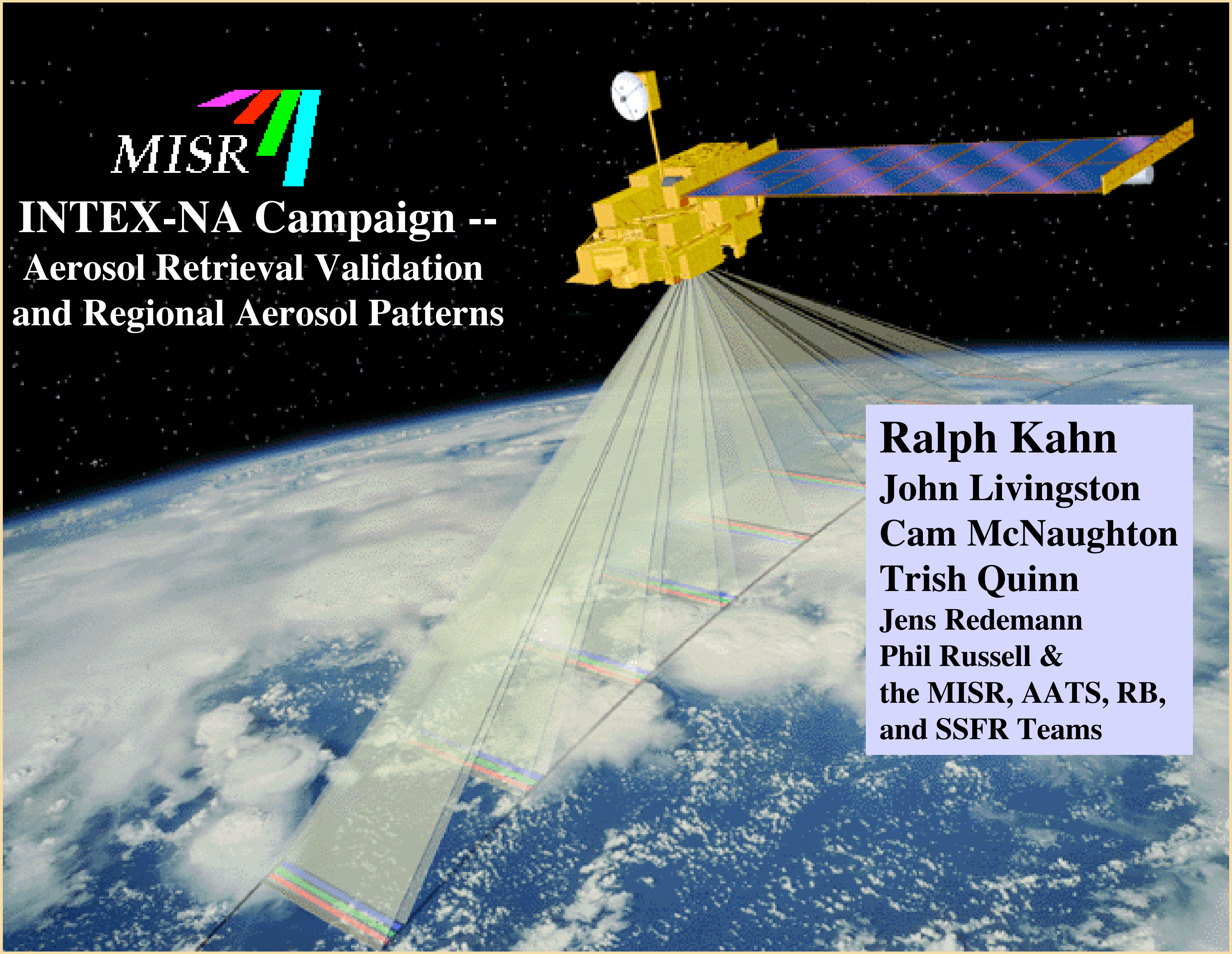
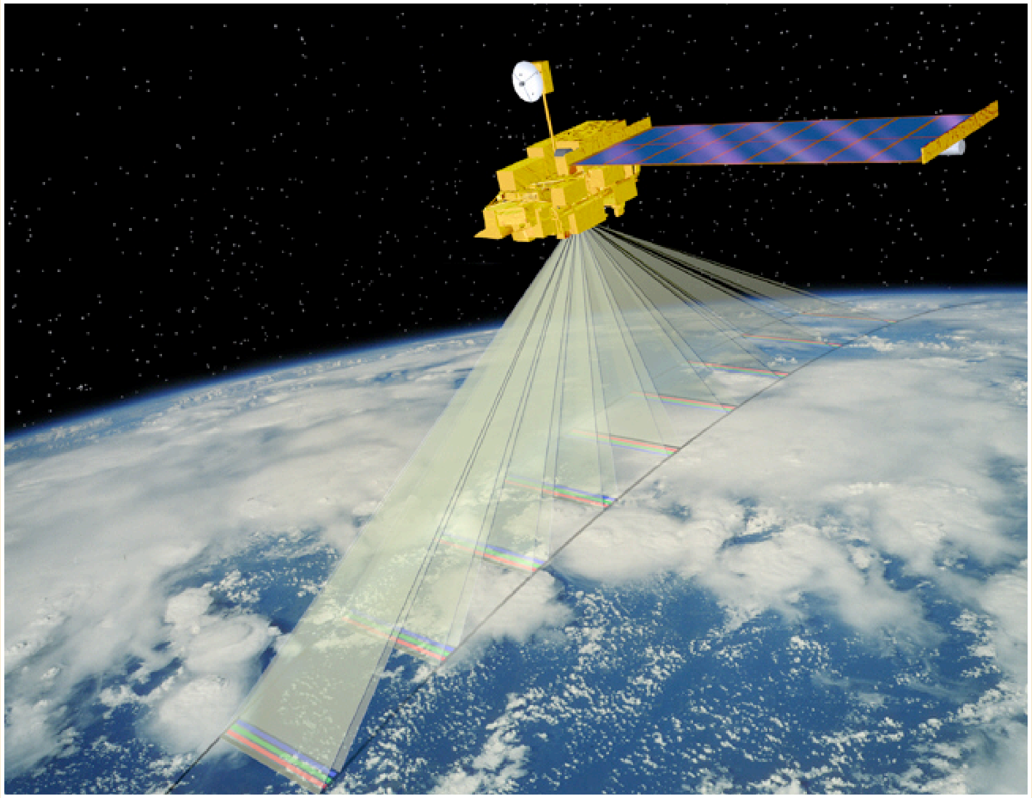


INTEX-NA Campaign --
Aerosol Retrieval Validation and Regional Aerosol Patterns

Ralph Kahn
John Livingston
Cam McNaughton
Trish Quinn
Jens Redemann
Phil Russell &
the MISR, AATS, RB, and SSFR Teams



Nine view angles at Earth surface: 70.5° forward to 70.5° aft

Four spectral bands at each angle: 446, 558, 672, 866 nm

Seven minutes to observe each scene at all 9 angles

400-km swath

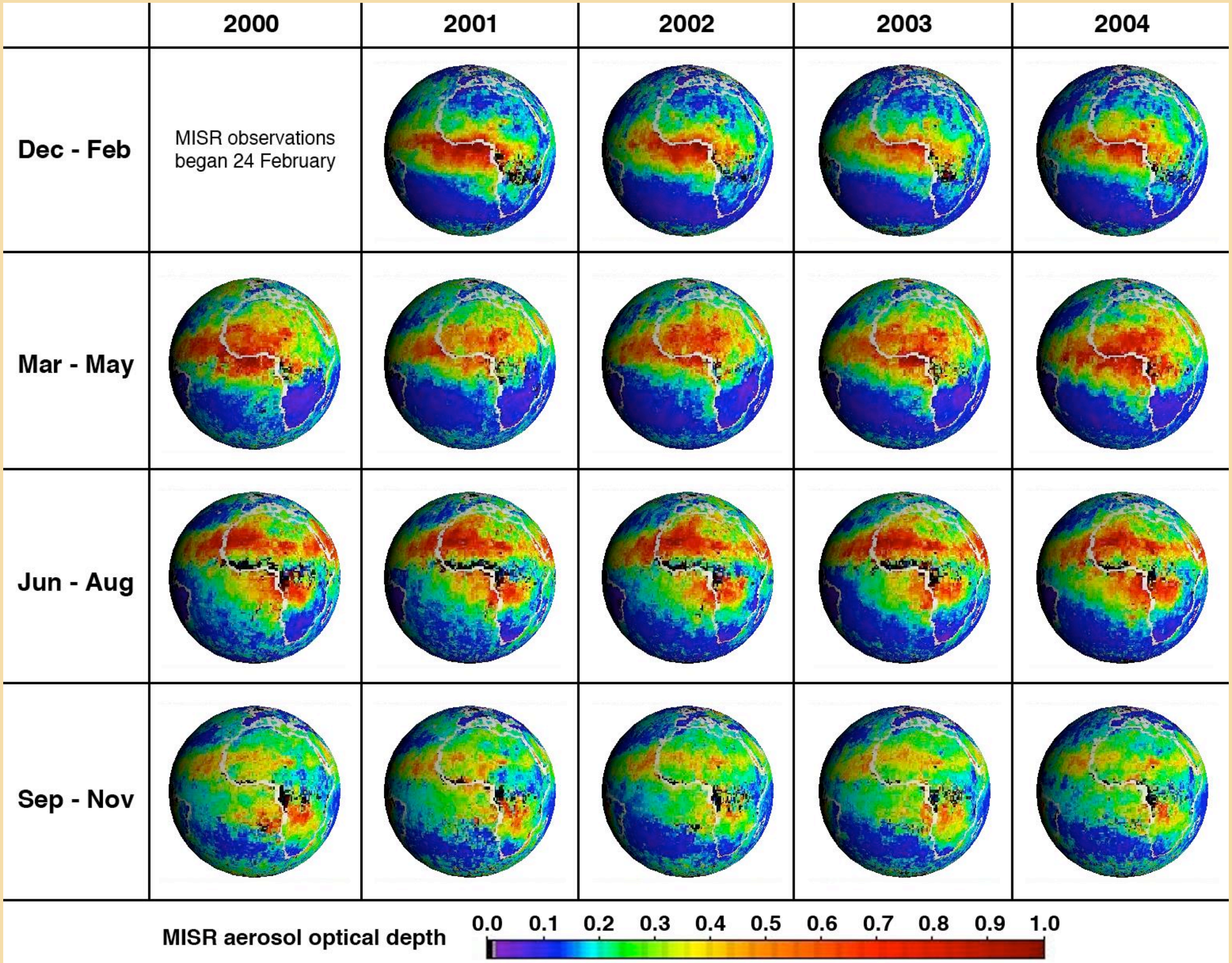
Global coverage about once per week

275 m - 1.1 km spatial sampling

Air mass factors from 1 (nadir) to 3

Scattering angles from ~60° to ~160° in mid-latitudes

Five Years of MISR Global Aerosol Products



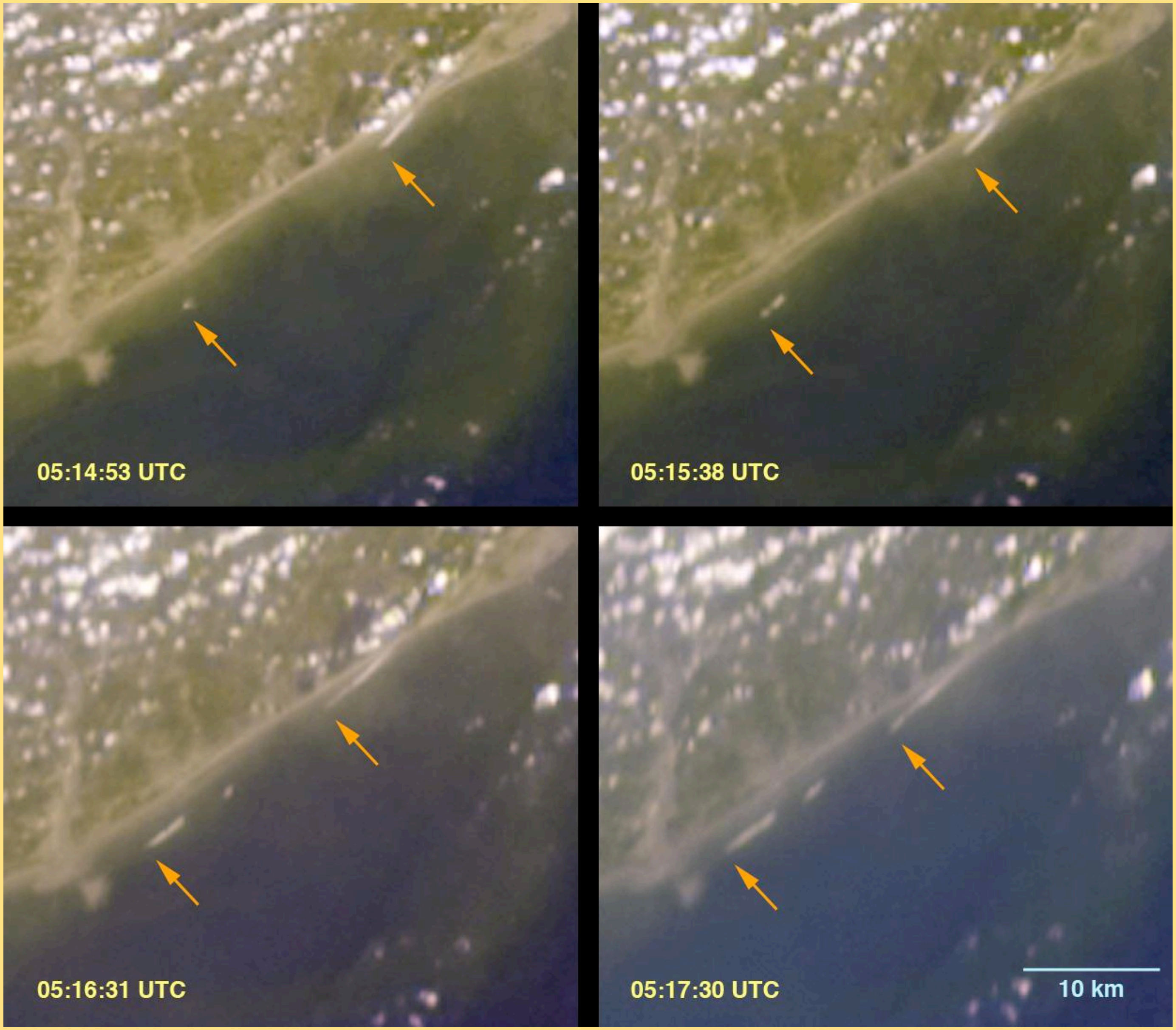
Mid-vis AOT

- Land & Water
- Bright Surfaces
- Globe ~ weekly
- ~ 10:30 AM

+ particle size, shape

MISR Views Tsunami, December 26, 2004

East-Central Coast of India near Vishakapatnam



GOALS FOR INTEX-NA MULTI-PLATFORM EXPERIMENT –

- **Provide Column *AOT* and *Particle Property* data**
  to Validate satellite aerosol retrievals and aerosol transport models
  MISR Validation amounts to refining the algorithm climatology

- **Quantify Regional Aerosol Amount and Type *Variability***
  on ~100 m to 100 km scales

- **Provide 3-D aerosol physics and chemistry for Closure Tests**

- **Provide 3-D Environmental Snapshots for regional aerosol climatology**
  From MISR – 2-D regional aerosol AOT and airmass type maps

- **Gain experience Coordinating *in situ*, surface, spacecraft aerosol observations**

- **Gain experience performing Integrated, multi-platform analysis**

Platform Roles in
Multi-Platform INTEX-NA Experiment –

- **MISR aboard the EOS-Terra Satellite**
  - -- Instantaneous ***regional*** column-average, 2-D ***AOT***, ***type*** & ***variability***
  - -- Satellite multi-angle aerosol retrieval **validation opportunity**

- **R/V Ron Brown**
  - -- Fixed ***point-of-reference*** and comparison platform for aircraft
  - -- ***Time series*** of column ***AOD***, ***Lidar Profiles***
  - -- Near-surface ***wind vector*** and ***aerosol samples***
  - -- Communicates Profiles and Wind Vectors near-real-time

