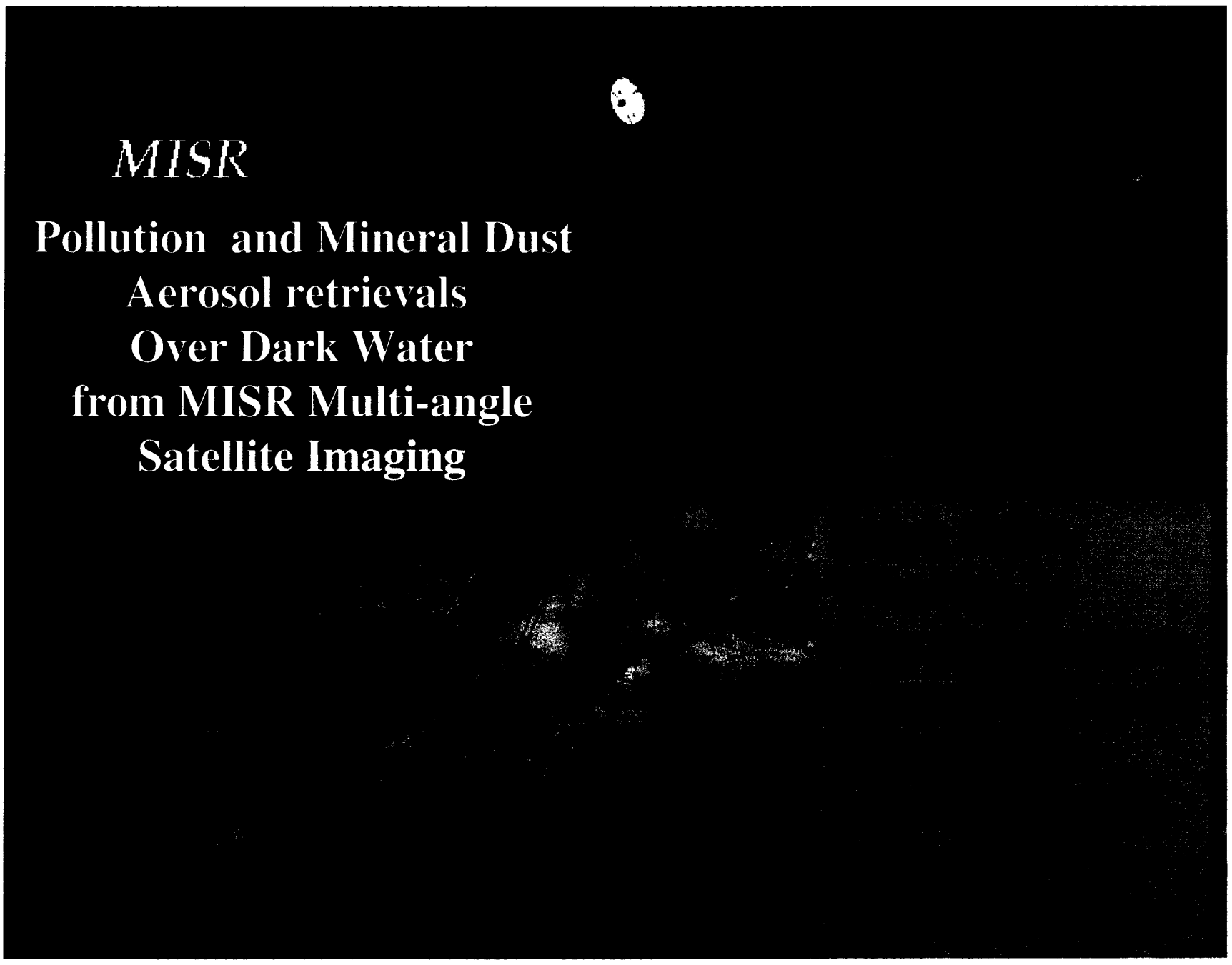
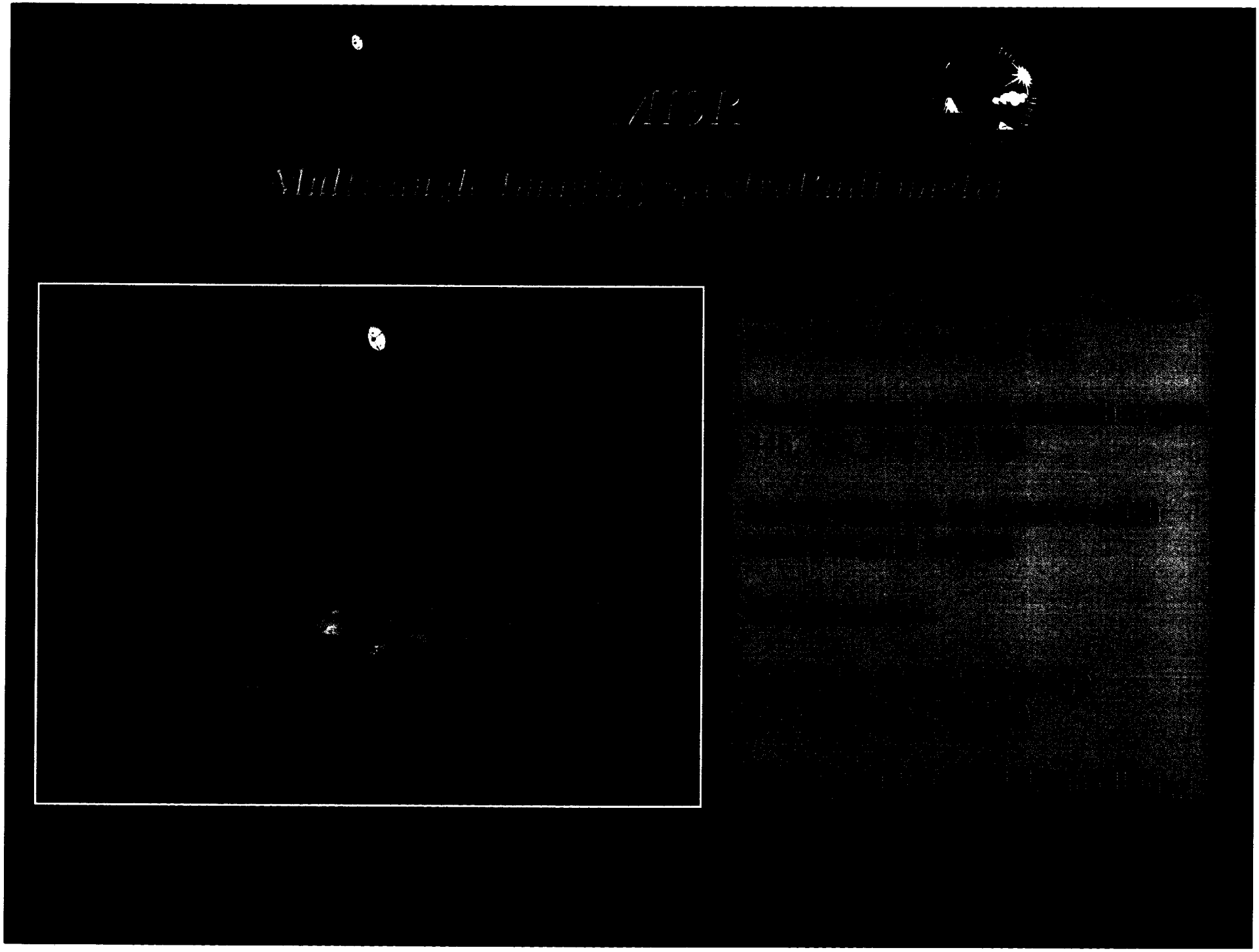
MISR

