

## SAFARI 2000 MAS Flight 00153

The SAFARI 2000 MAS contains 146 GB of data. Individual HDF files may exceed the size of a CD, and are best written to DVD. You may use this automated interface to order data from selected tracks (flight segments). If you require large portions of this data, we recommend that you contact us by email or phone and make special arrangements.

### Flight #00-153

#### RBG Images

[Click Image](#)

Track #04



R: 11.01 microns  
G: 2.15 microns  
B: 0.46 microns

Track #06

#### Summary Information

Date: **August 29, 2000**  
 ER-2 Flight Number: **00-153**  
 Location: **Northern South Africa and Mozambique**  
 Principal Investigator: **Dr. Michael King (NASA GSFC)**  
 Flight Scientist:  
 Additional Sensors: **AirMISR, CLS, LAS, MAS, MOPITT-A, S-HIS, SSFR** (see [Instrument Status](#) below)

#### Processing Information

Level-1B Data processed by: **Ames Research Center**  
 Level-1B Data Version: **#02**  
 Level-1B Configuration: ([sample file](#))  
 Calibration Type: **Final**  
 Calibration Version: **1.0**

#### Level-1B Browse Imagery

Straight Line Flight Tracks: **17 processed**  
 Scanlines Processed: **72926**  
[Solar Azimuth and Zenith Angles](#)

#### Flight Track Map



[Click to enlarge](#)

#### Browse Images

Click on the Flight Track number to see track images.  
 Click on the Check Box to list HDF files prior to adding to shopping cart.  
 Lat/Lon ranges are for the BEG-END scanline nadir pixels.

List	Flight Track	Time_Span (GMT)	Heading (Deg)	Lat_Range (Deg_S)	Lon_Range (Deg_E)	Length (Scanlines)	Altitude (msl)
<input type="checkbox"/>	<a href="#">01</a>	08:15-08:18	341	22.71-22.40	29.67-29.58	1185	15935
<input type="checkbox"/>	<a href="#">02</a>	08:28-08:38	194	22.37-23.39	29.39-29.13	3532	18803
<input type="checkbox"/>	<a href="#">03</a>	08:40-08:46	359	23.36-22.65	28.98-28.94	2380	19458
<input type="checkbox"/>	<a href="#">04</a>	08:50-08:52	80	22.51-22.46	29.31-29.56	805	19802
<input type="checkbox"/>	<a href="#">05</a>	08:52-09:04	84	22.46-22.46	29.56-31.02	4525	19948
<input type="checkbox"/>	<a href="#">06</a>	09:08-09:34	169	22.74-25.63	30.97-31.76	9999	19800
<input type="checkbox"/>	<a href="#">07</a>	09:34-10:01	168	25.63-28.56	31.76-32.54	9999	19988
<input type="checkbox"/>	<a href="#">08</a>	10:01-10:05	168	28.56-29.00	32.54-32.67	1522	19886
<input type="checkbox"/>	<a href="#">09</a>	10:08-10:35	358	29.00-25.97	32.90-32.92	9999	19866
<input type="checkbox"/>	<a href="#">10</a>	10:35-10:37	2	25.97-25.75	32.92-32.92	756	20086
<input type="checkbox"/>	<a href="#">11</a>	10:38-10:44	79	25.66-25.50	33.00-33.79	2475	20047
<input type="checkbox"/>	<a href="#">12</a>	10:47-10:56	324	25.29-24.42	33.84-33.11	3682	20030
<input type="checkbox"/>	<a href="#">13</a>	11:06-11:19	324	23.57-22.42	32.42-31.50	4807	20030
<input type="checkbox"/>	<a href="#">14</a>	11:22-11:26	288	22.56-22.46	31.21-30.81	1283	19693
<input type="checkbox"/>	<a href="#">15</a>	11:29-11:55	158	22.67-25.42	30.61-31.80	9745	19893



	<a href="#">16</a>	12:07-12:22	268	25.76-25.83	30.64-28.80	5482	20052
	<a href="#">17</a>	13:08-13:10	83	24.35-24.32	27.93-28.17	750	20138
<a href="#">All images in sequence</a>							

### ER-2 Flight Log

Author: [Dr. Michael King](#)  
Mission Scientist: [Dr. Michael King](#)  
ER-2 Pilot: [Ken Broda](#)  
Takeoff: [29Aug2000 0000 UTC](#)  
Landing: [29Aug2000 0000 UTC](#)  
Duration: [05:50:00](#)

#### Objective:

Map the Gauteng and lower Mozambique sectors. Overfly AERONET sites at Skukuza and Inhacal Island and document fires and burn scars. Underfly TOMS (0929 UTC). Monitor industrial and mining centers, including the Murchisan Lineament formation.

#### Key Flight Legs:

Light haze reported by pilot in predominantly clear conditions, although some cloud scenes. 20-30 fires observed in Mozambique, one large one. Some loss of MAS data (fail lights at 1203, 1226, 1233, 1311 UTC) during the mapping of the Mozambique sector.

The AERONET sites were overflown during this mission:

- Skukuza (20°01.2'S, 31°29.8'E)
- Inhaca Island (26°02'S, 32°54'E)

#### Pilot Report:

Light haze reported by pilot in predominantly clear conditions, although some cloud scenes. 20-30 fires observed in Mozambique, one large one. Some loss of MAS data (fail lights at 1203, 1226, 1233, 1311 UTC) during the mapping of the Mozambique sector.

#### Meteorology:

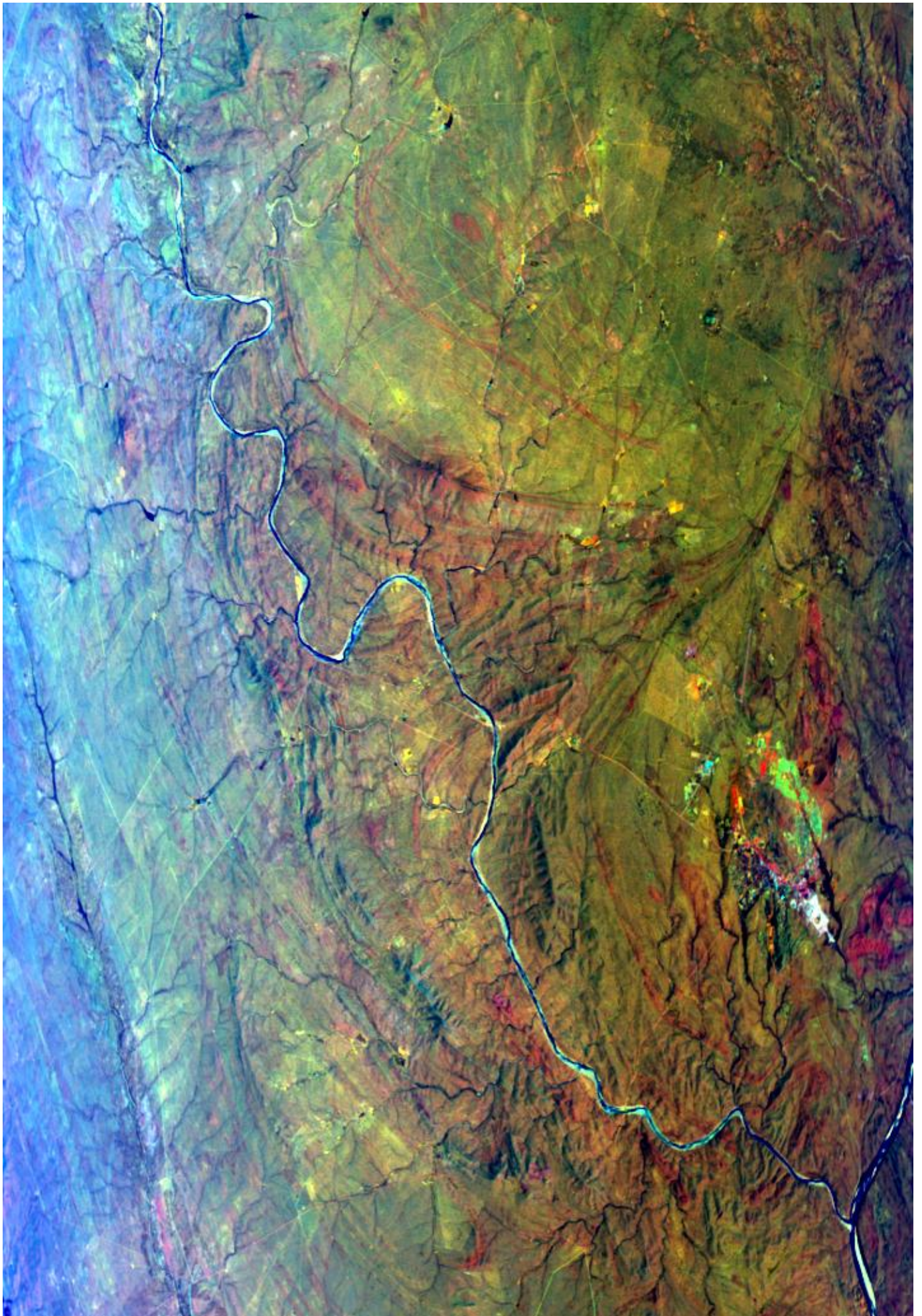
A cold front is trailing along the southern Cape coast. Continental high established over southeastern Botswana with dry air incirculation over the northern parts of South Africa, Zimbabwe, Botswana and southern Mozambique is keeping skies clear over these regions. Offshore flow over Natal with onshore over central Mozambique.

#### Instrument Status:

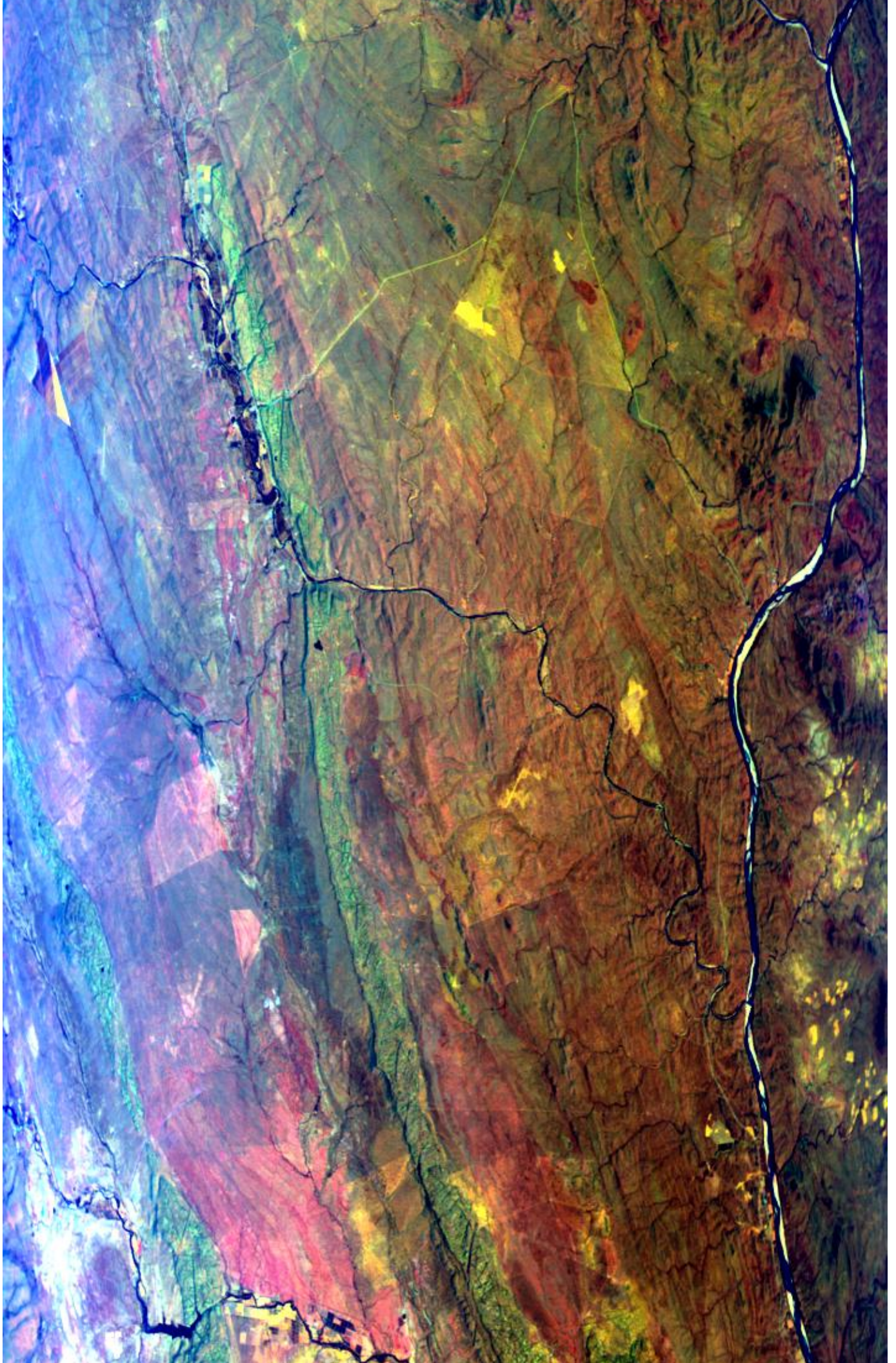
R: 11.01 microns  
G: 2.15 microns  
B: 0.46 microns

- AirMISR (Airborne Multi-angle Imaging Spectroradiometer): Not on plane; being repaired
- CLS (Cloud Lidar System): Lidar worked properly, but navigation data not recorded
- LAS (Leonardo Airborne Simulator): No Data
- MAS (MODIS Airborne Simulator): Partial data loss
- MOPITT-A (MOPITT Airborne Simulator): Worked well
- S-HIS (High-resolution Interferometer Sounder): Worked well
- SSFR (Solar Spectral Flux Radiometer): Worked well



















FLIGHT 00-153

29 AUGUST 2000

A/C 809

SAFARI



50 MAS Configuration for 00-153 29 Aug 2000 S. Africa and Mozambique

01	01	16	0	0.036664	0.0000	0.452	0.472	0.493	0.100	1981.92
02	02	16	0	0.039477	0.0000	0.534	0.554	0.577	0.100	1857.88
03	03	16	0	0.026889	0.0000	0.635	0.658	0.689	0.100	1549.55
04	04	16	0	0.031532	0.0000	0.687	0.708	0.731	0.100	1386.41
05	05	16	0	0.024015	0.0000	0.729	0.750	0.773	0.100	1260.07
06	06	16	0	0.024801	0.0000	0.810	0.830	0.855	0.100	1053.65
07	07	16	0	0.024699	0.0000	0.853	0.874	0.895	0.100	962.82
08	08	16	0	0.019821	0.0000	0.893	0.912	0.934	0.100	869.28
09	09	16	0	0.021366	0.0000	0.933	0.954	0.974	0.100	784.92
10	10	16	0	0.003422	0.0000	1.586	1.612	1.640	0.100	244.16
11	11	16	0	0.006333	0.0000	1.642	1.668	1.695	0.010	227.32
12	12	16	0	0.002939	0.0000	1.698	1.722	1.749	0.010	201.29
13	13	16	0	0.002905	0.0000	1.751	1.776	1.801	0.010	176.56
14	14	16	0	0.002992	0.0000	1.805	1.830	1.855	0.010	156.28
15	15	16	0	0.002860	0.0000	1.855	1.880	1.906	0.010	139.66
16	16	16	0	0.002717	0.0000	1.906	1.932	1.956	0.100	131.21
17	17	16	0	0.002462	0.0000	1.956	1.982	2.006	0.010	122.76
18	18	16	0	0.002408	0.0000	2.006	2.032	2.057	0.010	109.78
19	19	16	0	0.002327	0.0000	2.058	2.082	2.107	0.010	98.67
20	20	16	0	0.002366	0.0000	2.107	2.132	2.157	0.010	86.28
21	21	16	0	0.004980	0.0000	2.156	2.180	2.205	0.010	76.85
22	22	16	0	0.002708	0.0000	2.205	2.230	2.255	0.010	73.57
23	23	16	0	0.002783	0.0000	2.255	2.280	2.305	0.010	68.38
24	24	16	0	0.002616	0.0000	2.306	2.330	2.354	0.010	58.53
25	25	16	0	0.002558	0.0000	2.355	2.380	2.404	0.010	57.88
26	26	16	1	0.956000	0.0000	3.105	3.180	3.261	0.001	20.15
27	27	16	1	0.960000	0.0000	3.250	3.325	3.401	0.001	17.66
28	28	16	1	0.961000	0.0000	3.405	3.475	3.559	0.001	15.05
29	29	16	1	0.949000	0.0000	3.556	3.640	3.718	0.001	13.06
30	30	16	1	0.945000	0.0000	3.702	3.770	3.847	0.001	11.39
31	31	16	1	0.942000	0.0000	3.857	3.940	4.023	0.001	9.98
32	32	16	1	0.940000	0.0000	4.014	4.095	4.183	0.001	8.69
33	33	16	1	0.939000	0.0000	4.138	4.210	4.291	0.001	7.73
34	34	16	1	0.938000	0.0000	4.288	4.360	4.441	0.001	6.71
35	35	16	1	0.935000	0.0000	4.471	4.550	4.632	0.001	5.63
36	36	16	1	0.934000	0.0000	4.622	4.700	4.784	0.001	4.87
37	37	16	1	0.933000	0.0000	4.773	4.860	4.937	0.001	4.28



38	38	16	1	0.932000	0.0000	4.917	4.990	5.084	0.001	3.80
39	39	16	1	0.931000	0.0000	5.055	5.165	5.235	0.001	3.39
40	40	16	1	0.930000	0.0000	5.215	5.315	5.371	0.001	3.03
41	41	16	1	0.932000	0.0000	5.342	5.380	5.421	0.001	2.80
42	42	16	1	0.966000	0.0000	8.330	8.564	8.759	0.010	0.45
43	43	16	1	0.963000	0.0000	9.436	9.665	9.928	0.010	0.28
44	44	16	1	0.960000	0.0000	10.218	10.474	10.711	0.010	0.20
45	45	16	1	0.957000	0.0000	10.694	10.943	11.209	0.010	0.17
46	46	16	1	0.947000	0.0000	11.684	11.953	12.208	0.010	0.12
47	47	16	1	0.943000	0.0000	12.583	12.803	13.035	0.010	0.09
48	48	16	1	0.948000	0.0000	12.939	13.193	13.446	0.010	0.08
49	49	16	1	0.939000	0.0000	13.425	13.712	14.035	0.010	0.07
50	50	16	1	0.944000	0.0000	13.953	14.193	14.403	0.010	0.06

| | | | |     |     |     |     |     |     |  
 | | | | |     |     |     |     |     |     =(!)  
 | | | | |     |     |     |     |     =-Scale Factor  
 | | | | |     |     |     |     =- Right 50% spectral response  
 | | | | |     |     |     =-Peak 100% spectral response (microns)  
 | | | | |     |     =-Left 50% spectral response (microns)  
 | | | | |     =-Calibration intercept (only used for visible bands)  
 | | | | | =-----Calibration slope (only used for visible bands 1-25)  
 | | | |     Blackbody emmissivity (only used for IR bands 26-50)  
 | | | =-----0 => visible band, 1 => thermal infrared band"  
 | | =-----Number of bits in this channel (8 or 10)  
 | =-----Spectral band assigned to this channel  
 =----- Channel number  
 (!) Sensor weighted solar spectral irradiance (Watts/meter<sup>2</sup>/micron)  
 at mean Earth-Sun distance

NOTE: Factor in column 10 is used to scale radiances in  
 calibrated data by the following method:  
 $value\_stored = int( radiance / factor )$  for each channel

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Title	MODIS Airborne Simulator (MAS) Level-1B Data
Sensor_ID_Code	M5 105 MAS50
ExperimentName	SAFARI 2000
AircraftPlatform	NASA ER-2 (809)
NavFormatCode	Format (A-1)



LocationCode	Inertial (INU)
AltitudeCode	Inertial (INU)
CalibrationVersion	Version 1.0 Calibration
CalibrationName	SAFARI_Jul19-Oct19
SRF_Dataset	/rarray/calibrat/mas/srf/Oct_00/
SRF_FTP	ftp://asapdata/mas/srf/Oct_00/
NavDataSource	ER2 navigation recorder
NavDataPath	/nav/2000/er2/00-153
TbackBand	45, 47, 31, 273.0
GranuleVersion	1.0.0
MetadataVersion	1.0.0

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 -----  
 Conversion from counts to radiance in VIS and NIR channels is  
 $rad = (count - (cbb\_avg)) * slope$

"where,"

rad = radiance  
 cbb\_avg = cold black body counts (running average)  
 slope = from column 7 in above table  
 count = count value

\*\*\*\*\*

### IR Emissivity Correction (for MAS-50)

From Chris Moeller (UWisc)

\*\*\*\*\*

This is done in 2 steps:

1. Get the (TBACK Band) scan head count and convert it to a brightness temperature
2. Use the scan head temperature and the cold and warm black body counts/temperatures for computing the corrected slope and intercept for all IR bands.

(note: set to 1.0 for channels 1-25)

MAS BB Emissivity Coefficients

Hemispherical Reflectance (JPL) 11/00

convolved with MAS SRF (ARC) 10/00

Red spot Paint



Values in form Wavelength, Emissivity

\*\*\*\*\*

For Bands 26 thru 50:

0.95600, 0.96000, 0.96100, 0.94900, 0.94500,  
0.94200, 0.94000, 0.93900, 0.93800, 0.93500,  
0.93400, 0.93300, 0.93200, 0.93100, 0.93000,  
0.93200, 0.96600, 0.96300, 0.96000, 0.95700,  
0.94700, 0.94300, 0.94800, 0.93900, 0.94400,

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Config.asc creation date = 13-June-2001

Config.asc creation date = 13-June-2001

MODIS AIRBORNE SIMULATOR (MAS) FLIGHT LINE  
 INFORMATION FOR 29 Aug 2000  
 NASA FLIGHT NUMBER 00-153

START OF FLIGHT LINE					END OF FLIGHT				
LINE	FLIGHT DATA								
LINE	TIME	LAT	LON	SOLAR	TIME	LAT	LON	SOLAR	TIME
	HH:MM:SS	DEG	DEG	ZEN	HH:MM:SS	DEG	DEG	ZEN	HH:MM:SS
	SCAN	HEAD	ALT	AZIM	SCAN	HEAD	ALT	AZIM	SCAN
	LINES	DEG	M (GPS)	DEG	LINES	DEG	M (GPS)	DEG	LINES
1	08:15:23	-22.713	29.667	41.2	42.3	08:18:33	-22.395	29.582	40.6
	41.7	1185	341.0	15935					
2	08:28:39	-22.374	29.385	39.2	38.9	08:38:07	-23.387	29.128	38.8
	35.4	3532	194.3	18803					
3	08:40:07	-23.363	28.977	38.6	35.0	08:46:29	-22.648	28.939	37.2
	33.3	2380	359.0	19458					
4	08:50:11	-22.514	29.307	36.4	31.6	08:52:20	-22.462	29.559	36.0
	30.5	805	79.5	19802					
5	08:52:23	-22.461	29.564	36.0	30.5	09:04:29	-22.459	31.017	34.1
	23.5	4525	84.4	19948					
6	09:08:07	-22.739	30.967	34.1	21.9	09:34:53	-25.628	31.765	35.1
	8.2	9999	168.8	19800					
7	09:34:53	-25.628	31.765	35.1	8.2	10:01:39	-28.557	32.545	37.8
	355.6	9999	167.7	19988					
8	10:01:39	-28.557	32.545	37.8	355.6	10:05:43	-29.005	32.668	38.3
	353.8	1522	168.3	19886					
9	10:08:15	-28.999	32.901	38.4	352.4	10:35:01	-25.973	32.917	36.8
	340.9	9999	357.5	19866					
10	10:35:01	-25.972	32.917	36.8	340.9	10:37:02	-25.748	32.918	36.8
	340.0	756	1.6	20086					
11	10:38:10	-25.659	32.998	36.8	339.4	10:44:47	-25.499	33.793	37.5
	335.6	2475	79.0	20047					
12	10:47:07	-25.293	33.840	37.5	334.5	10:56:58	-24.415	33.108	37.5



331.4	3682	324.0	20030						
13	11:06:24	-23.570	32.419	37.5	328.5	11:19:16	-22.420	31.497	37.7
324.5	4807	323.7	20030						
14	11:22:49	-22.555	31.213	38.1	323.8	11:26:15	-22.458	30.811	38.3
323.1	1283	288.0	19693						
15	11:29:13	-22.674	30.609	38.8	322.5	11:55:18	-25.421	31.804	45.5
315.5	9745	158.0	19893						
16	12:07:28	-25.761	30.638	46.9	313.8	12:22:08	-25.825	28.803	48.2
312.0	5482	268.2	20052						
17	13:08:29	-24.346	27.929	55.1	301.9	13:10:29	-24.315	28.168	55.6
301.3	750	83.4	20138						

NUMBER OF FILES FOR THIS FLIGHT = 17  
 TOTAL NUMBER OF SCAN LINES = 72926  
 DATE THESE FILES WERE PROCESSED = 19-Sep-2002  
 DATE THIS LIST WAS CREATED = Wed Sep 25

14:12:59 PDT 2002

GRANULE VERSION = 2

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GLOBAL ATTRIBUTES

Attribute Name	Description
-----	-----
CreationDate	19-Sep-2002 23:00:03
AircraftPlatform	NASA ER-2 (809)
NavFormatCode	Format (A-1)
LocationCode	Inertial (INU)
AltitudeCode	Inertial (INU)
NavDataSource	ER2 navigation recorder
NavDataPath	/nav/2000/er2/00-153
CalibrationName	SAFARI_Jul19-Oct19
Reference	NCSA HDF Reference Manual, Version 4.1r4, 2000
title	MODIS Airborne Simulator (MAS) Level-1B Data
ExperimentName	SAFARI 2000