- **DC-8**
  - -- *In situ* sampling of ***aerosol optics***, ***chemistry***, & ***micro-physics***
  - -- ***Lidar reconnaissance*** of study volume
  - -- Detailed ***characterization of aerosol layers*** along- & across-wind

- **J31**
  - -- Total ***column & height-resolved spectral AOD*** and ***radiative flux***
  - -- ***Surface*** net spectral albedo
  - -- ***Layer definition***, optical closure, lower optical boundary condition

MISR Multi-angle Aerosol Retrieval Strengths -

- Sensitivity to Aerosols over Land
- Sensitivity to Aerosol over Very Bright Surfaces (e.g., Desert)
- Sensitivity to Particle Sphericity at least over dark water
- Sensitivity to Bi- and even Tri-modal Distributions (size & shape) in some cases
- Crude Sensitivity to Single-Scattering Albedo [~ 1.0 vs. 0.88 vs. 0.80 over dark water]
- Sensitivity to Optically Thin hazes over water and land
- Instantaneous AOT and Particle Type Regional Coverage
- Sensitivity to Plume Height

MISR Early Post-Launch Component Aerosol Optical Models (Version 15)

[illegible]	Component Name	r_1 (μm)	r_2 (μm)	r_c (μm)	r_e (μm)	σ	SSA (446)	SSA (558)	SSA (672)	SSA (866)	AOT((446) /AOT(558)	AOT(672)/ AOT(558)	AOT(867)/ AOT(558)	g (558)	Particle Size/Shape Category
	sph_nonabsorb_0.06	0.001	0.4	0.03	0.06	1.65	1.00	1.00	1.00	1.00	1.95	0.55	0.23	0.352	Small Spherical
2	sph_nonabsorb_0.12	0.001	0.75	0.06	0.12	1.7	1.00	1.00	1.00	1.00	1.54	0.66	0.35	0.609	Small Spherical
3	sph_nonabsorb_0.26	0.01	1.5	0.12	0.26	1.75	1.00	1.00	1.00	1.00	1.18	0.82	0.58	0.717	Medium Spherical
4	sph_nonabsorb_0.57	0.01	4	0.24	0.57	1.8	1.00	1.00	1.00	1.00	0.98	0.99	0.91	0.722	Large Spherical
5	sph_nonabsorb_1.28	0.01	8	0.5	1.28	1.85	1.00	1.00	1.00	1.00	0.96	1.04	1.10	0.728	Large Spherical
6	nonsph_absorb_1.18_lo	0.05	2	0.47	1.18	2.6	0.805	0.880	0.914	0.980	0.97	1.03	1.08	0.730	Medium Dust Low
7	nonsph_absorb_1.18_hi	0.05	2	0.47	1.18	2.6	0.805	0.880	0.914	0.980	0.97	1.03	1.08	0.730	Medium Dust High
8	nonsph_absorb_7.48	0.5	15	1.9	7.48	2.6	0.612	0.694	0.734	0.900	1.00	1.00	1.00	0.881	Coarse Dust
[illegible]	sph_absorb_0.04	0.001	0.5	0.012	0.04	2.0	0.250	0.209	0.172	0.123	1.37	0.77	0.54	0.337	Black Carbon

MISR Early Post-Launch (V15) Aerosol Mixture Properties [§]

		Fraction of AOT(558) in Component										
#	Type	1	2	3	4	5	6	7	8	9	SSA (558)	A_λ
1	Spherical Small Clean	1.0	-	-	-	-	-	-	-	-	1.00	3.22
2	Spherical Small Clean	0.5	0.5	-	-	-	-	-	-	-	1.00	2.71
3	Spherical Small Clean	-	1.0	-	-	-	-	-	-	-	1.00	2.24
4	Spherical Small Clean	-	0.5	0.5	-	-	-	-	-	-	1.00	1.63
5	Spherical Medium Clean	-	-	1.0	-	-	-	-	-	-	1.00	1.09
6	Spherical Medium Clean	-	-	0.5	0.5	-	-	-	-	-	1.00	0.56
7	Spherical Medium Clean	-	-	-	1.0	-	-	-	-	-	1.00	0.10
8	Spherical Medium Clean	-	-	-	0.5	0.5	-	-	-	-	1.00	-0.05
9	Spherical Bi-Modal Clean	-	0.5	-	-	0.5	-	-	-	-	1.00	0.82
10	Spherical Bi-Modal Clean	0.5	-	-	-	0.5	-	-	-	-	1.00	1.19
11	Spherical Small Dirty	0.85	-	-	-	-	-	-	-	0.15	0.88	2.87
12	Spherical Small Dirty	0.45	0.4	-	-	-	-	-	-	0.15	0.88	2.50
13	Spherical Small Dirty	-	0.85	-	-	-	-	-	-	0.15	0.88	2.09
14	Spherical Small Dirty	-	0.45	0.4	-	-	-	-	-	0.15	0.88	1.62
15	Spherical Medium Dirty	-	-	0.85	-	-	-	-	-	0.15	0.88	1.13
16	Spherical Medium Dirty	-	-	0.45	0.4	-	-	-	-	0.15	0.88	0.71
17	Spherical Medium Dirty	-	-	-	0.85	-	-	-	-	0.15	0.88	0.29
18	Dusty Low	-	-	0.75	-	-	0.25	-	-	-	0.97	0.72
19	Dusty Low	-	-	0.5	-	-	0.5	-	-	-	0.94	0.40
20	Dusty Low	-	-	0.25	-	-	0.75	-	-	-	0.91	0.13
21	Dusty Low	-	-	-	-	-	1.0	-	-	-	0.88	-0.11
22	Dusty Low	-	-	-	-	-	0.75	-	0.25	-	0.83	-0.08
23	Dusty Low	-	-	-	-	-	0.5	-	0.5	-	0.79	-0.06
24	Dusty High	-	-	-	-	-	-	1.0	-	-	0.88	-0.11

[§] Aerosol component optical models are described in Table 2; components 1-5 are spherical, non-absorbing, 6-7 are medium dust, 8 is coarse dust, and 9 is a soot analog. "A_λ." is the angstrom exponent, calculated as the slope of the least-squares fit line to the logarithm of the spectral AOT vs wavelength; larger particles generally produce smaller (or negative) A_λ.

RECENT UPGRADES TO THE MISR AEROSOL RETRIEVAL STANDARD ALGORITHM (VERSION 16)

- **More realistic Mineral Dust optical models**
- **Added Darker Spherical Pollution & Biomass Burning analogs**
- **Added a Richer Selection of Bi- and Tri-modal Mixtures**

+ Refined MISR Radiometric Calibration,
affecting MISR low-light-level Aerosol Retrievals

→ {Spherical, non-absorbing components w/ $r_{eff} = 0.57$ & 1.28 were removed}

These upgrades should reduce remaining discrepancies with sun photometers **by at least half.**

MISR data available from the NASA Langley Atmospheric Sciences Data Center:

http://eosweb.larc.nasa.gov/

MISR Component Aerosol Optical Models (Version 16)

Component Name	r_1 (μm)	r_2 (μm)	r_c (μm)	r_e (μm)	σ	SSA (446)	SSA (558)	SSA (672)	SSA (866)	AOT(446)/ AOT(558)	AOT(672)/ AOT(558)	AOT(867)/ AOT(558)	g (558)	Particle Size/Shape Category
sph_non-absorb_0.06	0.001	0.4	0.03	0.06	1.65	1.00	1.00	1.00	1.00	1.95	0.55	0.23	0.352	Very Small Spherical
sph_non-absorb_0.12	0.001	0.75	0.06	0.12	1.7	1.00	1.00	1.00	1.00	1.54	0.66	0.35	0.609	Small Spherical
sph_non-absorb_0.26	0.01	1.5	0.12	0.26	1.75	1.00	1.00	1.00	1.00	1.18	0.82	0.58	0.717	Medium Spherical
sph_non-absorb_2.80	0.1	50	1.0	2.80	1.90	1.00	1.00	1.00	1.00	0.99	1.02	1.06	0.776	Large Spherical
sph_absorb_ssa0.9_0.12	0.001	0.75	0.06	0.12	1.7	0.91	0.90	0.89	0.85	1.48	0.68	0.37	0.612	Small Spherical Absorbing
sph_absorb_ssa0.8_0.12	0.001	0.75	0.06	0.12	1.7	0.82	0.80	0.77	0.72	1.47	0.69	0.40	0.614	Small Spherical Very Absorbing
grains_mode1_h1	0.1	1	0.5	1.5	2.60	0.92	0.98	0.99	1.0	0.90	1.06	1.08	0.711	Medium non-spherical dust
spheroidal_mode2_h1	0.1	6	1.0	2.0	2.60	0.81	0.90	0.97	0.98	0.99	1.02	1.05	0.772	Large non-spherical dust

MISR Aerosol Mixture Properties (Version 16) §

		Fraction of AOT(558) in Component										
#	Type	1	2	3	4	5	6	7	8		SSA(558)	Ang
1	Bi-Mod_Sph_Clean_0.06+2.80	0.90	-	-	0.10	-	-	-	-		1.00	2.69
2	Bi-Mod_Sph_Clean_0.06+2.80	0.85	-	-	0.15	-	-	-	-		1.00	2.44
3	Bi-Mod_Sph_Clean_0.06+2.80	0.80	-	-	0.20	-	-	-	-		1.00	2.22
4	Bi-Mod_Sph_Clean_0.06+2.80	0.75	-	-	0.25	-	-	-	-		1.00	2.02
5	Bi-Mod_Sph_Clean_0.06+2.80	0.70	-	-	0.30	-	-	-	-		1.00	1.83
6	Bi-Mod_Sph_Clean_0.06+2.80	0.60	-	-	0.40	-	-	-	-		1.00	1.48
7	Bi-Mod_Sph_Clean_0.06+2.80	0.50	-	-	0.50	-	-	-	-		1.00	1.17
8	Bi-Mod_Sph_Clean_0.06+2.80	0.40	-	-	0.60	-	-	-	-		1.00	0.89
9	Bi-Mod_Sph_Clean_0.06+2.80	0.30	-	-	0.70	-	-	-	-		1.00	0.62
10	Bi-Mod_Sph_Clean_0.06+2.80	0.20	-	-	0.80	-	-	-	-		1.00	0.37
11	Bi-Mod_Sph_Clean_0.12+2.80	-	0.90	-	0.10	-	-	-	-		1.00	1.94
12	Bi-Mod_Sph_Clean_0.12+2.80	-	0.85	-	0.15	-	-	-	-		1.00	1.78
13	Bi-Mod_Sph_Clean_0.12+2.80	-	0.80	-	0.20	-	-	-	-		1.00	1.63
14	Bi-Mod_Sph_Clean_0.12+2.80	-	0.75	-	0.25	-	-	-	-		1.00	1.48
15	Bi-Mod_Sph_Clean_0.12+2.80	-	0.70	-	0.30	-	-	-	-		1.00	1.35
16	Bi-Mod_Sph_Clean_0.12+2.80	-	0.60	-	0.40	-	-	-	-		1.00	1.10
17	Bi-Mod_Sph_Clean_0.12+2.80	-	0.50	-	0.50	-	-	-	-		1.00	0.87
18	Bi-Mod_Sph_Clean_0.12+2.80	-	0.40	-	0.60	-		-	-		1.00	0.65
19	Bi-Mod_Sph_Clean_0.12+2.80	-	0.30	-	0.70	-	-	-	-		1.00	0.45
20	Bi-Mod_Sph_Clean_0.12+2.80	-	0.20	-	0.80	-	-	-	-		1.00	0.25
21	Bi-Mod_Sph_Clean_0.26+2.80	-	-	0.90	0.10	-	-	-	-		1.00	0.99
22	Bi-Mod_Sph_Clean_0.26+2.80	-	-	0.85	0.15	-	-	-	-		1.00	0.91
23	Bi-Mod_Sph_Clean_0.26+2.80	-	-	0.80	0.20	-	-	-	-		1.00	0.84
24	Bi-Mod_Sph_Clean_0.26+2.80	-	-	0.75	0.25	-	-	-	-		1.00	0.77
25	Bi-Mod_Sph_Clean_0.26+2.80	-	-	0.70	0.30	-	-	-	-		1.00	0.70
26	Bi-Mod_Sph_Clean_0.26+2.80	-	-	0.60	0.40	-	-	-	-		1.00	0.57
27	Bi-Mod_Sph_Clean_0.26+2.80	-	-	0.50	0.50	-	-	-	-		1.00	0.45
28	Bi-Mod_Sph_Clean_0.26+2.80	-	-	0.40	0.60	-	-	-	-		1.00	0.33
29	Bi-Mod_Sph_Clean_0.26+2.80	-	-	0.30	0.70	-	-	-	-		1.00	0.21
30	Bi-Mod_Sph_Clean_0.26+2.80	-	-	0.20	0.80	-	-	-	-		1.00	0.10
31	Bi-Mod_Sph_Abs_0.12+2.80	-	-	-	0.10	0.90	-	-	-		0.91	1.82

32	Bi-Mod_Sph_Abs_0.12+2.80	-	-	-	0.15	0.85	-	-	-		0.92	1.67
33	Bi-Mod_Sph_Abs_0.12+2.80	-	-	-	0.20	0.80	-	-	-		0.92	1.53
34	Bi-Mod_Sph_Abs_0.12+2.80	-	-	-	0.25	0.75	-	-	-		0.93	1.40
35	Bi-Mod_Sph_Abs_0.12+2.80	-	-	-	0.30	0.70	-	-	-		0.93	1.27
36	Bi-Mod_Sph_Abs_0.12+2.80	-	-	-	0.40	0.60	-	-	-		0.94	1.04
37	Bi-Mod_Sph_Abs_0.12+2.80	-	-	-	0.50	0.50	-	-	-		0.95	0.82
38	Bi-Mod_Sph_Abs_0.12+2.80	-	-	-	0.60	0.40	-	-	-		0.96	0.61
39	Bi-Mod_Sph_Abs_0.12+2.80	-	-	-	0.70	0.30	-	-	-		0.97	0.42
40	Bi-Mod_Sph_Abs_0.12+2.80	-	-	-	0.80	0.20	-	-	-		0.98	0.24
41	Bi-Mod_Sph_VAbs_0.12+2.80	-	-	-	0.10	-	0.90	-	-		0.82	1.70
42	Bi-Mod_Sph_VAbs_0.12+2.80	-	-	-	0.15	-	0.85	-	-		0.83	1.56
43	Bi-Mod_Sph_VAbs_0.12+2.80	-	-	-	0.20	-	0.80	-	-		0.84	1.43
44	Bi-Mod_Sph_VAbs_0.12+2.80	-	-	-	0.25	-	0.75	-	-		0.85	1.31
45	Bi-Mod_Sph_VAbs_0.12+2.80	-	-	-	0.30	-	0.70	-	-		0.86	1.19
46	Bi-Mod_Sph_VAbs_0.12+2.80	-	-	-	0.40	-	0.60	-	-		0.88	0.97
47	Bi-Mod_Sph_VAbs_0.12+2.80	-	-	-	0.50	-	0.50	-	-		0.90	0.77
48	Bi-Mod_Sph_VAbs_0.12+2.80	-	-	-	0.60	-	0.40	-	-		0.92	0.58
49	Bi-Mod_Sph_VAbs_0.12+2.80	-	-	-	0.70	-	0.30	-	-		0.94	0.39
50	Bi-Mod_Sph_VAbs_0.12+2.80	-	-	-	0.80	-	0.20	-	-		0.96	0.22
51	Tri-Mod_Sph_Abs_0.12+2.80	-	0.72	-	0.08	-	-	0.20	-		1.00	1.37
52	Tri-Mod_Sph_Abs_0.12+2.80	-	0.48	-	0.32	-	-	0.20	-		1.00	0.79
53	Tri-Mod_Sph_Abs_0.12+2.80	-	0.16	-	0.64	-	-	0.20	-		1.00	0.15
54	Tri-Mod_Sph_Abs_0.12+2.80	-	0.54	-	0.06	-	-	0.40	-		0.99	0.90
55	Tri-Mod_Sph_Abs_0.12+2.80	-	0.36	-	0.24	-	-	0.40	-		0.99	0.51
56	Tri-Mod_Sph_Abs_0.12+2.80	-	0.12	-	0.48	-	-	0.40	-		0.99	0.05
57	Tri-Mod_Sph_Abs_0.12+2.80	-	0.36	-	0.04	-	-	0.60	-		0.99	0.48
58	Tri-Mod_Sph_Abs_0.12+2.80	-	0.24	-	0.16	-	-	0.60	-		0.99	0.25
59	Tri-Mod_Sph_Abs_0.12+2.80	-	0.08	-	0.32	-	-	0.60	-		0.99	-0.05
60	Tri-Mod_Sph_Abs_0.12+2.80	-	0.18	-	0.02	-	-	0.80	-		0.98	0.10
61	Tri-Mod_Sph_Abs_0.12+2.80	-	0.12	-	0.08	-	-	0.80	-		0.98	-0.01
62	Tri-Mod_Sph_Abs_0.12+2.80	-	0.04	-	0.16	-	-	0.80	-		0.98	-0.15
63	Sph_0.12+Med&Coarse Dust	-	0.40	-	-	-	-	0.48	0.12		0.98	0.58
64	Sph_0.12+Med&Coarse Dust	-	0.40	-	-	-	-	0.36	0.24		0.97	0.60
65	Sph_0.12+Med&Coarse Dust	-	0.40	-	-	-	-	0.24	0.36		0.96	0.62
66	Sph_0.12+Med&Coarse Dust	-	0.40	-	-	-	-	0.12	0.48		0.95	0.64
67	Sph_0.12+Med&Coarse Dust	-	0.20	-	-	-	-	0.64	0.16		0.97	0.17