Pollution and Mineral Dust Aerosol retrievals Over Dark Water from MISR Multi-angle Satellite Imaging





NEW MULTI-ANGLE CAPABILITY – MORE INFORMATION ABOUT AEROSOLS

EXPECATIONS based on simulations over cloud-free, calm ocean:

- **Aerosol Extinction Optical Depth (τ_a)**

  -- Determined to at least 0.05 or 20%, whichever is larger, for common aerosol types except soot, even when the particle microphysical properties are poorly known.

- **Particle Size (r_a)**

  -- "Small," "Medium," and "Large" size discrimination over Accumulation Mode -- key for vis spectrum

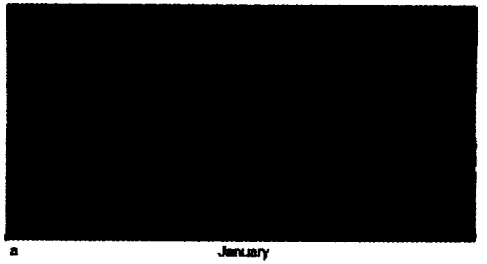
- **Indices of Refraction (nr, ni)**

  -- Two to four compositional groups
  (absorbing & non-absorbing, or "dark" and "light")

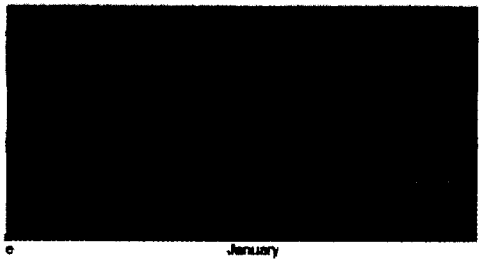
- **Spherical vs. Nonspherical** for Sahara dust indices

- **Poorer Sensitivity for ni >~ 0.008 (Black Carbon)**

➔ Under good conditions, expect MISR to distinguish **about 12 aerosol types** based on size, shape, and composition

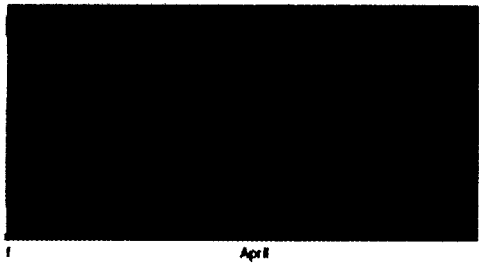


a January

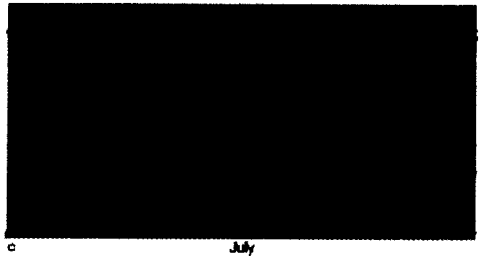


e January

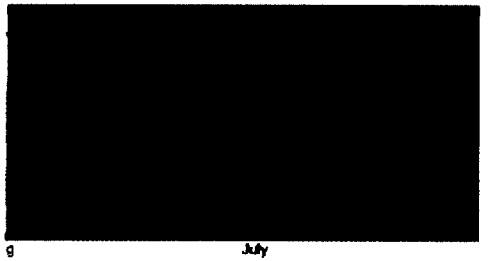
b April



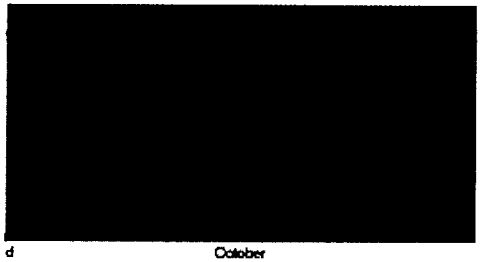
f April



c July



g July



d October

h October

- Carbonaceous + Dusty Maritime
- Dusty Maritime + Coarse Dust
- Carbonaceous + Black Carbon Maritime
- Carbonaceous + Dusty Continental
- Carbonaceous + Black Carbon Continental