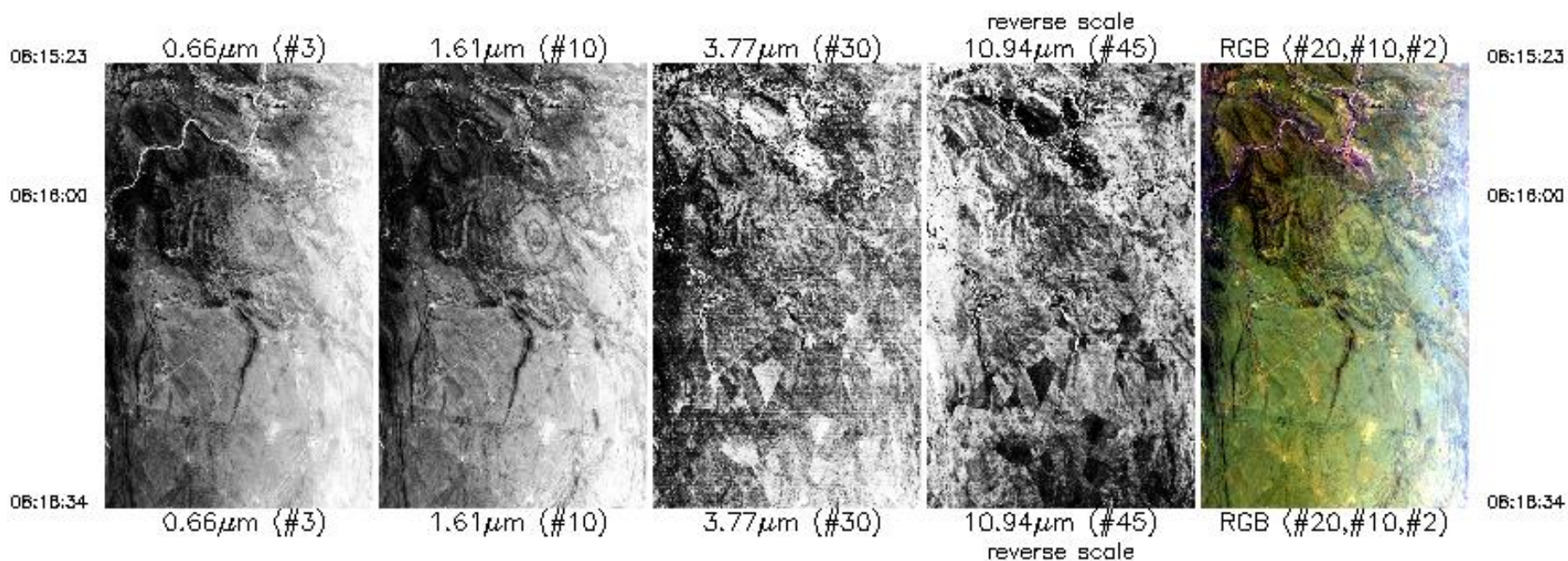
FlightNumber	00-153
FlightDate	29 Aug 2000
SiteLineRun	void
GeographicArea	Botswana
SRF_FTP	ftp://asapdata/mas/srf/Oct_00/
SRF_dataset	/rarray/calibrat/mas/srf/Oct_00/
FlightLineNumber	1
TotalFlightLines	17
DataUsersGuideSource	<a href="http://ltpwww.gsfc.nasa.gov/MAS/">http://ltpwww.gsfc.nasa.gov/MAS/</a>
SoftwareVersion	Level-1b Version 10.1.1 UR
CalibrationVersion	Version 1.0 Calibration
data_set	MAS SAFARI 2000
day_night_flag	D
granule_version	2
metadata_version	2.0.0
data_quality	Good
Other_Aircraft_Sensors	AirMISR, CLS, MOPPIT-A, Leonardo
Principal_Investigator	King
lat_UL	-22.66903
lon_UL	29.79471
lat_UR	-22.75647
lon_UR	29.53917
lat_LL	-22.35369
lon_LL	29.72324
lat_LR	-22.43685
lon_LR	29.44186
begin_date	20000828 081523
end_date	20000828 081834
RunTime	87,510 ms, or 73 ms/scanline
CompletionDate	19-Sep-2002 23:02:14
producer_granule_id	

MASL1B\_00153\_01\_20000828\_0815\_0818\_V02.hdf

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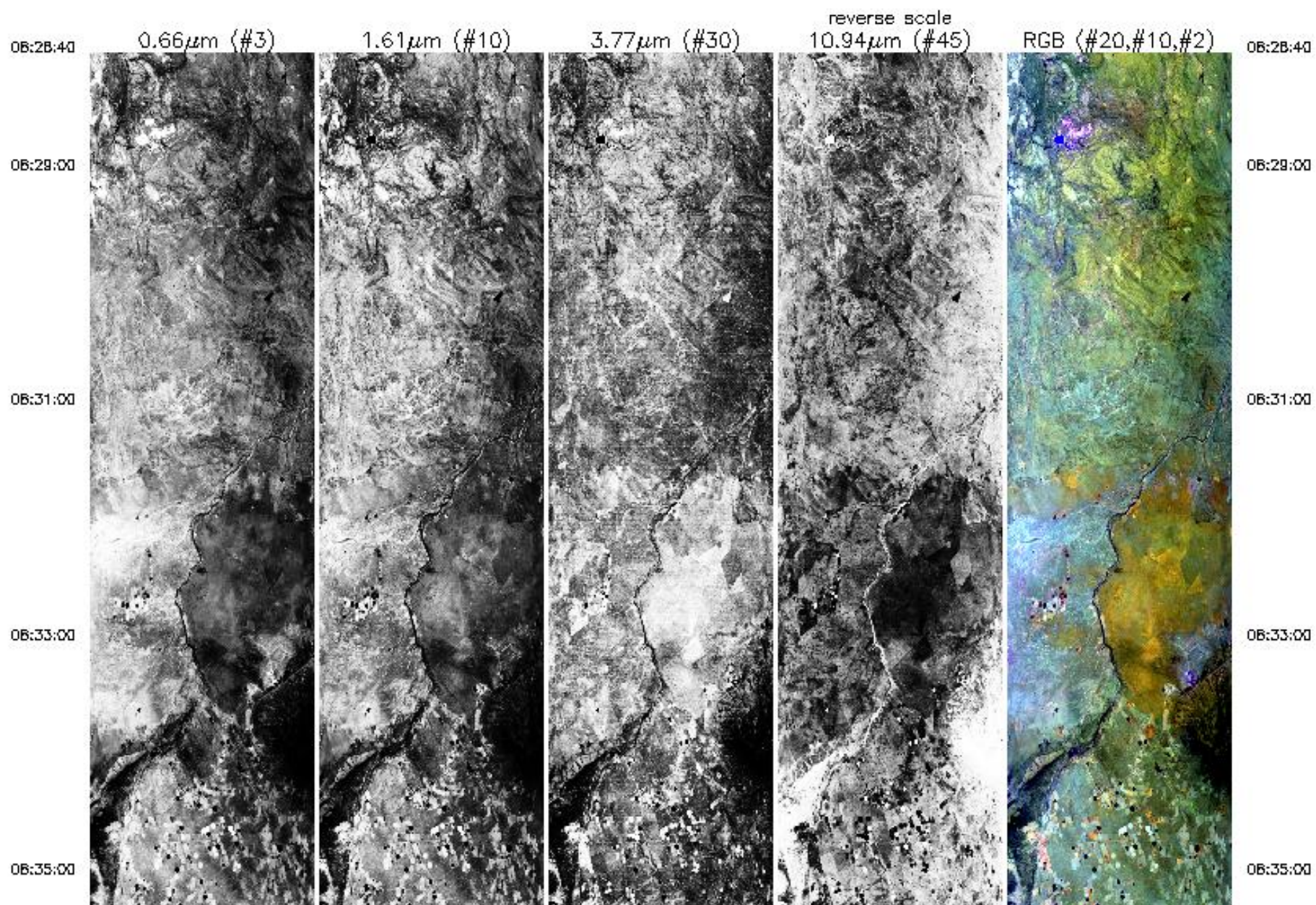
MODIS Airborne Simulator Browse Imagery  
 SAFARI 2000 Campaign – 29 Aug 2000  
 Botswana  
 Flight #00–153 Track #1



Upper Left Lat, Lon = -22.7°, 29.8°  
 Lower Right Lat, Lon = -22.4°, 29.4°  
 Aircraft Heading = 339.6°  
 Solar Zenith = 41.1°  
 GPS Altitude = 15995. m (MSL)

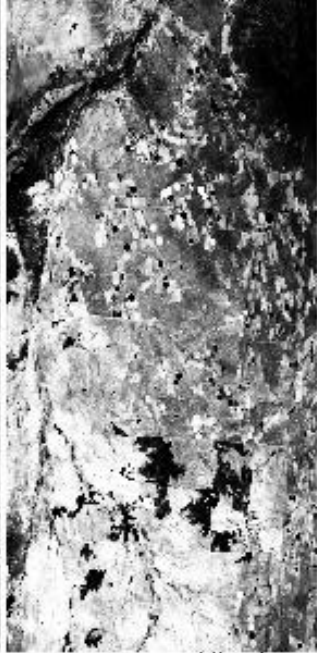
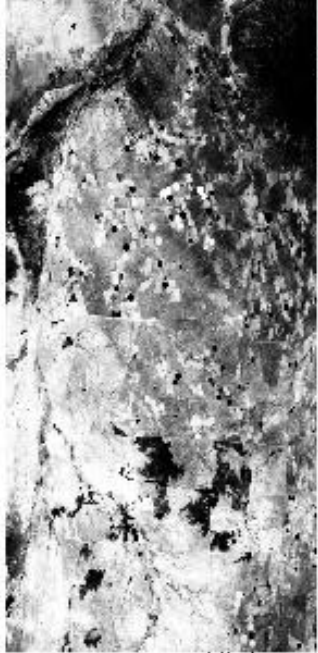


MODIS Airborne Simulator Browse Imagery  
SAFARI 2000 Campaign - 29 Aug 2000  
Botswana  
Flight #00-153 Track #2





06:35:00



06:35:00

06:37:00

06:37:00

06:38:07

06:38:07

0.66µm (#3)

1.61µm (#10)

3.77µm (#30)

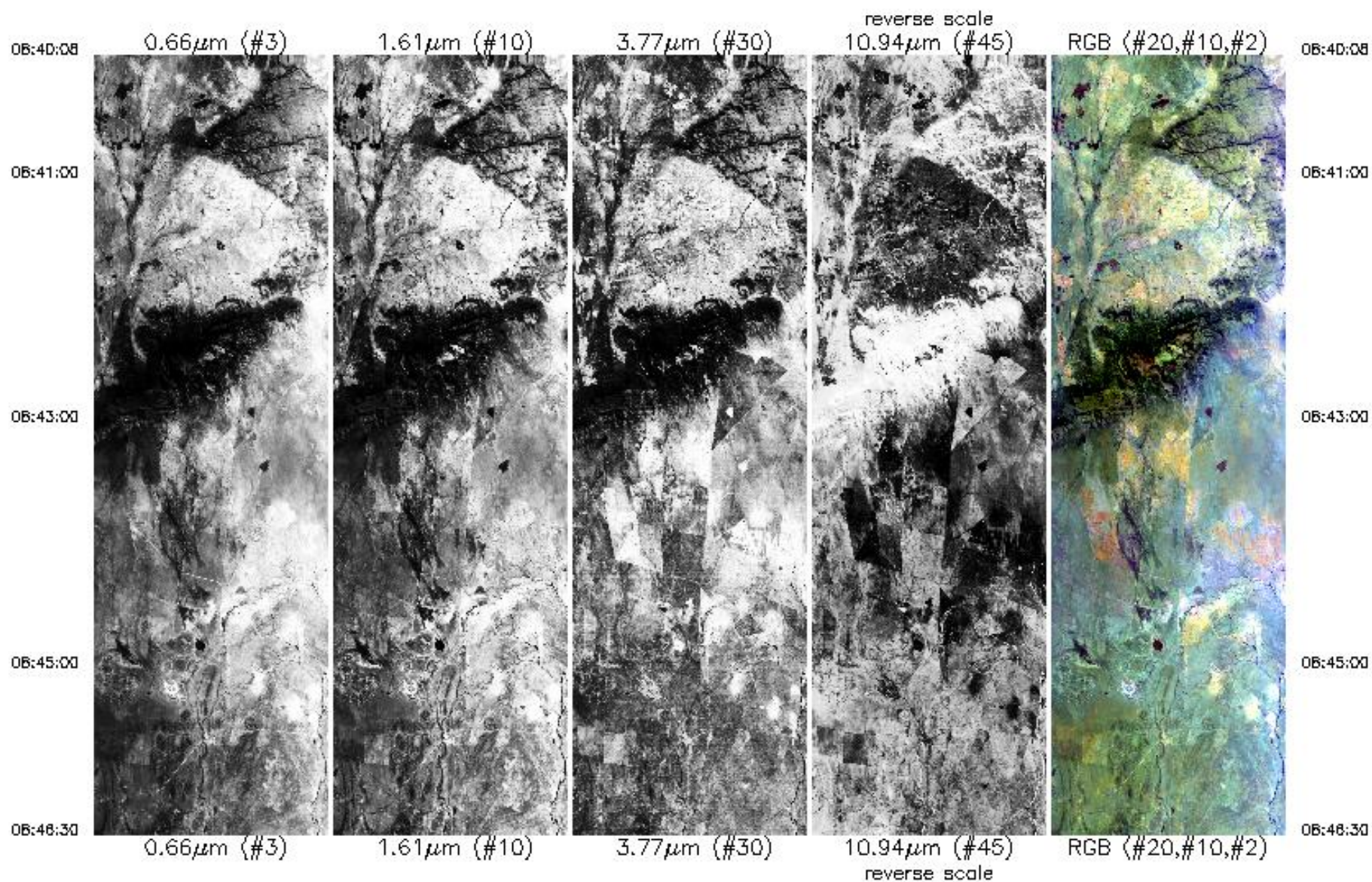
10.94µm (#45)  
reverse scale

RGB (#20,#10,#2)

Upper Left Lat, Lon = -22.3°, 29.2°  
 Lower Right Lat, Lon = -23.4°, 29.3°  
 Aircraft Heading = 194.6°  
 Solar Zenith = 39.2°  
 GPS Altitude = 18910. m (MSL)



MODIS Airborne Simulator Browse Imagery  
 SAFARI 2000 Campaign – 29 Aug 2000  
 Botswana  
 Flight #00-153 Track #3



Upper Left Lat, Lon = -23.4°, 29.1°  
 Lower Right Lat, Lon = -22.7°, 28.8°

06:48:30



0.66 $\mu\text{m}$  (#3)



1.61 $\mu\text{m}$  (#10)



3.77 $\mu\text{m}$  (#30)



10.94 $\mu\text{m}$  (#45)  
reverse scale



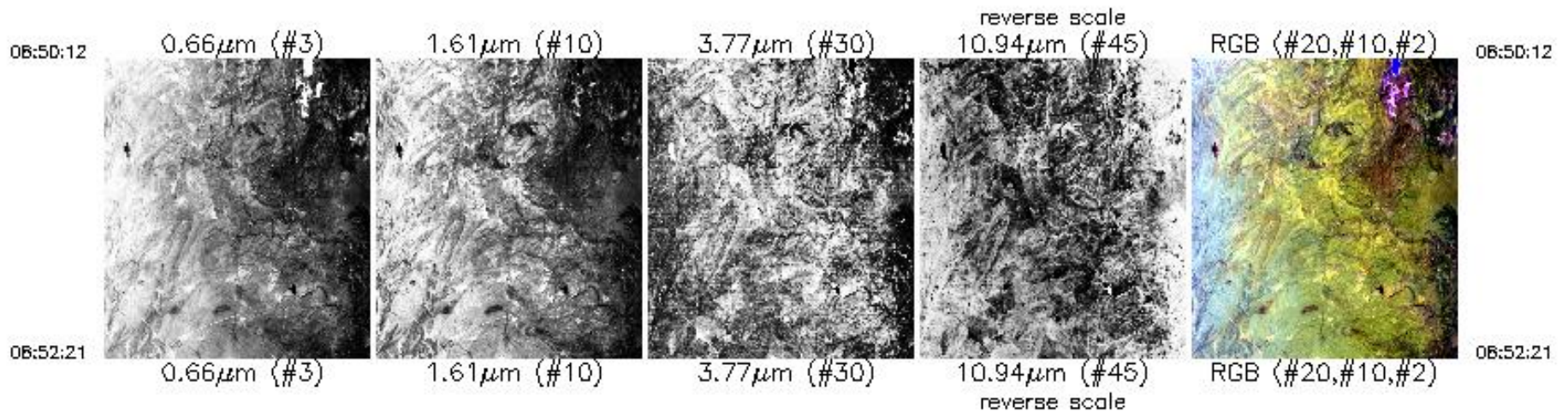
RGB (#20, #10, #2)

06:48:30

Upper Left Lat, Lon =  $-23.4^\circ$ ,  $29.1^\circ$   
Lower Right Lat, Lon =  $-22.7^\circ$ ,  $28.8^\circ$   
Aircraft Heading =  $0.5^\circ$   
Solar Zenith =  $38.5^\circ$   
GPS Altitude = 19456. m (MSL)



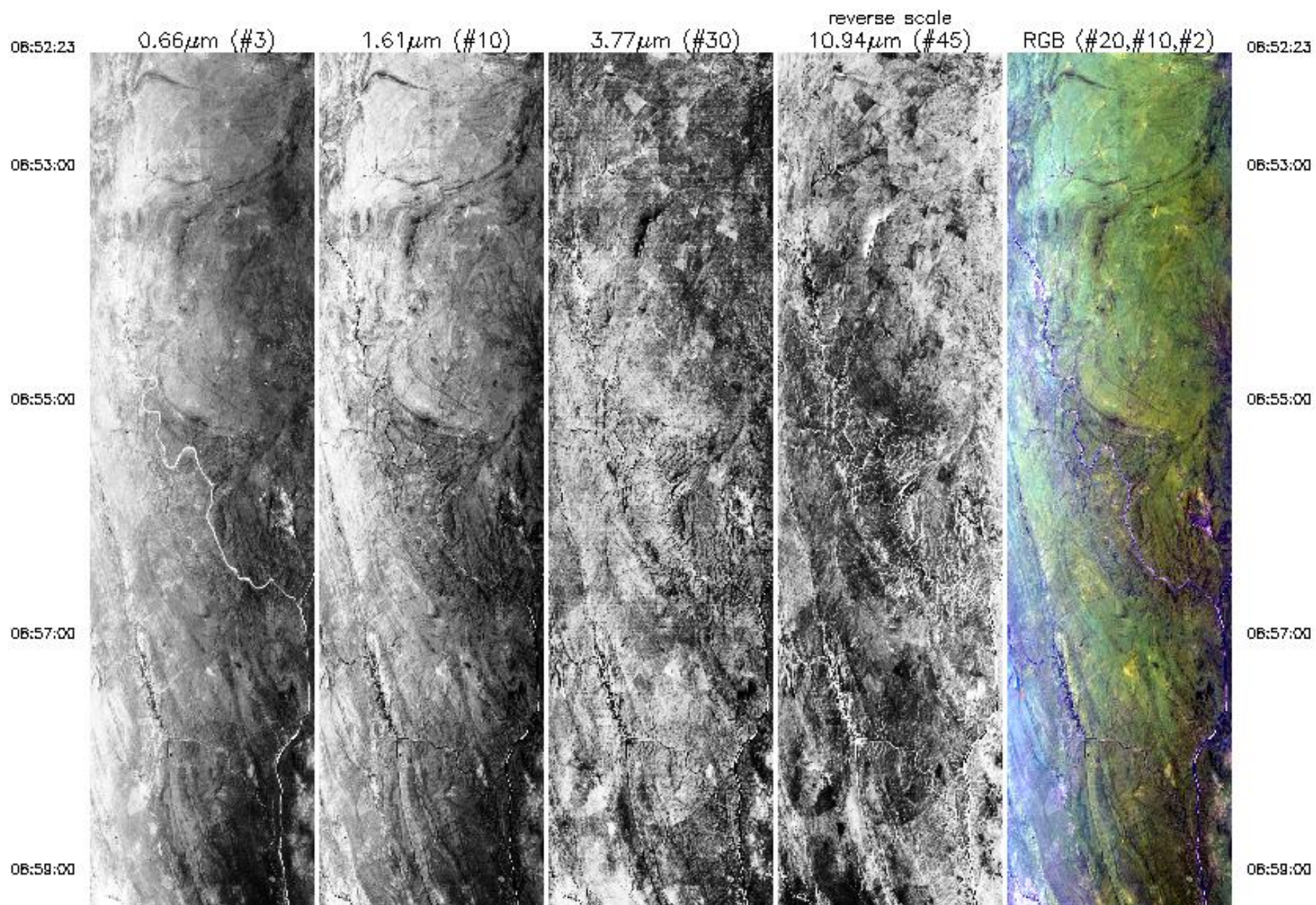
MODIS Airborne Simulator Browse Imagery  
 SAFARI 2000 Campaign – 29 Aug 2000  
 Botswana  
 Flight #00–153 Track #4



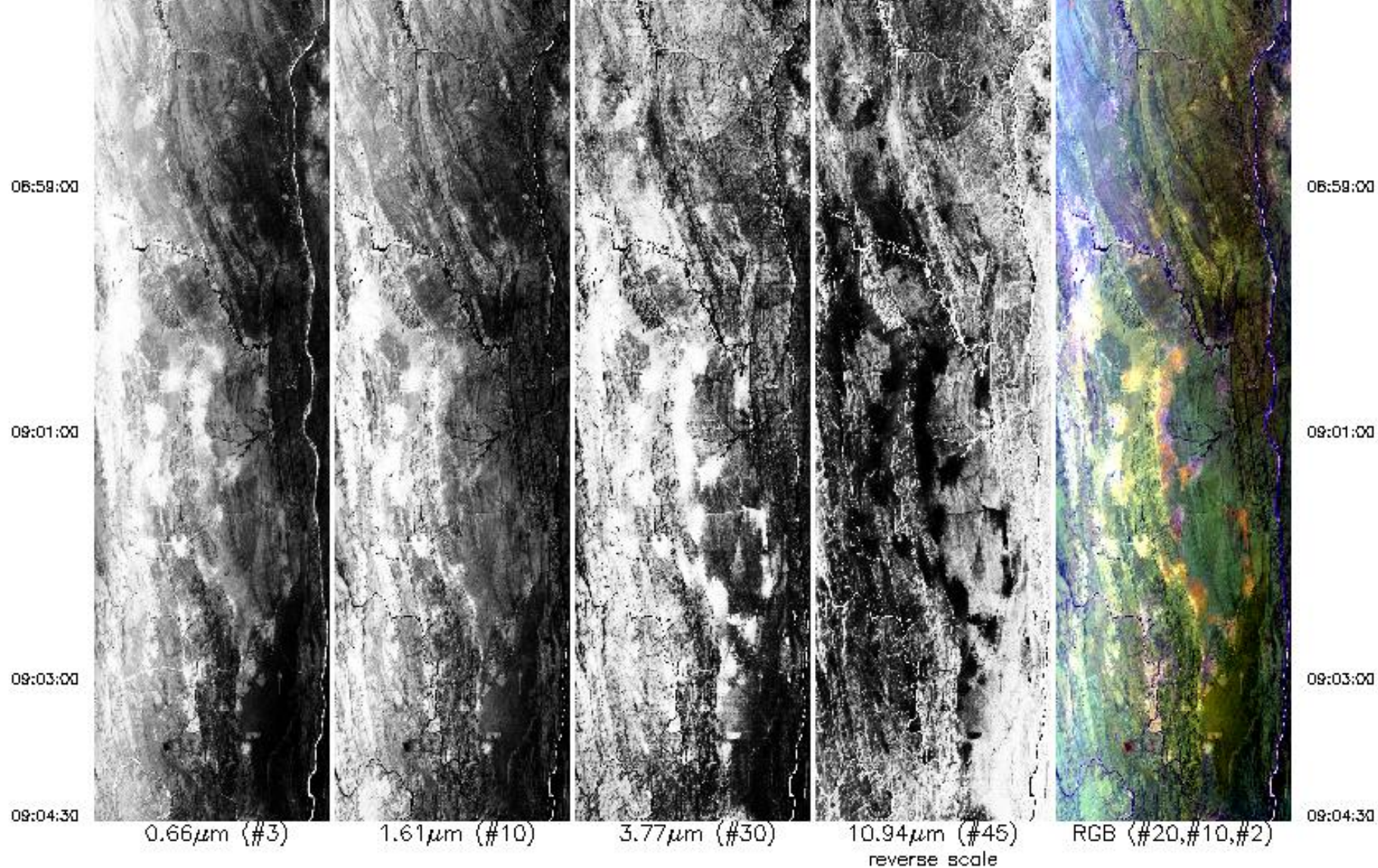
Upper Left Lat, Lon = -22.7°, 29.3°  
 Lower Right Lat, Lon = -22.3°, 29.5°  
 Aircraft Heading = 81.5°  
 Solar Zenith = 36.6°  
 GPS Altitude = 19781. m (MSL)



MODIS Airborne Simulator Browse Imagery  
SAFARI 2000 Campaign - 29 Aug 2000  
Botswana  
Flight #00-153 Track #5



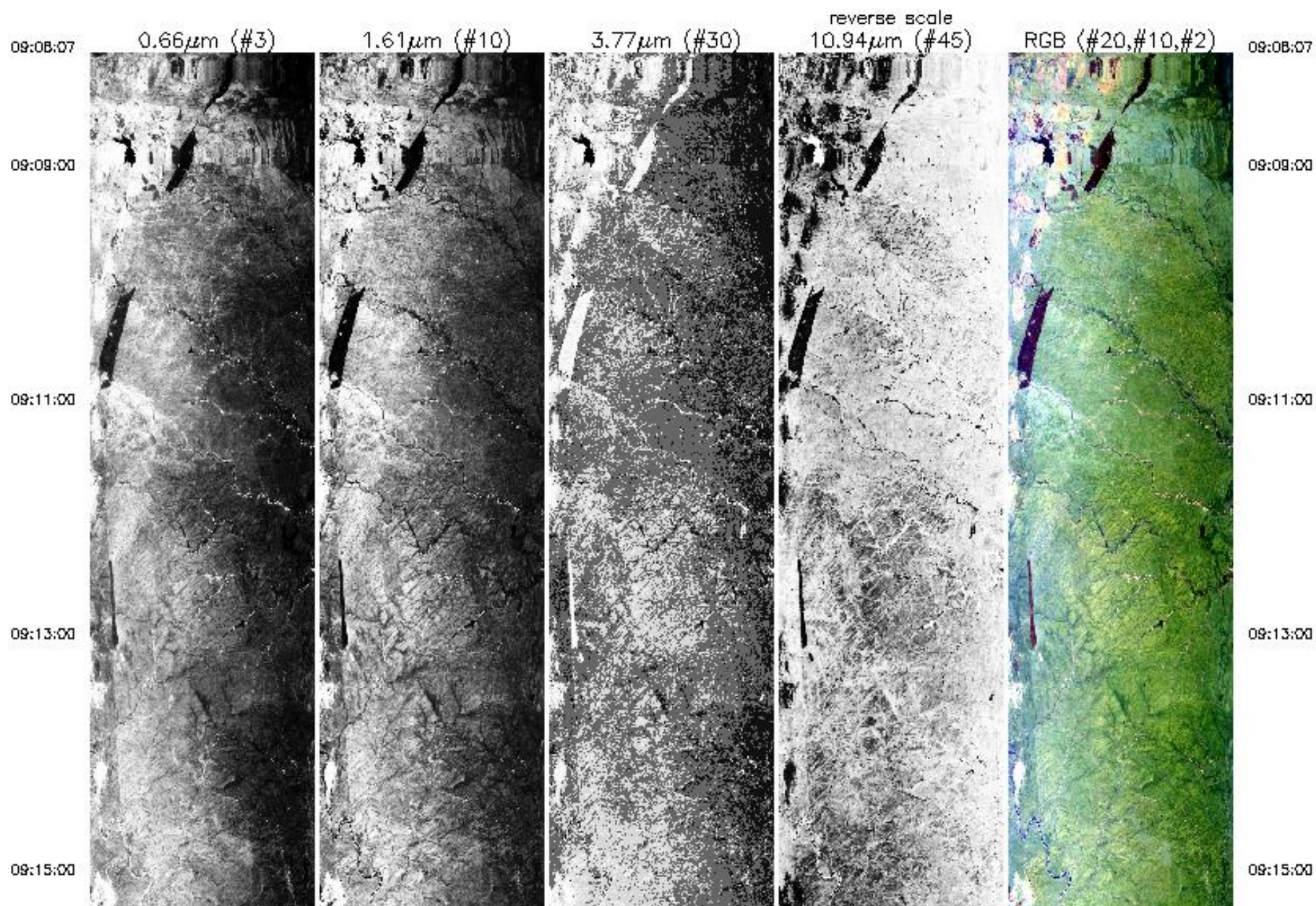




Upper Left Lat, Lon =  $-22.6^{\circ}$ ,  $29.6^{\circ}$   
 Lower Right Lat, Lon =  $-22.3^{\circ}$ ,  $31.0^{\circ}$   
 Aircraft Heading =  $78.2^{\circ}$   
 Solar Zenith =  $36.1^{\circ}$   
 GPS Altitude = 19971. m (MSL)