68	Sph_0.12+Med&Coarse Dust	-	0.20	-	-	-	-	0.48	0.32		0.96	0.19
69	Sph_0.12+Med&Coarse Dust	-	0.20	-	-	-	-	0.32	0.48		0.95	0.21
70	Sph_0.12+Med&Coarse Dust	-	0.20	-	-	-	-	0.16	0.64		0.93	0.24
71	Medium + Coarse Dust	-	-	-	-	-	-	0.80	0.20		0.96	-0.22
72	Medium + Coarse Dust	-	-	-	-	-	-	0.60	0.40		0.95	-0.19
73	Medium + Coarse Dust	-	-	-	-	-	-	0.40	0.60		0.93	-0.16
74	Medium + Coarse Dust	-	-	-	-	-	-	0.20	0.80		0.92	-0.13

MISR–Aircraft Coincidences During INTEX-NA
July 15 – August 07, 2004

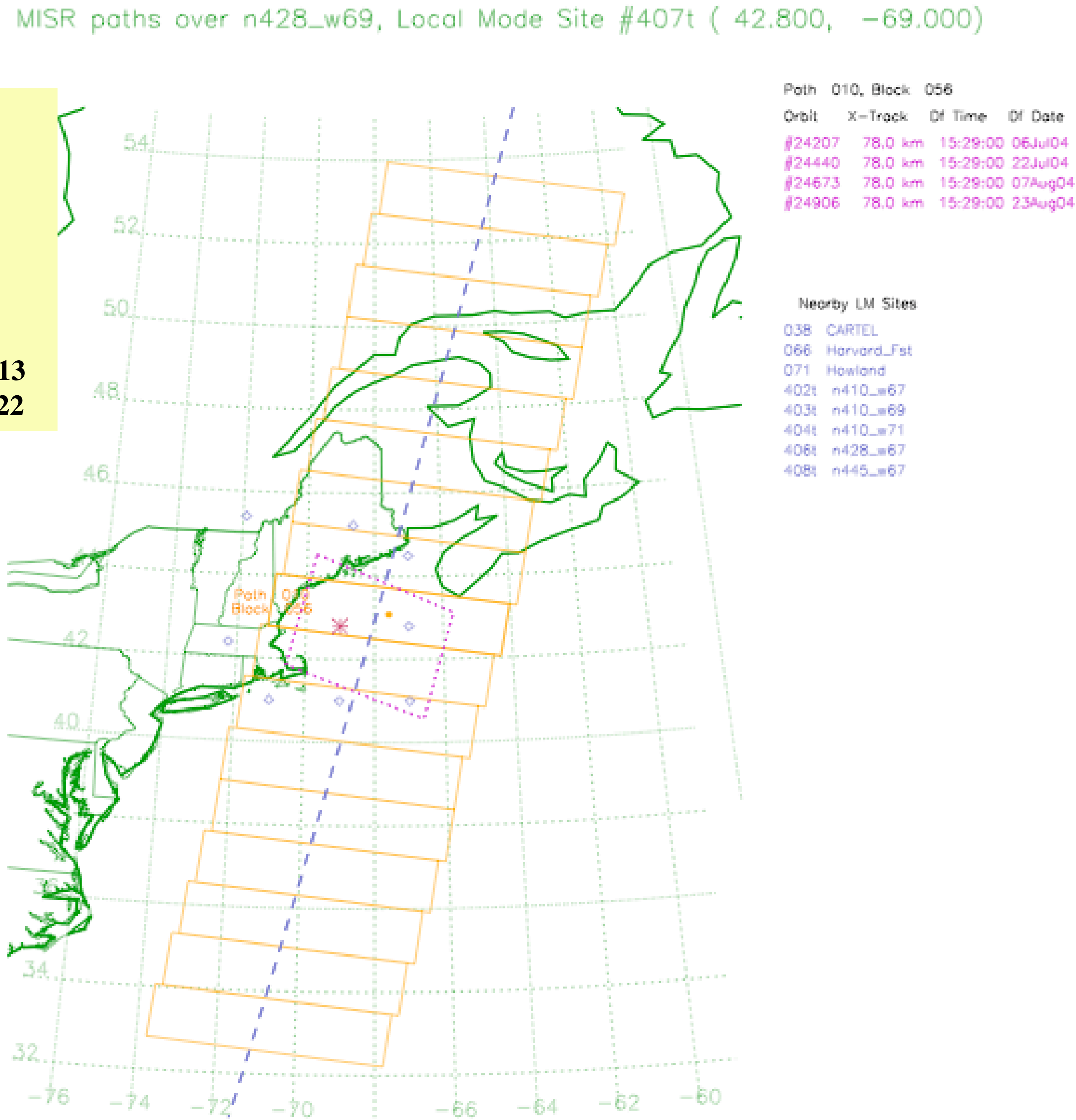
DATE	PATH	ORBIT#	UTC	J31#	DC8#	NOTES
Jul 15	9	24338	15:22	--	08	DC8 over Iowa
Jul 20	12	24411	15:40	11	--	Mostly Cloudy
Jul 22	10	24440	15:28	13	11	**2 Aircraft in Clear**
Jul 29	11	24542	15:34	16a	--	**Partly Cloudy**
Aug 02	7	24600	15:09	--	15	G. of St. Lwrnce; Cldy.
Aug 07**	10	24673	15:28	22	17	**Golden Day!**