- Carbonaceous + Dusty Maritime (1a)
- Carbonaceous + Dusty Maritime (1b)
- Carbonaceous + Dusty Maritime (1c)
- Dusty Maritime + Coarse Dust (2a)
- Dusty Maritime + Coarse Dust (2b)
- Carbonaceous + Black Carbon Maritime (3a)
- Carbonaceous + Black Carbon Maritime (3b)
- Carbonaceous + Dusty Continental (4a)
- Carbonaceous + Dusty Continental (4b)
- Carbonaceous + Dusty Continental (4c)
- Carbonaceous + Black Carbon Continental (5a)
- Carbonaceous + Black Carbon Continental (5b)
- Carbonaceous + Black Carbon Continental (5c)

Plate 1

MISR Aerosol Retrieval Algorithm Validation

Aimed at **determining quantitatively the unique contributions** multi-angle imaging can make to aerosol science

Must involve:

- Critically **testing and refining** our algorithms

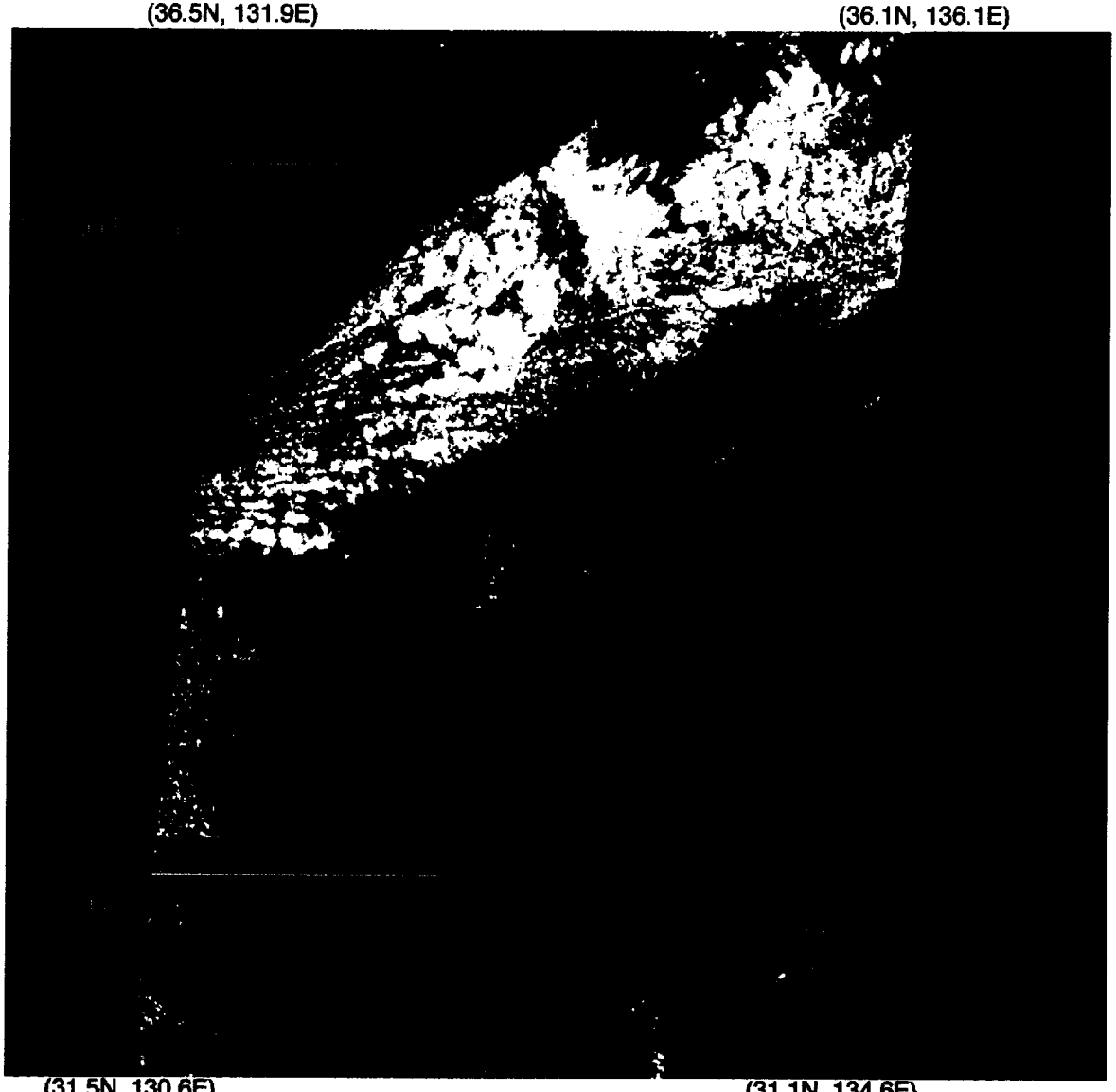
- Quantitatively **assessing the sensitivity** of the best algorithms we can produce