MODIS Airborne Simulator Browse Imagery  
SAFARI 2000 Campaign - 29 Aug 2000  
Botswana  
Flight #00-153 Track #6





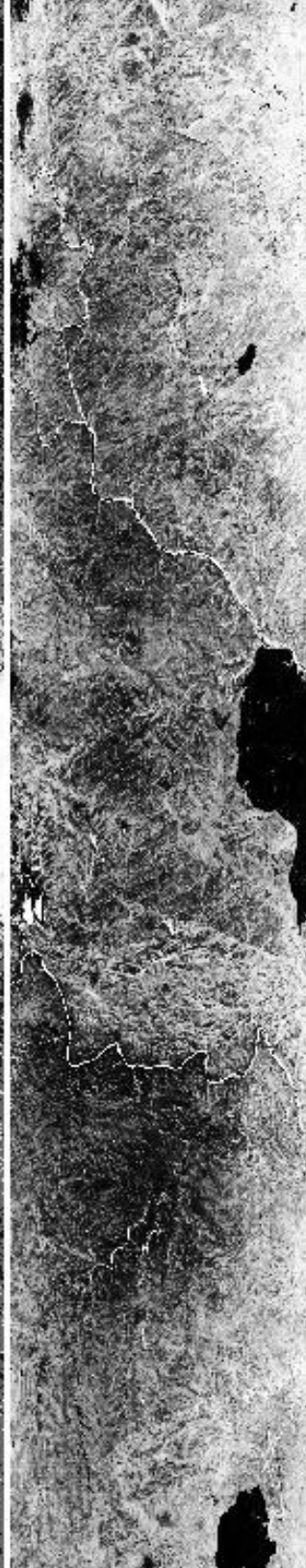
09:15:00

09:17:00

09:19:00

09:21:00

09:23:00



09:15:00

09:17:00

09:19:00

09:21:00

09:23:00



09:23:00



09:25:00



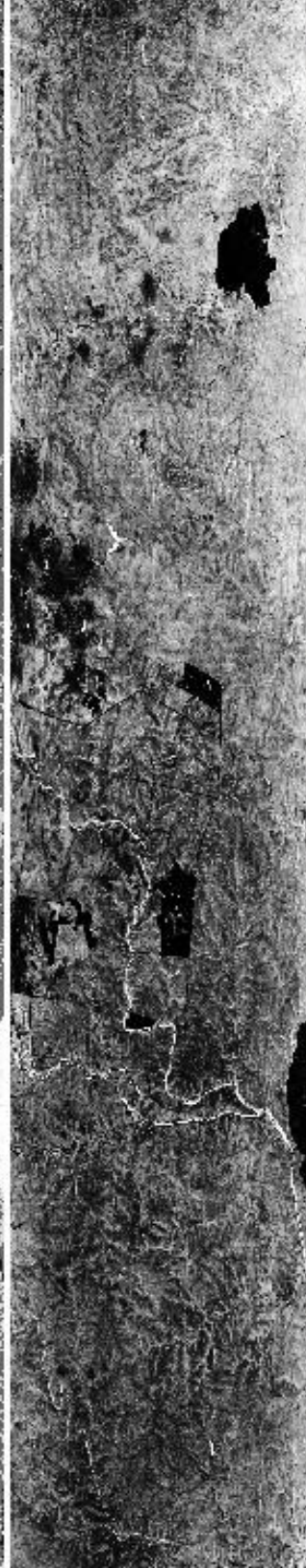
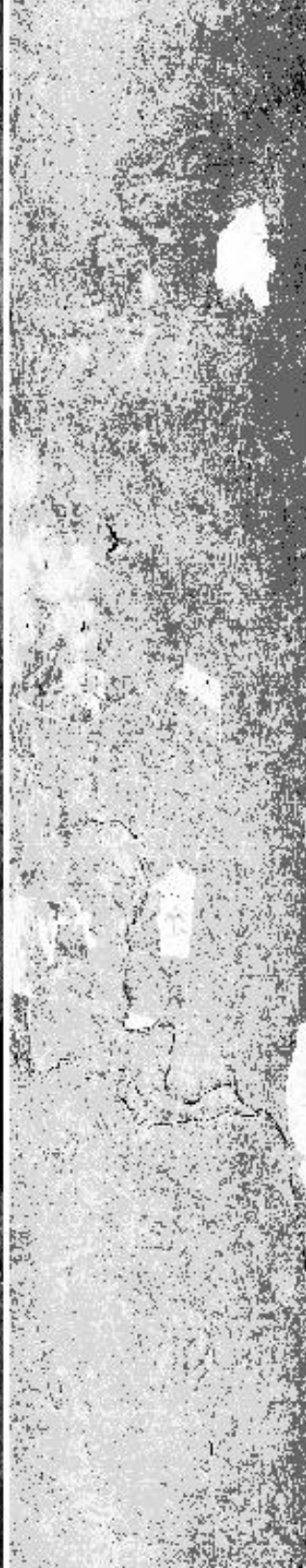
09:27:00



09:29:00



09:31:00



09:23:00

09:25:00

09:27:00

09:29:00

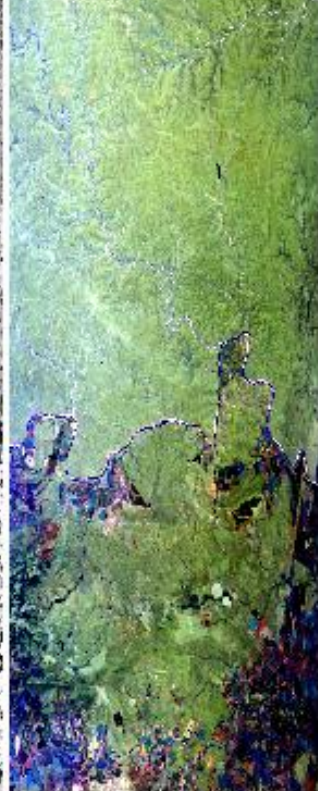
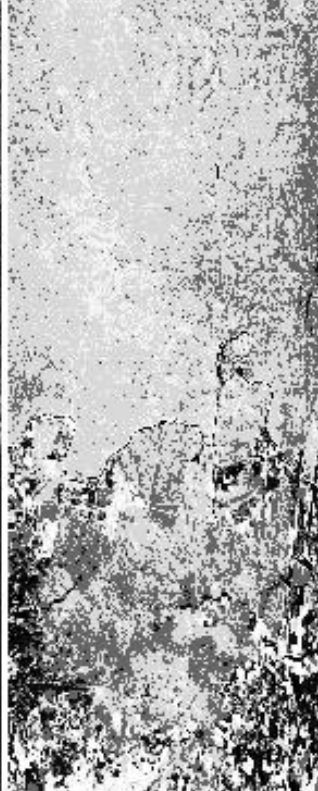
09:31:00



09:31:00

09:33:00

09:34:53



09:31:00

09:33:00

09:34:53

0.66 $\mu$ m (#3)

1.61 $\mu$ m (#10)

3.77 $\mu$ m (#30)

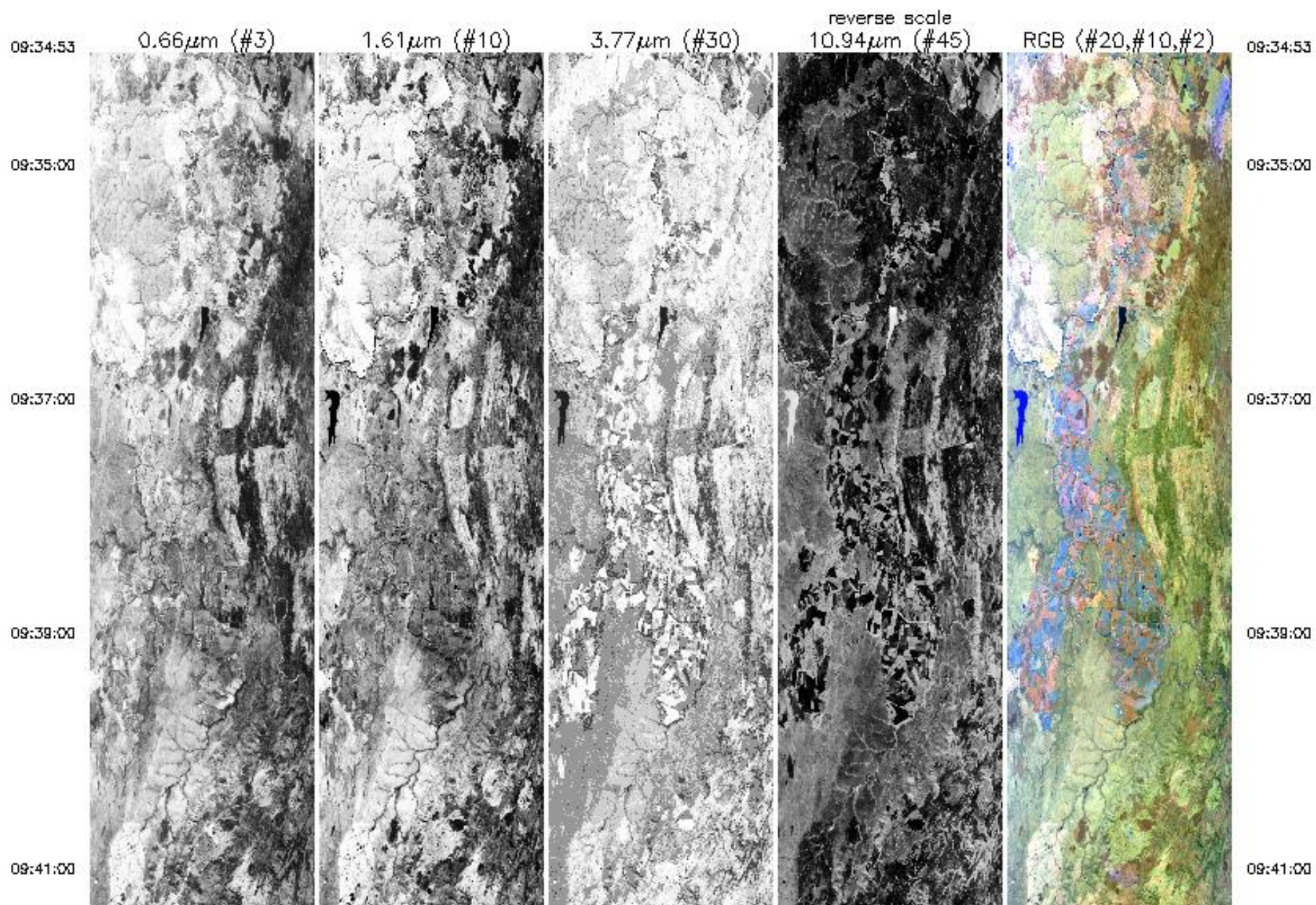
10.94 $\mu$ m (#45)  
reverse scale

RGB (#20, #10, #2)

Upper Left Lat, Lon =  $-22.8^\circ$ ,  $30.8^\circ$   
 Lower Right Lat, Lon =  $-25.6^\circ$ ,  $31.9^\circ$   
 Aircraft Heading =  $170.7^\circ$   
 Solar Zenith =  $34.2^\circ$   
 GPS Altitude = 20059. m (MSL)



MODIS Airborne Simulator Browse Imagery  
SAFARI 2000 Campaign - 29 Aug 2000  
Botswana  
Flight #00-153 Track #7





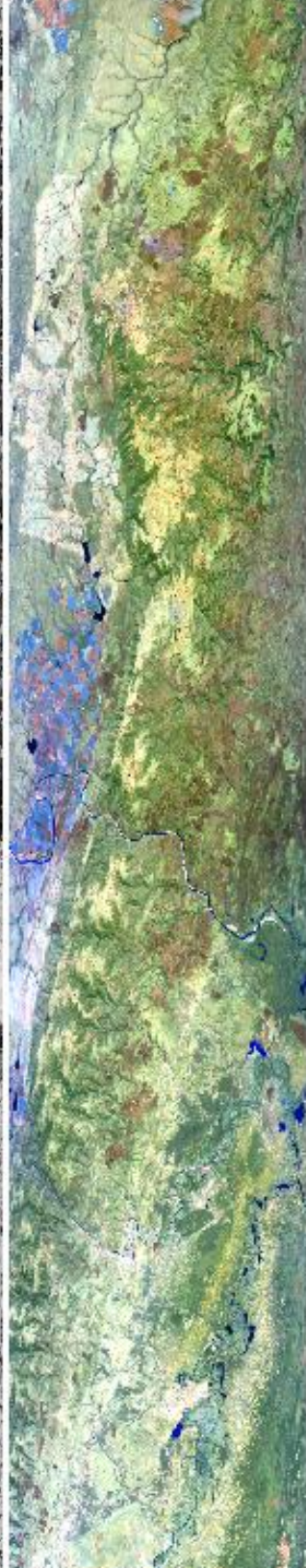
09:41:00

09:43:00

09:45:00

09:47:00

09:48:00



09:41:00

09:43:00

09:45:00

09:47:00

09:48:00



09:49:00



09:51:00



09:53:00



09:55:00



09:57:00



09:49:00

09:51:00

09:53:00

09:55:00

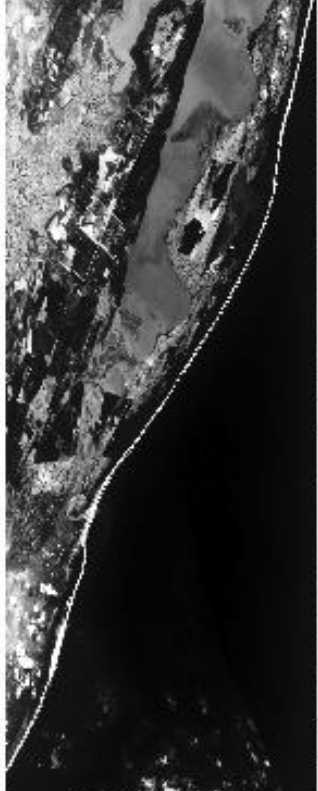
09:57:00



09:57:00

09:58:00

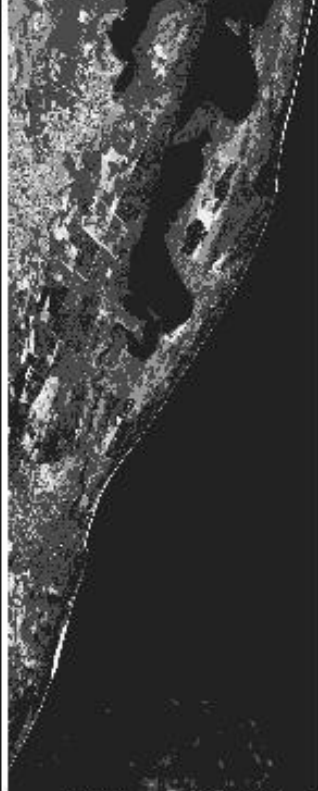
10:01:39



0.66 $\mu\text{m}$  (#3)



1.61 $\mu\text{m}$  (#10)



3.77 $\mu\text{m}$  (#30)



10.94 $\mu\text{m}$  (#45)  
reverse scale



RGB (#20,#10,#2)

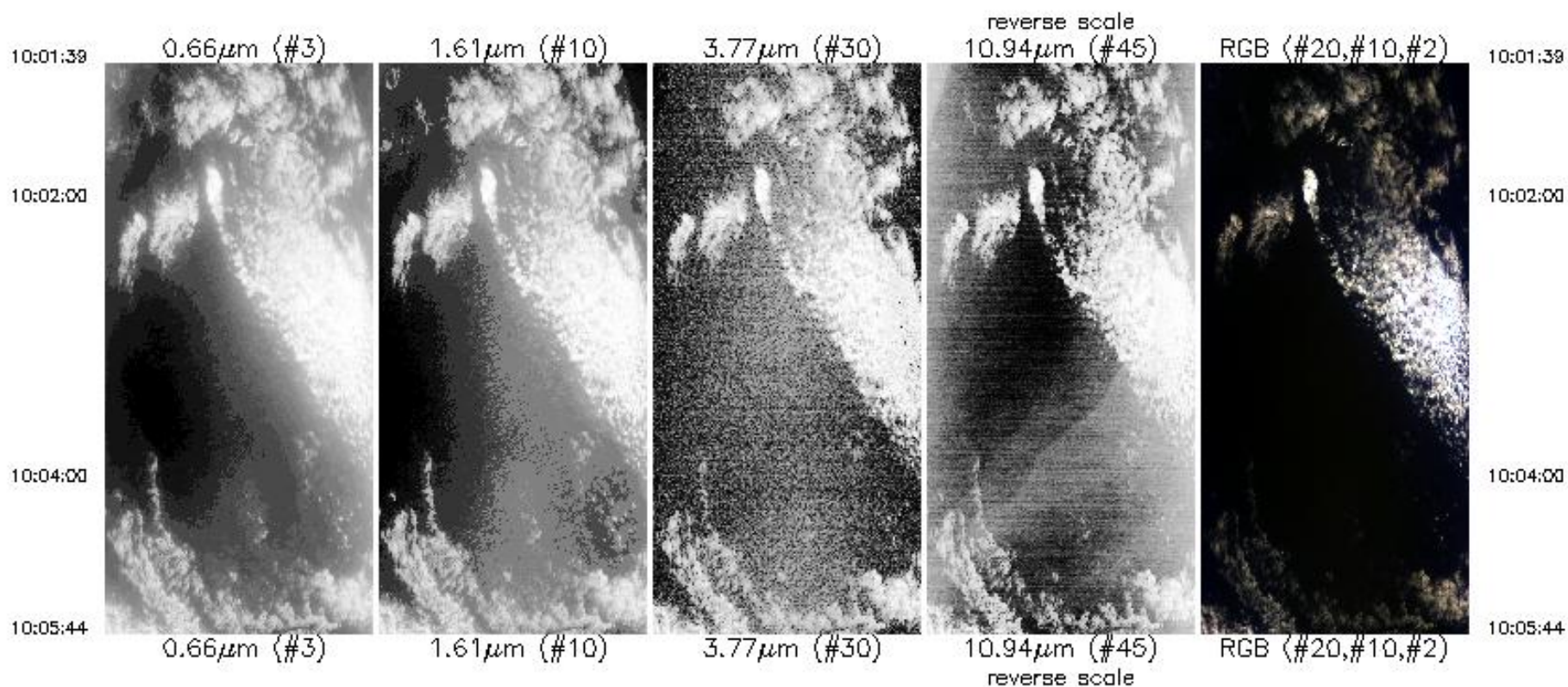
09:57:00

09:58:00

10:01:39

Upper Left Lat, Lon =  $-25.7^\circ$ ,  $31.6^\circ$   
Lower Right Lat, Lon =  $-28.5^\circ$ ,  $32.7^\circ$   
Aircraft Heading =  $167.0^\circ$   
Solar Zenith =  $35.1^\circ$   
GPS Altitude = 19864. m (MSL)

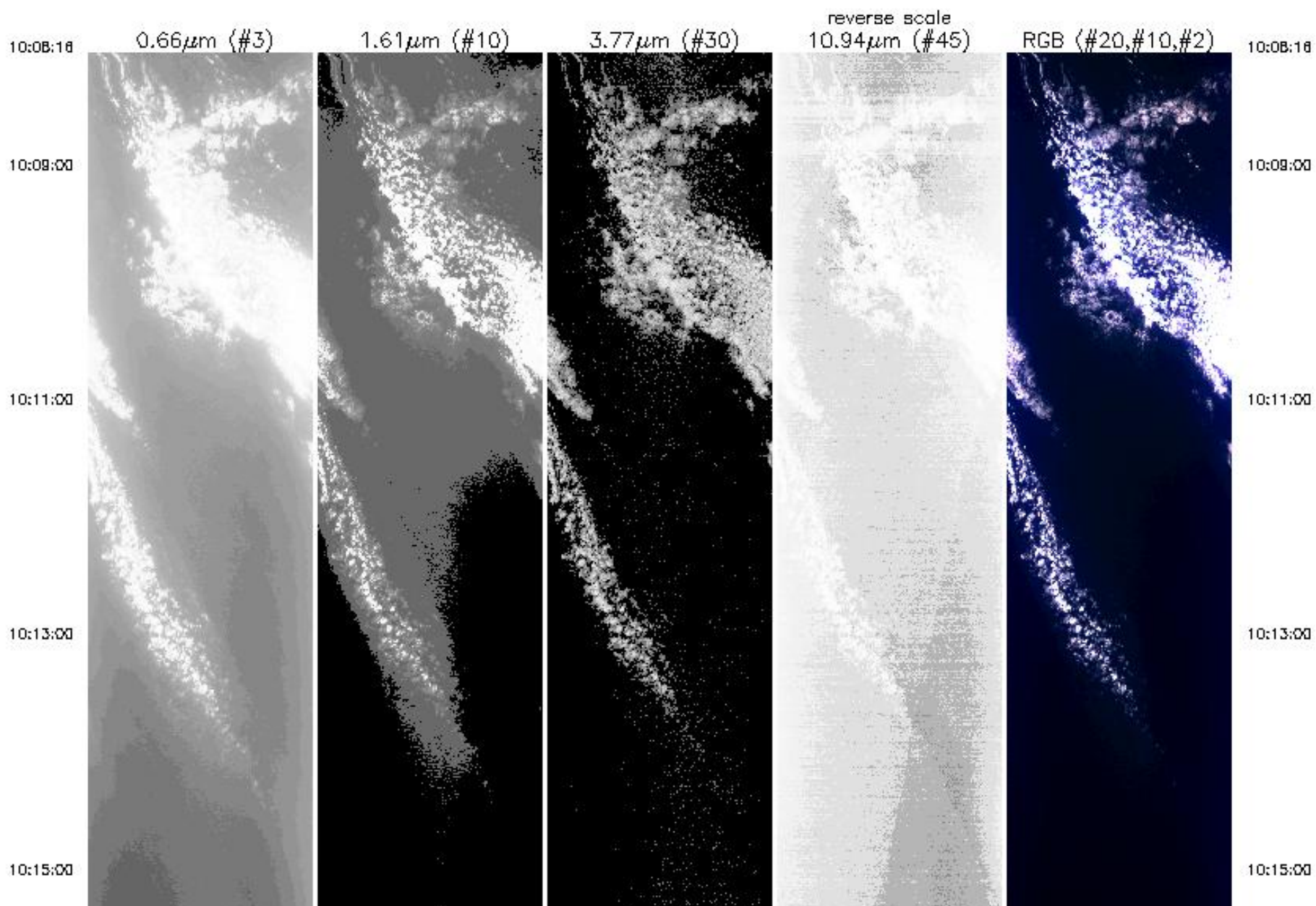
MODIS Airborne Simulator Browse Imagery  
 SAFARI 2000 Campaign - 29 Aug 2000  
 Botswana  
 Flight #00-153 Track #8



Upper Left Lat, Lon =  $-28.6^\circ$ ,  $32.4^\circ$   
 Lower Right Lat, Lon =  $-29.0^\circ$ ,  $32.8^\circ$   
 Aircraft Heading =  $168.5^\circ$   
 Solar Zenith =  $37.8^\circ$   
 GPS Altitude = 19888. m (MSL)



MODIS Airborne Simulator Browse Imagery  
SAFARI 2000 Campaign - 29 Aug 2000  
Botswana  
Flight #00-153 Track #9