MISR Coverage Map

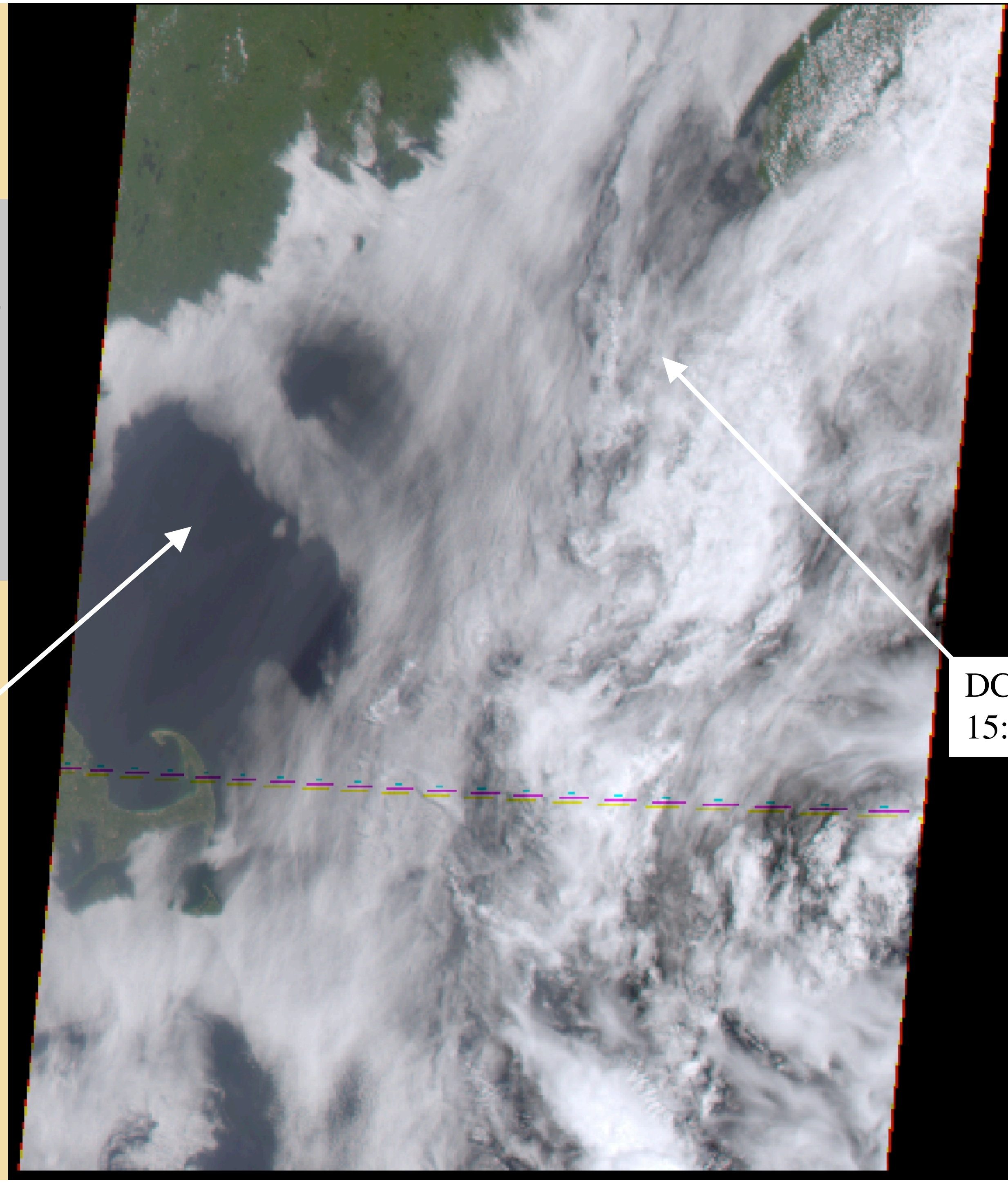
Path 010

Blocks 55-58

July 22 -- DC-8 **#11** & J-31 **#13**
Aug 07 -- DC-8 **#17** & J-31 **#22**

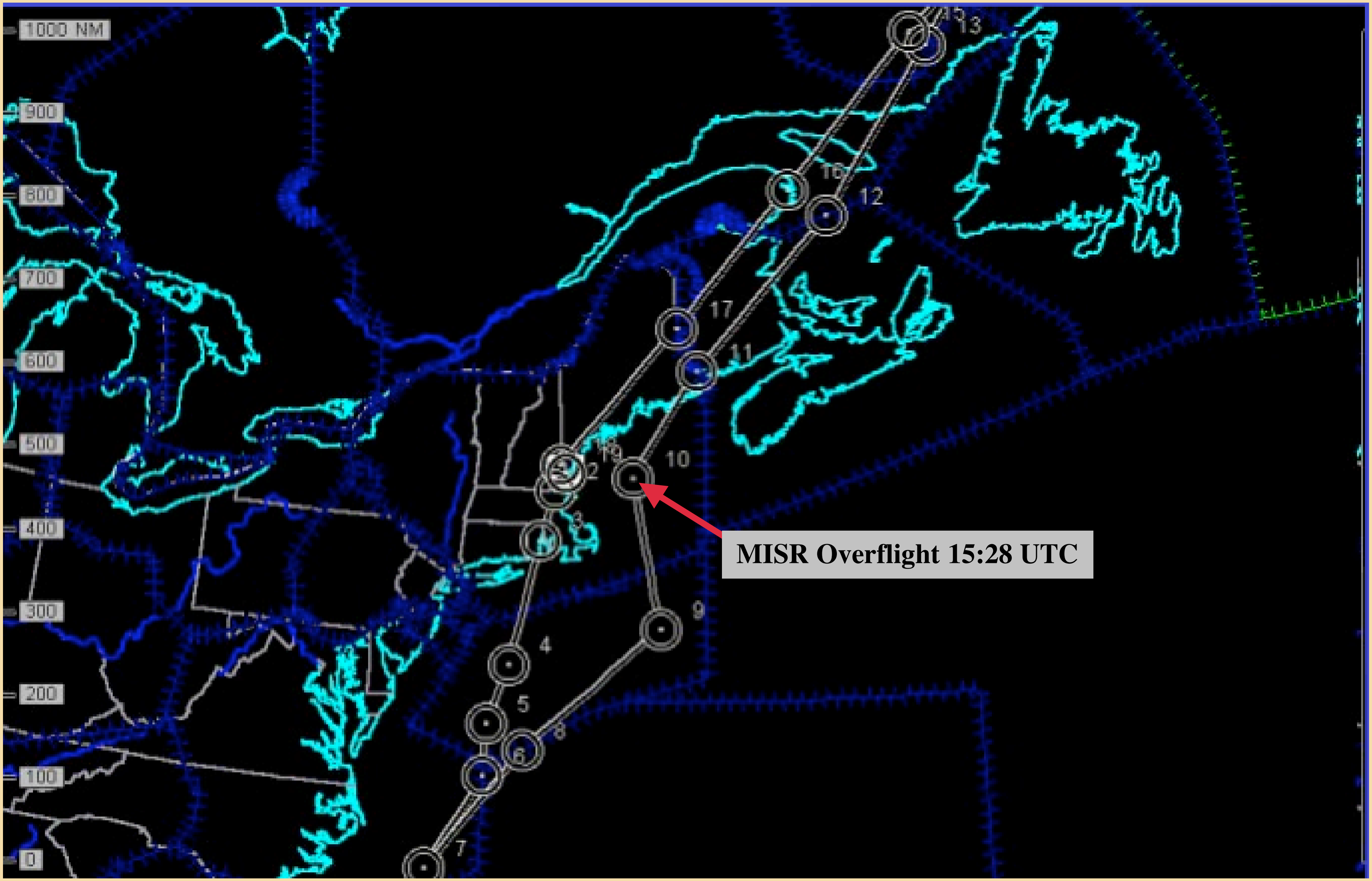


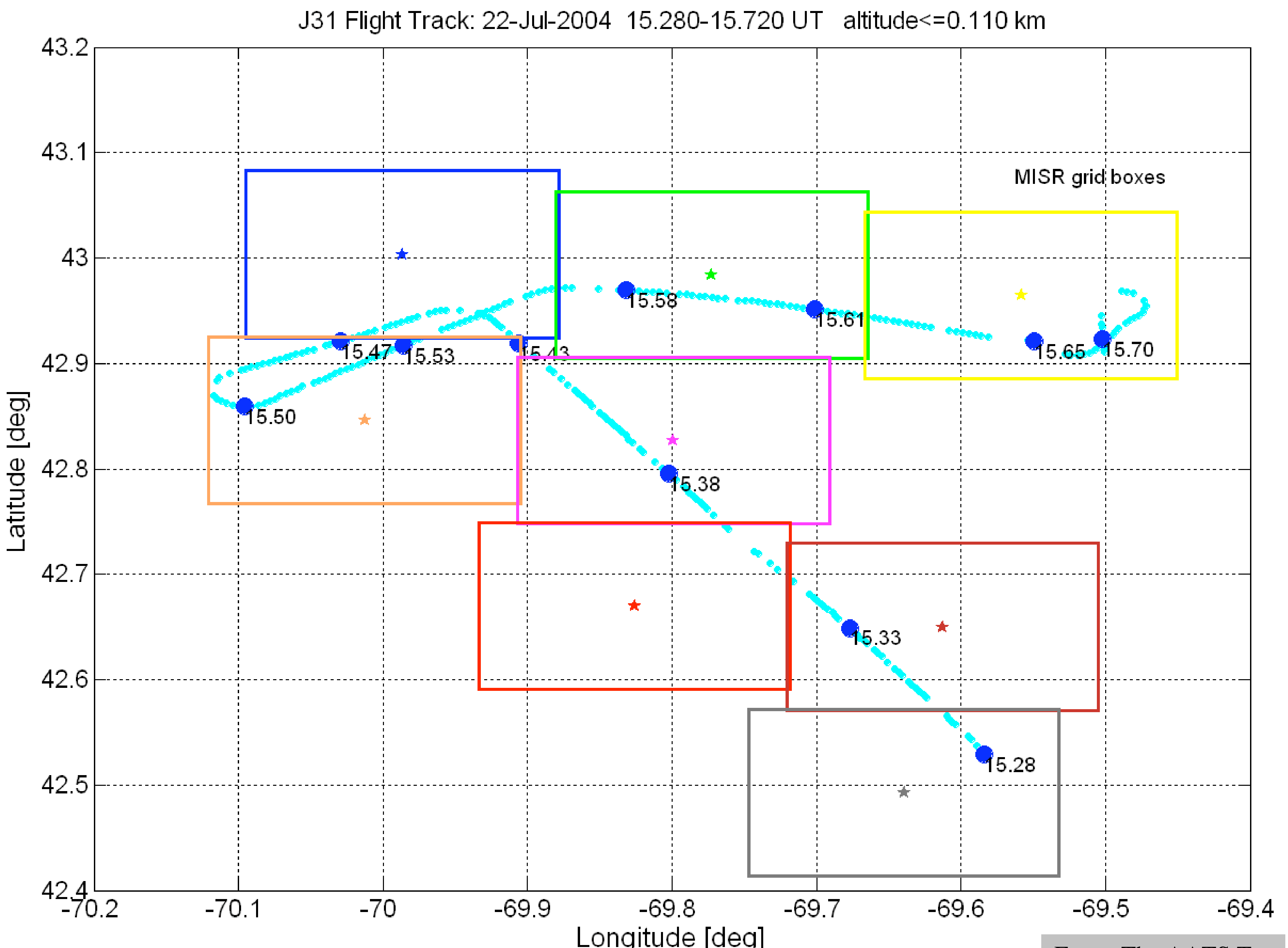
MISR Aa
Level 1B2 RGB
July 22, 2004
Orbit 24440
Blocks 55-58
1.1 km resolution



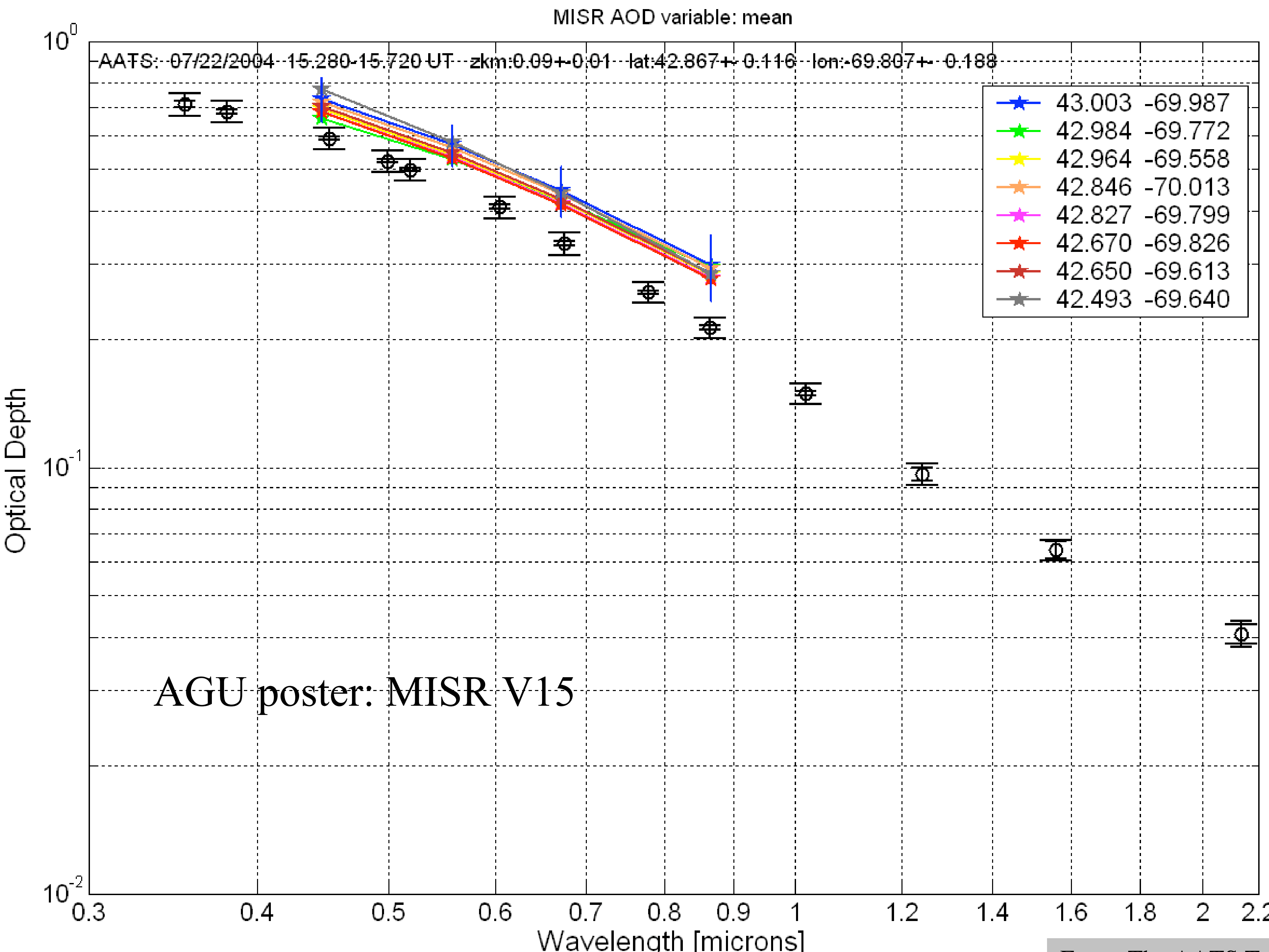
INTEX -- July22, 2004 -- **DC8 Flight #11**

MISR Overflight -- 15:28 UTC; Path010 Orbit 24440

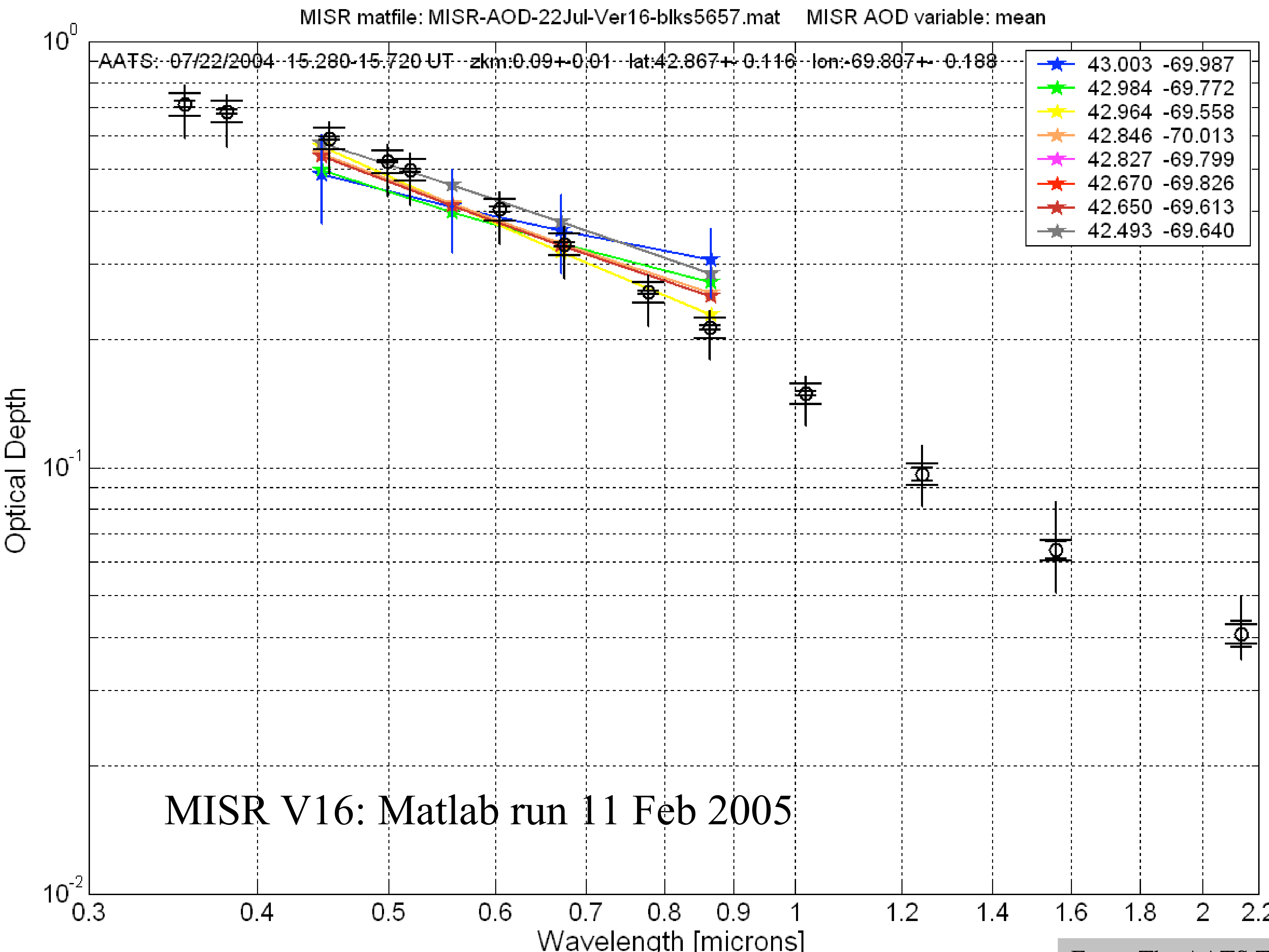




From: The AATS Tean



From: The AATS Tean



From: The AATS Tea

MISR ***Preliminary*** Aerosol Type Validation

July 22, 2004

[MISR Standard Aerosol Product **Versions 15 and 16; J31 Coincidences**]

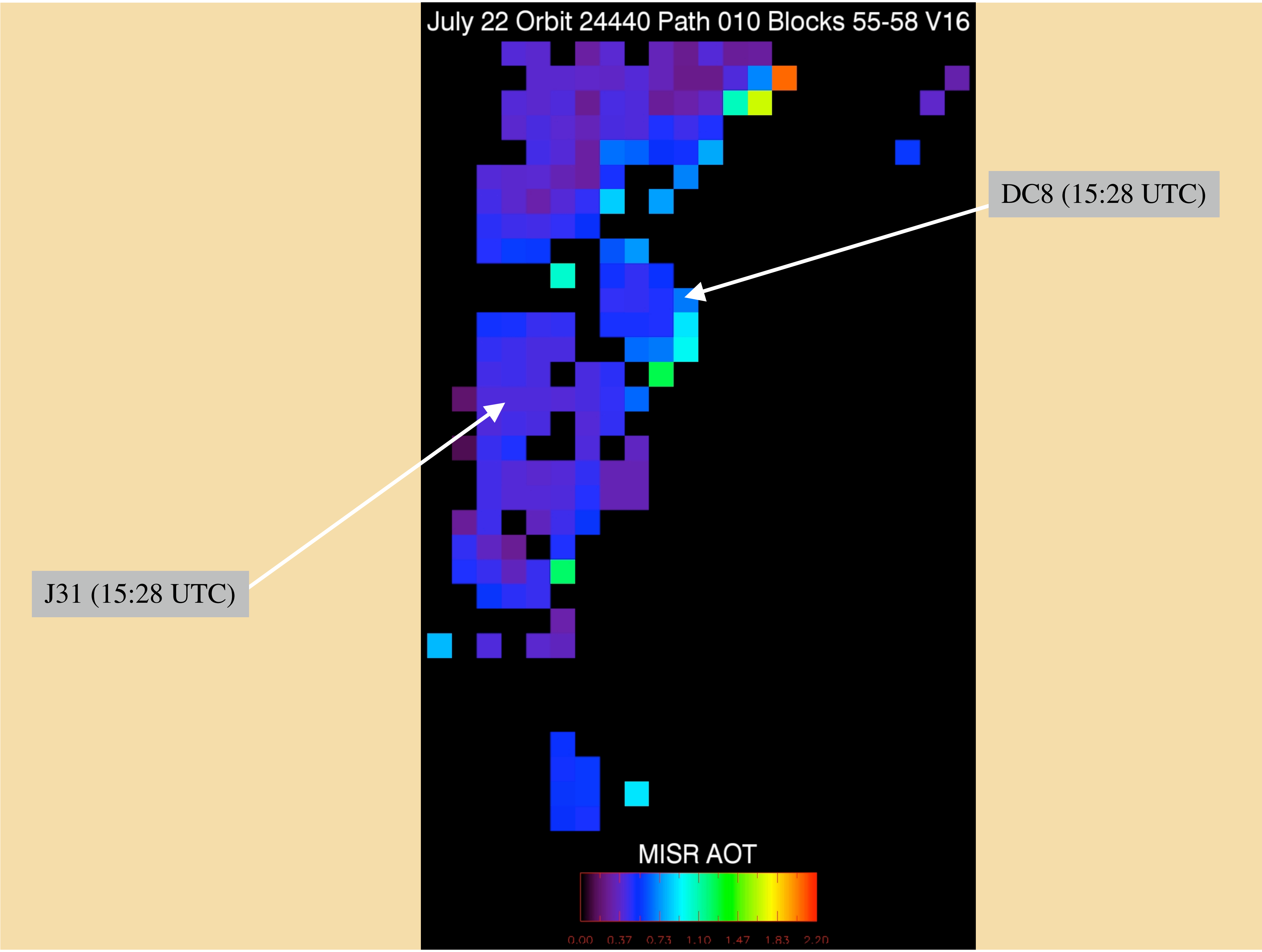
Block; Y, X 56; 5, 7	**MISR V15**	**MISR V16**	**AATS** (approx.)
Blue AOT	0.735	0.485	0.60
Green AOT	0.573	0.410	0.44
Red AOT	0.447	0.364	0.33
NIR AOT	0.299	0.312	0.21
Green SSA	0.941	0.98	--
Angstrom Exp.	1.37	0.67	~ 1.5
Successful Mdls.	3, 4, **5**, 14, 15	**54**, 57, 63	--