Then: Apply them to the **global, multi-year** MISR data set

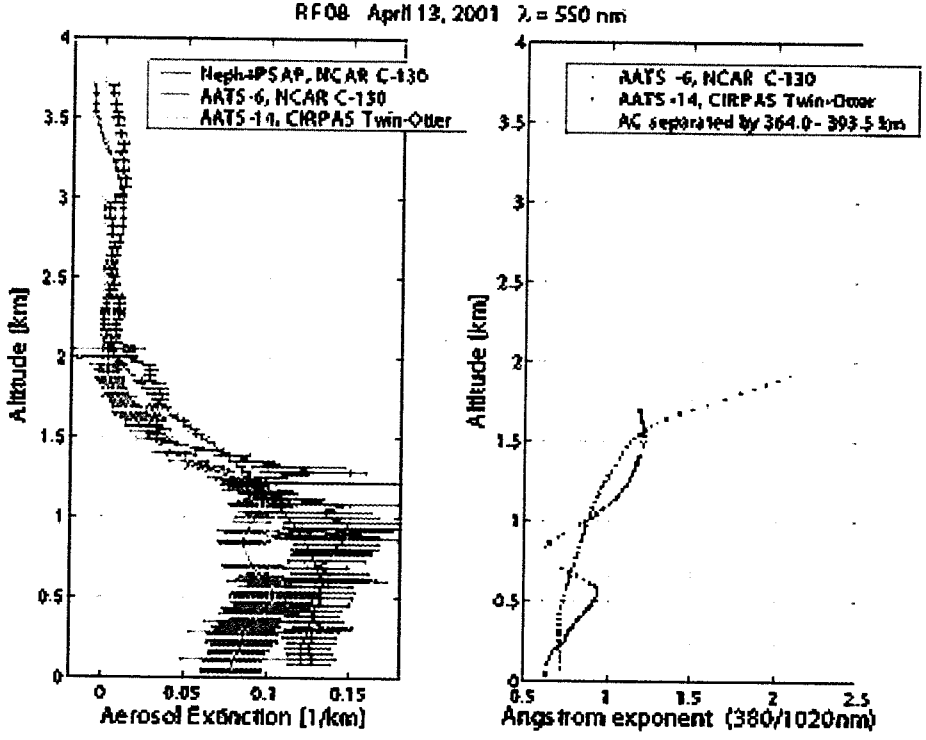
Supplemented by: More detailed **surface and *in situ*** data

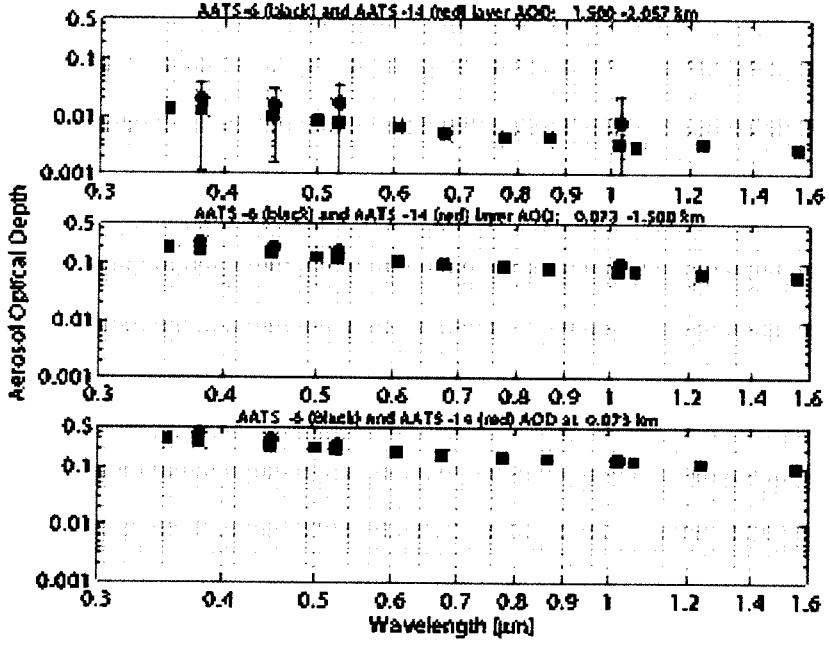
...to improve regional and **global aerosol climatologies**
for **aerosol budget** and **climate change** applications

ACE Asia: Orbit 7015, Blocks 62-65
April 13, 2001
MISR Level 1B2 ELLIPSOID RGB AN (nadir)

