TERRA/SSF Aerosols Over Oceans: VIRS-like vs. MODIS

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MOTIVATION

1) LEARN BY COMPARISON
2) HEREDITARY WITH AVHRR & VIRS
3) MULTI-SPECTRAL IMPROVEMENTS

DATA

➢ **Global/One Week/FM1&2**

➢ $\tau_1(0.659)$, $\tau_2(1.640 \ \mu m)$

Dec 15-21, 2000 FM1	Dec 15-21, 2000 FM2
Jun 01-07, 2001 FM1	Jun 01-07, 2001 FM2

Cloud Screening

MODIS (Ref?):   Done by MODIS Team

VIRS-like (Minnis et al):   Consistent w/ TRMM/VIRS

Sampling

MODIS: Beyond 40° glint

VIRS-like: Beyond 40° glint & Anti-solar side of Orbit

Aerosol Retrievals

MODIS (Tanre et al. 1997)

- **Spectral:**   6 bands from 0.55-2.13 μm
- **Aerosol:**   Var Bi-LogNormal (Mode Location/Ratio)
- **Surface:**   Fresnel (V=7 m/s) + Black (except 0.55 μm)
- **RT Model:**   Ahmad-Fraser (JAS 1981)

VIRS-like (Ignatov Stowe 2000, 2002)

- **Spectral:**   Single-Channel: 0.659 & 1.640 μm
- **Aerosol:**   Prescribed (Fixed) Mono-LogNormal
- **Surface:**   Fresnel (V=1 m/s) + Small Diff.Ref.
- **RT Model:**   Vermote et al. 6S (IEEE/TGARS 1997)

OF AEROSOL FOOTPRINTS
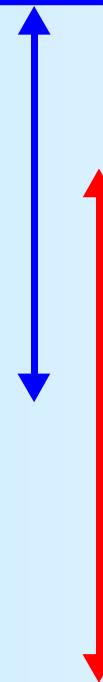
VIRS-like	DEC 15-21 2000 FM1	DEC 15-21 2000 FM2	JUN 1-7 2001 FM1	JUN 1-7 2001 FM2
	14%	14%	4%	5%
	42%	47%	43%	47%
MODIS	44%	39%	53%	48%
	M⊕V=100% N=2,268,474	M⊕V=100% N=2,217,566	M⊕V=100% N=2,652,508	M⊕V=100% N=2,542,214

TERRA/SSF MODIS AEROSOLS: PROPORTION OF POPULATION

~10% (VIRS NO MODIS)
~45% (VIRS AND MODIS)
~45% (MODIS NO VIRS)