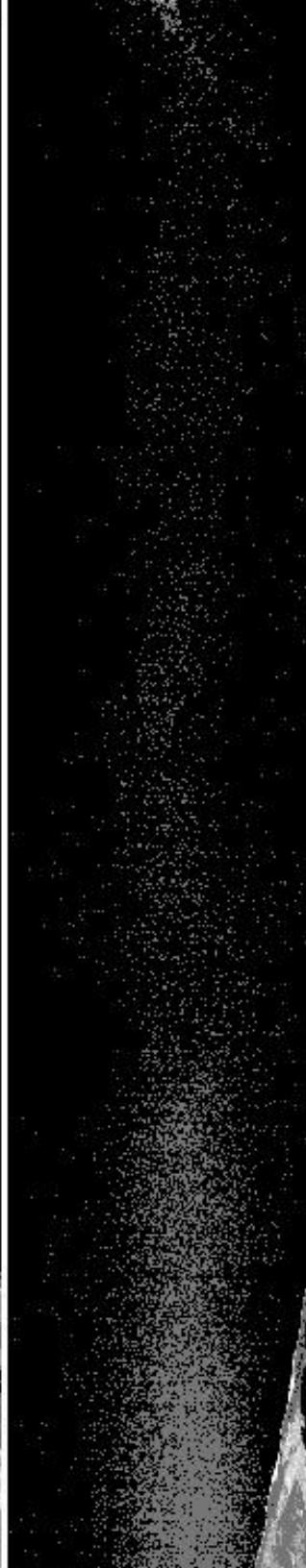
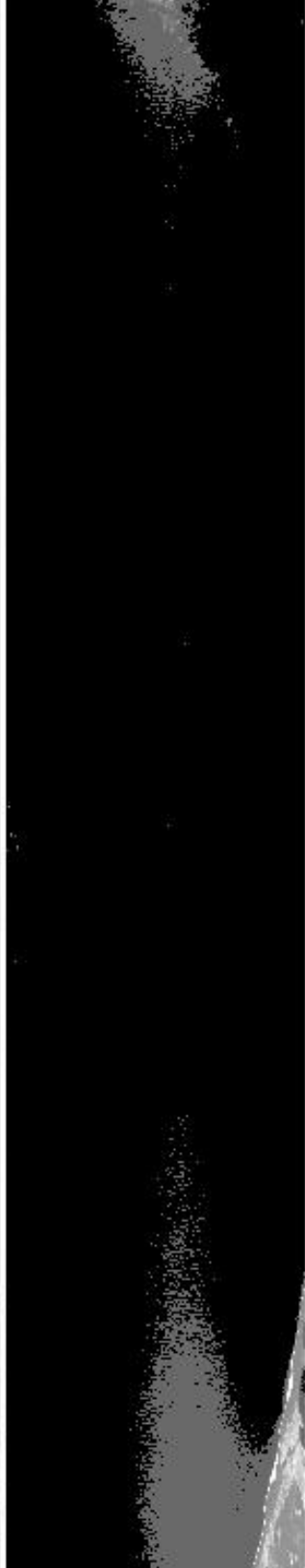
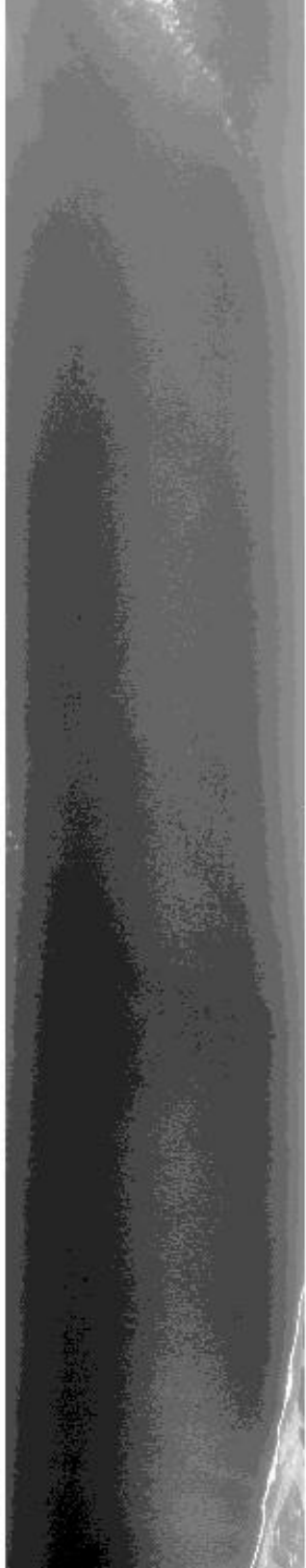
10:15:00

10:17:00

10:19:00

10:21:00

10:23:00



10:15:00

10:17:00

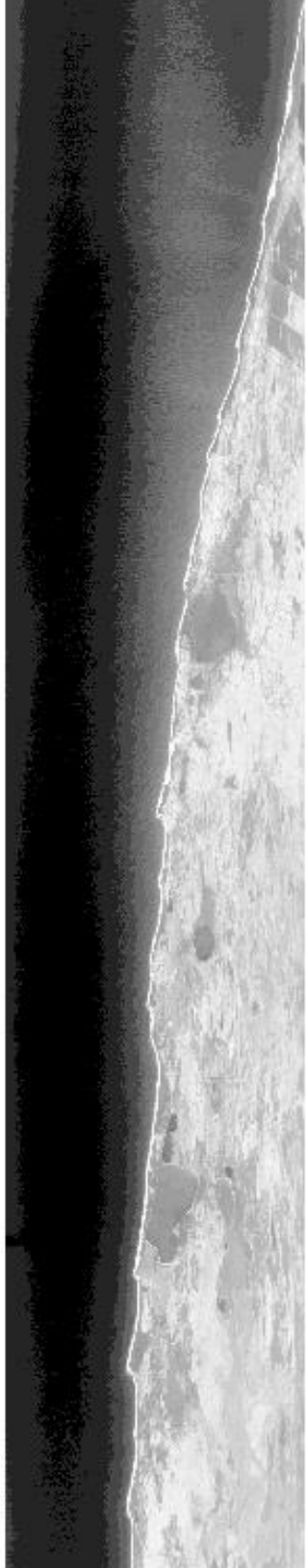
10:19:00

10:21:00

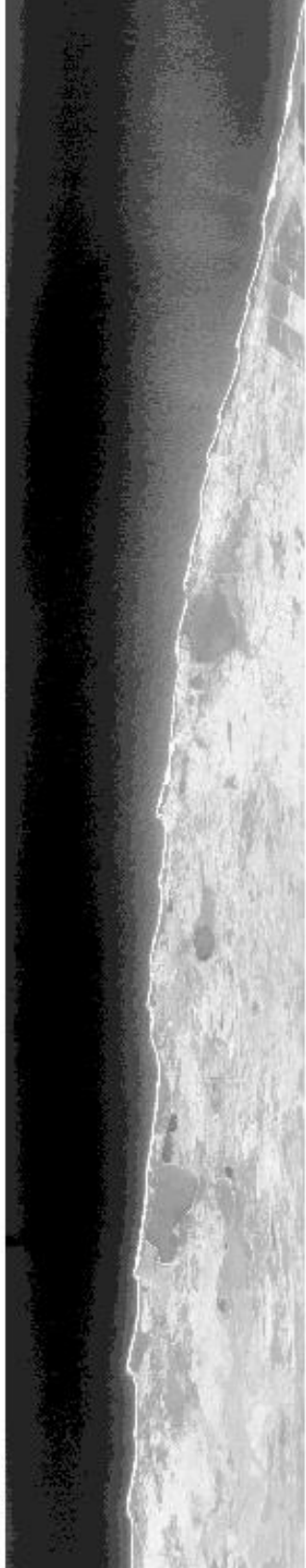
10:23:00



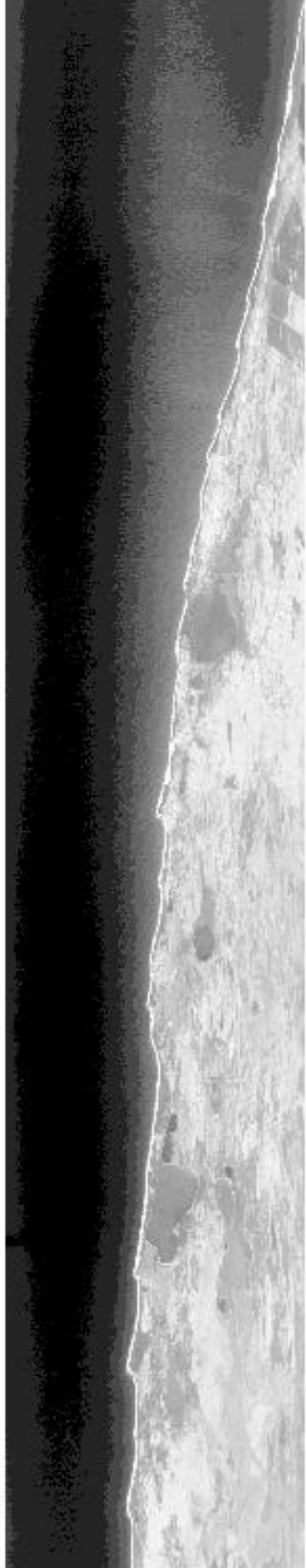
10:23:00



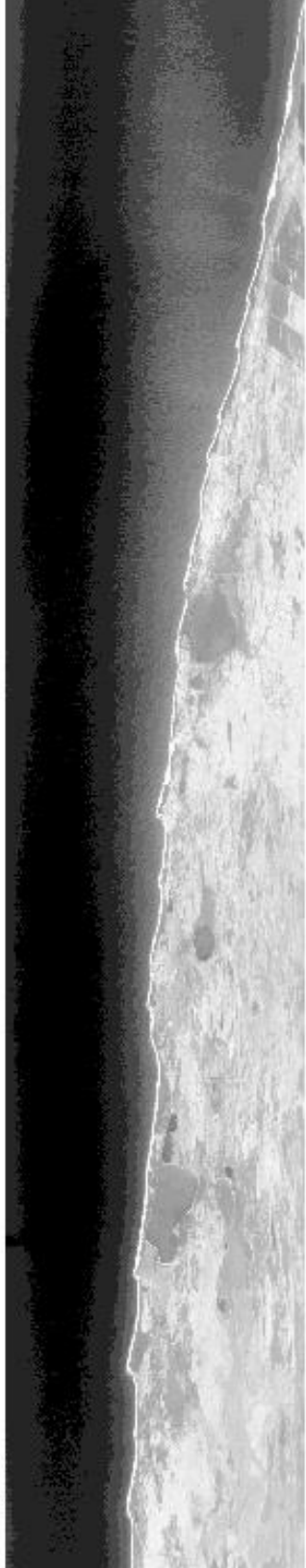
10:25:00



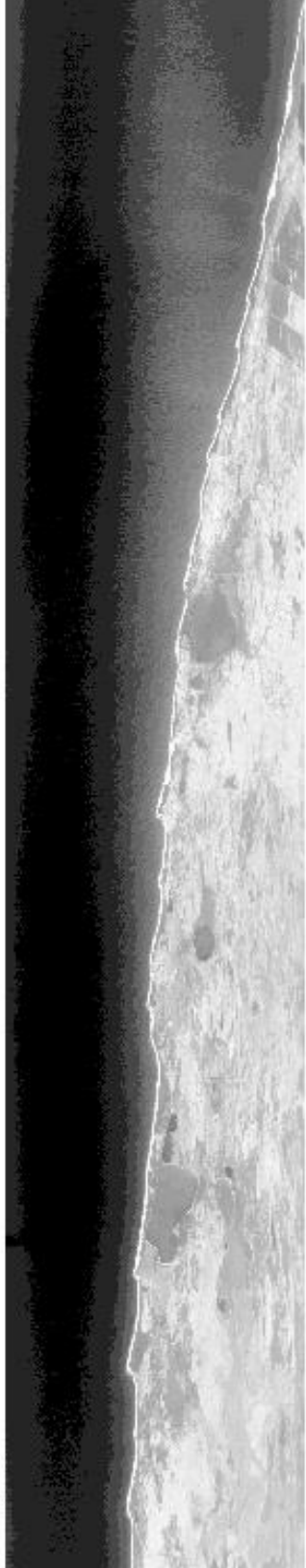
10:27:00



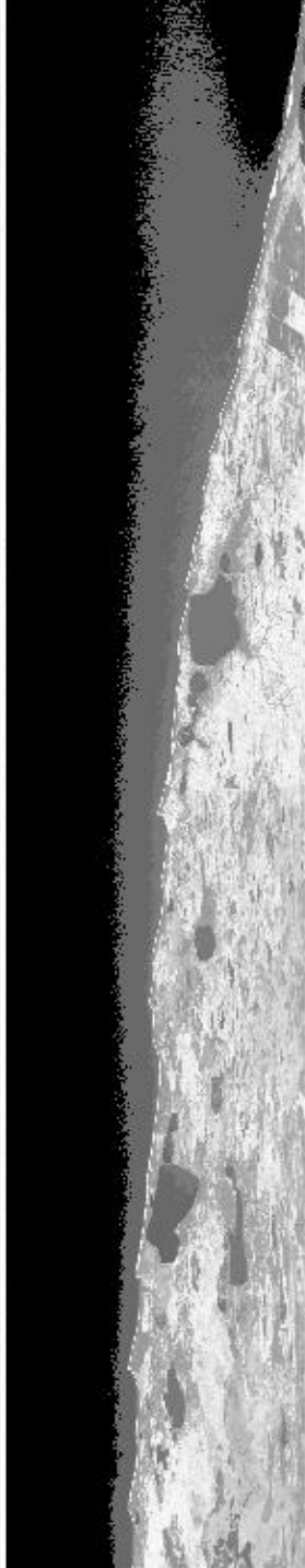
10:29:00



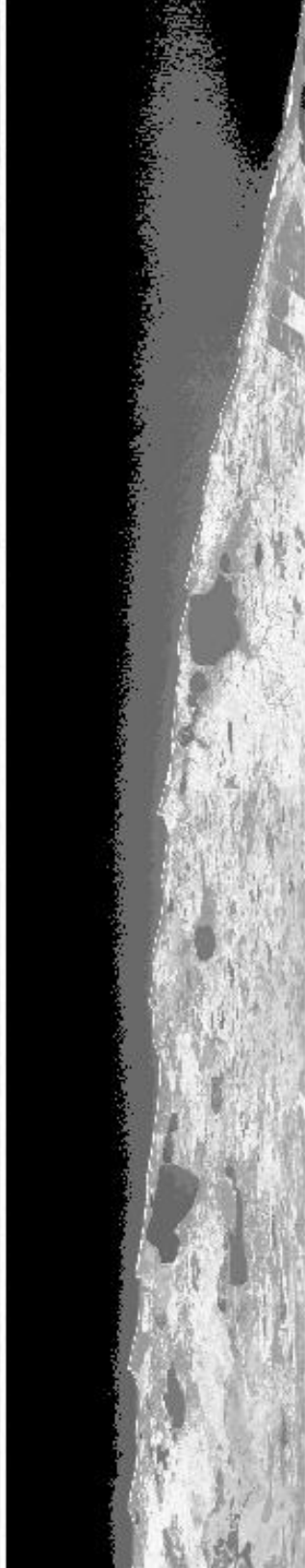
10:31:00



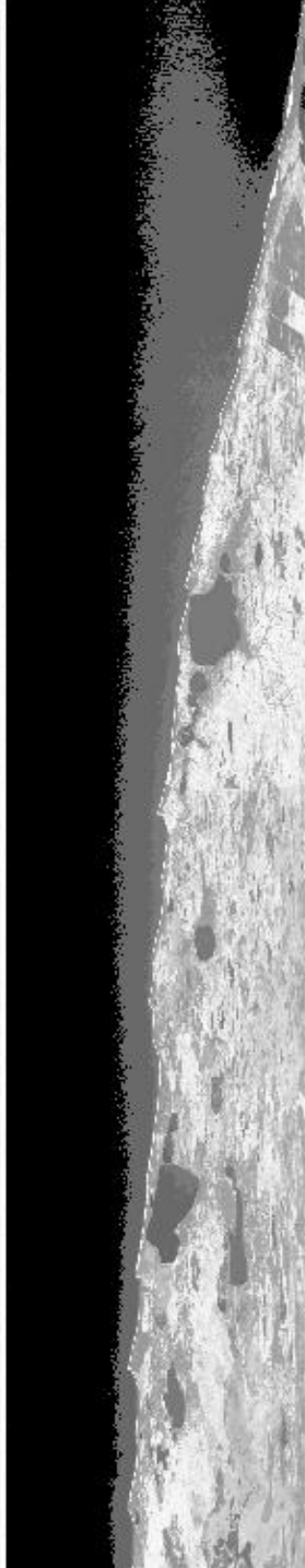
10:23:00



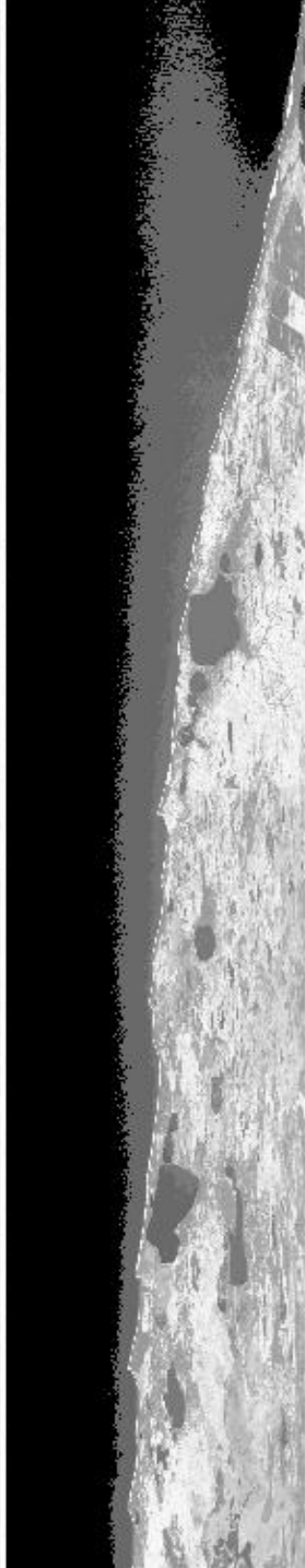
10:25:00



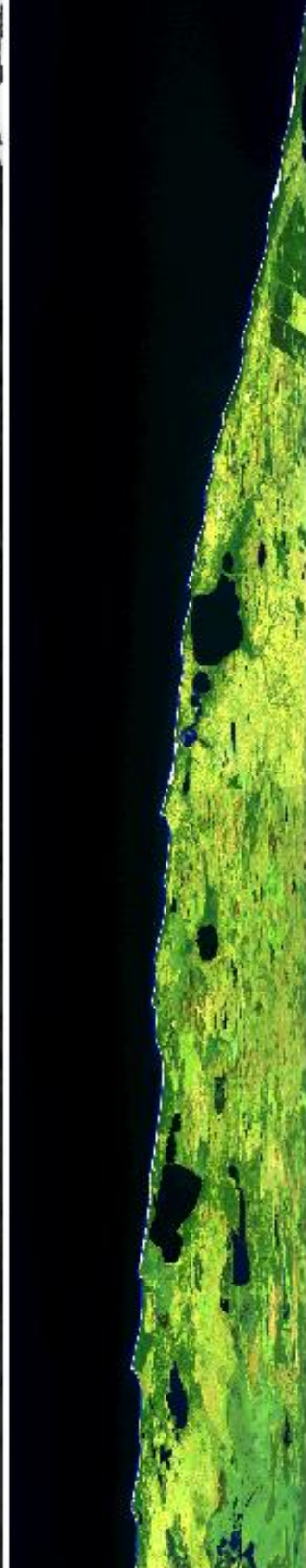
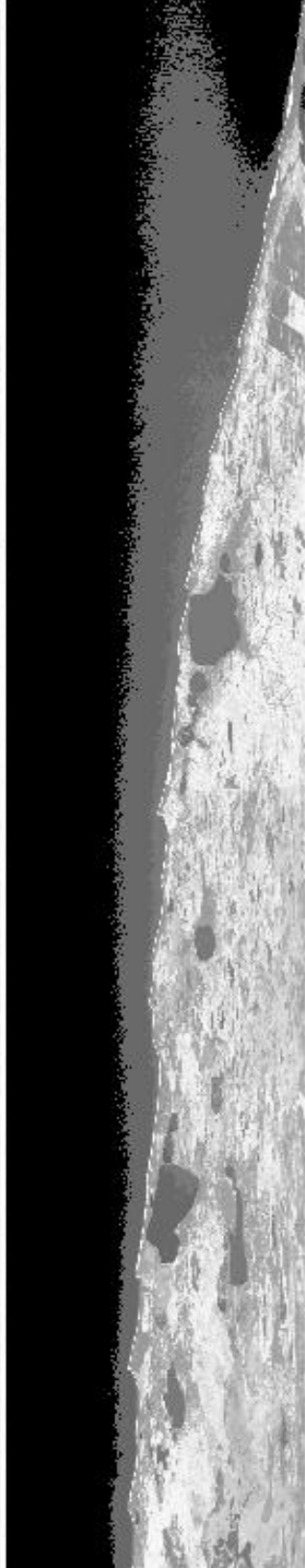
10:27:00



10:29:00



10:31:00



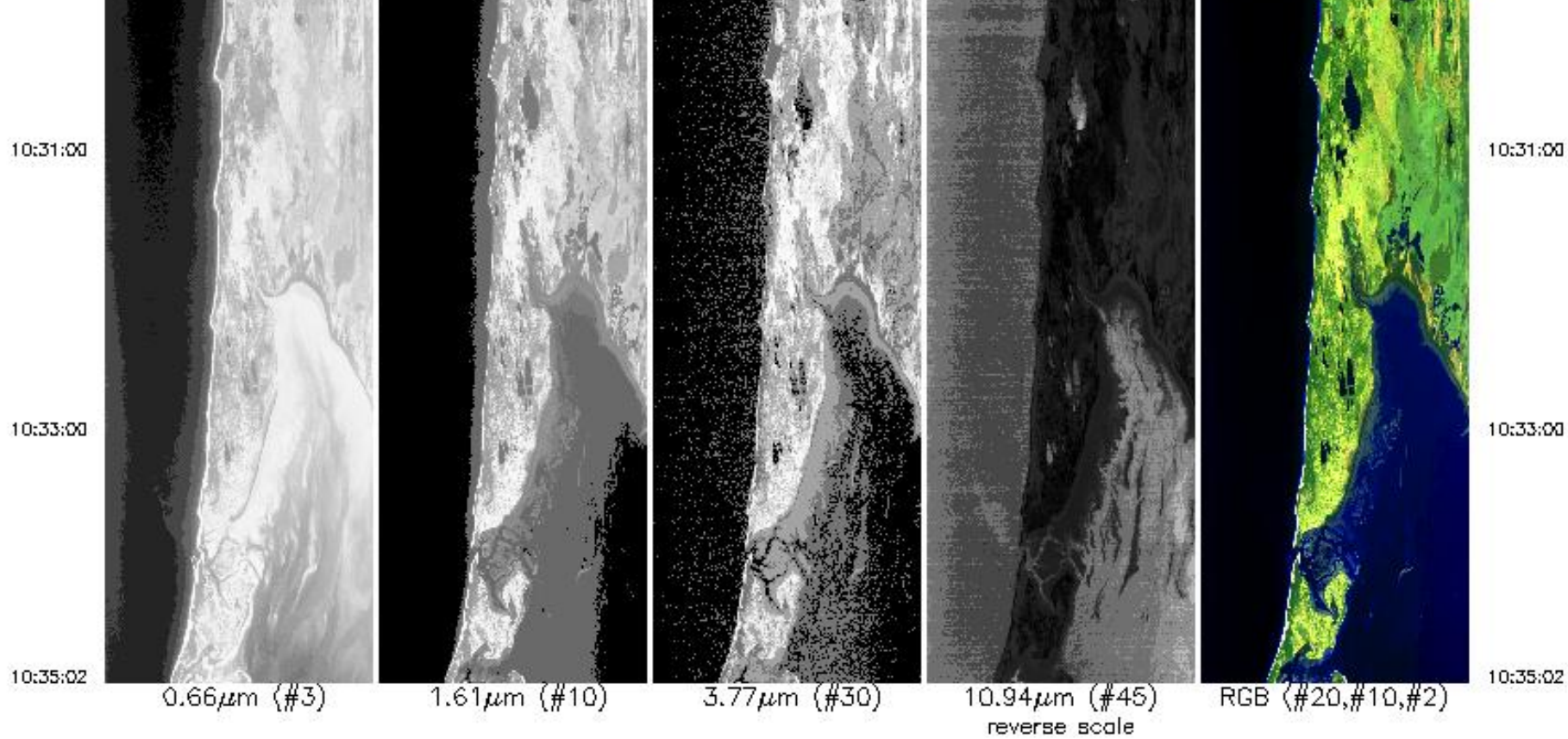
10:23:00

10:25:00

10:27:00

10:29:00

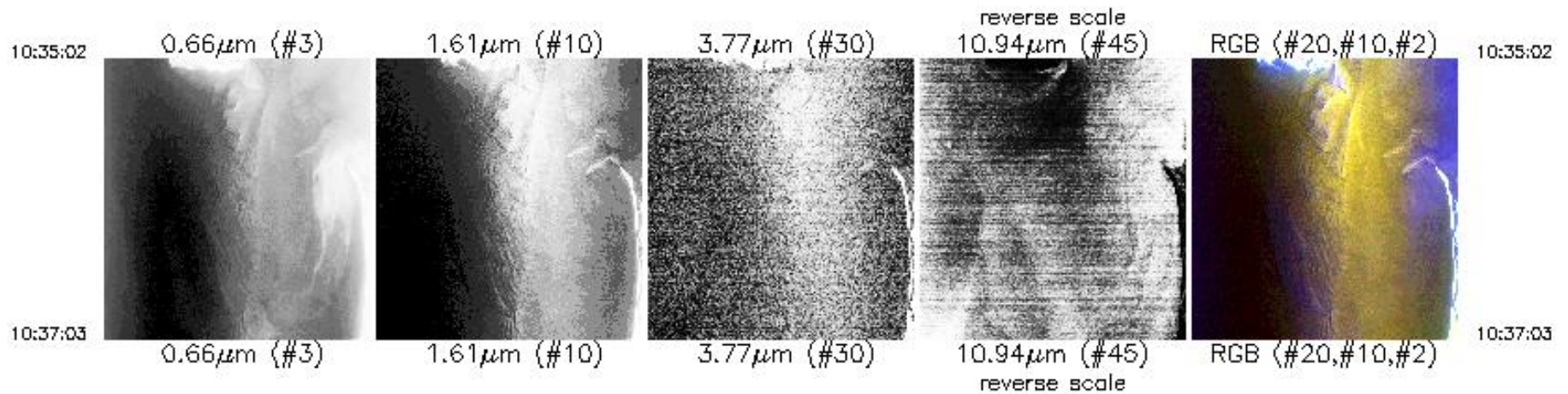
10:31:00



Upper Left Lat, Lon =  $-29.0^\circ$ ,  $33.1^\circ$   
 Lower Right Lat, Lon =  $-26.0^\circ$ ,  $32.7^\circ$   
 Aircraft Heading =  $354.2^\circ$   
 Solar Zenith =  $38.4^\circ$   
 GPS Altitude = 1991. m (MSL)