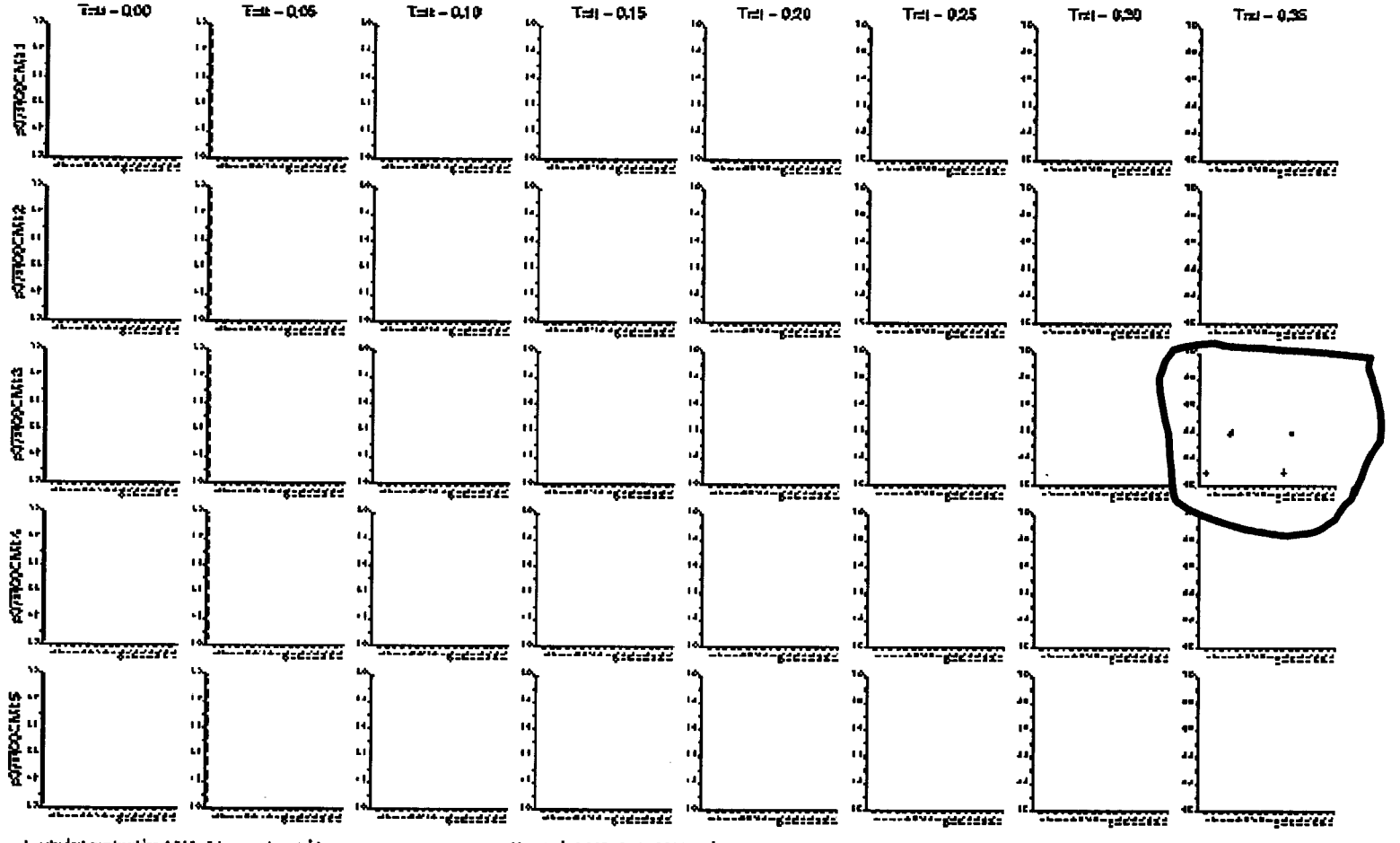


AATS-14, AATS-6, Neph-130+PSAP-130 Profiles
April 13, 2001





MISR Research Retrieval April 13, 2001, Orbit 7015, Patch t2 (near C-130)



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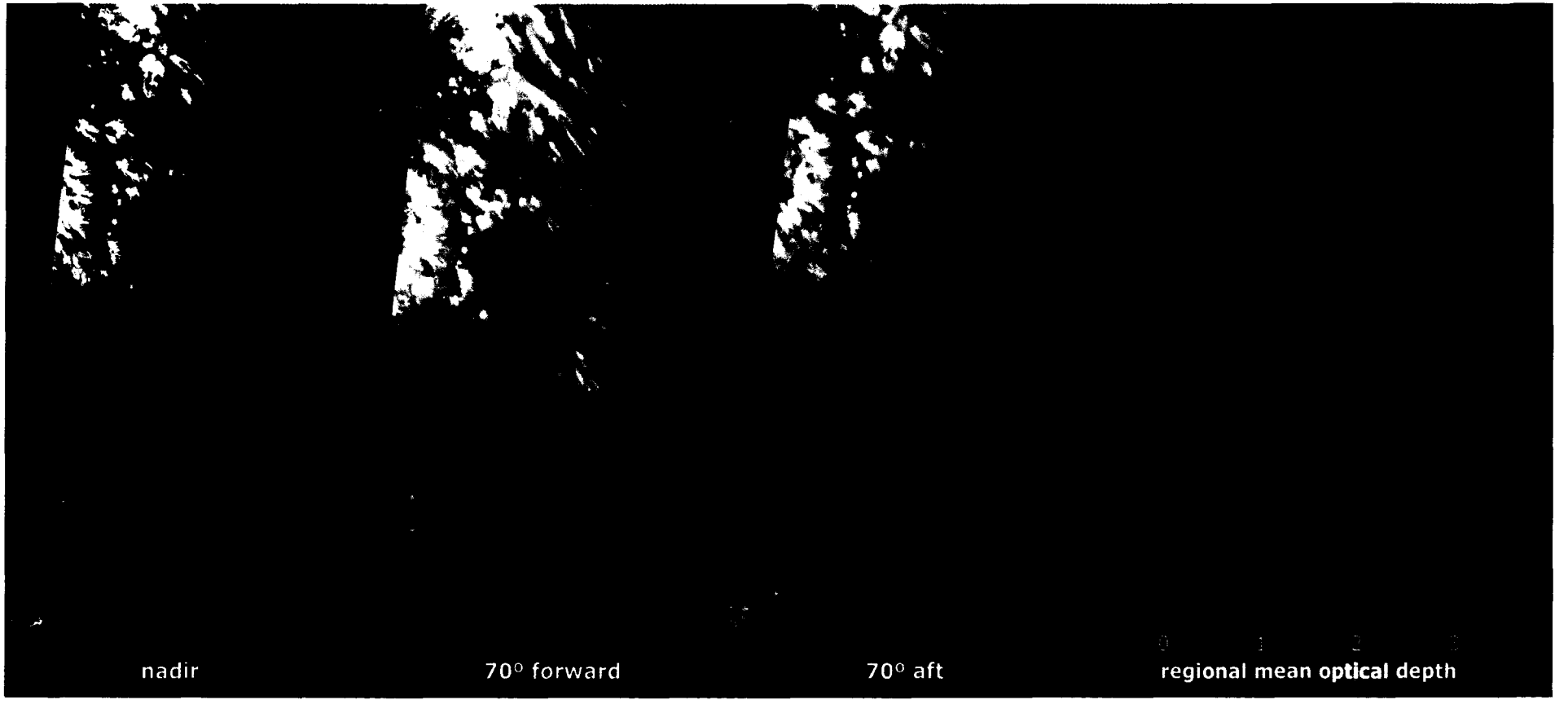
MISR Views of Houston Area and Galveston Bay, September 12, 2002
Orbit 14533, Block 67, UTC 255_17:05:57