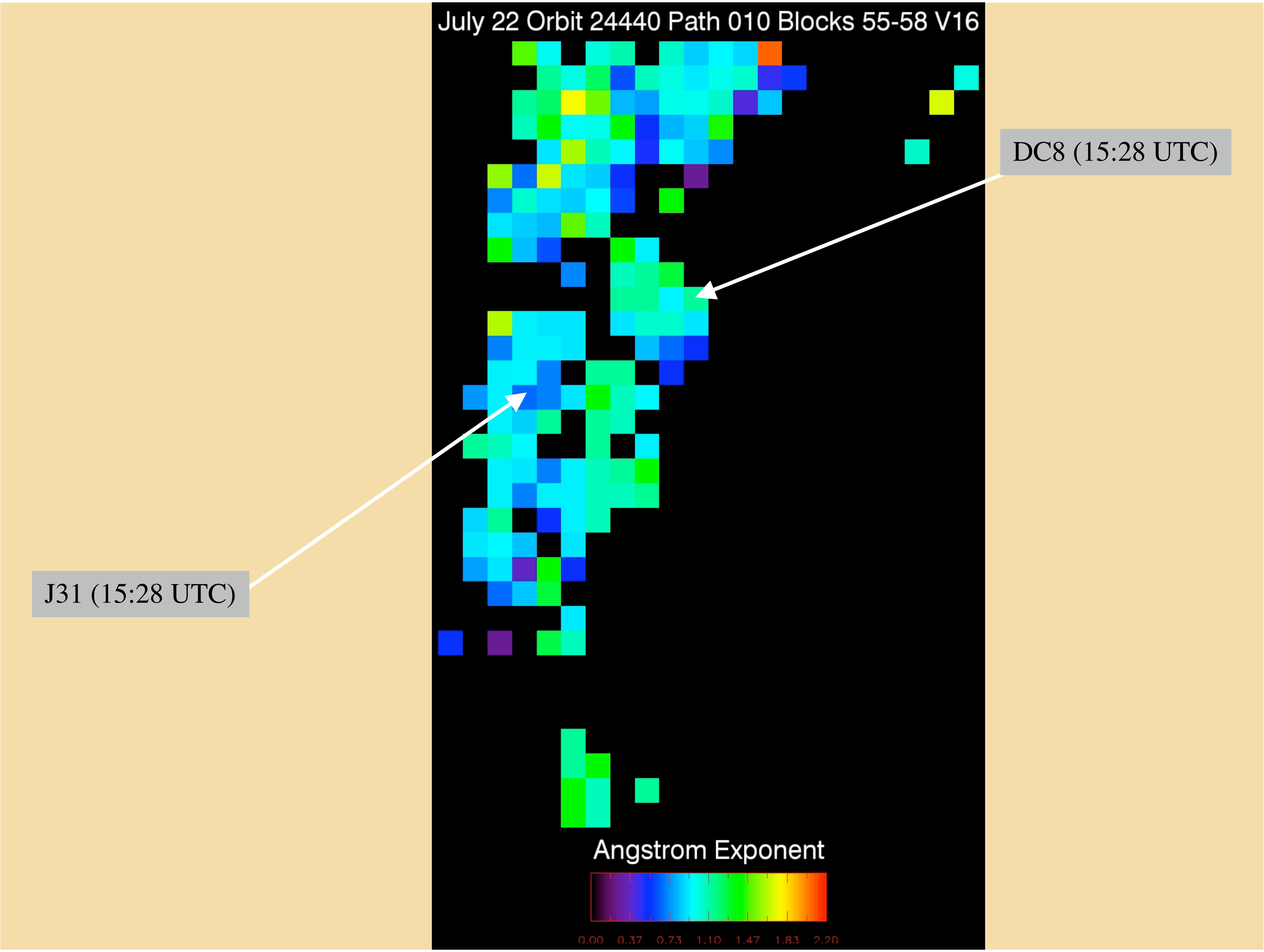
- **Observations**

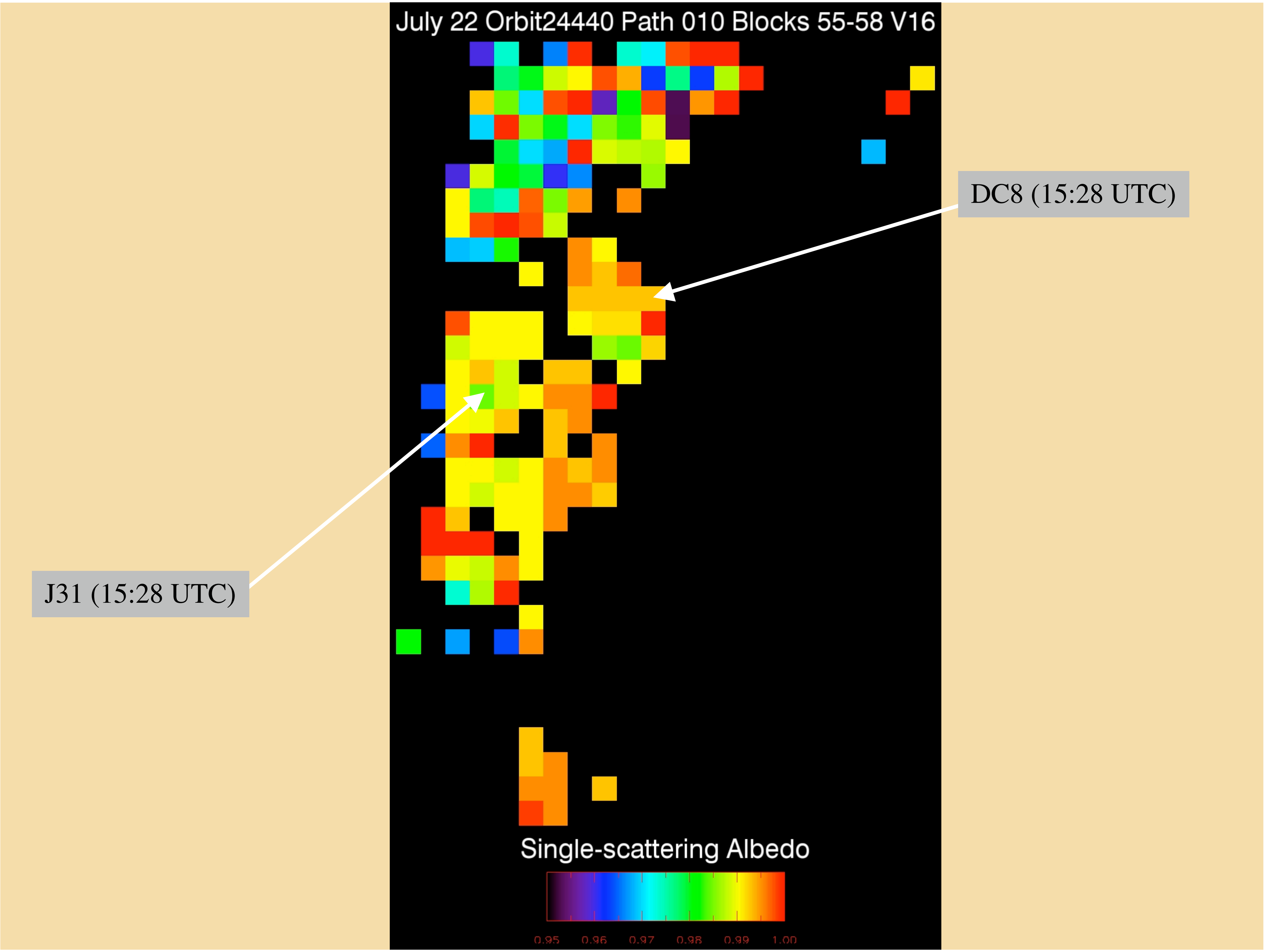
  -- **AOT**: V16 closer to AATS (Higher SSA → lower AOT)
  -- **Angstrom Exp**: V15 closer to AATS (smaller particles → steeper slope)
  -- V15 Mixtures: **100% sph_0.26**, others have some sph_0.12, sph_0.57, and BC
  -- V16 Mixture: **54% sph_0.12, 06% sph_2.8, + 40% med. Dust**; others more dust
  -- V15, V16 have similar AOT for nearby pixels; V16 Ang. up to 1.12 nearby

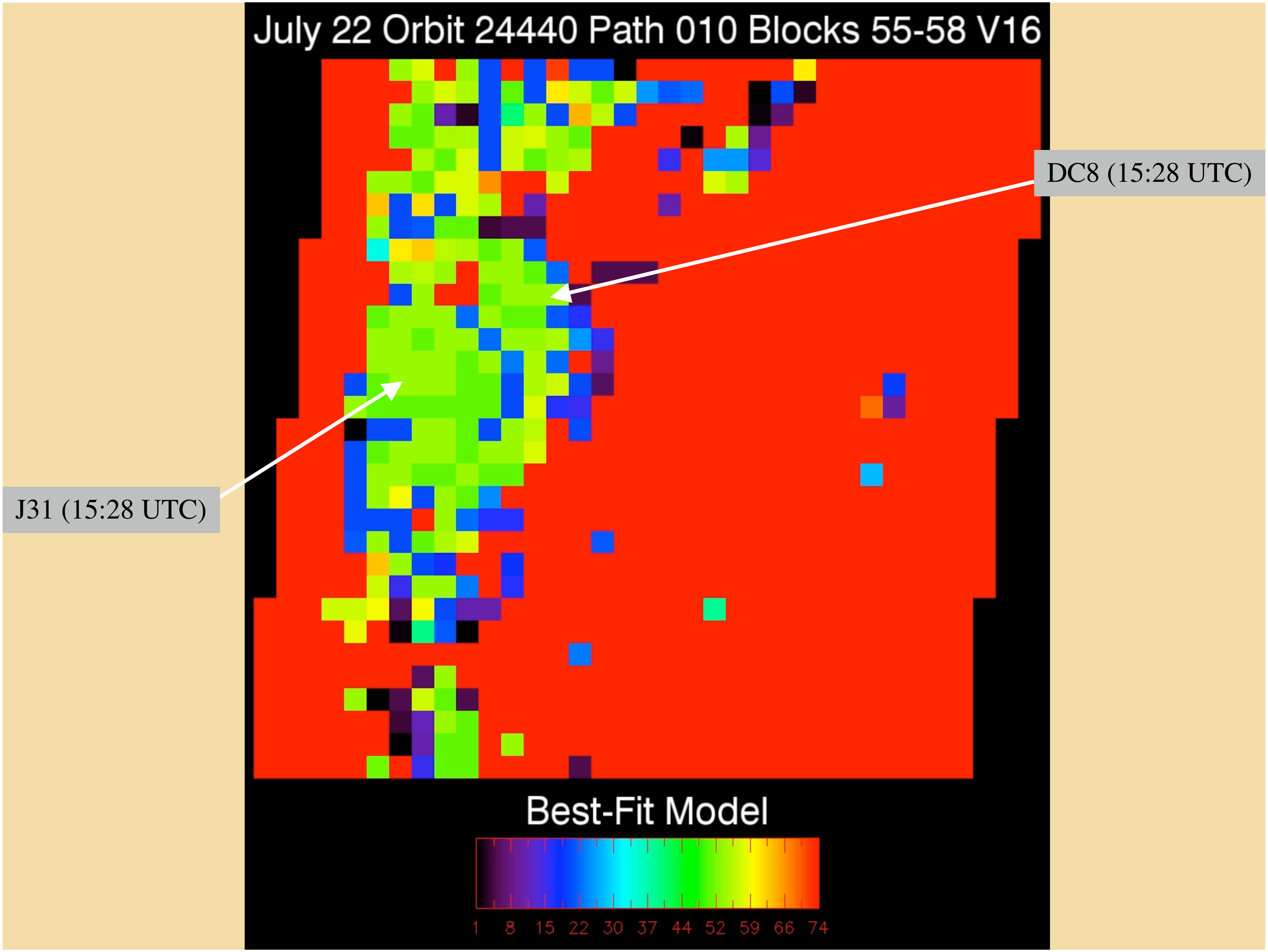
- **Conjectures**

  -- **Tiny black carbon** (BC) is a poor way to model aerosol absorption here (V15)
  -- V16 picks up something **> 0.26 or non-spherical** as dust – Cirrus or med sph?
  -- V16 might add **0.57 or 1.28 spherical** particles to the climatology(?)


July 22 Orbit 24440 Path 010 Blocks 55-58 V16
DC8 (15:28 UTC)
J31 (15:28 UTC)
MISR AOT
0.00 0.37 0.73 1.10 1.47 1.83 2.20


July 22 Orbit 24440 Path 010 Blocks 55-58 V16
DC8 (15:28 UTC)
J31 (15:28 UTC)
Angstrom Exponent
0.00 0.37 0.73 1.10 1.47 1.83 2.20


July 22 Orbit24440 Path 010 Blocks 55-58 V16
DC8 (15:28 UTC)
J31 (15:28 UTC)
Single-scattering Albedo
0.95
0.96
0.97
0.98
0.99
1.00


July 22 Orbit 24440 Path 010 Blocks 55-58 V16
DC8 (15:28 UTC)
J31 (15:28 UTC)
Best-Fit Model
1 8 15 22 30 37 44 52 59 66 74

MISR ***Preliminary*** Regional Aerosol Arimass Analysis
July 22, 2004
[MISR Standard Aerosol Product **Version 16**]

• The only relatively cloud-free area is toward the **West Side** of swath (DC-8, J31, Ron Brown)

-- Mid-visible column **optical depth** **0.3 to 0.5**

-- Mid-visible column **SSA** **0.99 ± 0.01**

-- Column **Angstrom Exponent** **0.85 to 1.1** (medium-large particles)

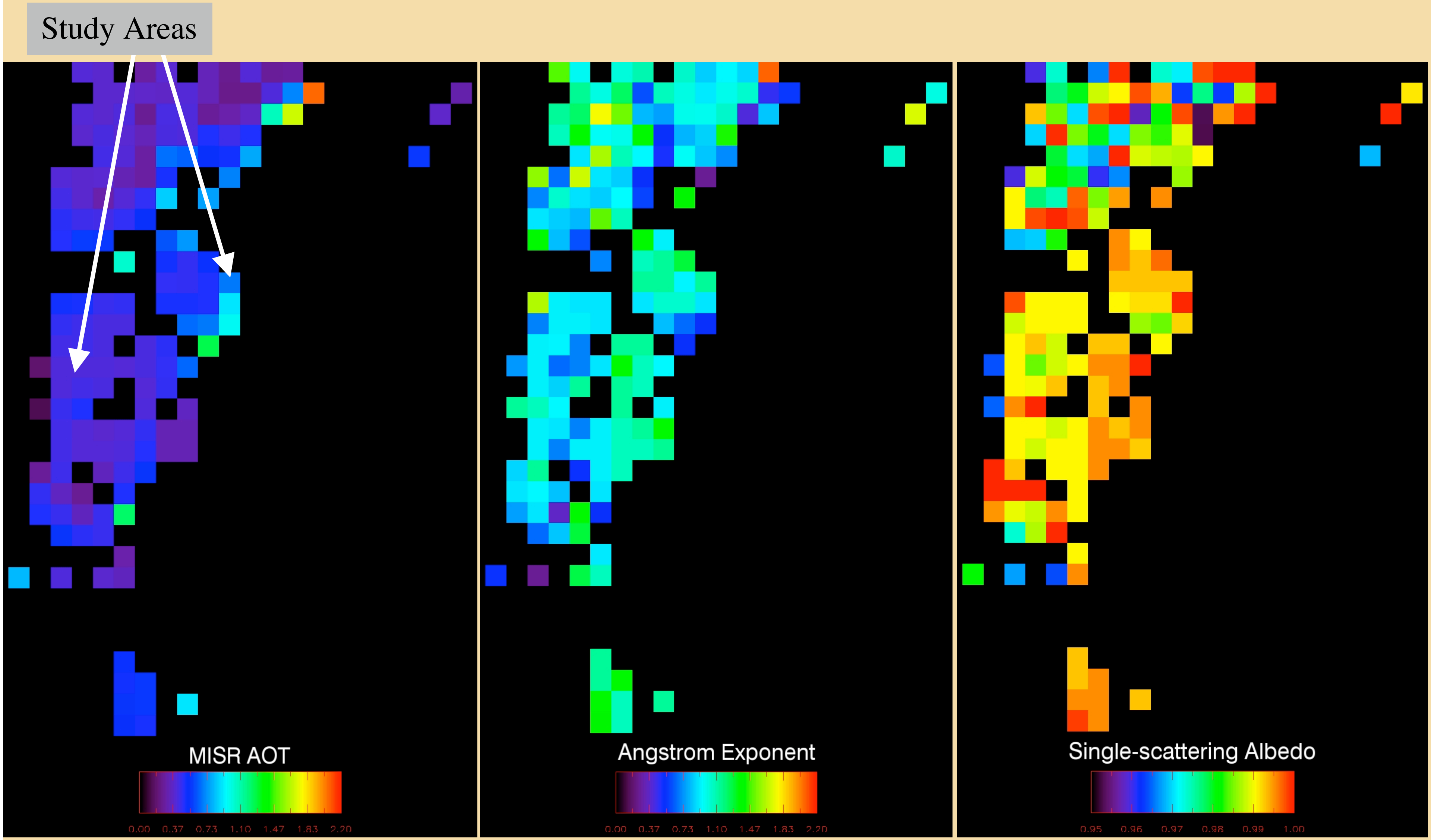
-- Aerosol **Air Mass** **fairly uniform**

