

Advances in aerosol and cloud retrievals from spectral radiometers

Intro to session (5 min)

Infrastructure updates: (25 min)

- Laura Riihimaki—MFRSR 1625 nm channel
- Rick Wagener—implementing Christine Chiu's 3-channel Cimel cloud retrieval
- Justin Monroe—new VAP data quality efforts (SAS, MFRSR)

New hyperspectral retrievals: (30 min)

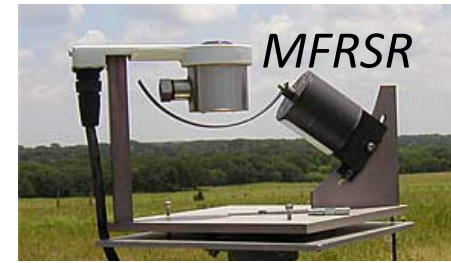
- Dave Turner--New AERloe retrieval
- Weidong Yang/Sasha Marshak -- SAS cloud retrieval from MAGIC
- Joe Michalsky-- RSS data/aerosol retrievals from Aug 2009-Mar2014

Hyperspectral Shortwave Retrievals and Data quality: (60 min)

- *Connor Flynn—update on SAS data quality and AOD retrievals
- *Discussion about priorities and path forward

Motivation: Timing is right for more attention to radiometer measurements

- Needed for current ARM/ASR priorities
 - Only instruments able to measure shallow cu properties (OD, LWP, Re)
 - Absorbing aerosols
 - Anchor active sensor measurements
- New retrievals from hyper-spectral radiometers
 - AERIoe—boundary layer thermodynamic profiles
 - Cloud phase, etc
 - Trace gasses
- Several radiometer workshops last winter:
 - ARM MFRSR workshop
 - Joint agency Radiation Science Workshop (Sebastian Schmidt & Sam Hall)



SAS



Goals of session

- Inform community of new retrievals and infrastructure updates
- Discuss priorities and path forward for spectral radiometers regarding data quality and development of new retrievals
 - Where is there community support/collaboration?
 - What scientific drivers should motivate ARM prioritization?

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MFRSR 1625 nm update

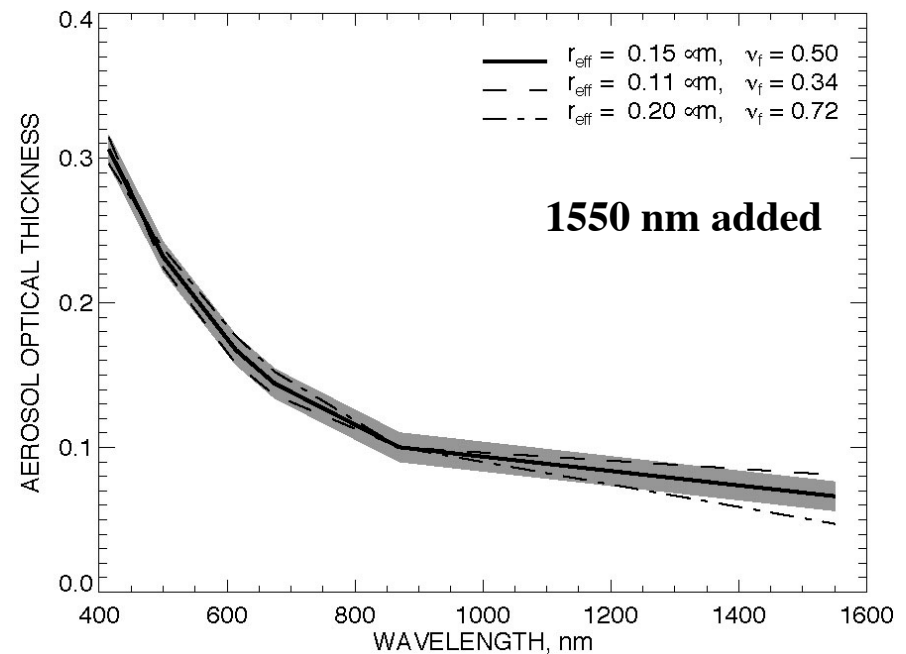
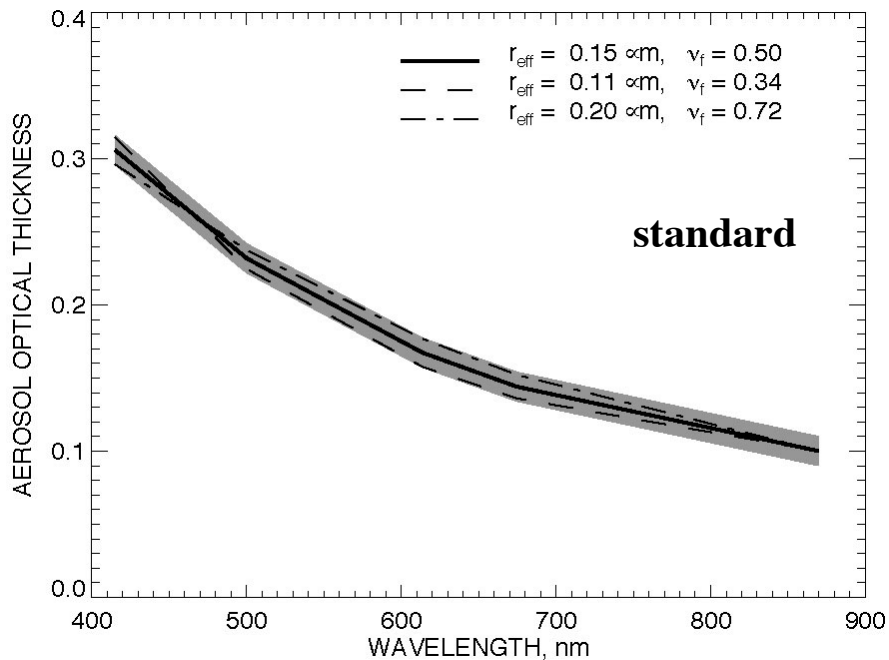
ARM approved updating MFRSR heads to replace the broadband (open channel) measurement with a 1625 nm filter



