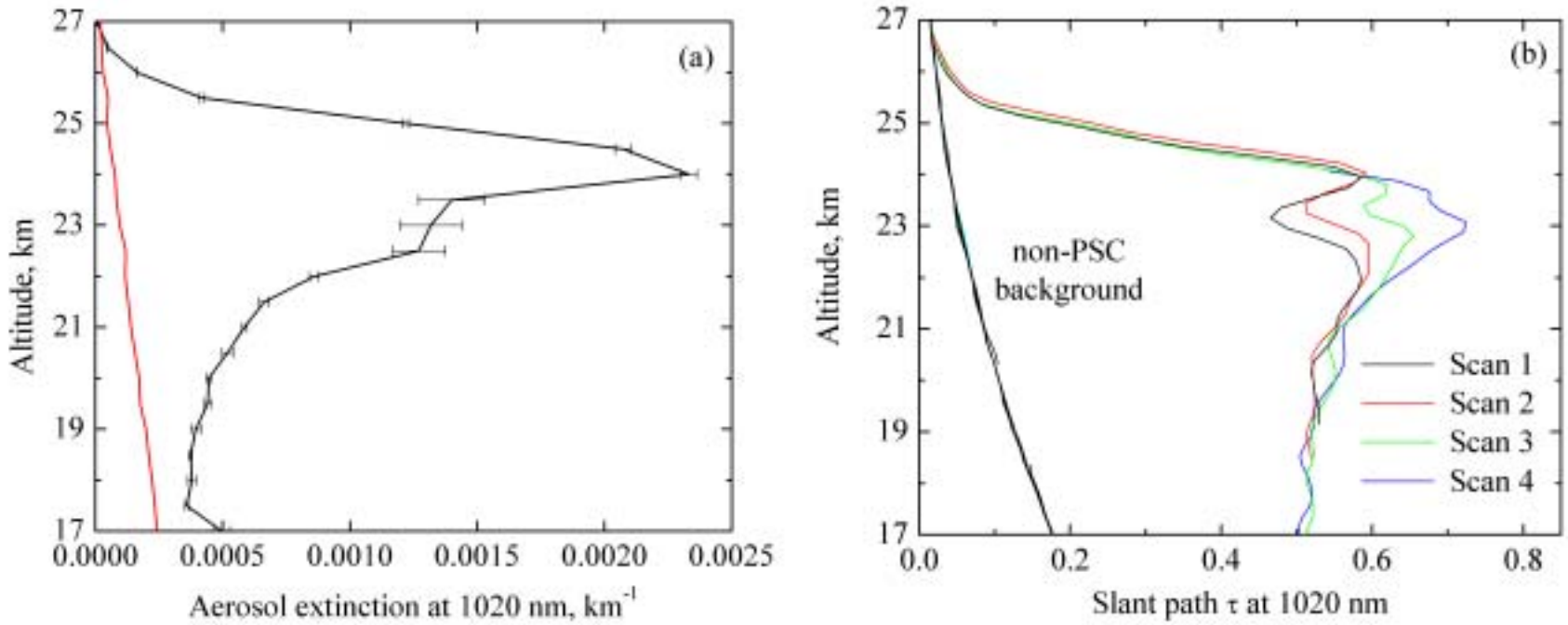


SOLVE PSC Lidar Data with SAGE III-like Sampling



SAGE II PSC Spatial Inhomogeneity

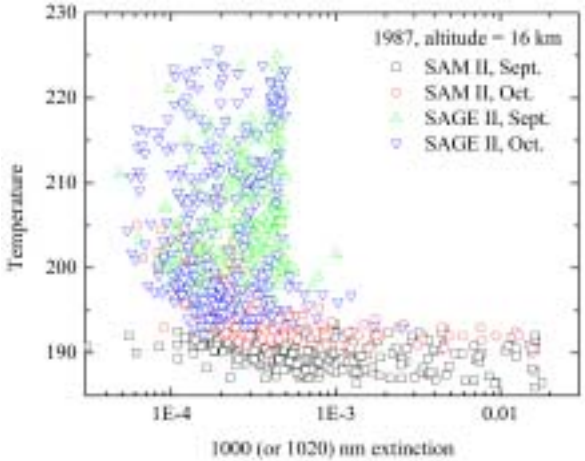
February 1, 1989 (50°N, 17°E)