-- Mixtures 51 and 54 dominate
(**tri-modal - spherical, medium-very large, clean + dust**)

• The “dust” may be large, nonspherical, non-absorbing **cirrus**!
[No cirrus model is included in the V16 Standard MISR Aerosol Retrieval]

• Or it could be **missing medium spherical** clean (larger than 0.26)?
[The V16 climatology has only 0.06, 0.12, 0.26, and 2.80 spherical particles]

July 22, 2004, Orbit 24440, Path 010, Blocks 55-58 V16

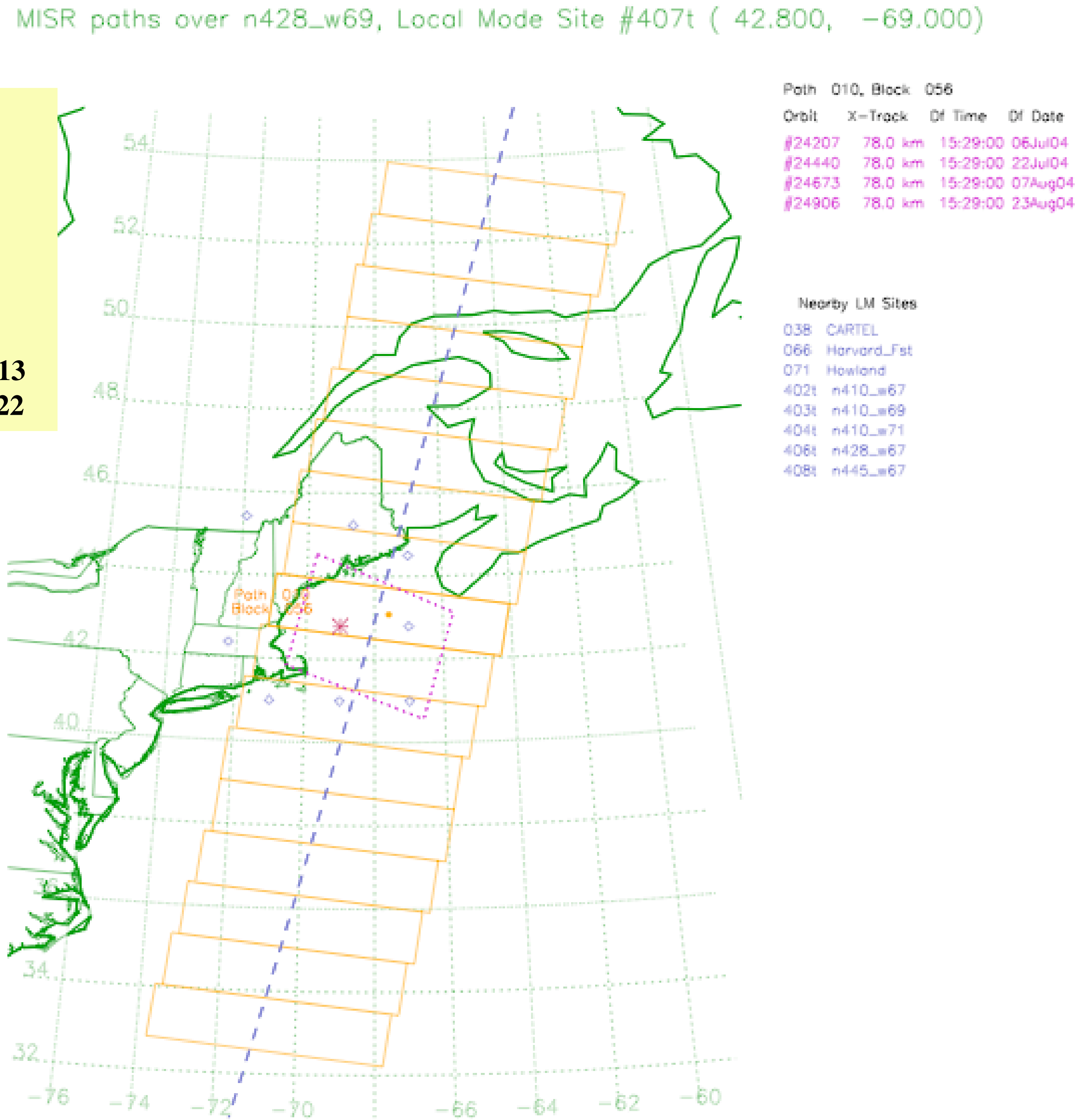


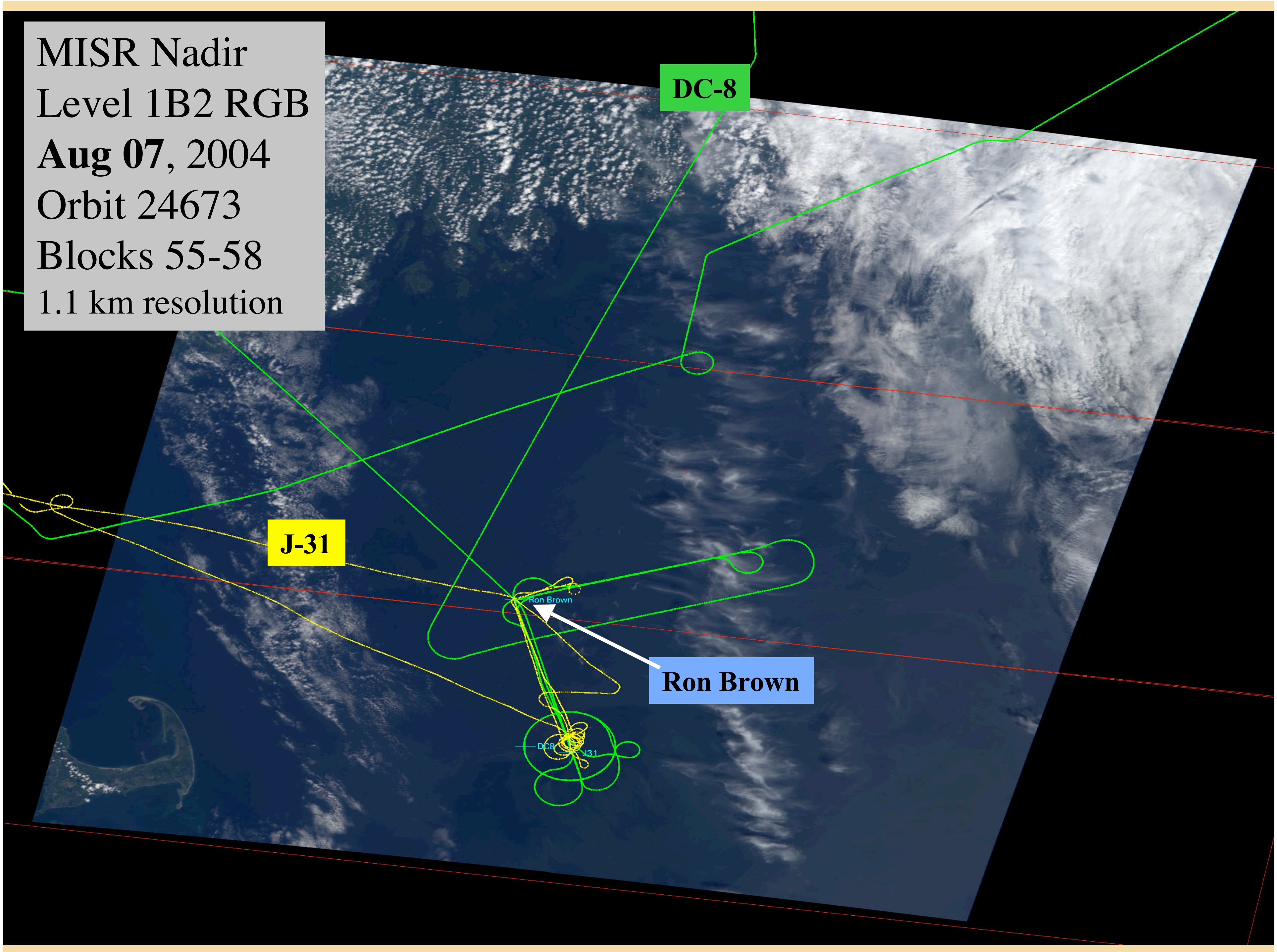
MISR Coverage Map

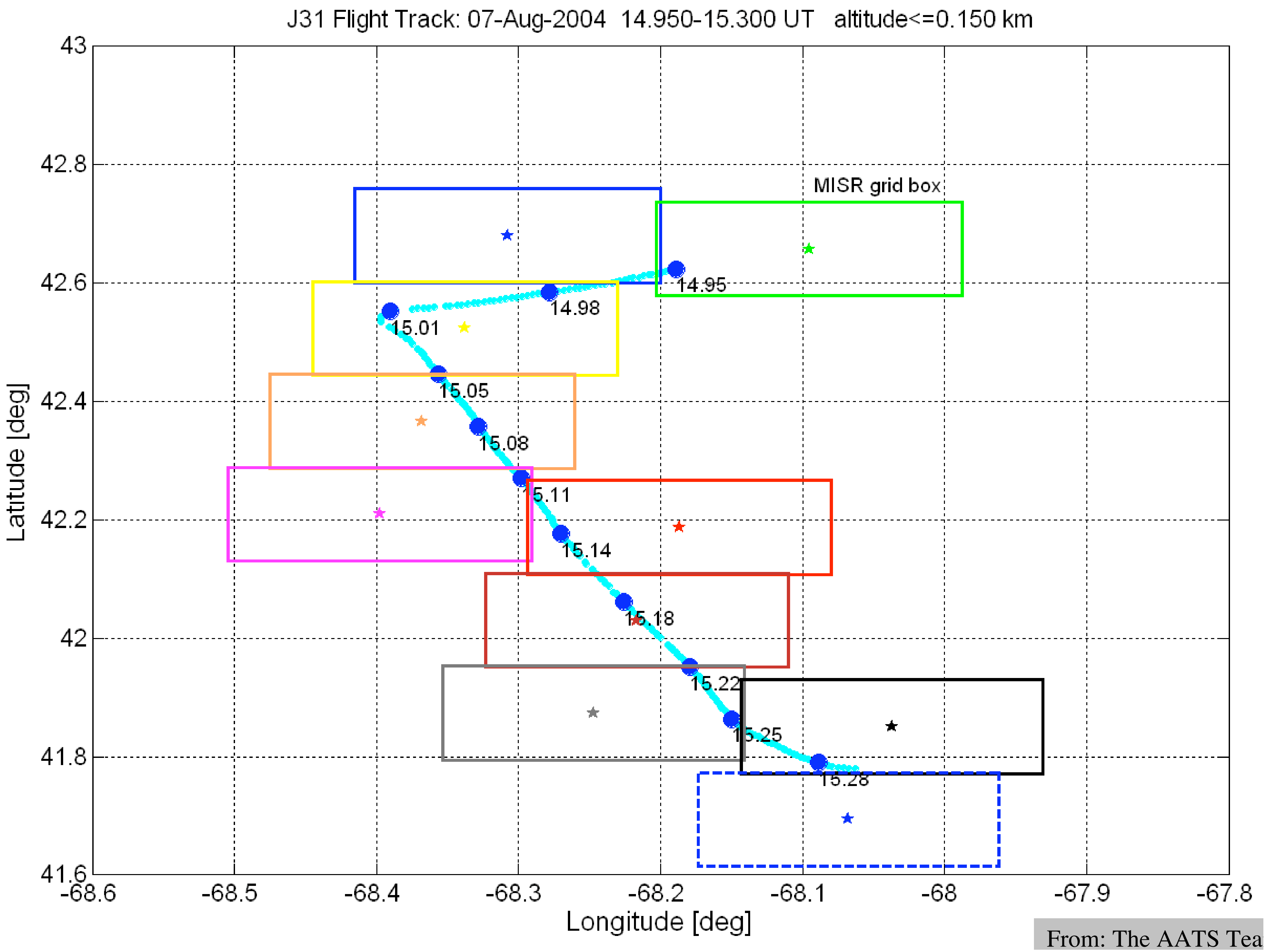
Path 010

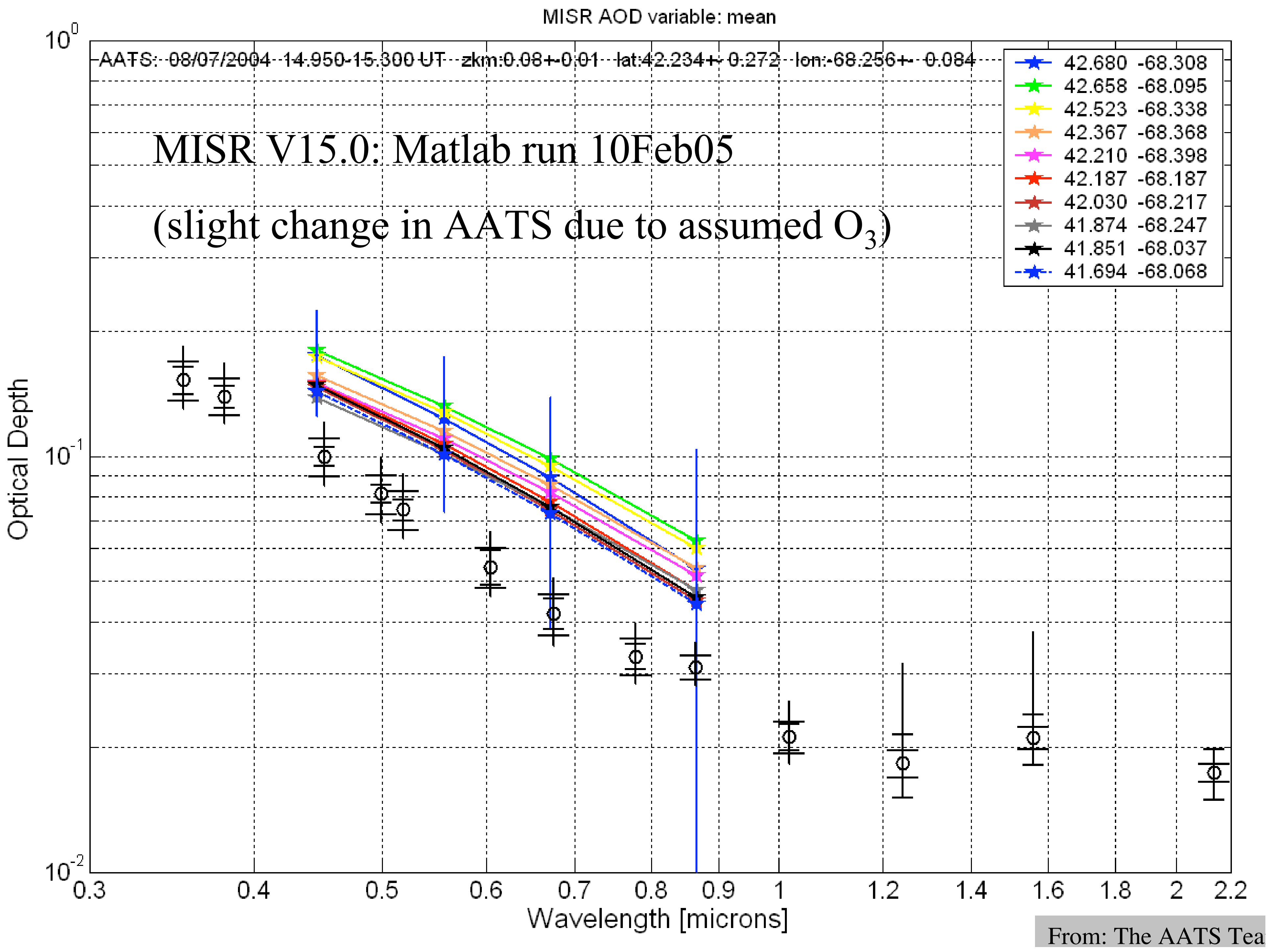
Blocks 55-58

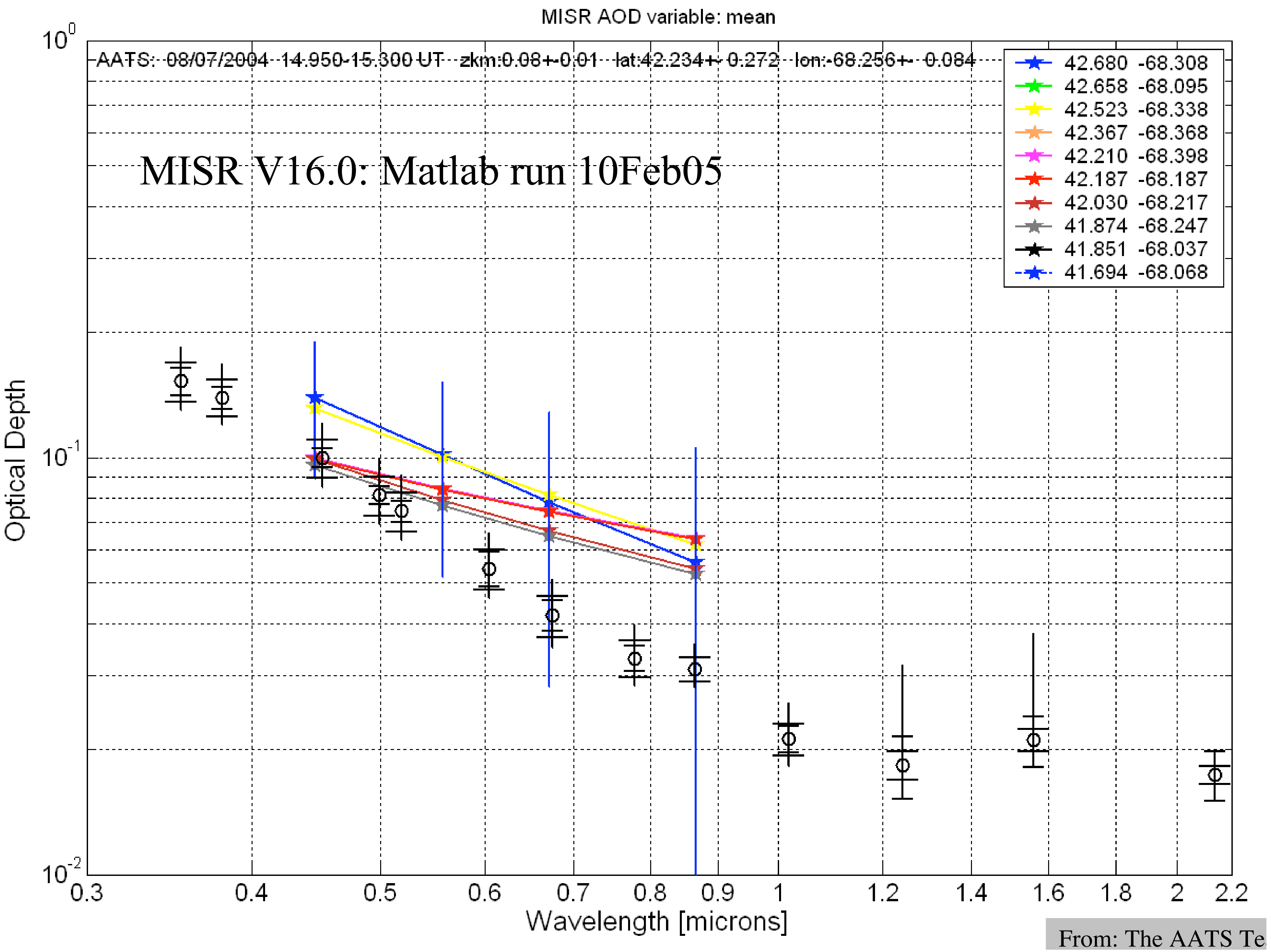
July 22 -- DC-8 **#11** & J-31 **#13**
Aug 07 -- DC-8 **#17** & J-31 **#22**




MISR Nadir
Level 1B2 RGB
Aug 07, 2004
Orbit 24673
Blocks 55-58
1.1 km resolution
DC-8
J-31
Ron Brown


J31 Flight Track: 07-Aug-2004 14.950-15.300 UT altitude<=0.150 km
Latitude [deg]
Longitude [deg]
43
42.8
42.6
42.4
42.2
42
41.8
41.6
-68.6
-68.5
-68.4
-68.3
-68.2
-68.1
-68
-67.9
-67.8
MISR grid box
14.95
14.98
15.01
15.05
15.08
15.11
15.14
15.18
15.22
15.25
15.28
From: The AATS Tea


MISR AOD variable: mean
AATS: 08/07/2004 14.950-15.300 UT zkm:0.08+-0.01 lat:42.234+-0.272 lon:-68.256+-0.084
MISR V15.0: Matlab run 10Feb05
(slight change in AATS due to assumed O3)
42.680 -68.308