- Scientific motivation:
 - Better aerosol retrievals
 - Potential for cloud effective radius retrievals
 - Improved spectral albedos

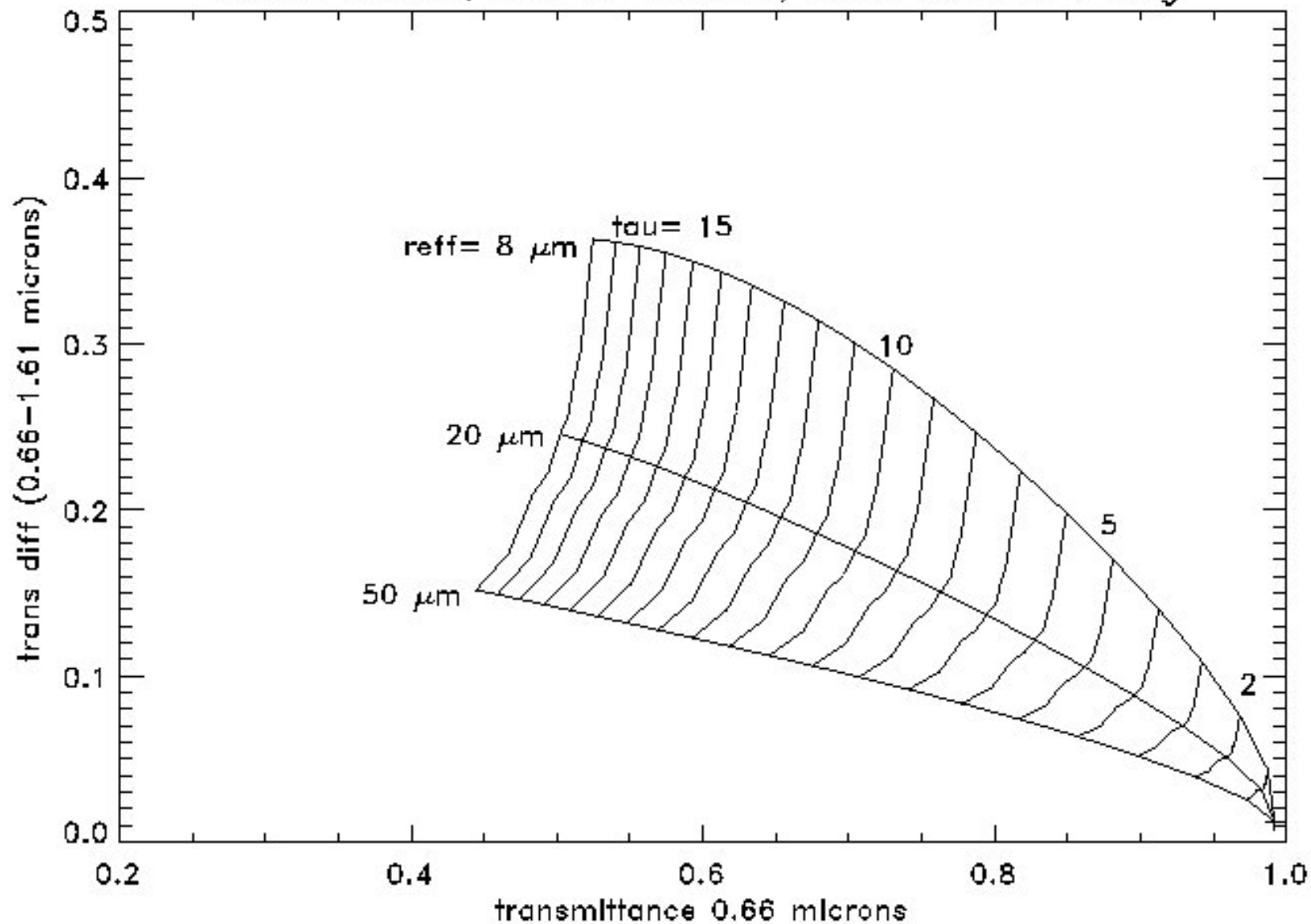
Improving aerosol retrievals

1550 nm channel allows to **separate between aerosol models** that are indistinguishable within the standard MFRSR range and accuracy.



The model spectral AOT curve (solid) derived using Mie theory for bimodal gamma size distribution with fine $r_{\text{eff}} = 0.15 \mu\text{m}$, coarse $r_{\text{eff}} = 1.5 \mu\text{m}$, and 50% fine mode fraction in 870 nm AOT (set to 0.1). AOTs from two competitive aerosol models fitting within 0.01 error margin (grey area) in 415 - 870 nm spectral range are shown by dashed and dash-dotted lines.

Water Clouds, NK Plot Ground, solar zenith= 0 deg



GRASS01, FOV03, 18 Jul 1970