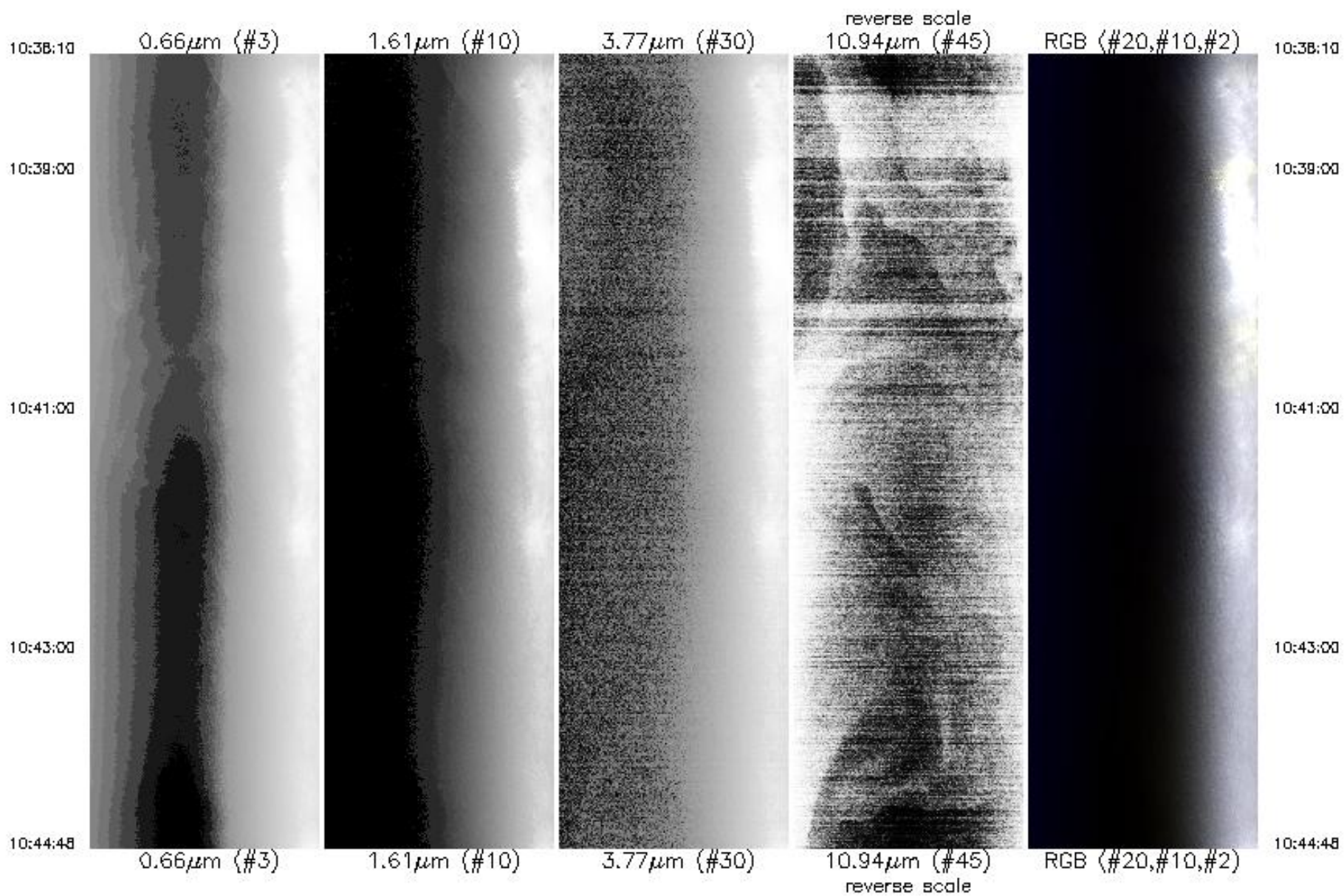


MODIS Airborne Simulator Browse Imagery  
 SAFARI 2000 Campaign – 29 Aug 2000  
 Botswana  
 Flight #00-153 Track #10



Upper Left Lat, Lon = -26.0°, 33.1°  
 Lower Right Lat, Lon = -25.7°, 32.7°  
 Aircraft Heading = 1.6°  
 Solar Zenith = 36.9°  
 GPS Altitude = 20092. m (MSL)

MODIS Airborne Simulator Browse Imagery  
SAFARI 2000 Campaign - 29 Aug 2000  
Botswana/Namibia  
Flight #00-153 Track #11



Upper Left Lat Lon = -25.8° 33.0°



10:44:48



0.66 $\mu$ m (#3)



1.61 $\mu$ m (#10)



3.77 $\mu$ m (#30)



10.94 $\mu$ m (#45)  
reverse scale

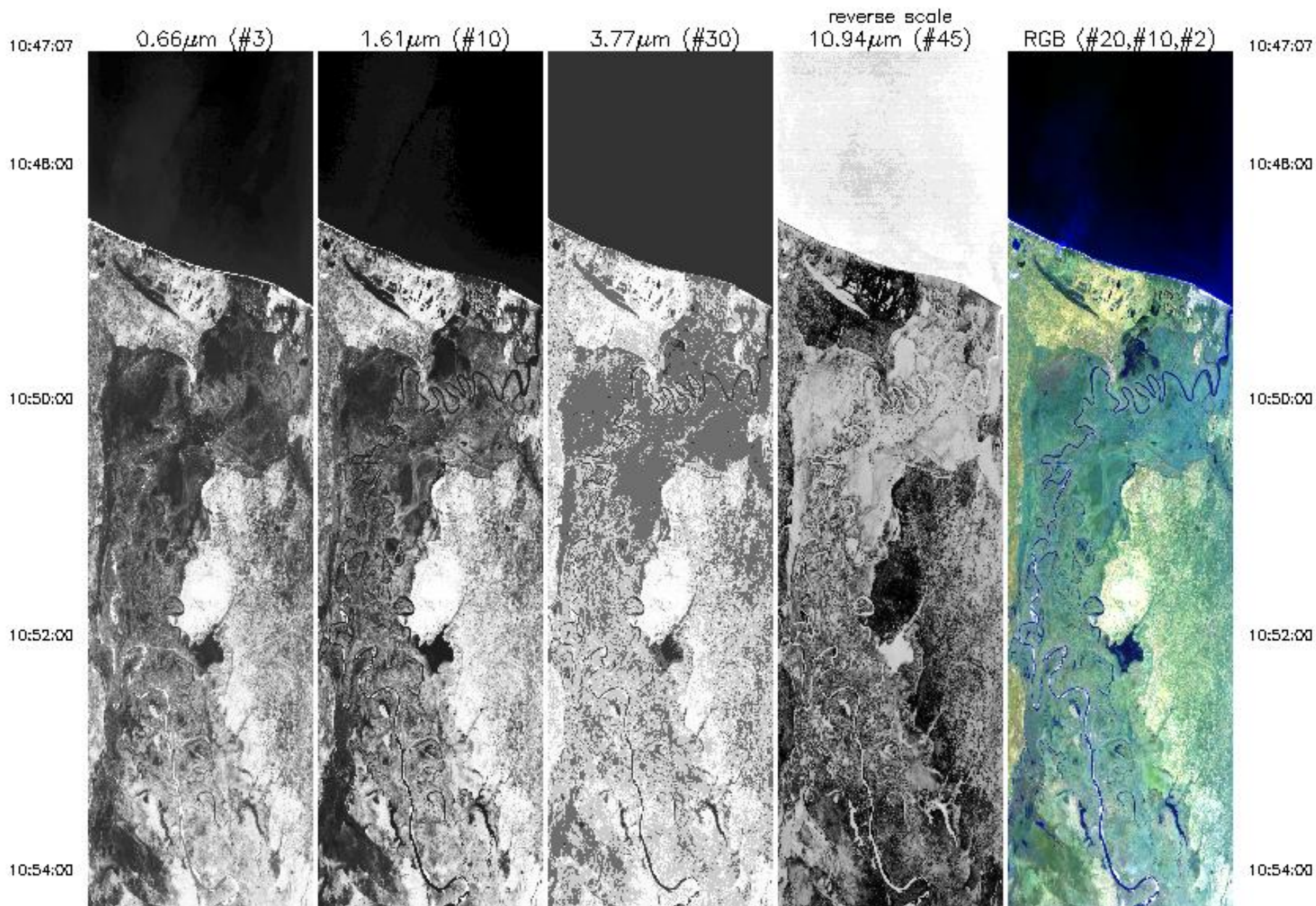


RGB (#20,#10,#2)

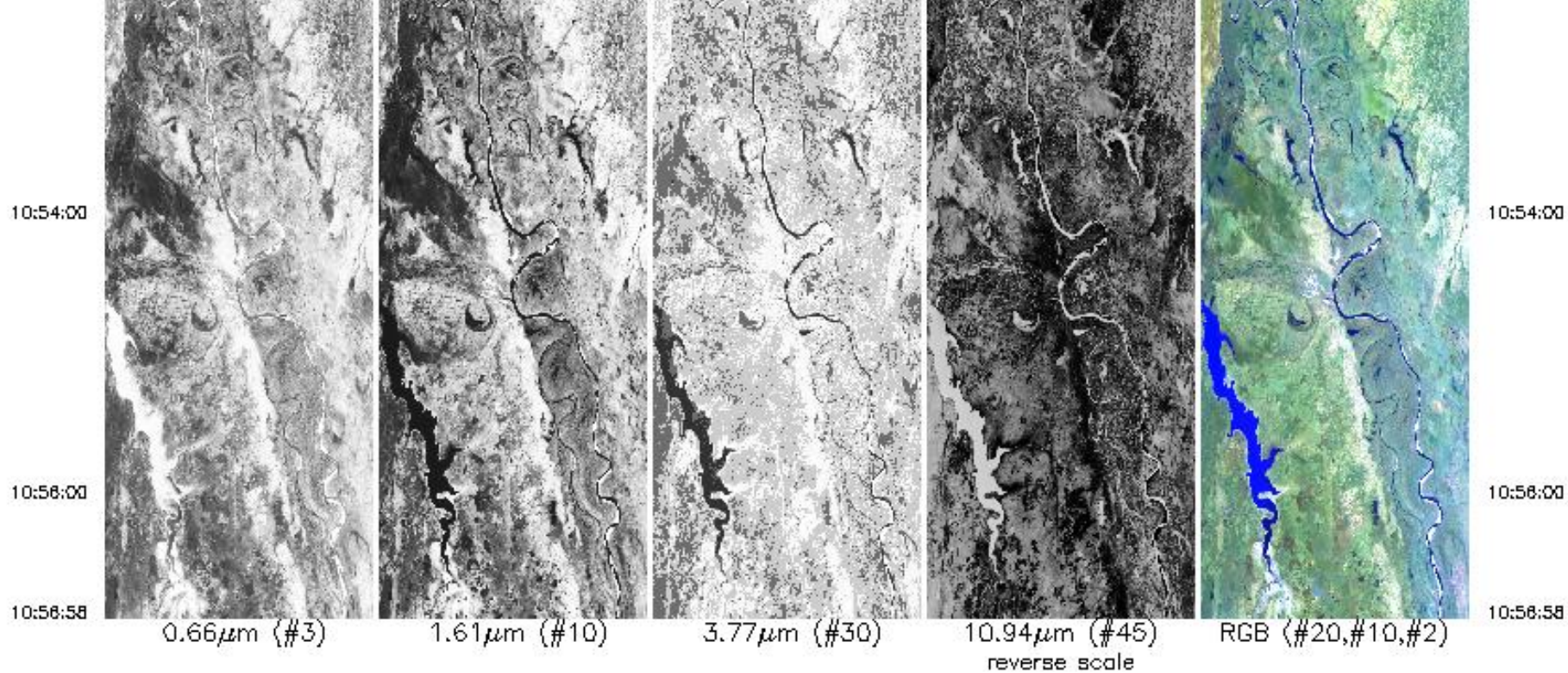
10:44:48

Upper Left Lat, Lon =  $-25.8^\circ$ ,  $33.0^\circ$   
Lower Right Lat, Lon =  $-25.3^\circ$ ,  $33.8^\circ$   
Aircraft Heading =  $80.3^\circ$   
Solar Zenith =  $37.0^\circ$   
GPS Altitude = 20046. m (MSL)

MODIS Airborne Simulator Browse Imagery  
SAFARI 2000 Campaign - 29 Aug 2000  
Botswana/Namibia  
Flight #00-153 Track #12



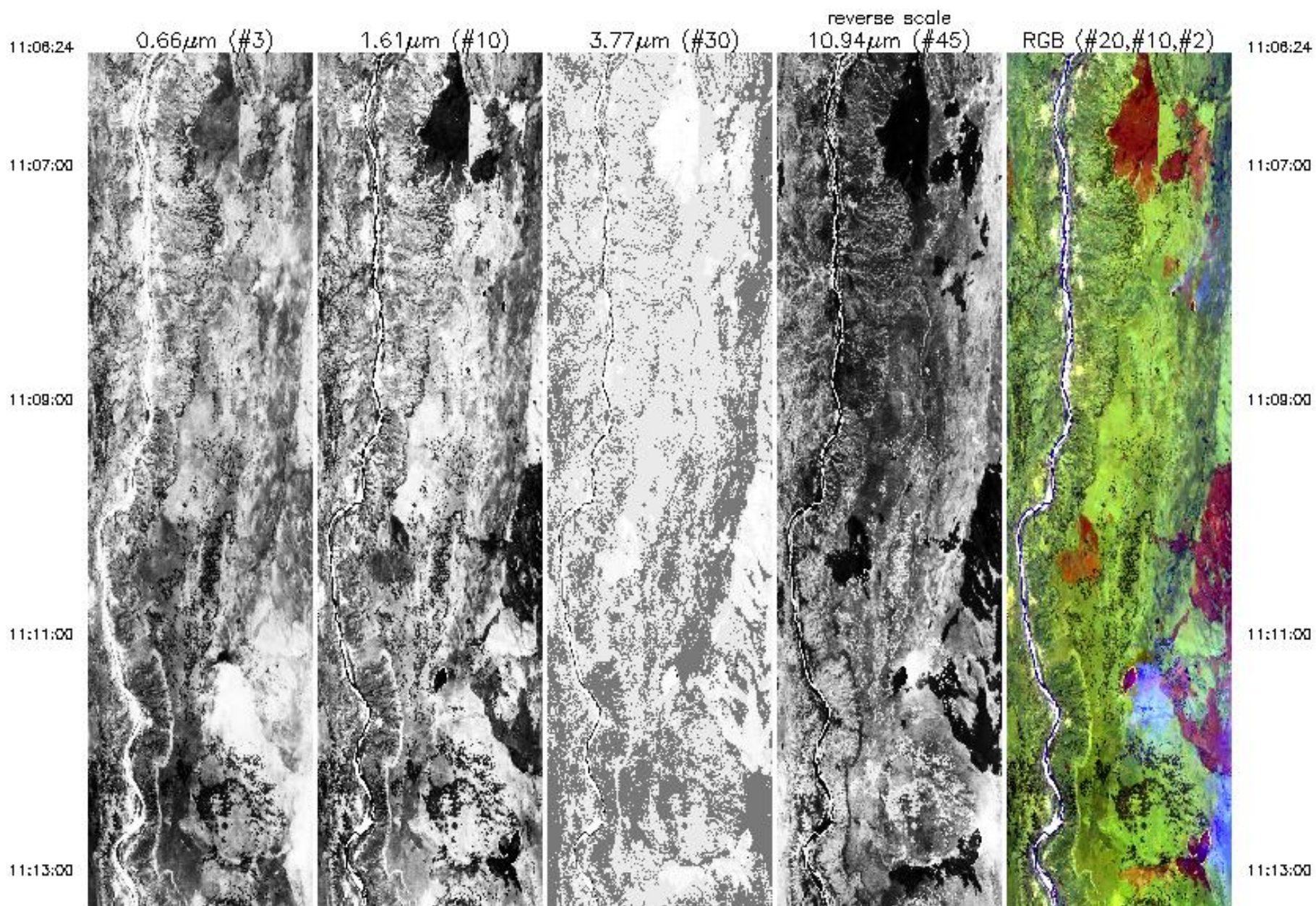




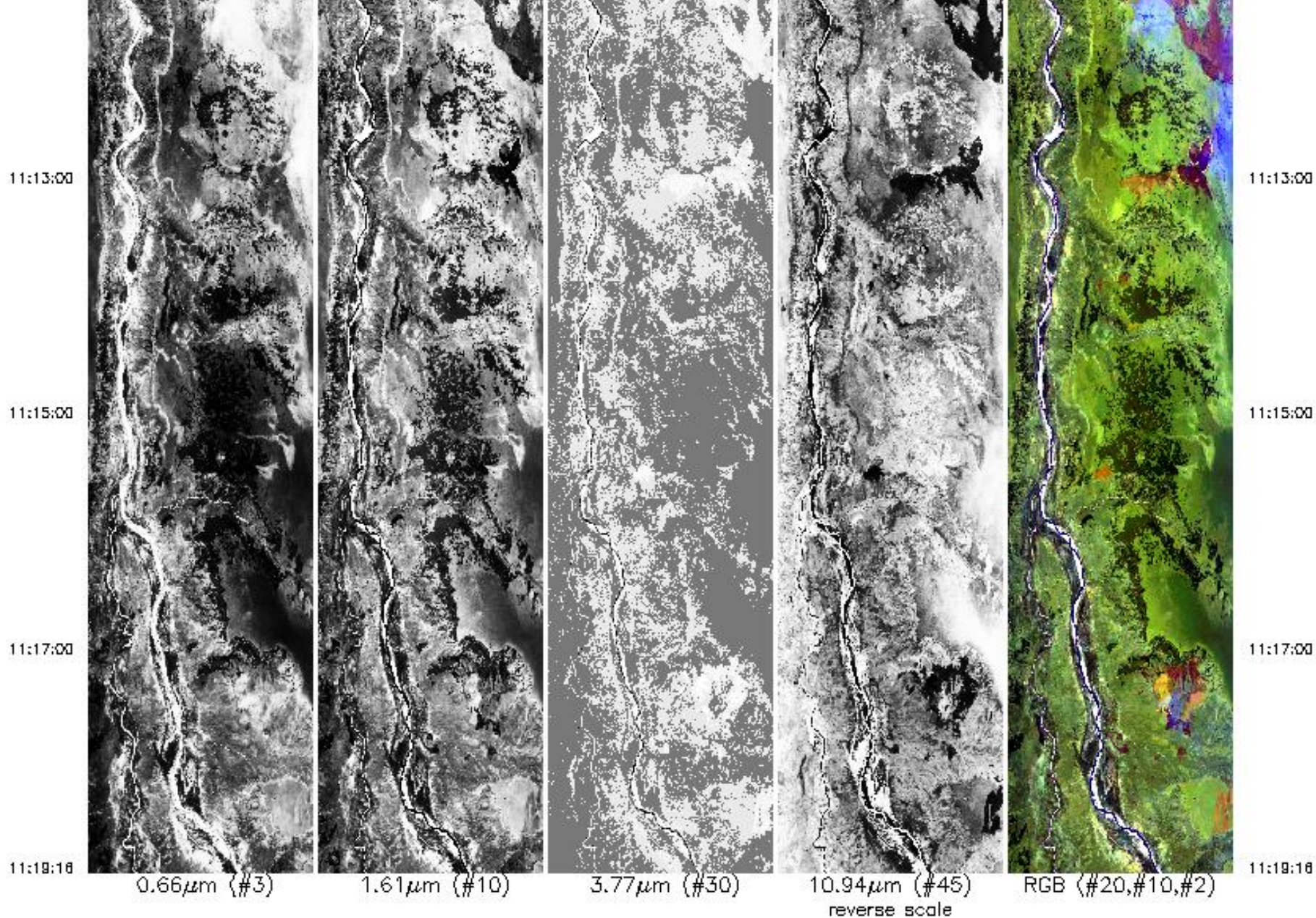
Upper Left Lat, Lon =  $-25.2^\circ$ ,  $34.0^\circ$   
 Lower Right Lat, Lon =  $-24.5^\circ$ ,  $33.0^\circ$   
 Aircraft Heading =  $324.3^\circ$   
 Solar Zenith =  $37.5^\circ$   
 GPS Altitude = 20037. m (MSL)



MODIS Airborne Simulator Browse Imagery  
SAFARI 2000 Campaign - 29 Aug 2000  
Botswana  
Flight #00-153 Track #13







Upper Left Lat, Lon =  $-23.5^\circ$ ,  $32.6^\circ$   
 Lower Right Lat, Lon =  $-22.5^\circ$ ,  $31.4^\circ$   
 Aircraft Heading =  $323.7^\circ$   
 Solar Zenith =  $37.5^\circ$   
 GPS Altitude = 20014. m (MSL)

Lower Right Lat, Lon = -22.5°, 31.4°

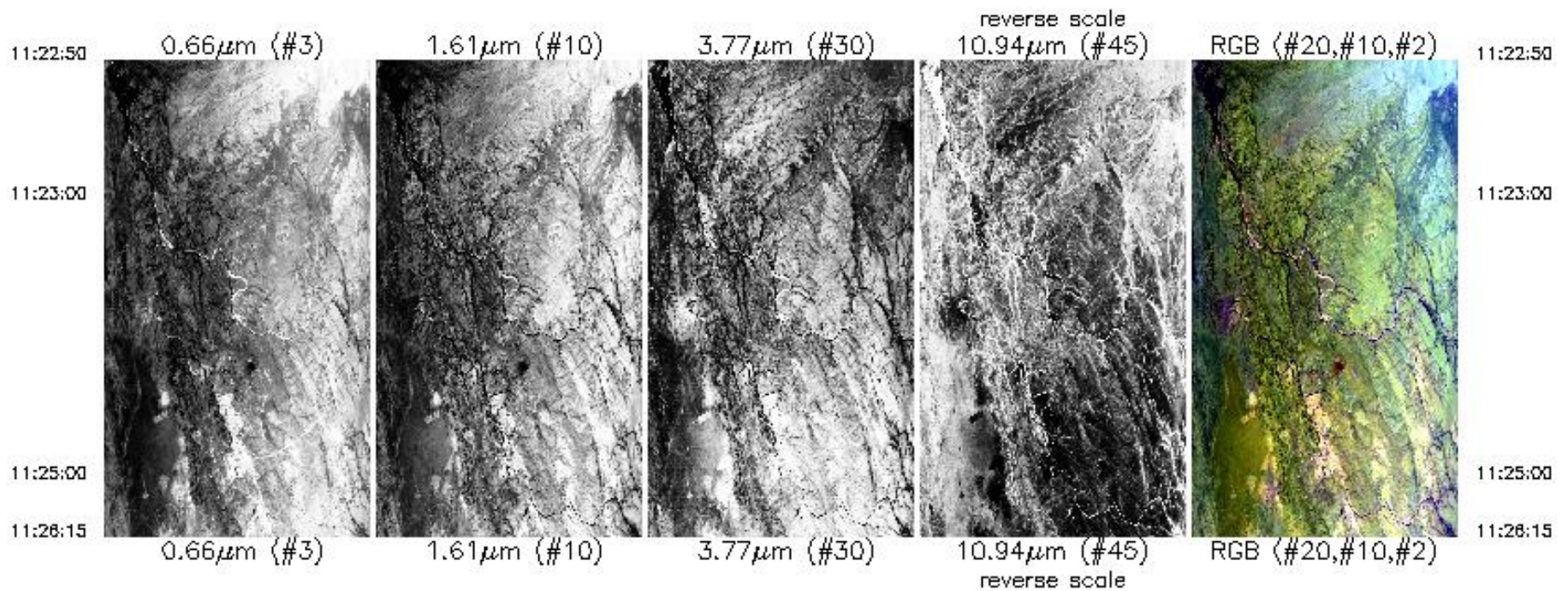
Aircraft Heading = 323.7°

Solar Zenith = 37.5°

GPS Altitude = 20014. m (MSL)



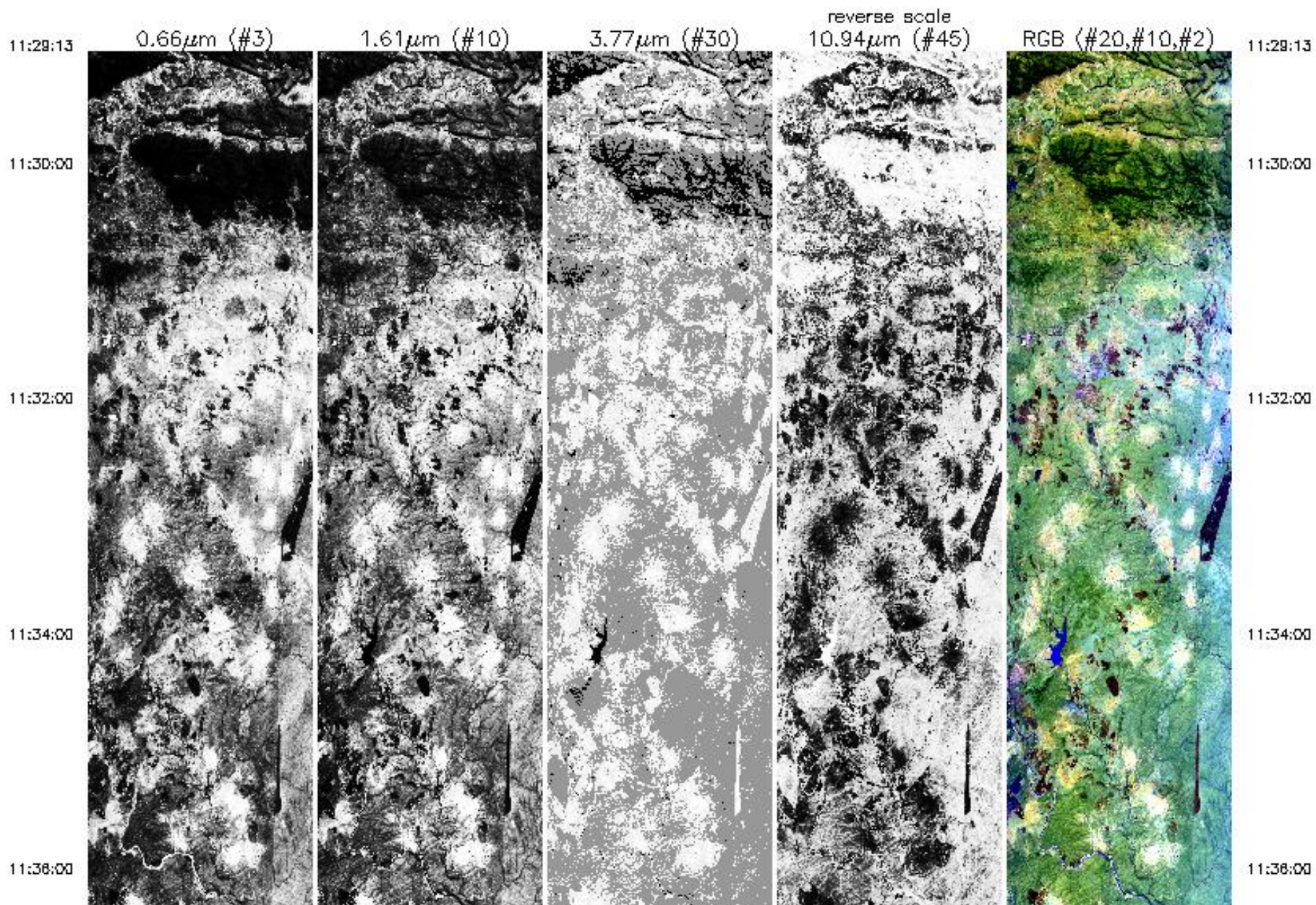
MODIS Airborne Simulator Browse Imagery  
 SAFARI 2000 Campaign – 29 Aug 2000  
 Botswana  
 Flight #00-153 Track #14