FM1 FM2
15–21 DEC, 2000

FM1 FM2
1–7 JUN, 2001
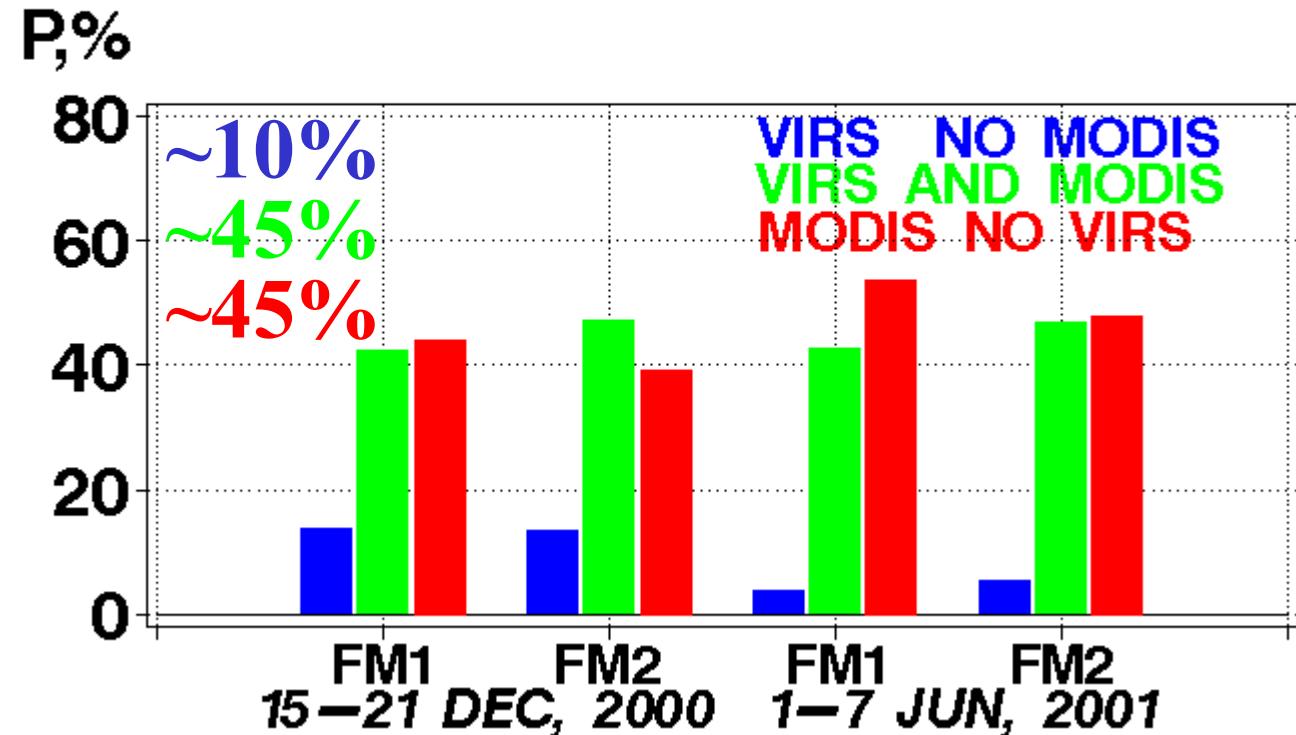
τ-RETRIEVALS

TERRA/SSF MODIS AEROSOLS:
OPTICAL DEPTH @ 0.659 μm

τ_1

A

VIRS NO MODIS
VIRS AND MODIS
MODIS NO VIRS

0.20
0.15
0.10
0.05

FM1   FM2   FM1   FM2
15–21 DEC, 2000   1–7 JUN, 2001

TERRA/SSF MODIS AEROSOLS:
OPTICAL DEPTH @ 1.640 μm

τ_2

B

VIRS NO MODIS
VIRS AND MODIS
MODIS NO VIRS

0.15
0.10
0.05
0.00

FM1   FM2   FM1   FM2
15–21 DEC, 2000   1–7 JUN, 2001
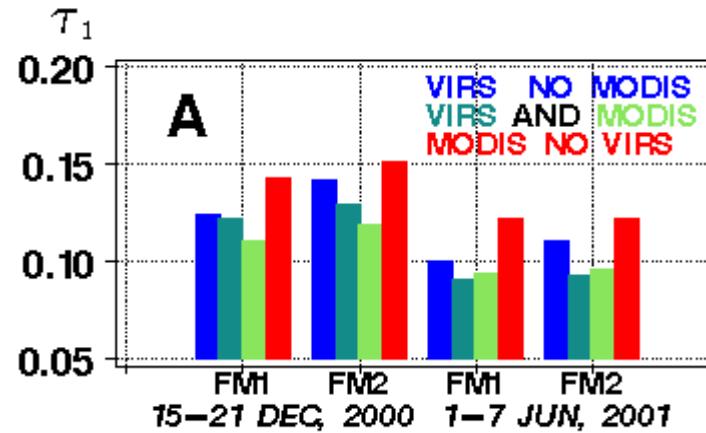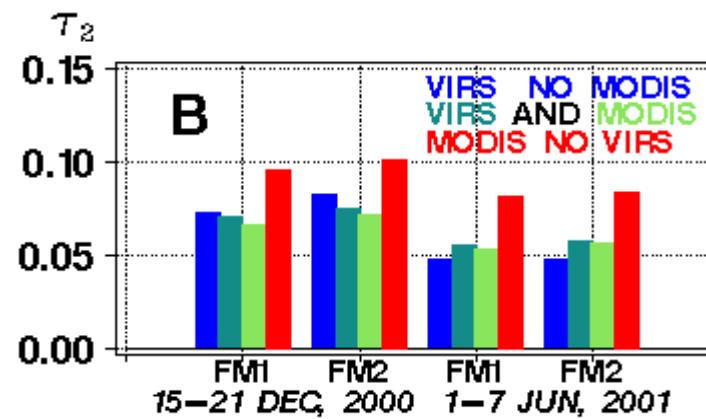
- **VIRS – MODIS** ($\delta\tau_1\sim0.004$; $\delta\tau_2\sim0.003$)
  - **Lat/Lon Domain: Identical**
  - **Sun/View/Scatter/Glint: Identical**
  - **Cloud Condition/Sampling: Close**
  - **Aerosol Algorithm: DIFFER**