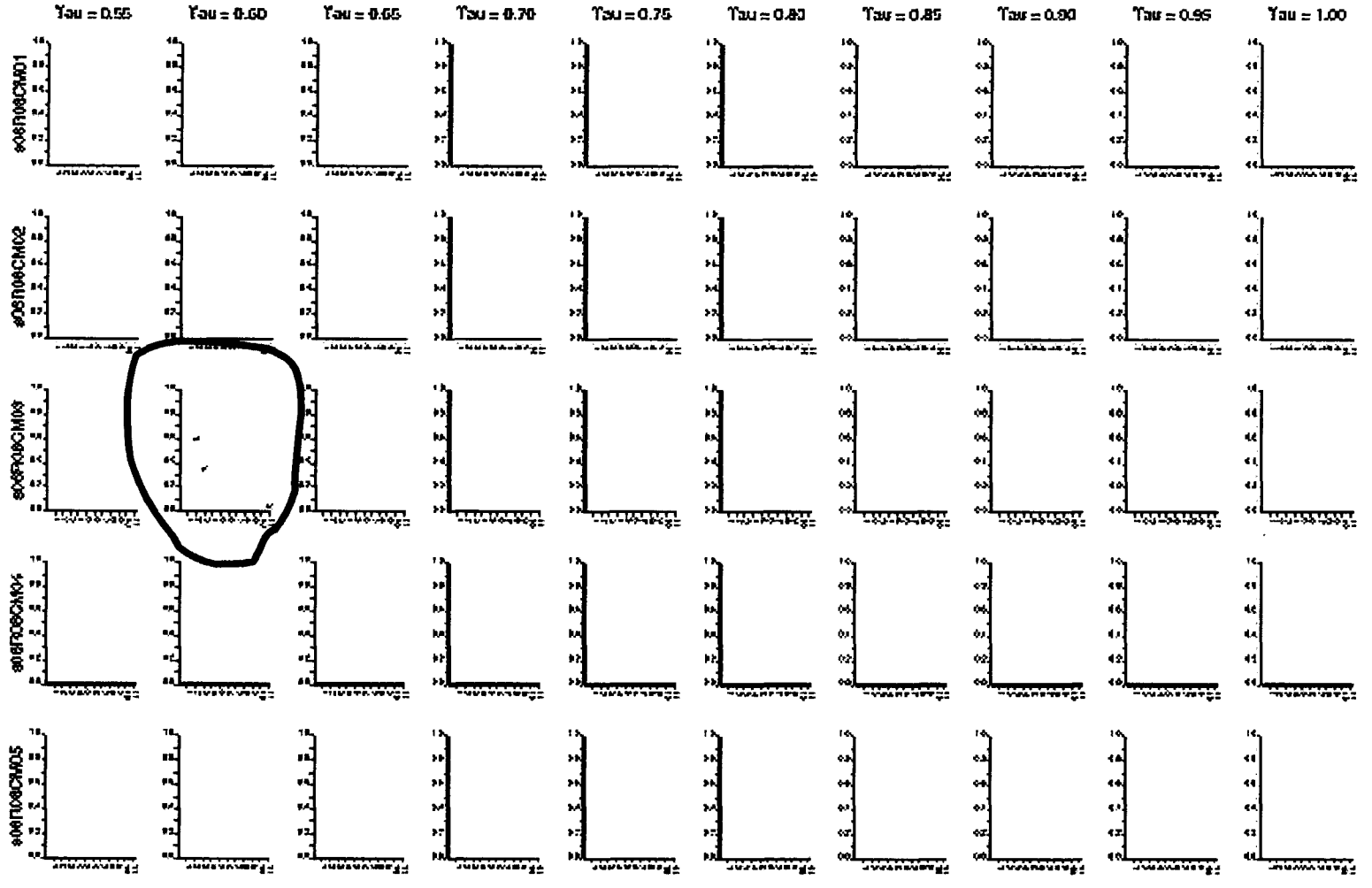


NADIR **70° Forward** **70° Aft** **MISR AOT(558)**

Representative Component Aerosol Models

Component Name	D_1 (μm)	D_2 (μm)	D_c (μm)	σ	n_r	n_i	Sub-μm Fract. *AOT (550)*	*SSA* (558)	*SSA* (672)	*SSA* (866)	σ_{ep} (558)	σ_{ep} (672)	σ_{ep} (866)	Particle Size/Shape Category
Pollution_0.23	0.01	5.0	0.23 area	1.48	1.47	0.023	0.969	0.854	0.827	0.772	0.024	0.015	0.008	Medium Spherical
Pollution_0.30	0.01	5.0	0.30 area	1.44	1.47	0.028	0.975	0.855	0.837	0.799	0.069	0.048	0.028	Medium Spherical
Asia_Accum_ Dust_Plates	0.02	2.0	1.0 num.	2.0	1.51	0.0011 (672) 7.12E-4 (865)	--	0.978	0.991	0.995	2.64	2.889	2.669	Medium Non-spherical
Asia_Accum_ Dust_Grains	0.02	2.0	1.0 num.	2.0	1.51	0.0011 (672) 7.12E-4 (865)	--	0.977	0.989	0.995	2.55	2.438	2.433	Medium Non-spherical
Asia_Coarse_ Dust	0.2	10.0	0.52 area	2.4	1.51	0.0011 (672) 7.12E-4 (865)	0.361	0.934	0.969	0.987	2.346	2.399	2.839	Large Non-spherical
Sea_Salt_3.3	0.1	15.	3.3 area	3.02	1.48	0.0	0.231	1.00	1.00	1.00	1.735	1.758	1.783	Large Spherical
High_Alt_ Sulfate	0.1	4.0	0.90 num.	1.30	1.43	0.0	0.819	1.00	1.00	1.00	2.429	2.616	2.440	Medium Spherical