Upper Left Lat, Lon = -22.4°, 31.3°  
 Lower Right Lat, Lon = -22.6°, 30.8°  
 Aircraft Heading = 288.5°  
 Solar Zenith = 38.1°  
 GPS Altitude = 19661. m (MSL)



MODIS Airborne Simulator Browse Imagery  
SAFARI 2000 Campaign - 29 Aug 2000  
Botswana  
Flight #00-153 Track #15





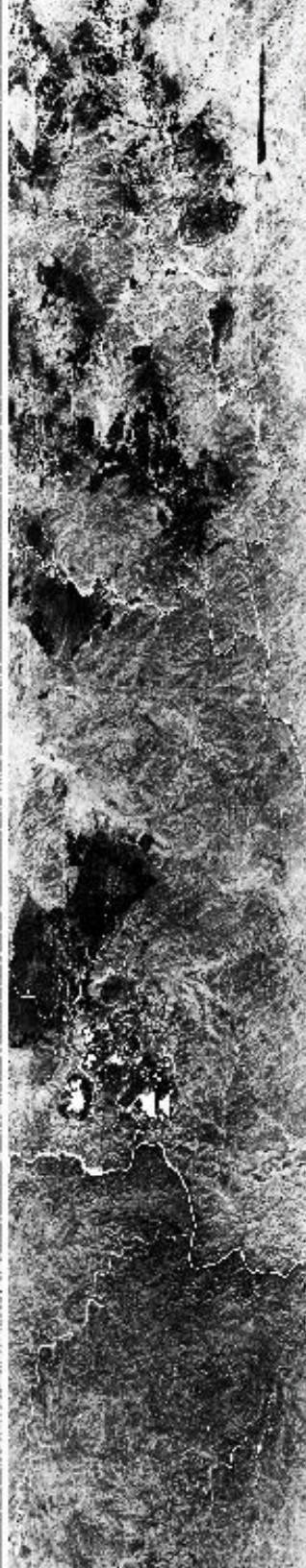
11:36:00

11:36:00

11:40:00

11:42:00

11:44:00



11:36:00

11:36:00

11:40:00

11:42:00

11:44:00



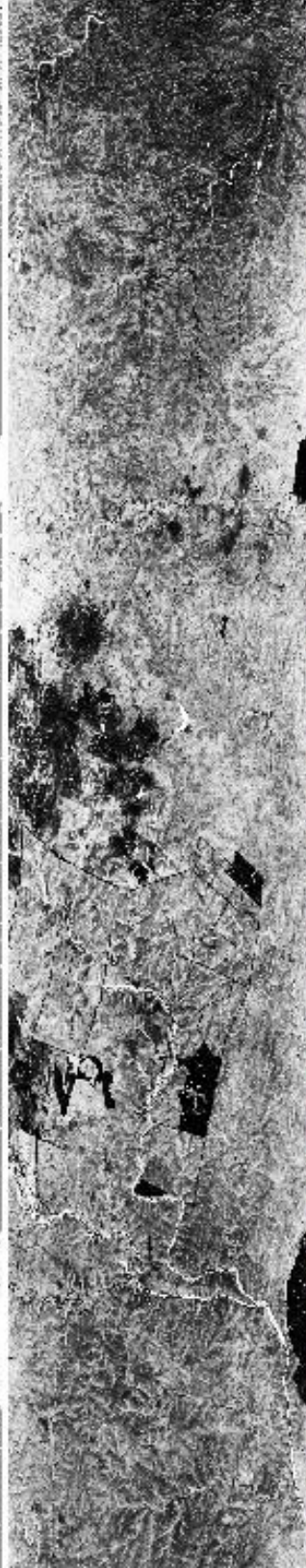
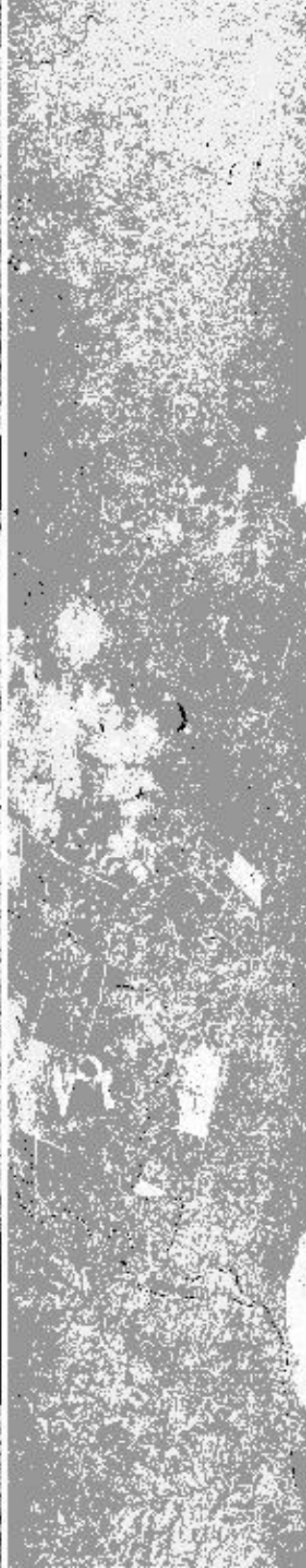
11:44:00

11:46:00

11:48:00

11:50:00

11:52:00



11:44:00

11:46:00

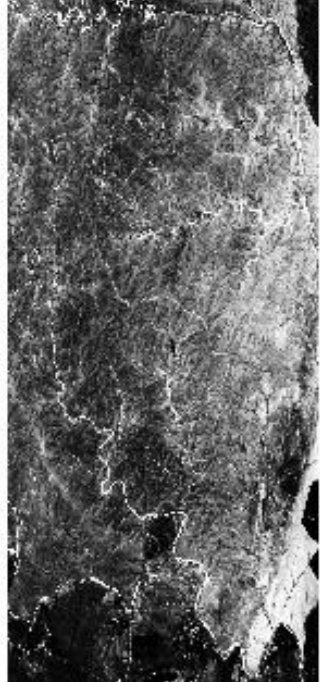
11:48:00

11:50:00

11:52:00



11:52:00



0.66 $\mu$ m (#3)



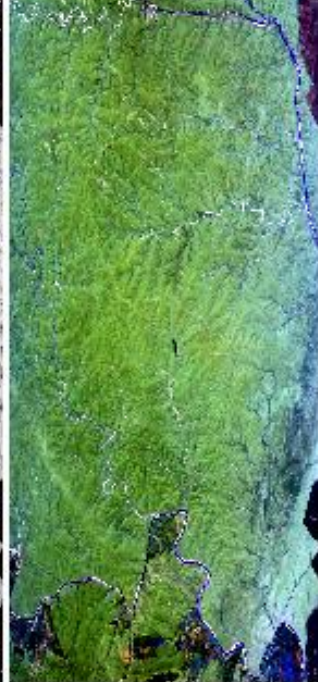
1.61 $\mu$ m (#10)



3.77 $\mu$ m (#30)



10.94 $\mu$ m (#45)  
reverse scale



RGB (#20,#10,#2)

11:54:00

11:55:18

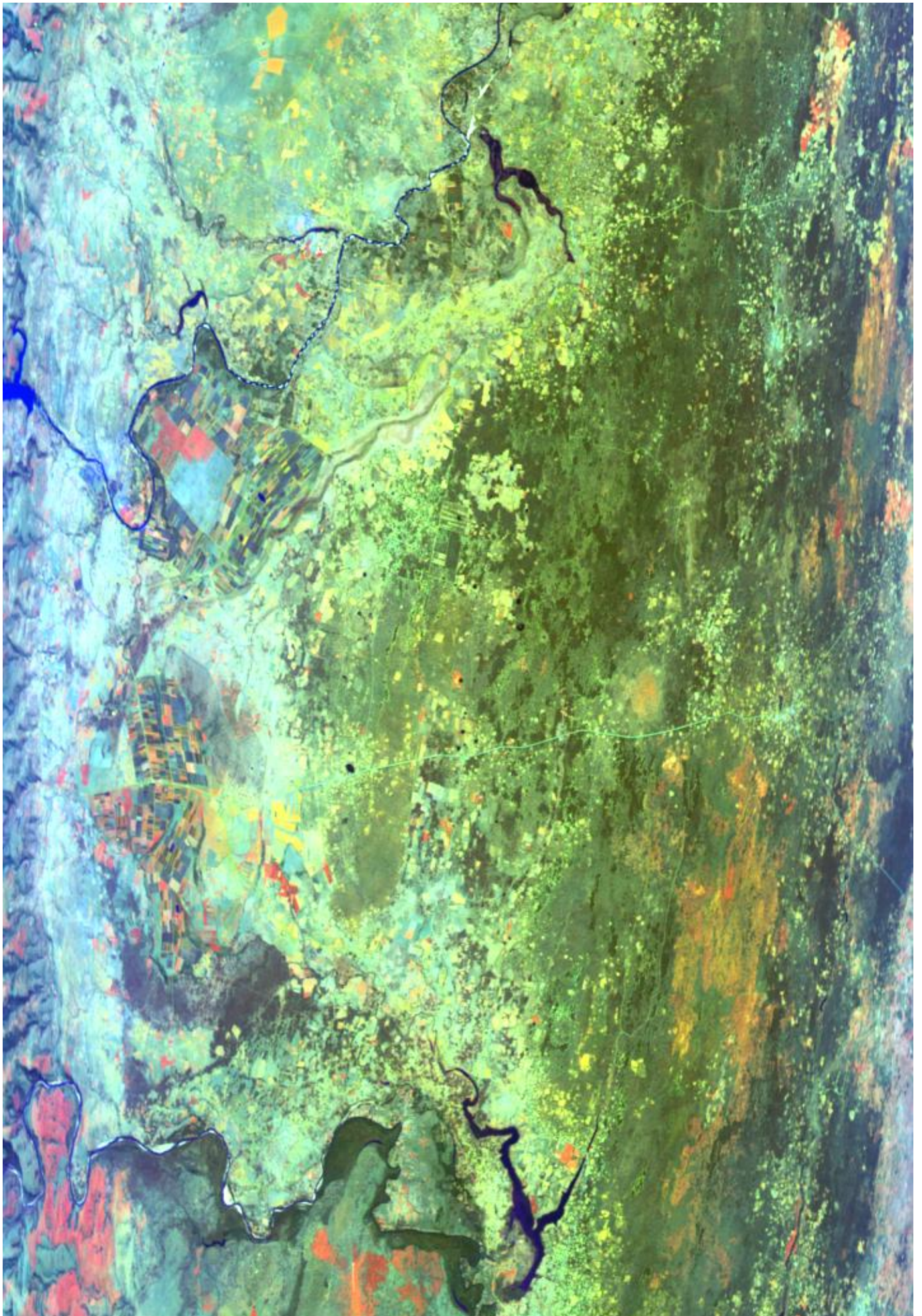
11:52:00

11:54:00

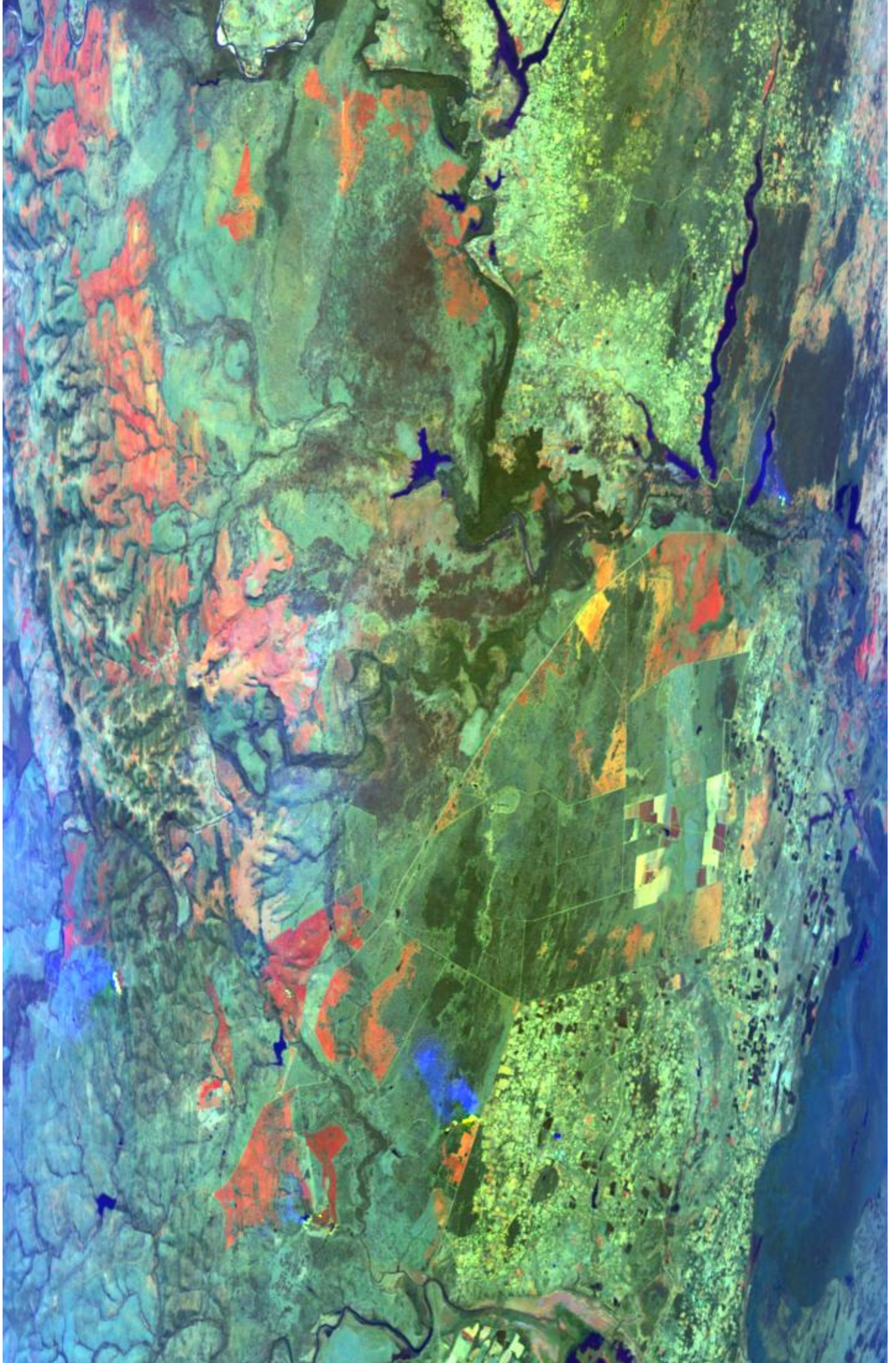
11:55:18

Upper Left Lat, Lon =  $-22.7^{\circ}$ ,  $30.4^{\circ}$   
Lower Right Lat, Lon =  $-25.4^{\circ}$ ,  $32.0^{\circ}$   
Aircraft Heading =  $158.4^{\circ}$   
Solar Zenith =  $38.7^{\circ}$   
GPS Altitude = 19964. m (MSL)

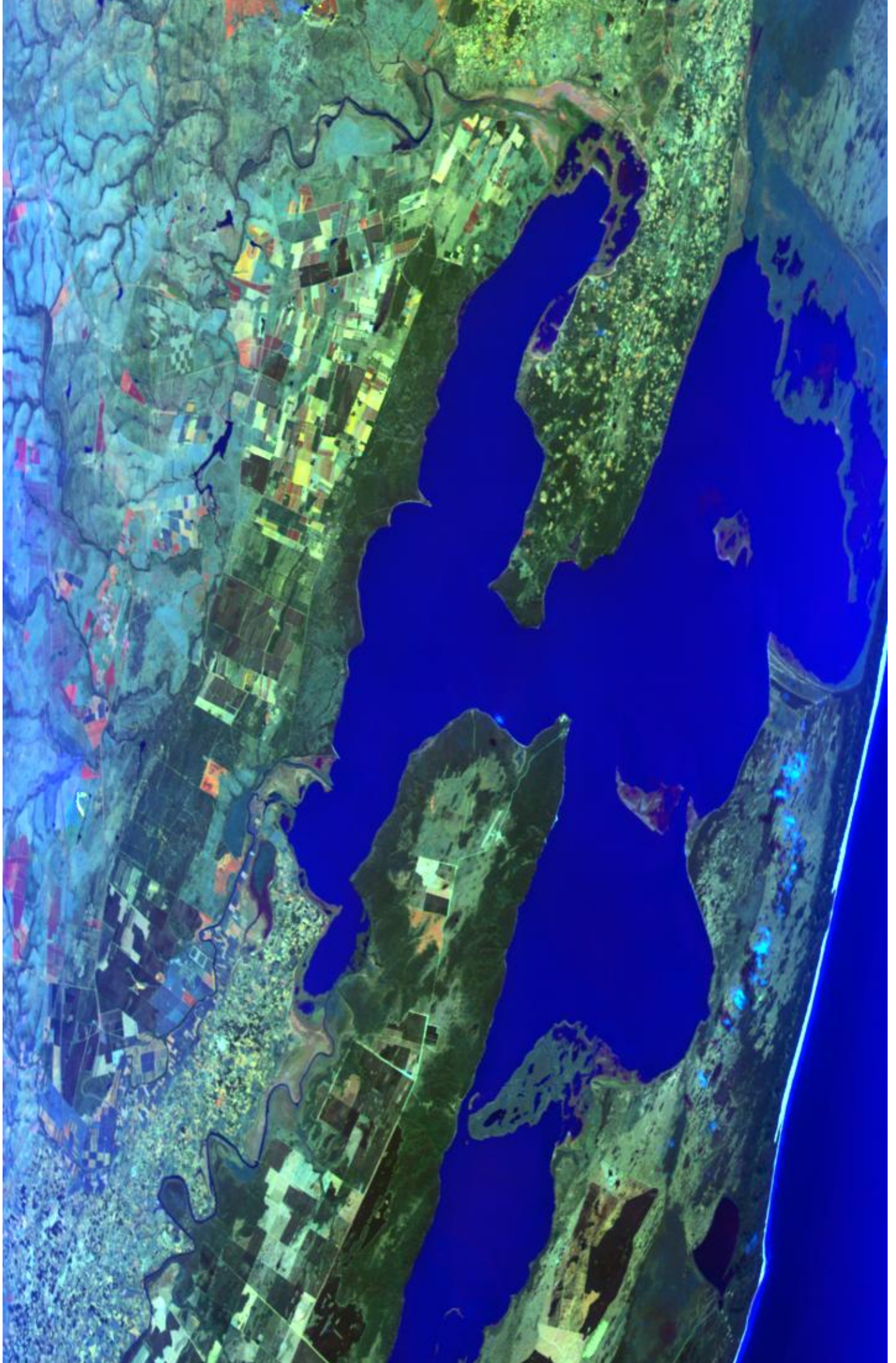




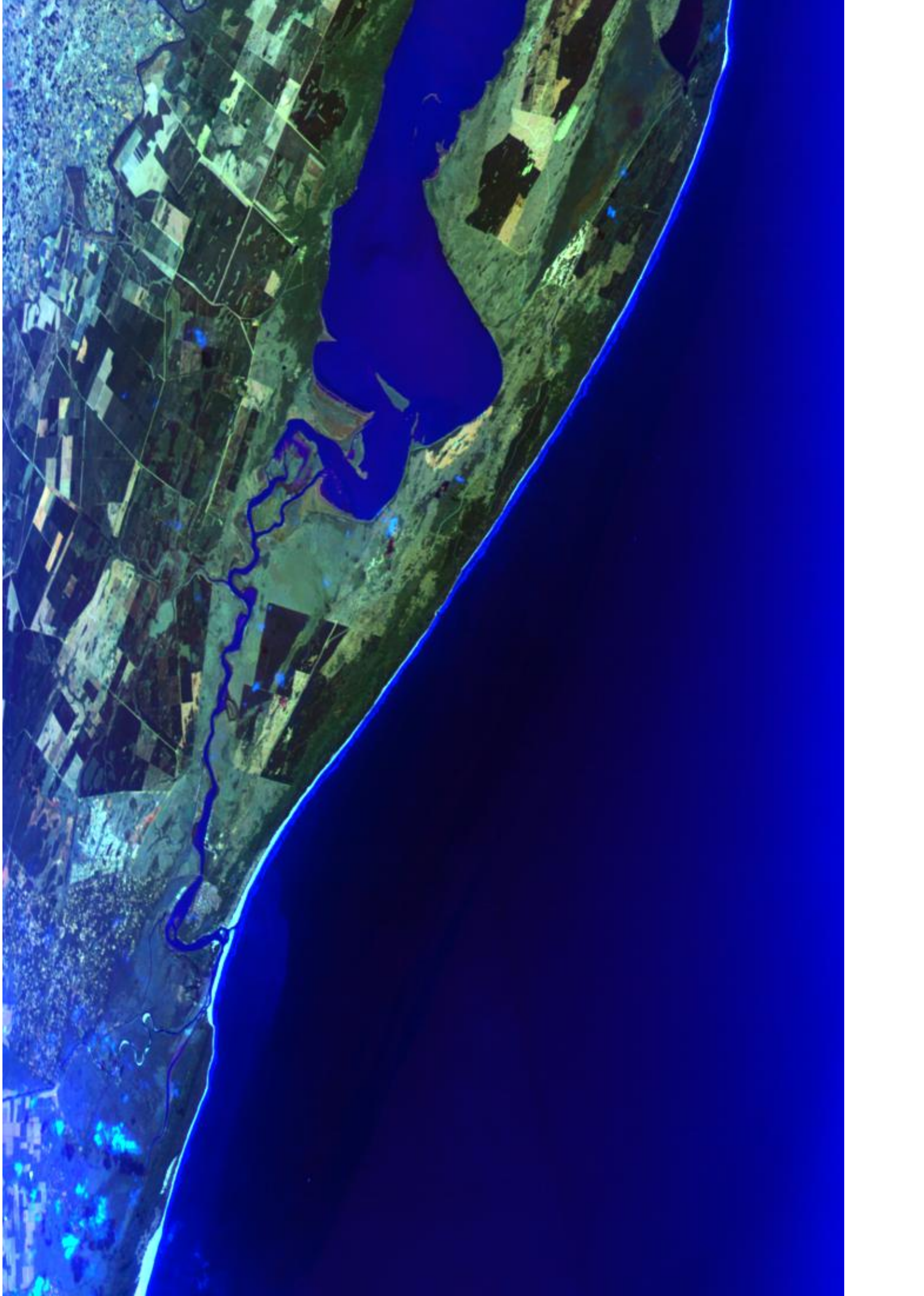










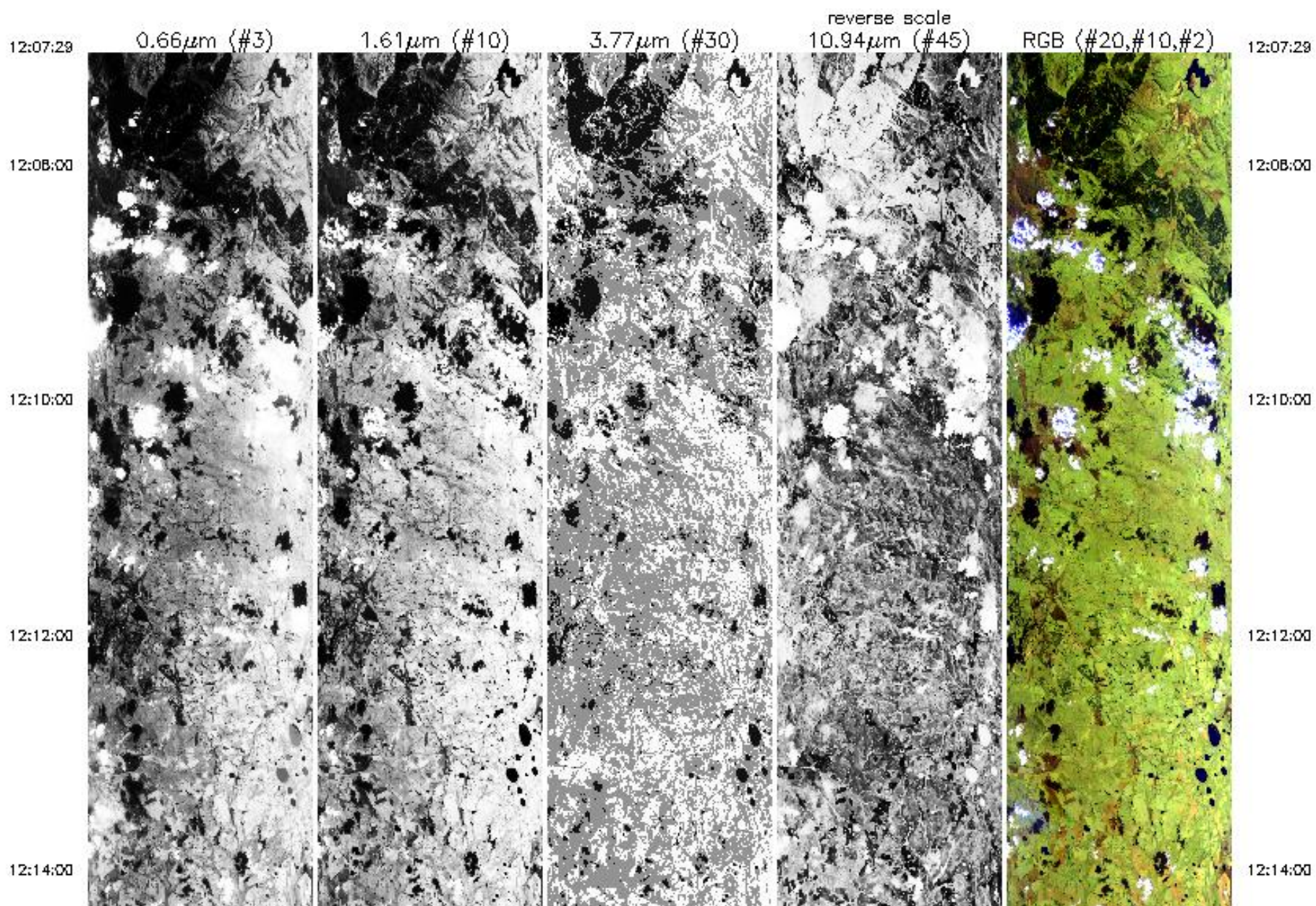




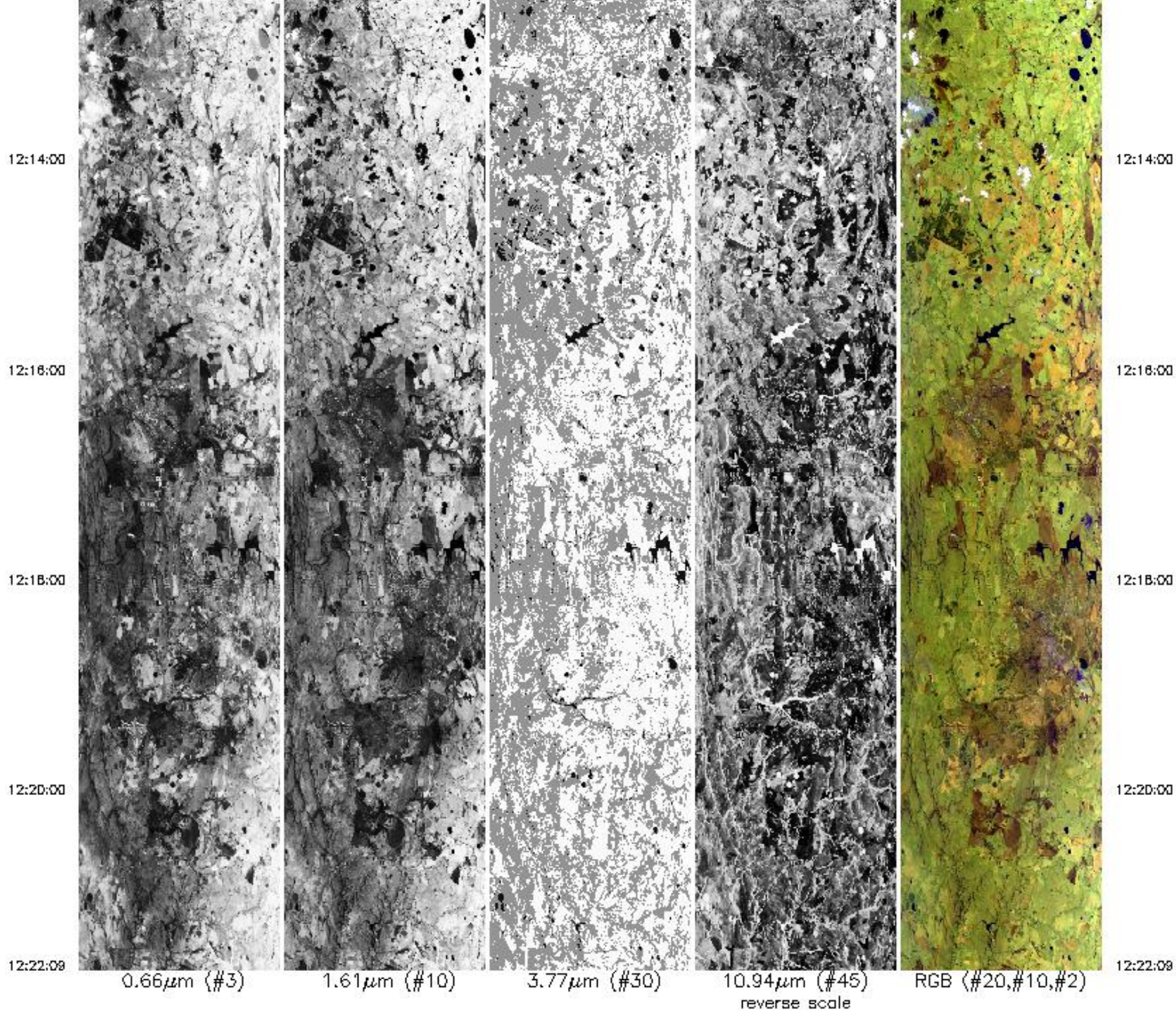




MODIS Airborne Simulator Browse Imagery  
SAFARI 2000 Campaign - 29 Aug 2000  
Botswana  
Flight #00-153 Track #16