- **VIRS – VIRS** ($\delta\tau_1\sim0.01$; $\delta\tau_2\sim0.002$)
  - **Lat/Lon Domain: DIFFER?**
  - **Cloud Condition: DIFFER?**
  - **Sun/View/Scatter/Glint: DIFFER?**
  - **Aerosol Algorithm: Identical**

- **MODIS – MODIS** ($\delta\tau_1\sim0.03$; $\delta\tau_2\sim0.03$)
  - **Lat/Lon Domain: DIFFER?**
  - **Cloud Condition: DIFFER?**
 - **Sun/View/Scatter/Glint: DIFFER?**
  - **Aerosol Algorithm: Identical**

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CLOUD AMOUNT

TERRA/SSF MODIS
PERCENT CLOUD AMOUNT

~40%
~40%
~60%

VIRS   NO MODIS
VIRS AND MODIS
MODIS NO VIRS

FM1   FM2
15—21 DEC, 2000

FM1   FM2
1—7 JUN, 2001
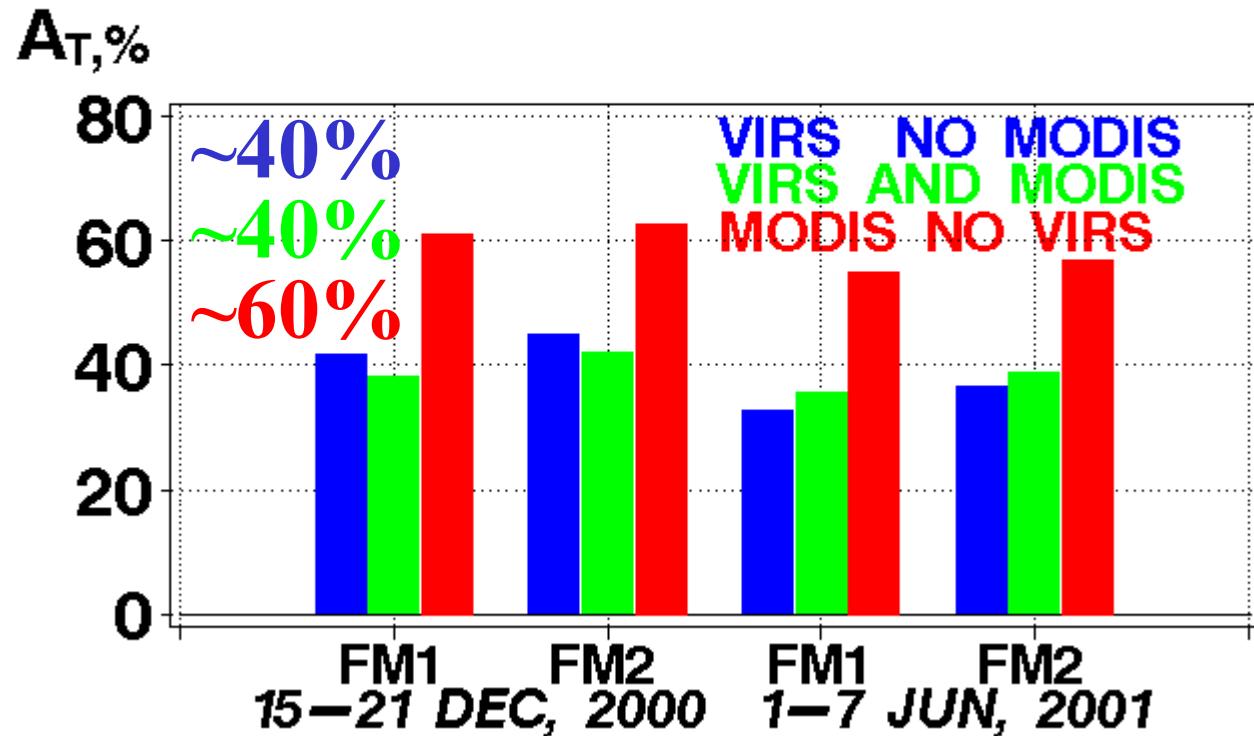
SCATTER ANGLE
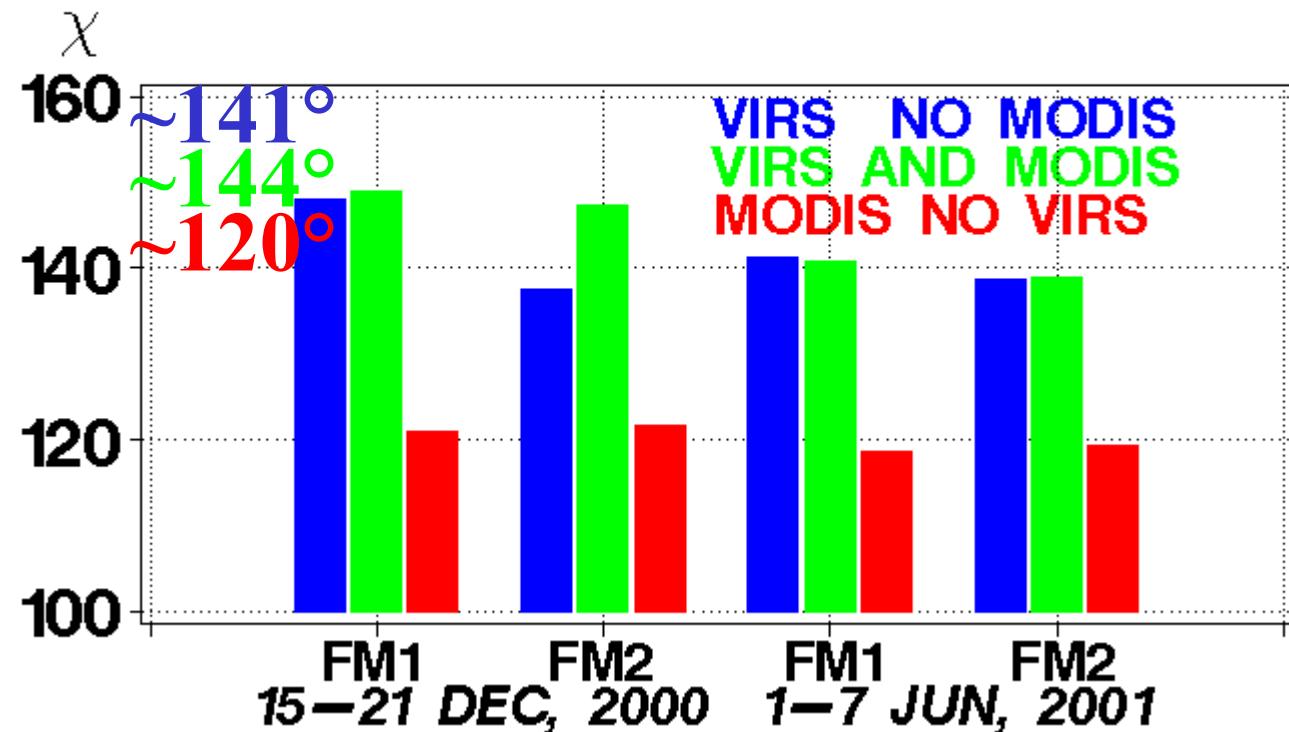
CONCLUSION

Sub-Samples: (Cloud/Sampling)
VIRS NO MODIS: ~10%
VIRS AND MODIS: ~45%
MODIS NO VIRS: ~45%

Average τ -Retrievals:
• **VIRS compares to MODIS**
(Aerosol algorithm: Effect small)
• **MODIS differs from MODIS**
(Cloud/Scat Angle Stats differ)

PLANS

Comprehensive Checks of VIRS-like and MODIS for Self- and Inter-Consistency