MISR Research Retrieval Sept. 12, 2002, Orbit 14553, Patch t1 (Galveston Bay)



1 - spherical_nonabsorbing_0.06 (sulfate, sea salt, organic)
2 - spherical_nonabsorbing_0.12 (sulfate, sea salt, organic)
3 - spherical_nonabsorbing_0.26 (sulfate, sea salt, organic)
4 - spherical_nonabsorbing_0.57 (sulfate, sea salt, organic)
5 - spherical_nonabsorbing_1.28 (sea salt, organic)
6 - spherical_nonabsorbing_6.96 (water soluble)
7 - nonspherical_absorbing_1.18_lo (red dust)
8 - nonspherical_absorbing_1.18_hi (red dust)
9 - nonspherical_absorbing_7.48 (red dust)
10 - spherical_absorbing_0.04 (black carbon)
11 - thin_cirrus_hexagonal_columns_from_Mishchenko

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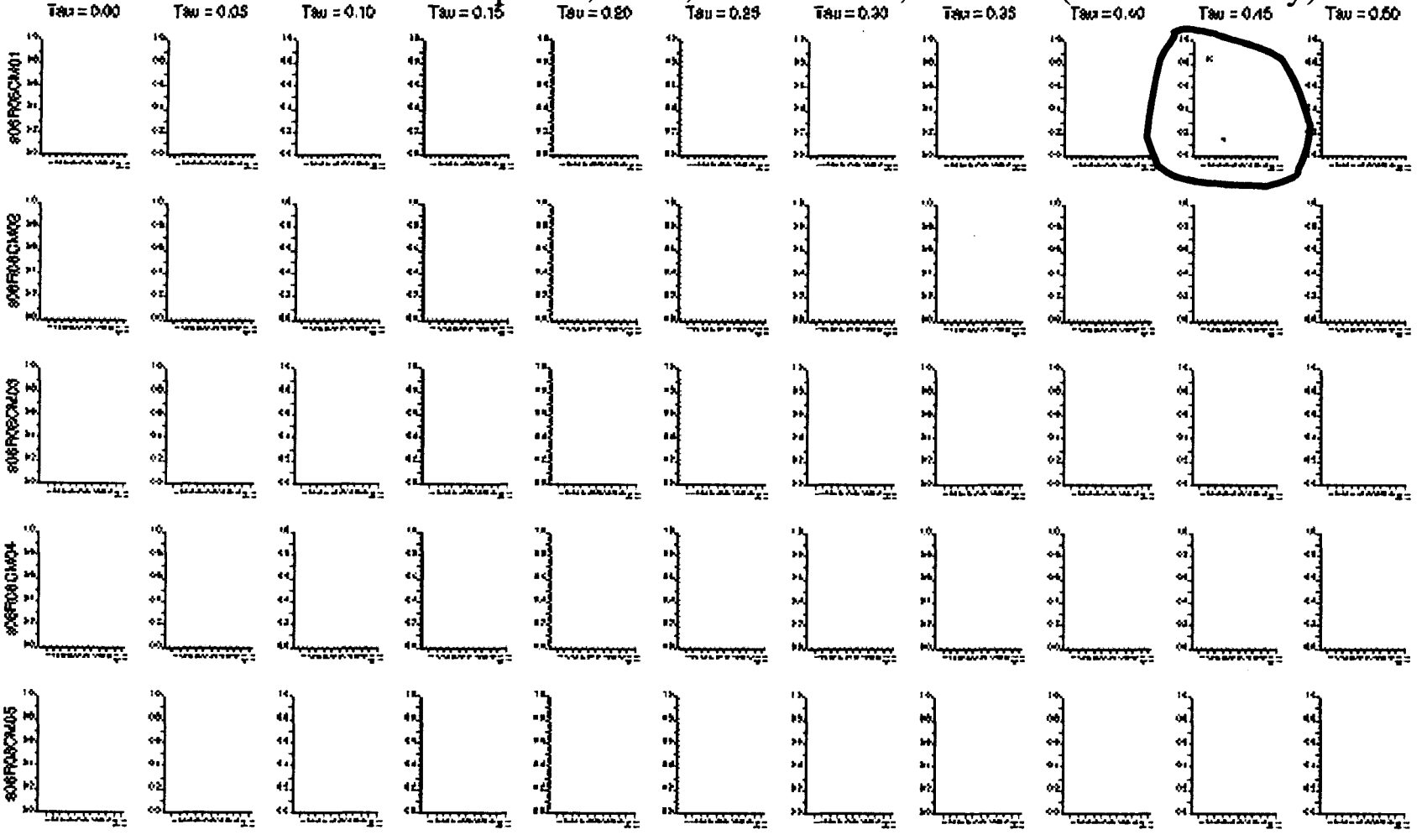
MISR Research Retrieval Sept. 12, 2002, Orbit 14553, Patch t2 (Galveston Bay)