42.658 -68.095
42.523 -68.338
42.367 -68.368
42.210 -68.398
42.187 -68.187
42.030 -68.217
41.874 -68.247
41.851 -68.037
41.694 -68.068
Optical Depth
Wavelength [microns]
From: The AATS Tea


MISR AOD variable: mean
AATS: 08/07/2004 14.950-15.300 UT zkm:0.08+-0.01 lat:42.234+-0.272 lon:-68.256+-0.084
MISR V16.0: Matlab run 10Feb05
42.680 -68.308
42.658 -68.095
42.523 -68.338
42.367 -68.368
42.210 -68.398
42.187 -68.187
42.030 -68.217
41.874 -68.247
41.851 -68.037
41.694 -68.068
Optical Depth
Wavelength [microns]
From: The AATS Te

MISR *Preliminary* Aerosol Type Validation
August 07, 2004

[MISR Standard Aerosol Product **Versions 15 and 16; J31 Coincidences**]

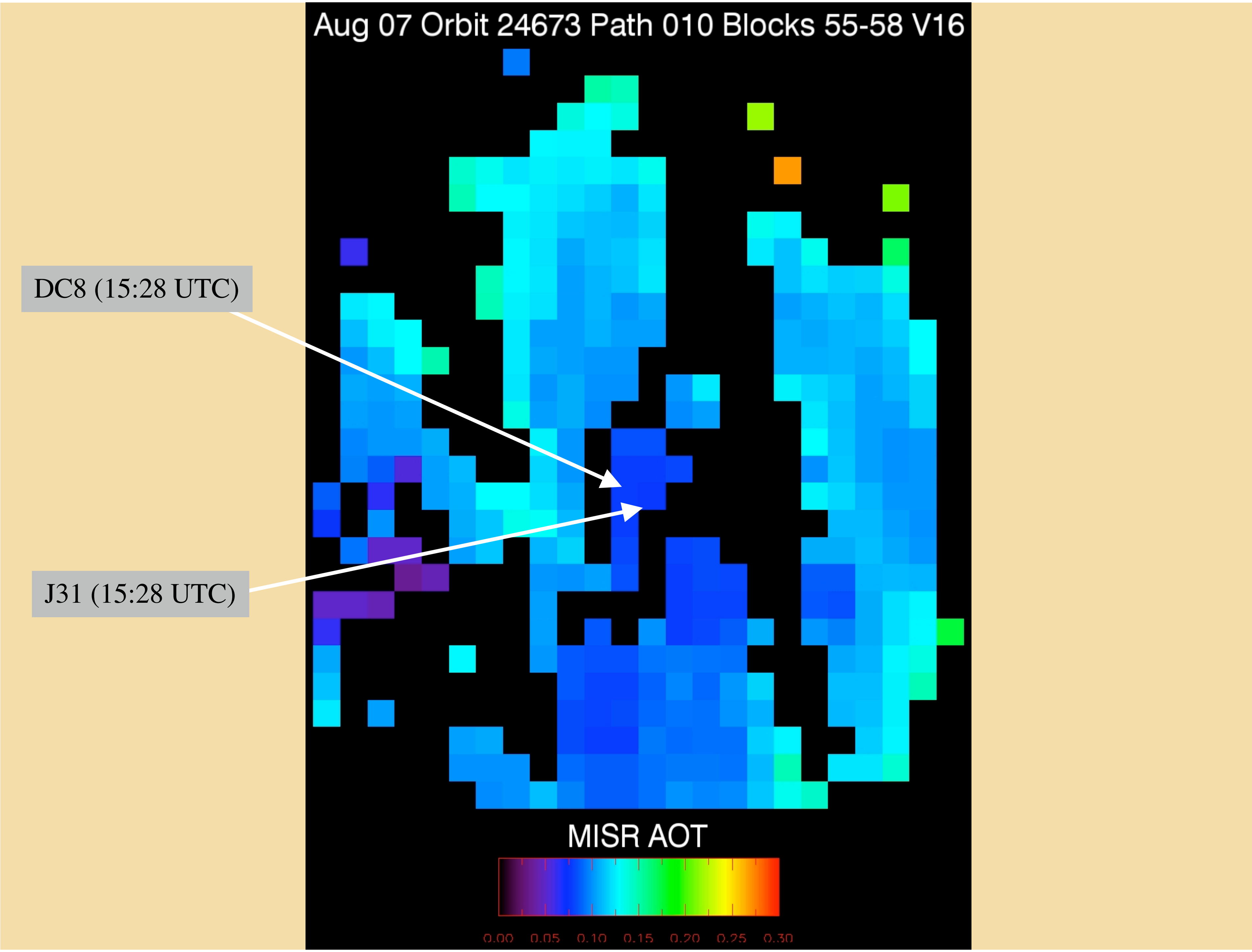
Block; Y, X 57; 16, 5	**MISR V15**	**MISR V16**	**AATS** (approx.)
Blue AOT	0.138	0.096	0.10
Green AOT	0.101	0.08	0.064
Red AOT	0.075	0.065	0.043
NIR AOT	0.048	0.052	0.031
Green SSA	0.911	0.99	--
Angstrom Exp.	1.62	0.91	~ 1.6
Successful Mdls.	4, **13**, 14, 15	**54**	--

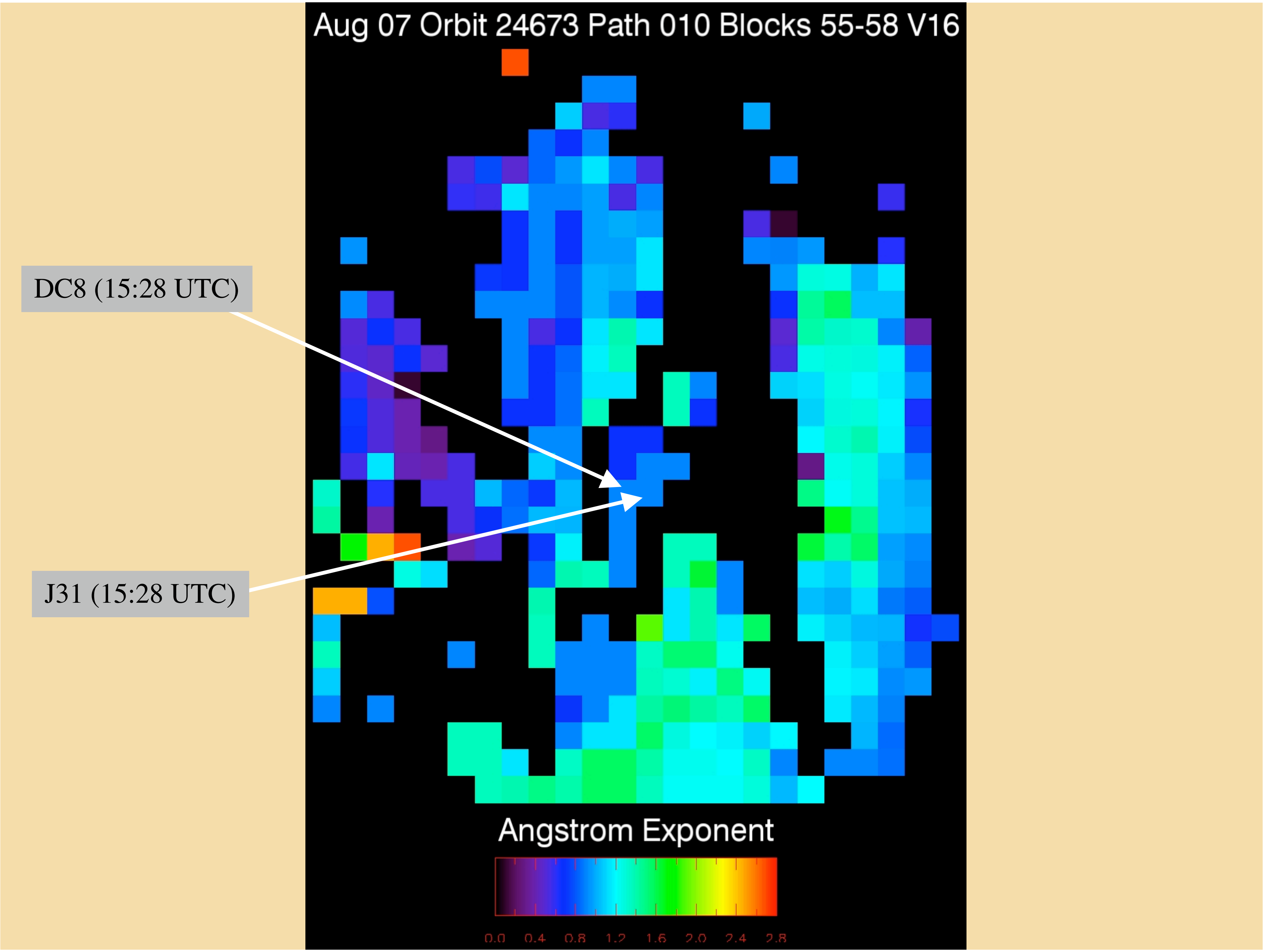
- **Observations**

  -- **AOT**: V16 closer to AATS (Higher SSA → lower AOT)
  -- **Angstrom Exp**: V15 closer to AATS (smaller particles → steeper slope)
  -- V15 Mixtures: **85% sph_0.12, 15% BC**, the others have some sph_0.26
  -- V16 Mixture: **54% sph_0.12, 06% sph_2.8, + 40% med. dust**
  -- V15, V16 results similar for nearby pixels

