Using Sun and Aureole Measurements (SAM) to Check MODIS COD and R_{eff} Retrievals for Cirrus

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1. Introduction

- Cirrus is important for climate
  - ~ 25% coverage globally
  - Climate effects poorly understood
- In-situ measurement is difficult
  - Reason for SPARTICUS, MACPEX
- Remote measurement is difficult
  - Complex shapes
  - Strong forward scattering
- Sun and aureole measurements, SAM[1]
  - New validation tool[2]

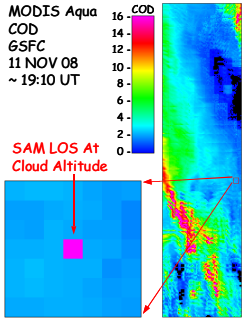
[1] JTECH 25, pgs 2531-2548, 2009
[2] Suggested by Bryan Baum and Ping Yang

2. SAM Calibration

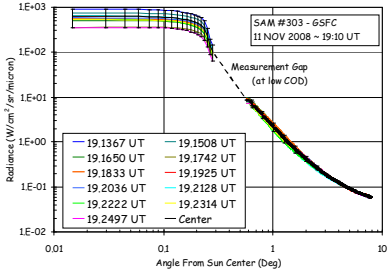
- SAM radiance measurements
  - Solar disk and aureole profiles
    - At 670 +/- 5 nm
  - Lab calibration NIST traceable
  - Field calibration using AERONET
  - Integration time correction
  - Operating temperature correction
  - Radiometric accuracy:
    - Aureole radiance ~15%
    - Disk radiance ~5%

3. Example 1: GSFC 11 NOV 08

- MODIS retrievals of COD and R_{eff} are nearly uniform
- LOS parallax is accounted for

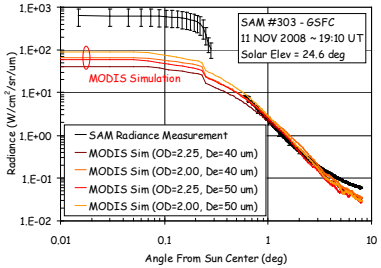


4. SAM Disk, Aureole Profiles



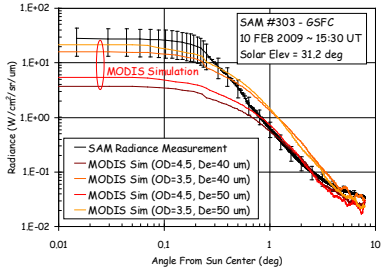
- SAM profiles are nearly identical
- Black curve shows center, extent

5. Data And MCAP Simulations[3]



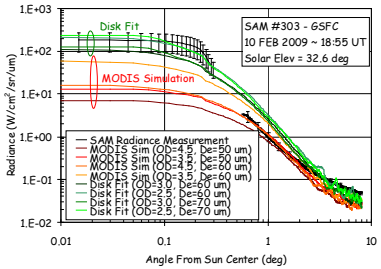
- Simulations using MODIS COD, R_{eff}, and YB phase functions don't match data

6. Example 2: GSFC 10 FEB 09



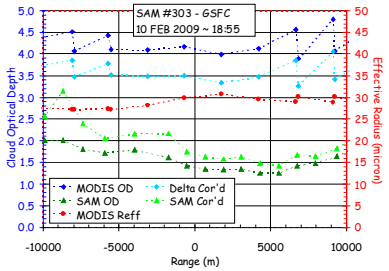
- Simulations using MODIS COD, R_{eff}, and YB phase functions don't match data

7. Example 3: GSFC 10 FEB 09



- When COD is adjusted ad hoc, the simulated aureole is too high

8. COD Corrections Attempted[4]



- Delta photons for MODIS
- Forward scattering for SAM

9. Conclusions

- SAM is a new Cal/Val technique
  - Suggest independent verification
  - Review MODIS phase functions
- Future projects:
  - Comparisons with Raman lidar, MFRSR, GOES, CALIPSO
  - Particle size (SPARTICUS)
  - Develop SAM OD correction
    - Use aureole measurements
    - Verify and validate

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[3]The authors acknowledge and thank Yu You (TAMU), who has also performed scattering calculations, showing similar effects on SAM COD.

[4]The authors acknowledge and thank Steve Platnick and Zhibo Zhang (GSFC) for their help with the MODIS delta photon correction.

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