1 - spherical_nonabsorbing_0.06 (surfate, sea salt, organic)
2 - spherical_nonabsorbing_0.12 (surfate, sea salt, organic)
3 - spherical_nonabsorbing_0.26 (surfate, sea salt, organic)
4 - spherical_nonabsorbing_0.67 (surfate, sea salt, organic)
5 - spherical_nonabsorbing_1.26 (sea salt, organic)
6 - spherical_nonabsorbing_8.96 (water soluble)
7 - nonspherical_absorbing_1.18_lo (red dust)
8 - nonspherical_absorbing_1.18_hi (red dust)
9 - nonspherical_absorbing_7.18 (red dust)
10 - spherical_absorbing_0.04 (black carbon)
11 - thin_cirrus_hexagonal_columns_Iron_Mishchenko

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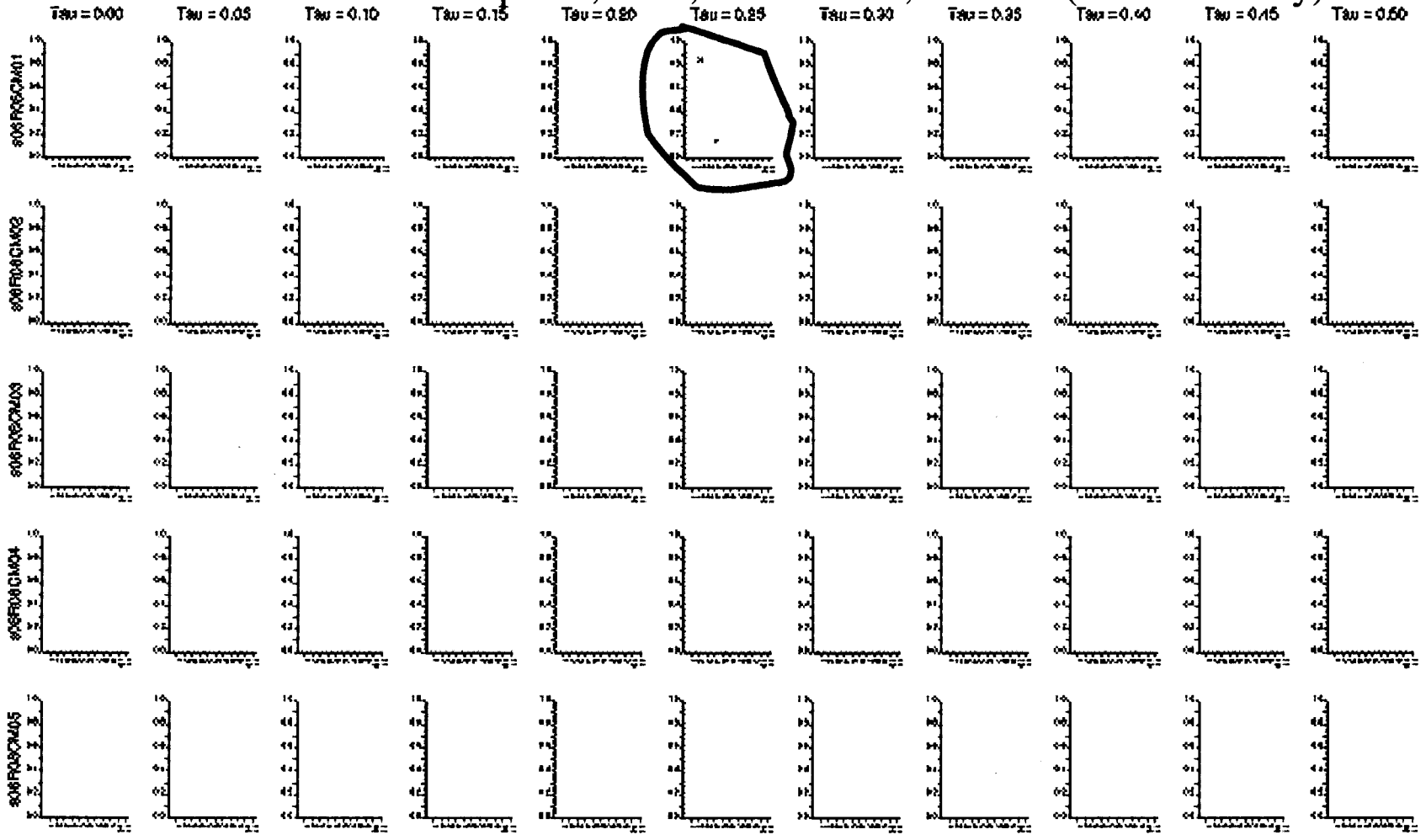
MISR Research Retrieval Sept. 12, 2002, Orbit 14553, Patch t3 (Galveston Bay)



1 - spherical_nonabsorbing_0.06 (sulfate, sea salt, organic)
2 - spherical_nonabsorbing_0.12 (sulfate, sea salt, organic)
3 - spherical_nonabsorbing_0.26 (sulfate, sea salt, organic)
4 - spherical_nonabsorbing_0.67 (sulfate, sea salt, organic)
5 - spherical_nonabsorbing_1.28 (sea salt, organic)
6 - spherical_nonabsorbing_6.96 (water soluble)
7 - nonspherical_absorbing_1.18_lo (red dust)
8 - nonspherical_absorbing_1.18_hi (red dust)
9 - nonspherical_absorbing_7.16 (red dust)
10 - spherical_absorbing_0.04 (black carbon)
11 - thin_cirrus_hexagonal_columns_from_Mishchenko

tau_water = 0.002, aim_stat_index = 1, windspeed_index = 1
File id: /data/science/explorer/dsm/local_mode_V2.2/houston/14553/chisq/t3/s06/3x3/s06R06CM??3300007333.bin chisq_max_3 = 2.935920625