Upper Left Lat, Lon =  $-25.6^\circ$ ,  $30.6^\circ$



12:22:08



0.66 $\mu\text{m}$  (#3)



1.61 $\mu\text{m}$  (#10)



3.77 $\mu\text{m}$  (#30)



10.94 $\mu\text{m}$  (#45)  
reverse scale



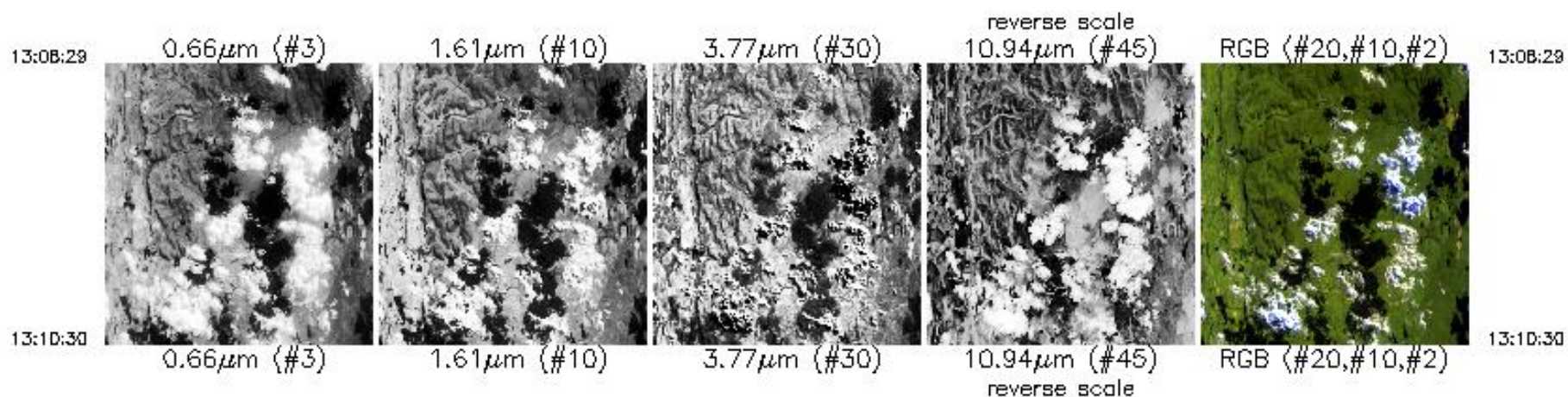
RGB (#20, #10, #2)

12:22:08

Upper Left Lat, Lon =  $-25.6^\circ$ ,  $30.6^\circ$   
Lower Right Lat, Lon =  $-26.0^\circ$ ,  $28.8^\circ$   
Aircraft Heading =  $268.3^\circ$   
Solar Zenith =  $46.8^\circ$   
GPS Altitude = 20072. m (MSL)



MODIS Airborne Simulator Browse Imagery  
SAFARI 2000 Campaign – 29 Aug 2000  
Botswana  
Flight #00-153 Track #17

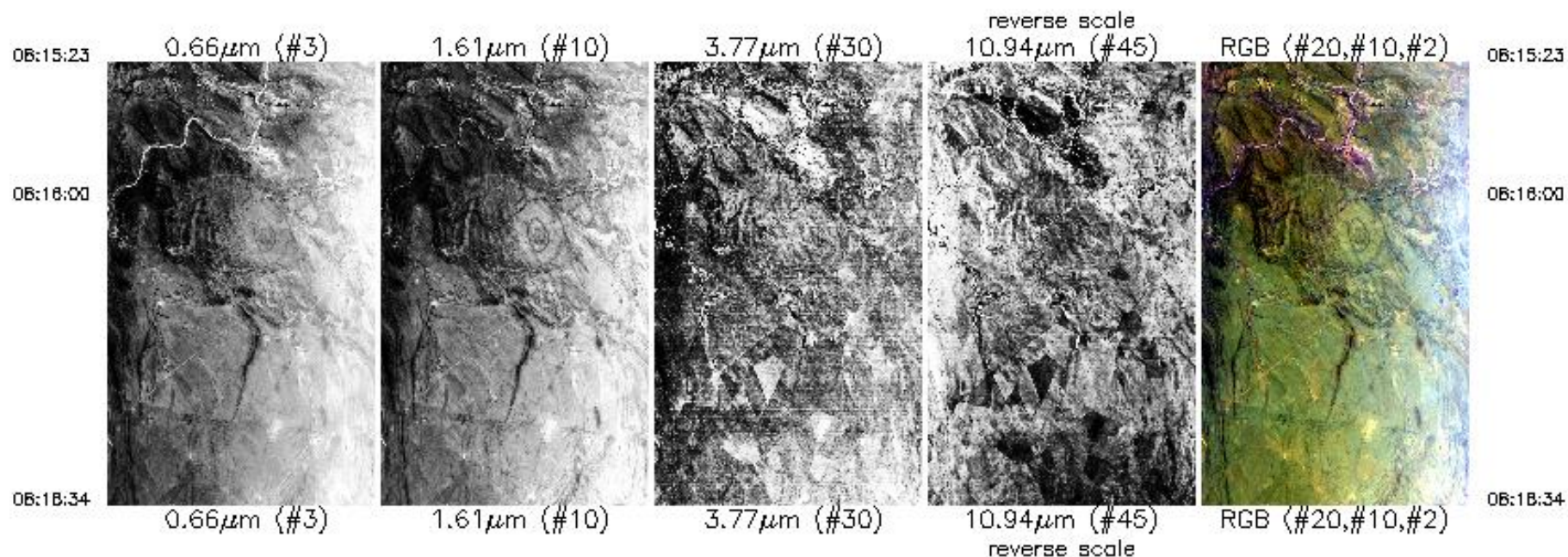


Upper Left Lat, Lon = -24.5°, 27.9°  
Lower Right Lat, Lon = -24.2°, 28.1°  
Aircraft Heading = 83.5°  
Solar Zenith = 55.2°  
GPS Altitude = 20136. m (MSL)



## Flight #00-153 Browse Imagery

MODIS Airborne Simulator Browse Imagery  
SAFARI 2000 Campaign – 29 Aug 2000  
Botswana  
Flight #00-153 Track #1

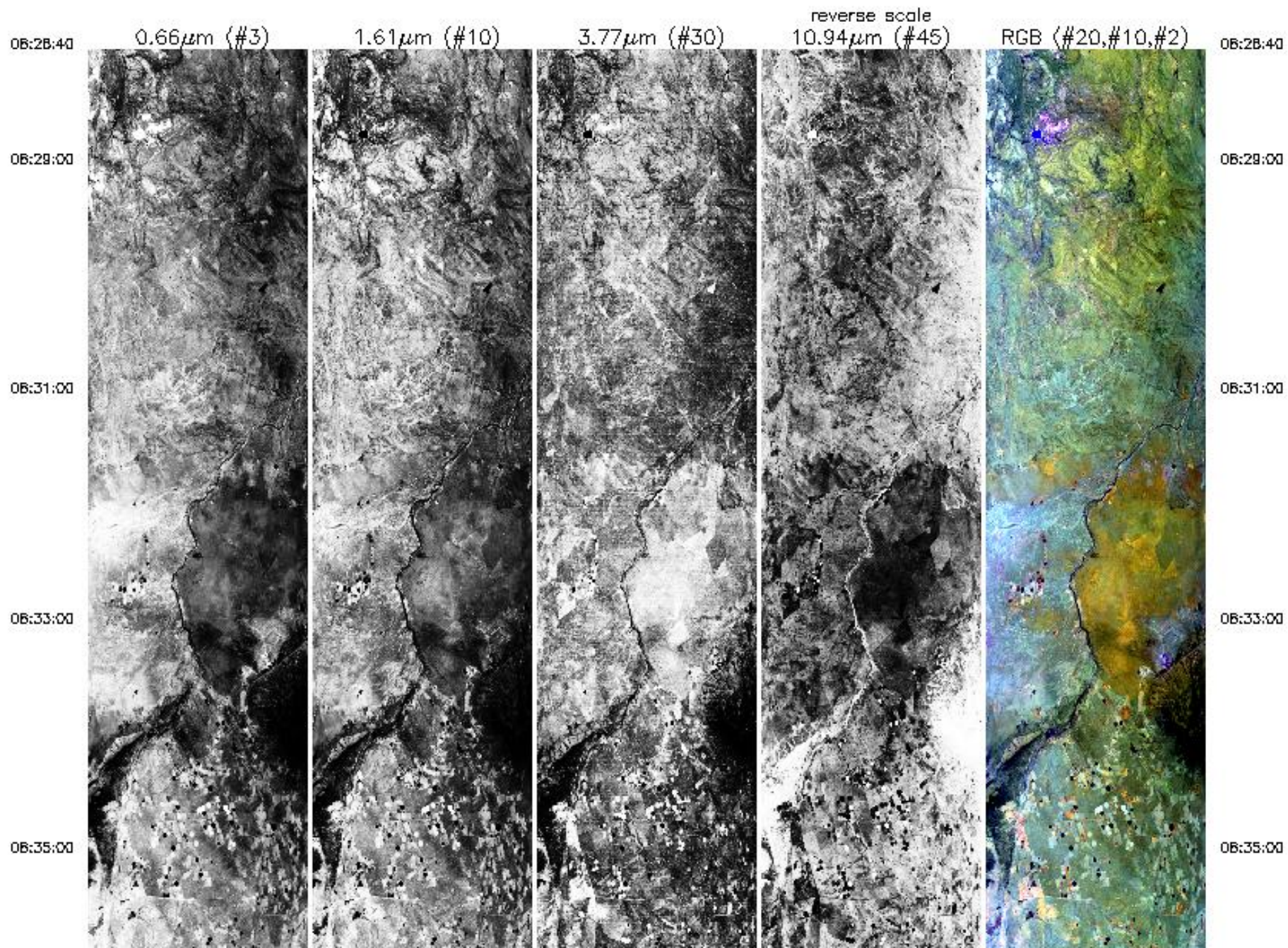


Upper Left Lat, Lon =  $-22.7^{\circ}$ ,  $29.8^{\circ}$   
Lower Right Lat, Lon =  $-22.4^{\circ}$ ,  $29.4^{\circ}$   
Aircraft Heading =  $339.6^{\circ}$   
Solar Zenith =  $41.1^{\circ}$   
GPS Altitude = 15995. m (MSL)

MODIS Airborne Simulator Browse Imagery  
SAFARI 2000 Campaign – 29 Aug 2000  
Botswana  
Flight #00-153 Track #2

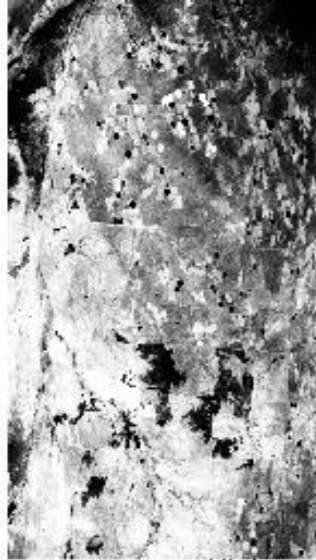


MODIS Airborne Simulator Browse Imagery  
SAFARI 2000 Campaign - 29 Aug 2000  
Botswana  
Flight #00-153 Track #2





06:35:00



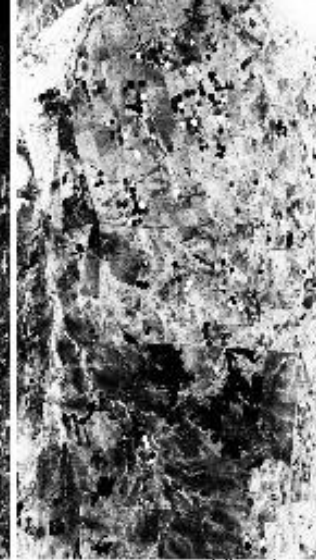
0.66µm (#3)



1.61µm (#10)



3.77µm (#30)



10.94µm (#45)  
reverse scale



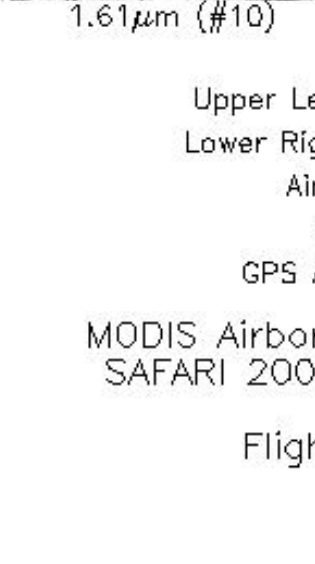
RGB (#20,#10,#2)

06:35:00

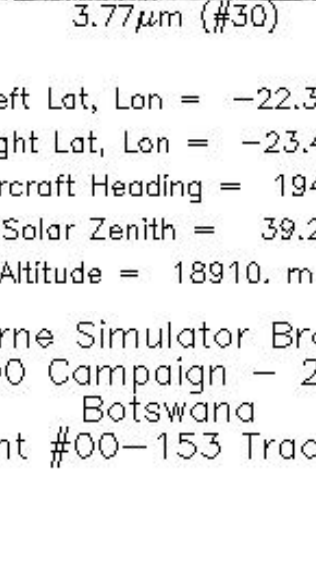
06:37:00



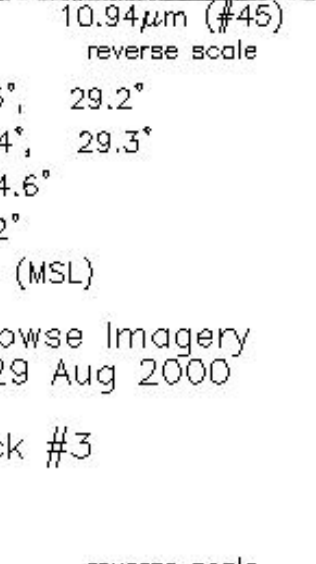
0.66µm (#3)



1.61µm (#10)



3.77µm (#30)



reverse scale  
10.94µm (#45)



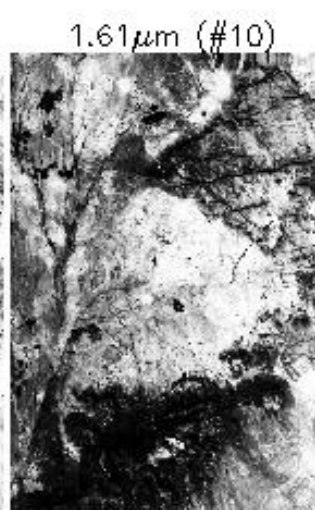
RGB (#20,#10,#2)

06:37:00

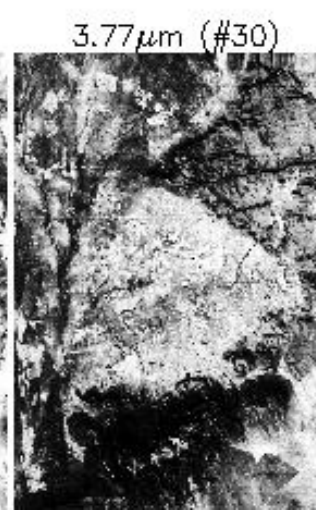
06:38:07



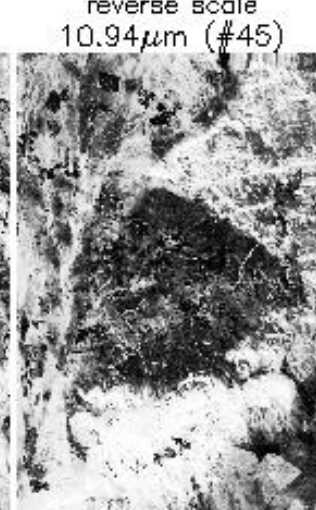
0.66µm (#3)



1.61µm (#10)



3.77µm (#30)



reverse scale  
10.94µm (#45)



RGB (#20,#10,#2)

06:38:07

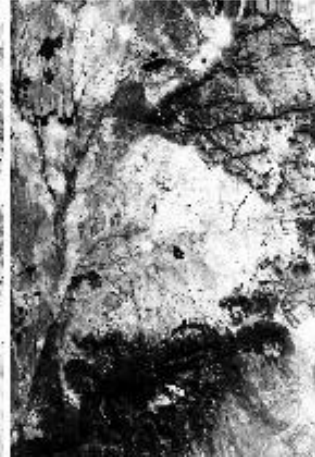
Upper Left Lat, Lon = -22.3°, 29.2°  
Lower Right Lat, Lon = -23.4°, 29.3°  
Aircraft Heading = 194.6°  
Solar Zenith = 39.2°  
GPS Altitude = 18910. m (MSL)

MODIS Airborne Simulator Browse Imagery  
SAFARI 2000 Campaign - 29 Aug 2000  
Botswana  
Flight #00-153 Track #3

06:40:08



0.66µm (#3)



1.61µm (#10)



3.77µm (#30)



reverse scale  
10.94µm (#45)



RGB (#20,#10,#2)

06:40:08

06:41:00



0.66µm (#3)



1.61µm (#10)



3.77µm (#30)



reverse scale  
10.94µm (#45)



RGB (#20,#10,#2)

06:41:00



06:43:00

06:45:00

06:46:30



0.66µm (#3)



1.61µm (#10)



3.77µm (#30)



10.94µm (#45)  
reverse scale



RGB (#20,#10,#2)

06:43:00

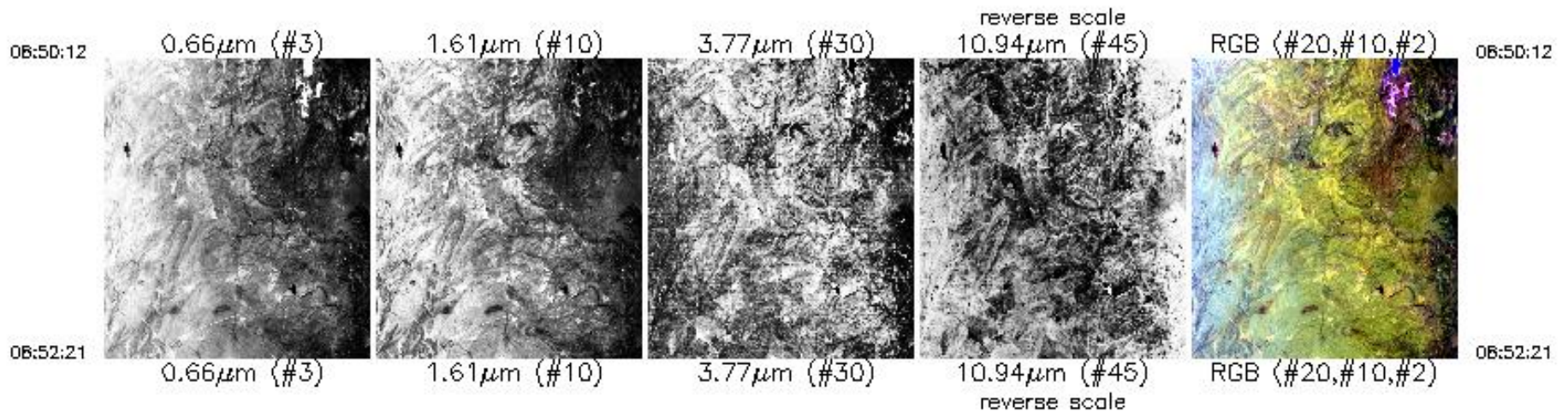
06:45:00

06:46:30

Upper Left Lat, Lon = -23.4°, 29.1°  
 Lower Right Lat, Lon = -22.7°, 28.8°  
 Aircraft Heading = 0.5°  
 Solar Zenith = 38.5°  
 GPS Altitude = 19456. m (MSL)

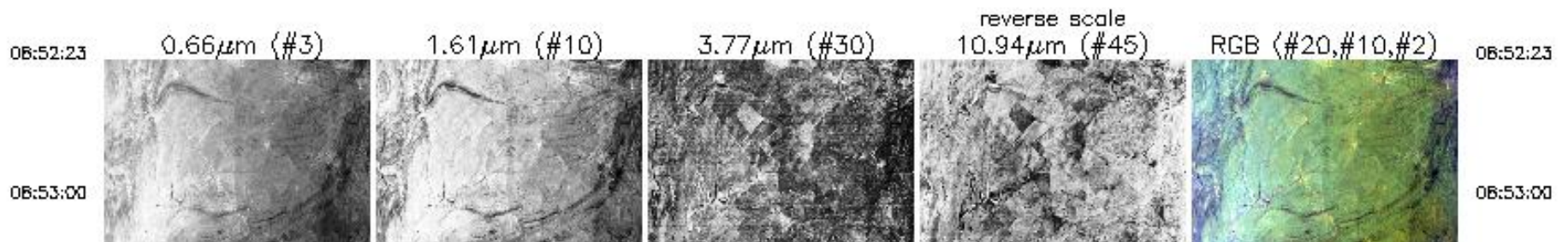


MODIS Airborne Simulator Browse Imagery  
 SAFARI 2000 Campaign – 29 Aug 2000  
 Botswana  
 Flight #00–153 Track #4