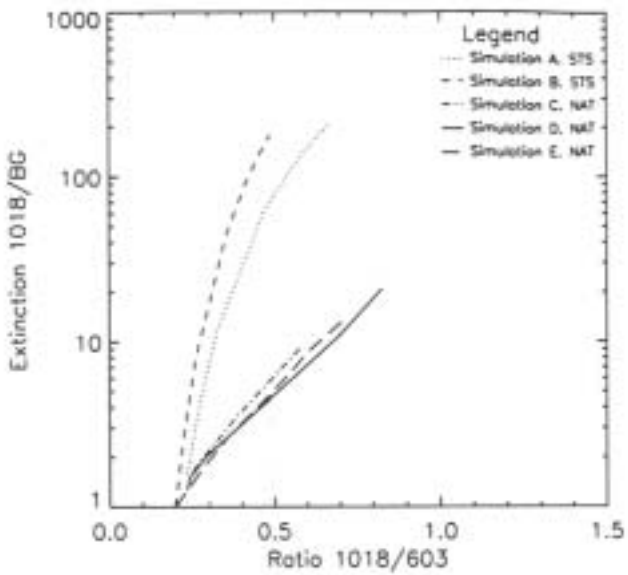
Proposed Tasks

- Develop algorithm to screen standard SAGE III profiles for PSC events
- Calculate PSC optical signatures using University of Leeds and ETH Zurich models
- Develop algorithm to retrieve aerosol extinction on a packet-by-packet basis for solar occultations (to be applied to PSC events only)
- Develop algorithm to retrieve aerosol extinction for lunar occultations (385, 521, 676, 757 nm)
- Analyze SAGE III PSC observations and produce maps by type/composition for Arctic and Antarctic

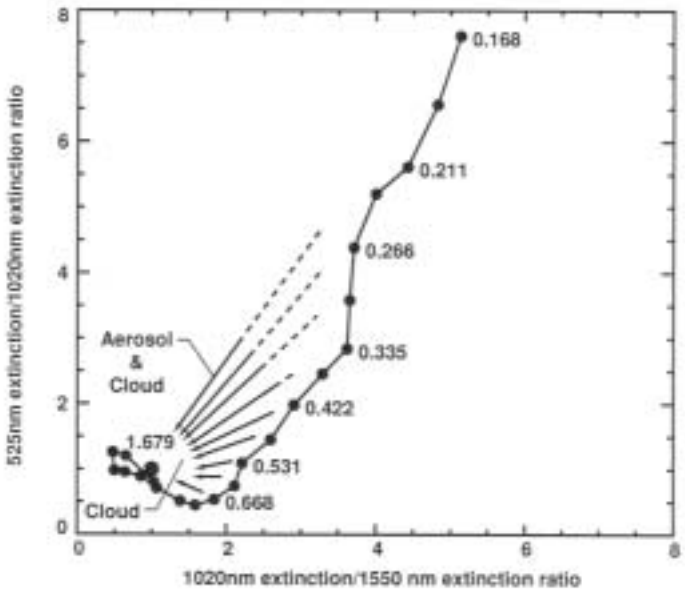
Possible PSC Screening Techniques



1-λ extinction threshold (Poole and Pitts, Fromm et al.)



2-λ NAT/STS discrimination (Strawa et al.)



3-λ SAGE III cloud detection (Kent et al.)

Initial Packet-by-Packet Solar Occultation Aerosol Retrieval Approach

- Apply technique offline only to those events identified as likely PSCs
- Assume all horizontal inhomogeneity in the tangent point plane is due to aerosol extinction
- Use unbinned (packet-by-packet) Level 1b slant-path transmittances/optical depths
- Clear gaseous absorption and Rayleigh scattering using standard (binned) profile products
- Calculate packet-by-packet aerosol slant-path optical depths as the residuals
- Peel to aerosol extinction assuming homogeneity along line of sight

Lunar Occultation
Aerosol Retrieval Approach

- Estimate exo-atmospheric I_0 from lunar model
  - -- Uses USGS Project ROLO images
  - -- Uses NCEP met data for refraction calculations
  - -- Outputs instrument FOV across unrefracted moon
  - -- Corrects position and FOV for refraction
  - -- Regression fitting establishes packet position on moon
- Compute pseudo-transmittance from measured I and model I_0 (with proper scaling factor)
- Clear gas species and Rayleigh slant-path optical depth contributions
- Calculate aerosol contribution from residuals

Schedule

- Complete algorithm to screen standard SAGE III profiles for PSC events (with Leeds/ETH optical signatures) – December 2003
- Complete algorithm to retrieve aerosol extinction on a packet-by-packet basis for solar occultations (to be applied to PSC events only) – June 2004
- Complete algorithm to retrieve aerosol extinction for lunar occultations (385, 521, 676, 757 nm) – December 2004
- Analyze SAGE III PSC observations and produce maps by type/composition for Arctic and Antarctic – throughout project