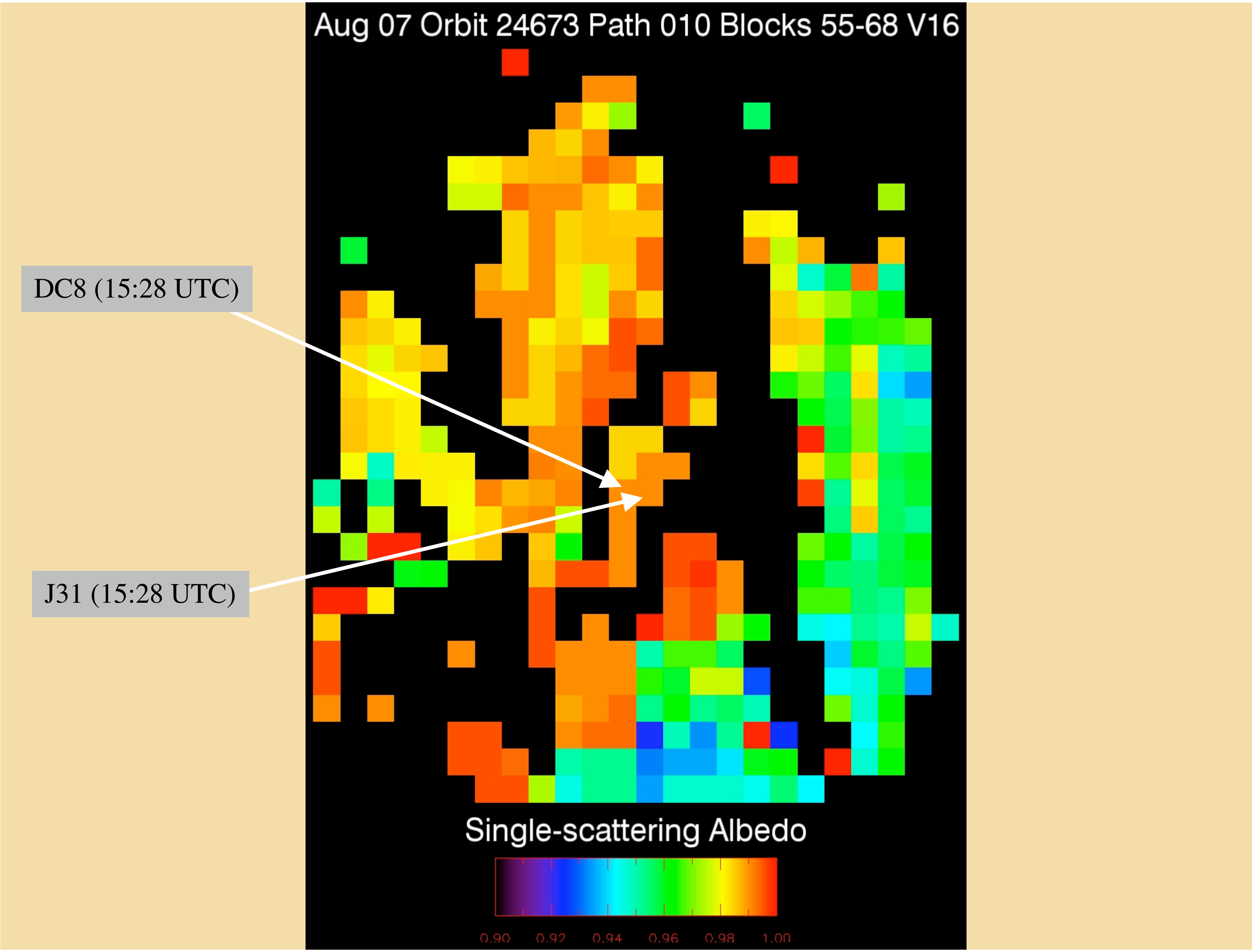
- **Conjectures**

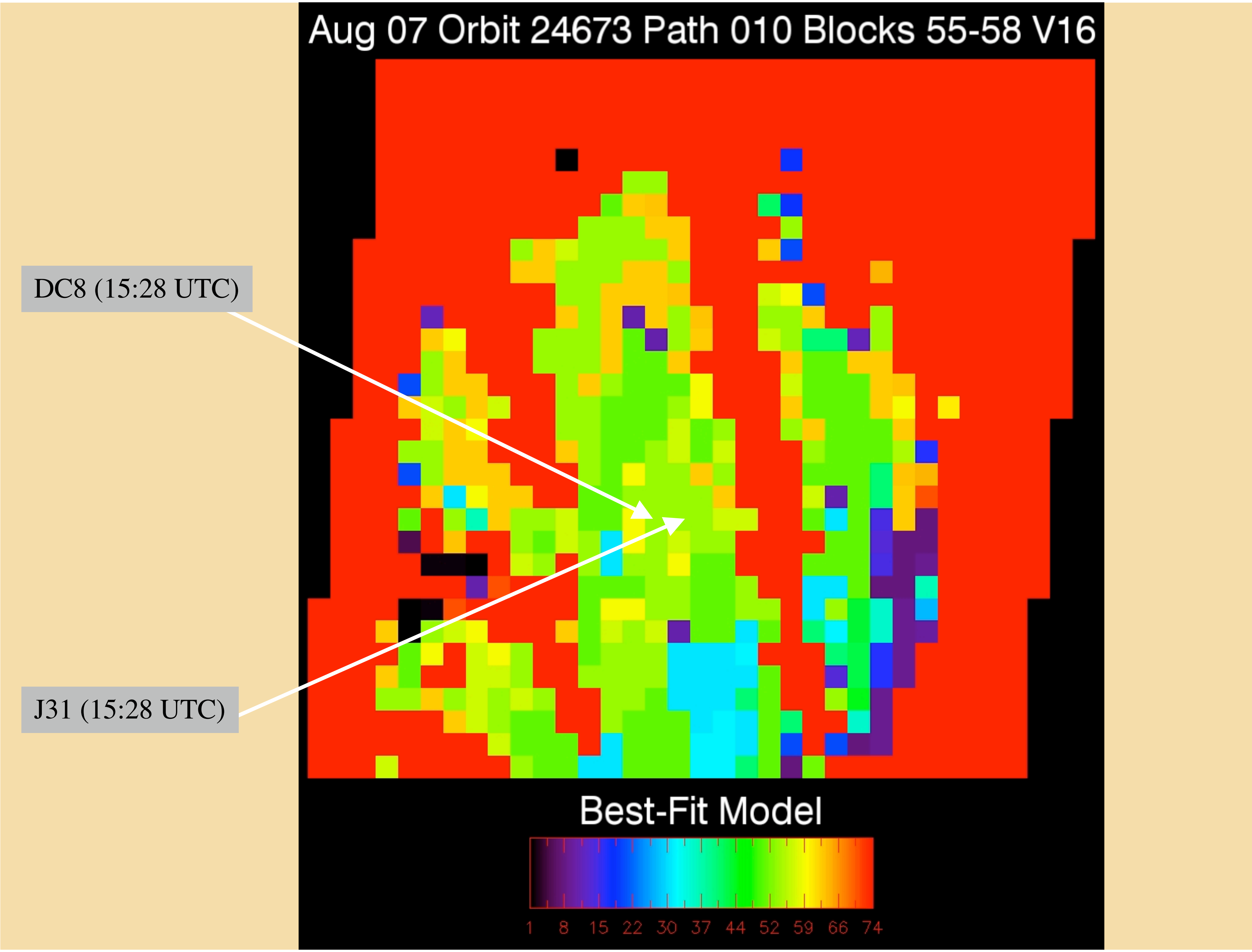
  -- **Tiny black carbon** (BC) is a poor way to model aerosol absorption here (V15)
  -- V16 picks up something **> 0.26 or non-spherical** as dust – Cirrus or med. sph?
  -- V16 might add **0.57 or 1.28 spherical** particles to the climatology(?)


Aug 07 Orbit 24673 Path 010 Blocks 55-58 V16
DC8 (15:28 UTC)
J31 (15:28 UTC)
MISR AOT
0.00
0.05
0.10
0.15
0.20
0.25
0.30



Aug 07 Orbit 24673 Path 010 Blocks 55-58 V16
DC8 (15:28 UTC)
J31 (15:28 UTC)
Angstrom Exponent
0.0
0.4
0.8
1.2
1.6
2.0
2.4
2.8


Aug 07 Orbit 24673 Path 010 Blocks 55-68 V16
DC8 (15:28 UTC)
J31 (15:28 UTC)
Single-scattering Albedo
0.90
0.92
0.94
0.96
0.98
1.00



Aug 07 Orbit 24673 Path 010 Blocks 55-58 V16
DC8 (15:28 UTC)
J31 (15:28 UTC)
Best-Fit Model
1 8 15 22 30 37 44 52 59 66 74

MISR *Preliminary* Regional Aerosol Airmass Analysis
August 07, 2004

[MISR Standard Aerosol Product **Version 16**]

- Over the **Central, North** and **West Side** of swath (DC-8, J31, Ron Brown)

  -- Mid-visible column **optical depth** **0.08 to 0.10**

  -- Mid-visible column **SSA** **0.98 ± 0.01**

  -- Column **Angstrom Exponent** **0.5 to 1.2** (medium-large particles)

  -- Aerosol **Air Mass** **fairly uniform**

  -- Mixtures 51, 54, 60, 63
  (**tri-modal - spherical, medium-very large, clean + dust**)

- To the **East and South** of swath (east of ~ -67˚ W, south of ~ 40˚ N)

  -- Mid-visible column **optical depth** **1.0 to 1.2**

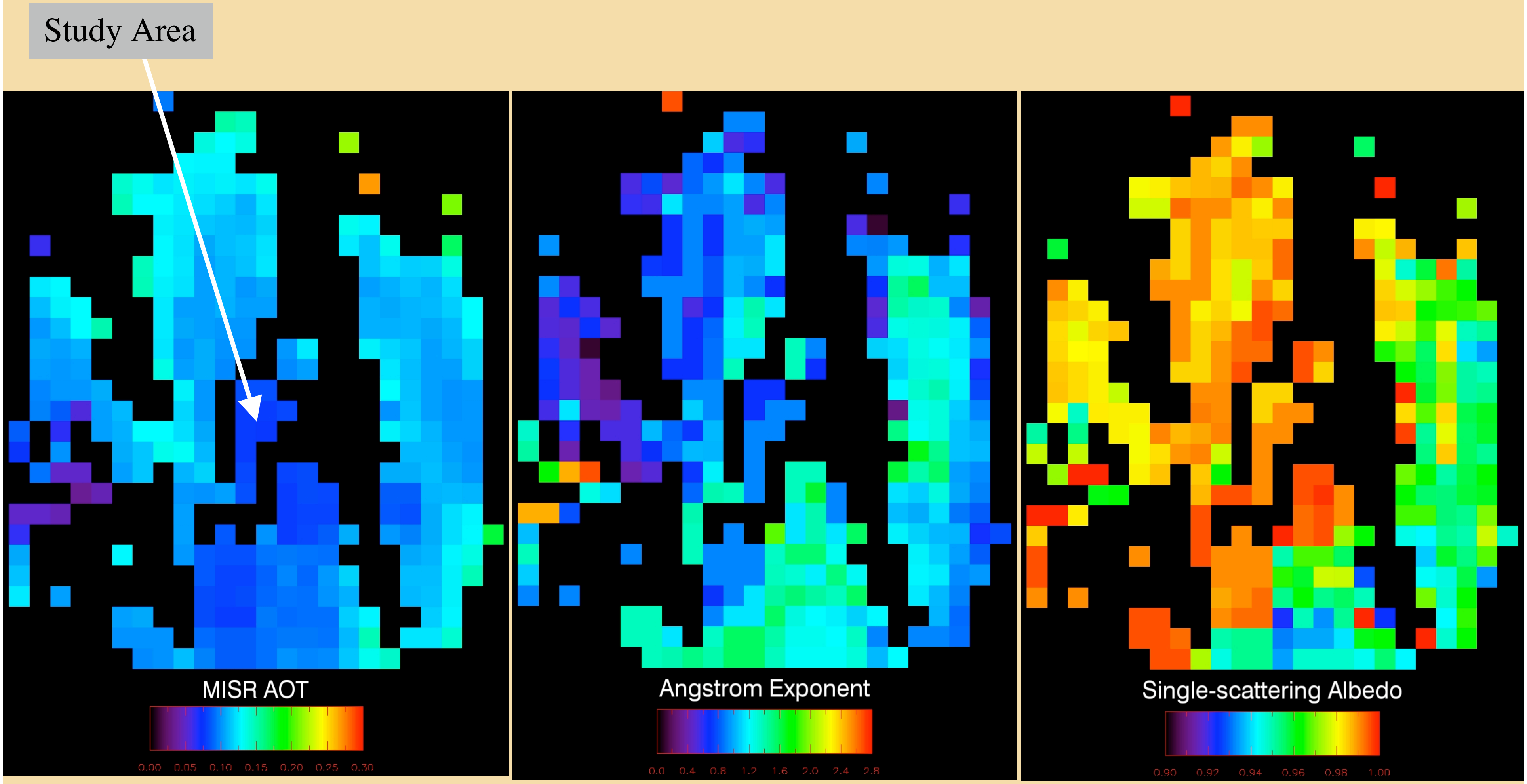
  -- Mid-visible column optical **SSA** **0.95 ± 0.01**

  -- Column **Angstrom Exponent** **~ 0.9 to 1.7** (small-medium)

  -- Aerosol **Air Mass** **fairly uniform**

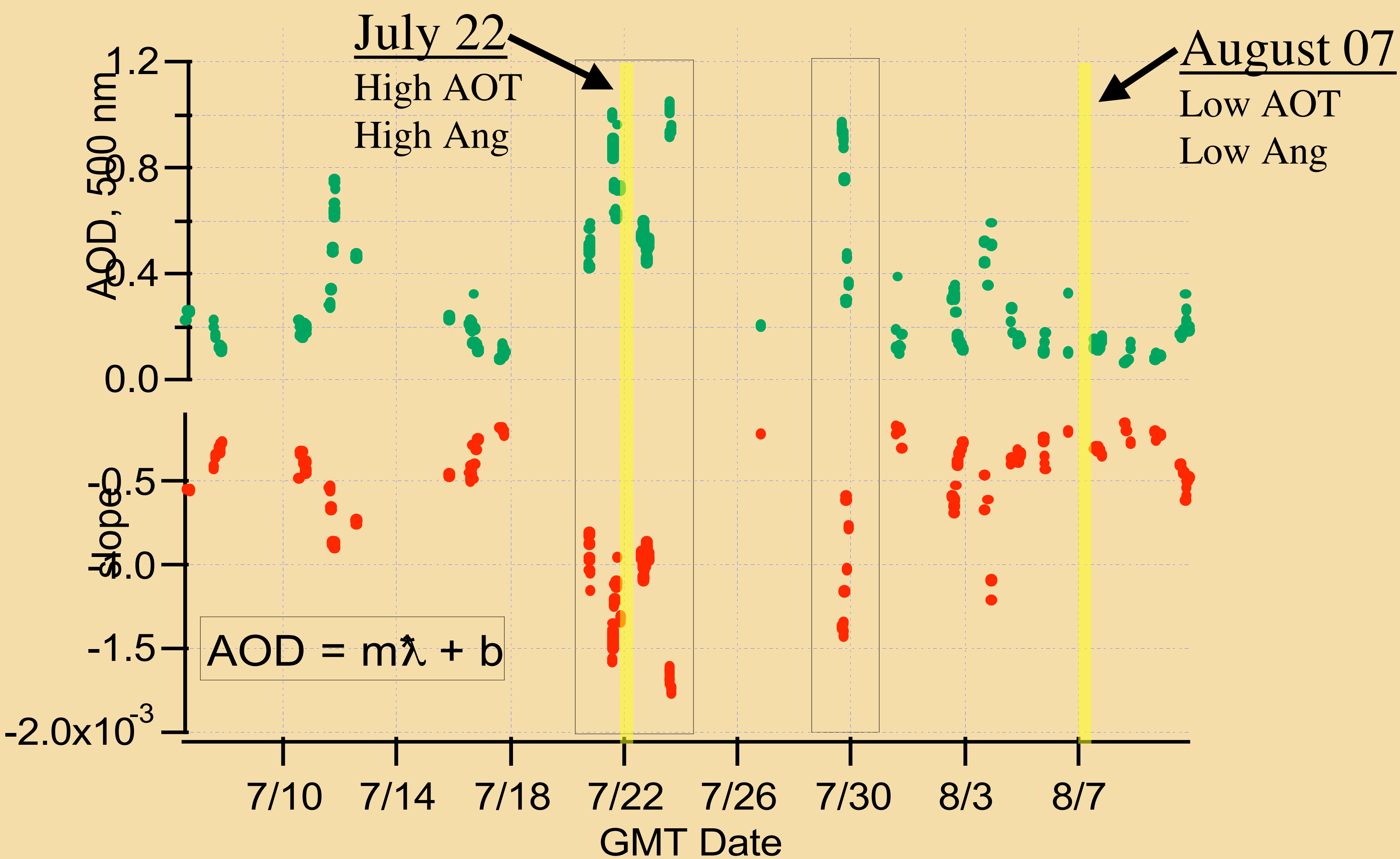
  -- Mixtures 31, 32, (**bi-modal, spherical, small + large, absorbing**),
  and 56, 57 (**tri-modal - spherical, medium-large, clean + dust**)

Aug 07, 2004, Orbit 24673, Path 010, Blocks 55-58 V16



Time series of AOD and spectral slope

Higher AOD Regions: **Polluted**, more **Small** particles, stronger **Spectral Slope**



From: Trish Quinn, RB Team

Next MISR **Validation** Steps

- Particle **Sizes** (and **Shapes**) during coincidences –
  - -- Cirrus or medium-spherical particles on July 22 and Aug 07?
    - → DC-8 + further AATS analysis
- Particle **SSA** and **surface albedo** contributions –
  - -- Is retrieved particle SSA correct, or is the surface brighter & SSA lower?
    - → DC-8 + SSFR

Next MISR **Regional Analysis** Steps

- Complete Particle Property **Validation** for Near-coincidences
- Compare refined **MISR regional retrieval with Aircraft**-observed airmass patterns
- **MISR 2-D Variability** analysis