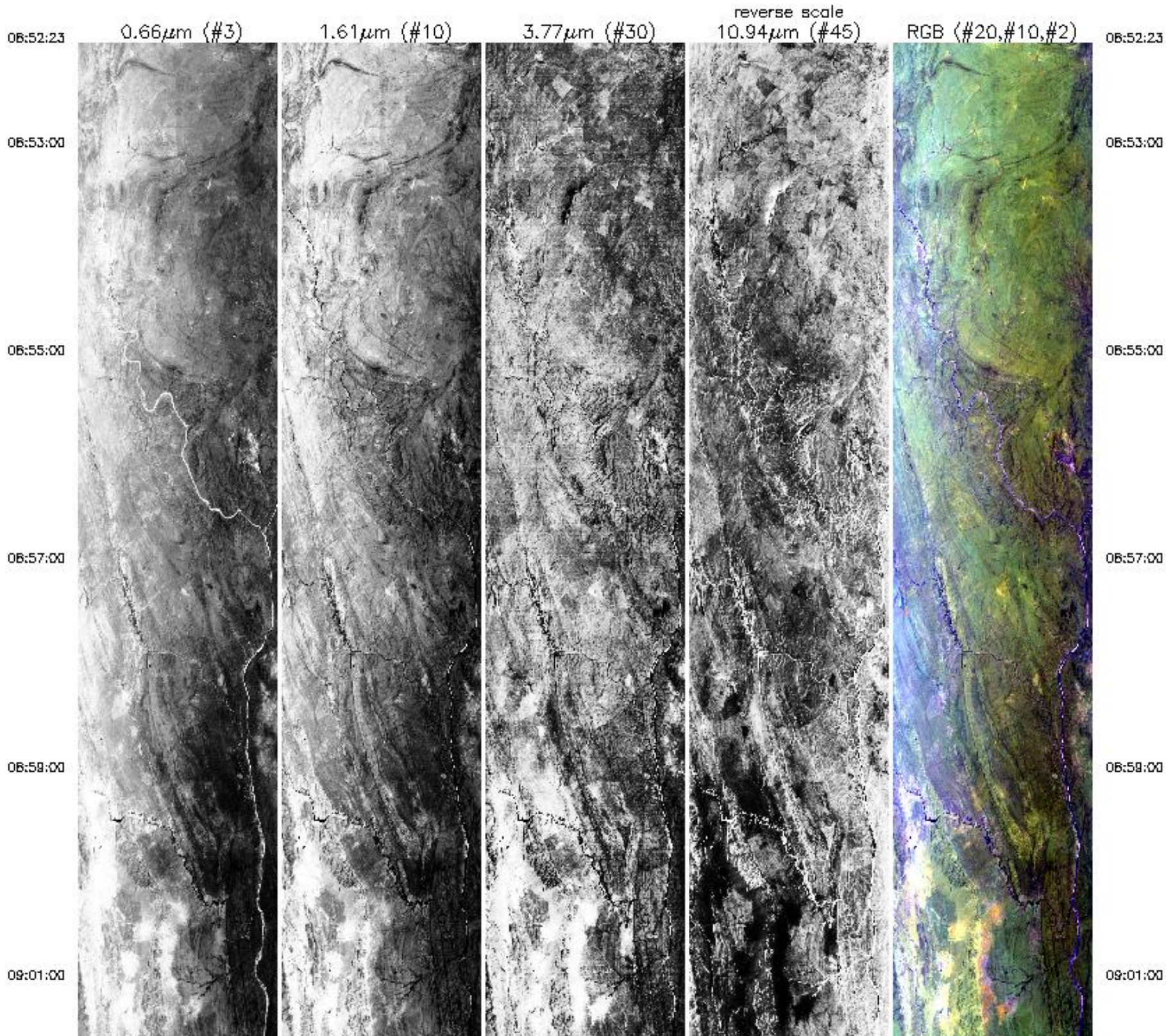


Upper Left Lat, Lon = -22.7°, 29.3°  
 Lower Right Lat, Lon = -22.3°, 29.5°  
 Aircraft Heading = 81.5°  
 Solar Zenith = 36.6°  
 GPS Altitude = 19781. m (MSL)

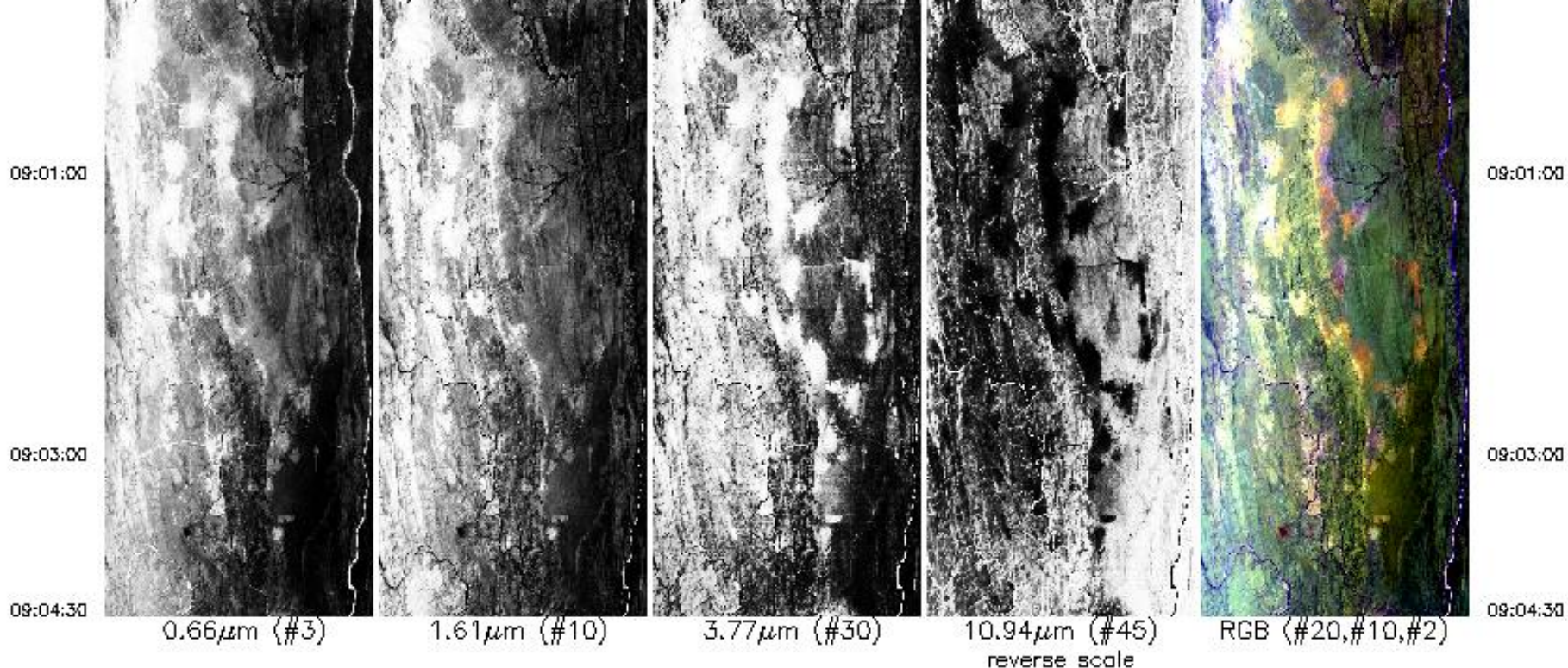
MODIS Airborne Simulator Browse Imagery  
 SAFARI 2000 Campaign – 29 Aug 2000  
 Botswana  
 Flight #00–153 Track #5





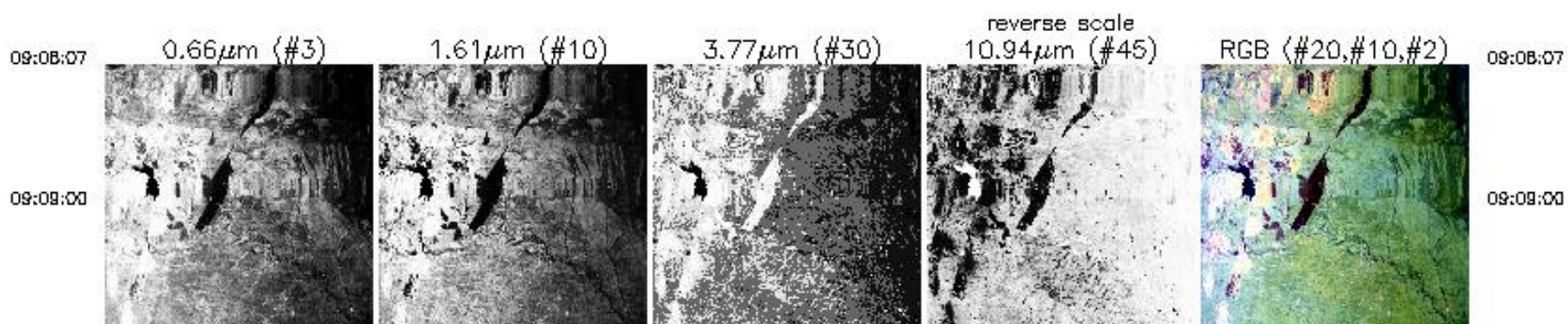






Upper Left Lat, Lon =  $-22.6^\circ$ ,  $29.6^\circ$   
 Lower Right Lat, Lon =  $-22.3^\circ$ ,  $31.0^\circ$   
 Aircraft Heading =  $78.2^\circ$   
 Solar Zenith =  $36.1^\circ$   
 GPS Altitude = 19971. m (MSL)

MODIS Airborne Simulator Browse Imagery  
 SAFARI 2000 Campaign - 29 Aug 2000  
 Botswana  
 Flight #00-153 Track #6





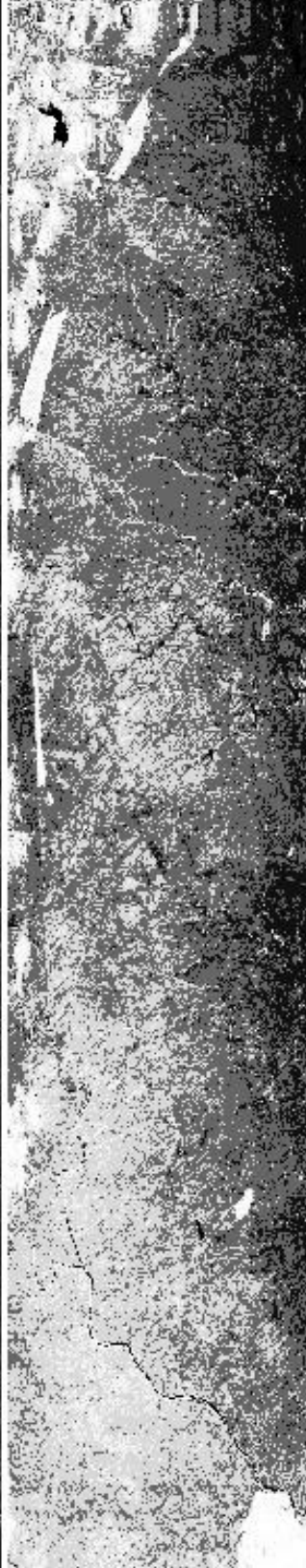
09:09:00

09:11:00

09:13:00

09:15:00

09:17:00



09:09:00

09:11:00

09:13:00

09:15:00

09:17:00



09:17:00



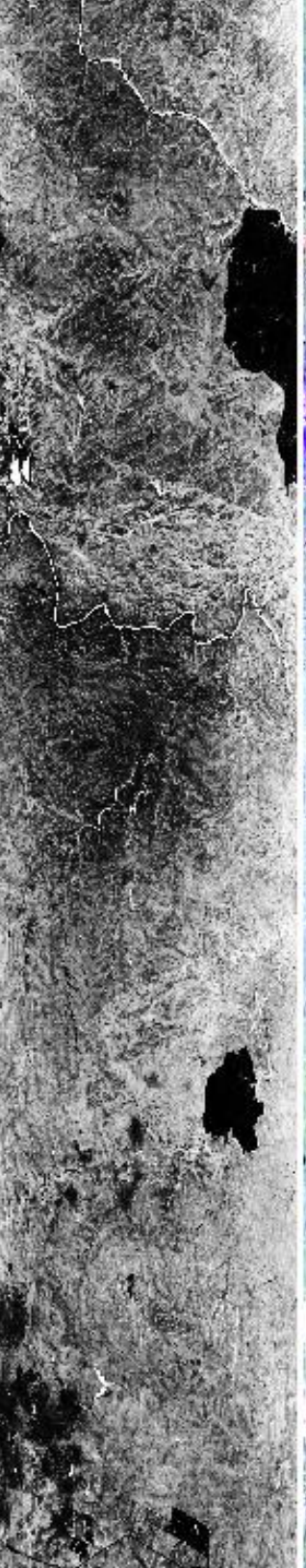
09:19:00



09:21:00



09:23:00



09:25:00



09:17:00

09:19:00

09:21:00

09:23:00

09:25:00



09:25:00



09:27:00



09:29:00



09:31:00



09:33:00



09:25:00

09:27:00

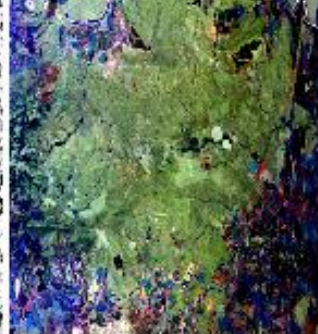
09:29:00

09:31:00

09:33:00



09:33:00



09:33:00

09:34:53

0.66µm (#3)

1.61µm (#10)

3.77µm (#30)

10.94µm (#45)

RGB (<#20,#10,#2)

09:34:53

reverse scale

Upper Left Lat, Lon = -22.8°, 30.8°

Lower Right Lat, Lon = -25.6°, 31.9°

Aircraft Heading = 170.7°

Solar Zenith = 34.2°

GPS Altitude = 20059. m (MSL)

MODIS Airborne Simulator Browse Imagery

SAFARI 2000 Campaign - 29 Aug 2000

Botswana

Flight #00-153 Track #7

09:34:53

0.66µm (#3)

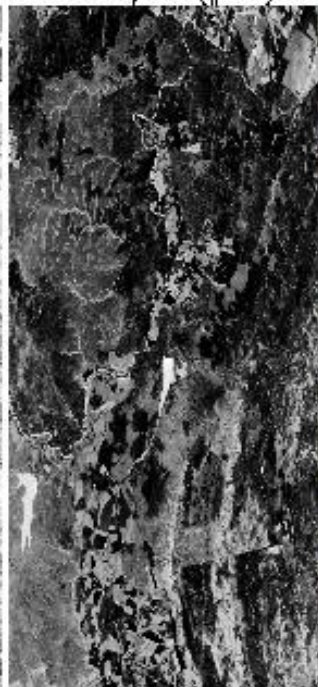
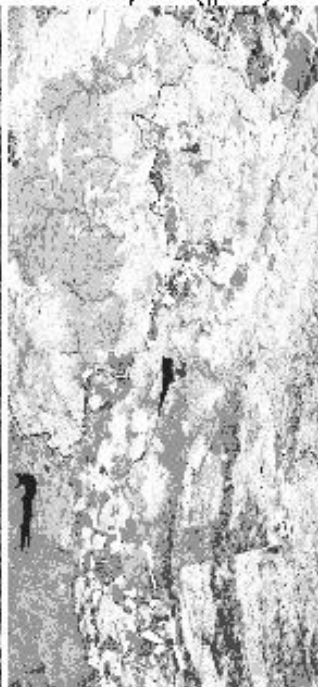
1.61µm (#10)

3.77µm (#30)

reverse scale  
10.94µm (#45)

RGB (<#20,#10,#2)

09:34:53



09:35:00

09:35:00

09:37:00

09:37:00



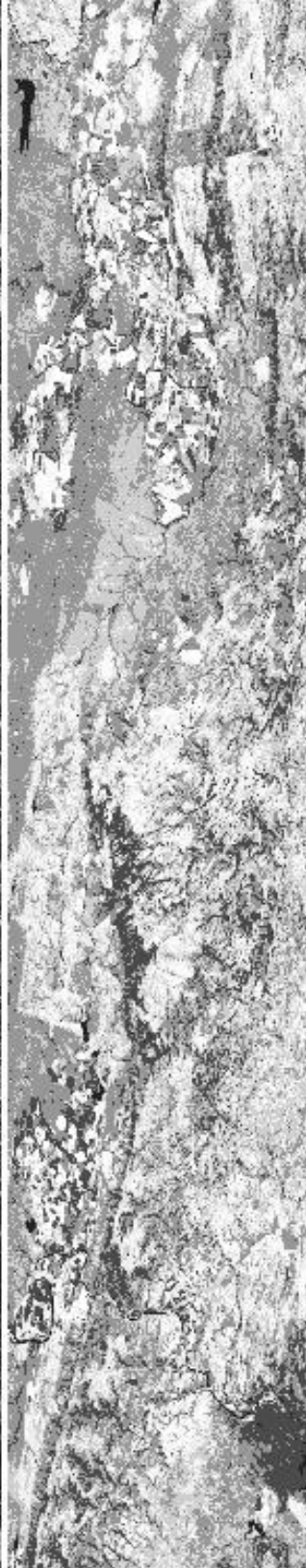
09:37:00



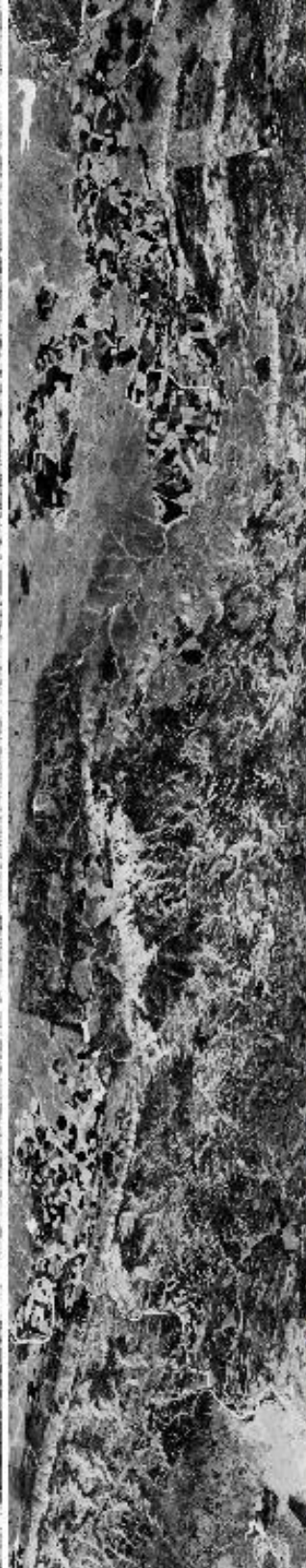
09:39:00



09:41:00



09:43:00



09:45:00



09:37:00

09:39:00

09:41:00

09:43:00

09:45:00



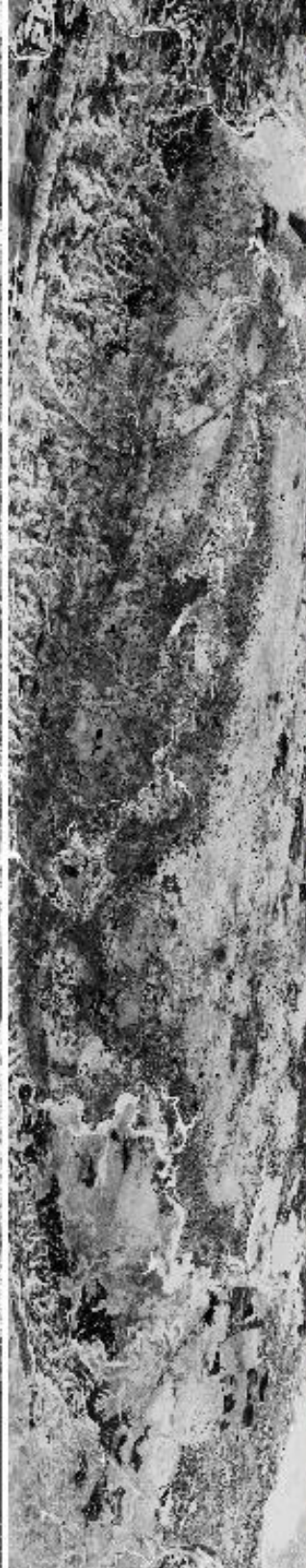
09:45:00

09:47:00

09:49:00

09:51:00

09:53:00



09:45:00

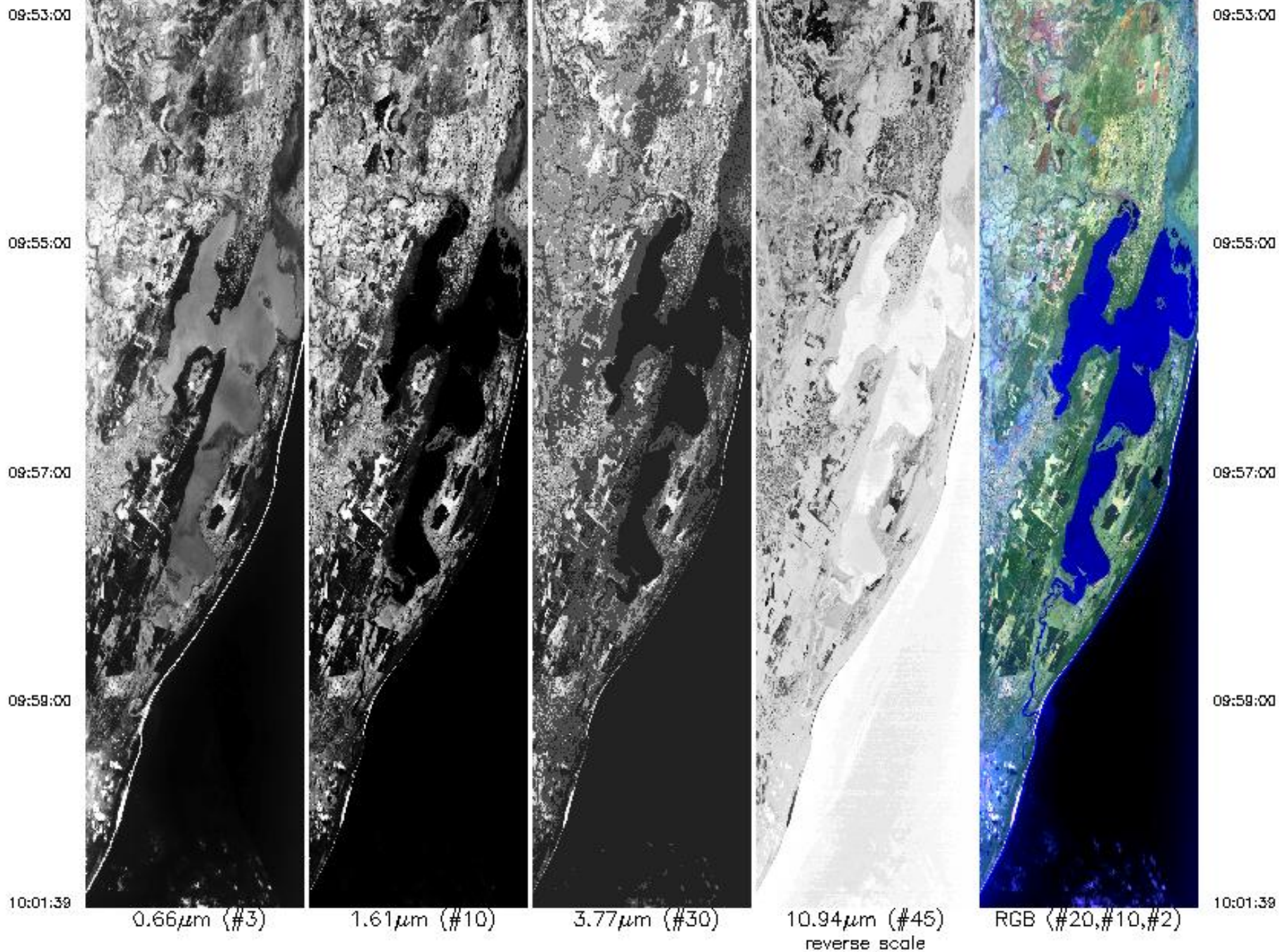
09:47:00

09:49:00

09:51:00

09:53:00



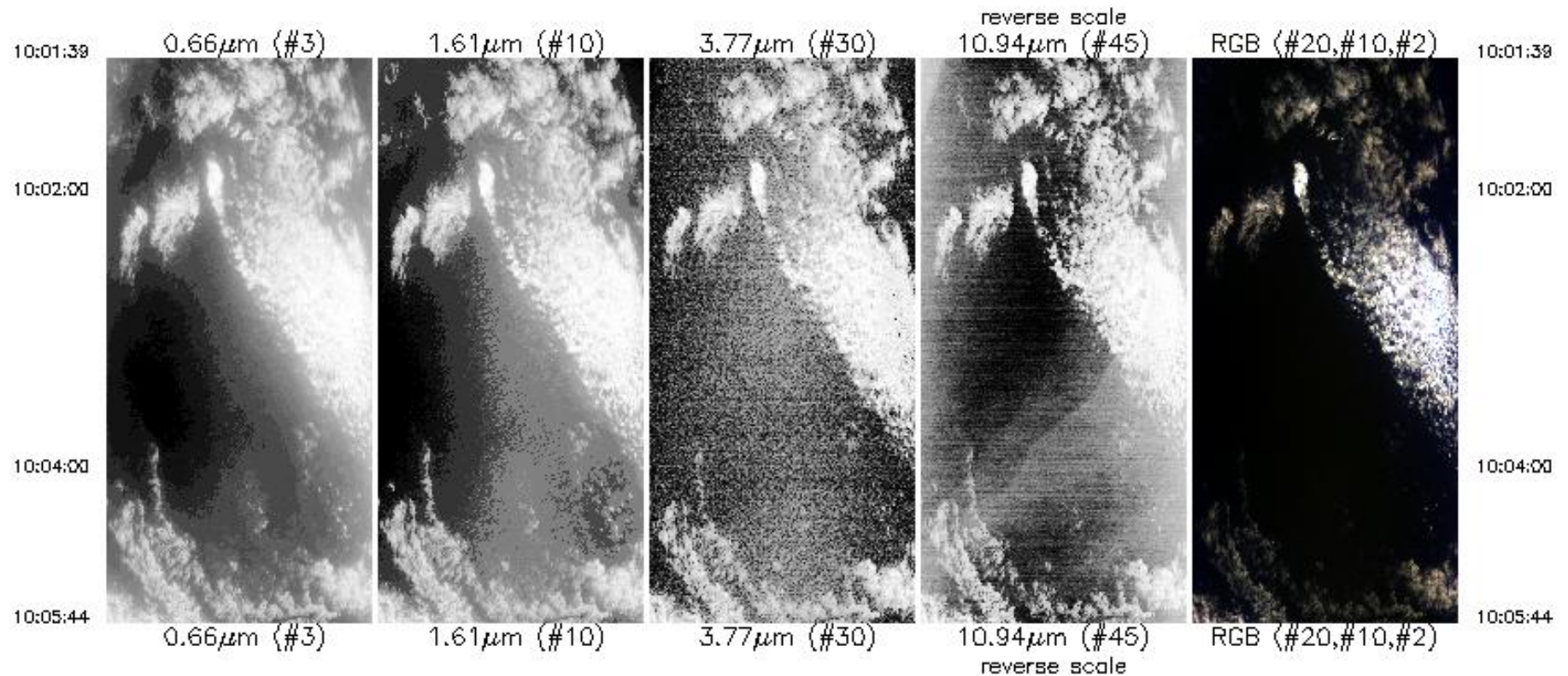


Upper Left Lat, Lon =  $-25.7^\circ$ ,  $31.6^\circ$   
 Lower Right Lat, Lon =  $-28.5^\circ$ ,  $32.7^\circ$   
 Aircraft Heading =  $167.0^\circ$   
 Solar Zenith =  $35.1^\circ$   
 GPS Altitude = 19864. m (MSL)



Upper Left Lat, Lon =  $-25.7^\circ$ ,  $31.6^\circ$   
 Lower Right Lat, Lon =  $-28.5^\circ$ ,  $32.7^\circ$   
 Aircraft Heading =  $167.0^\circ$   
 Solar Zenith =  $35.1^\circ$   
 GPS Altitude = 19864. m (MSL)

MODIS Airborne Simulator Browse Imagery  
 SAFARI 2000 Campaign – 29 Aug 2000  
 Botswana  
 Flight #00-153 Track #8

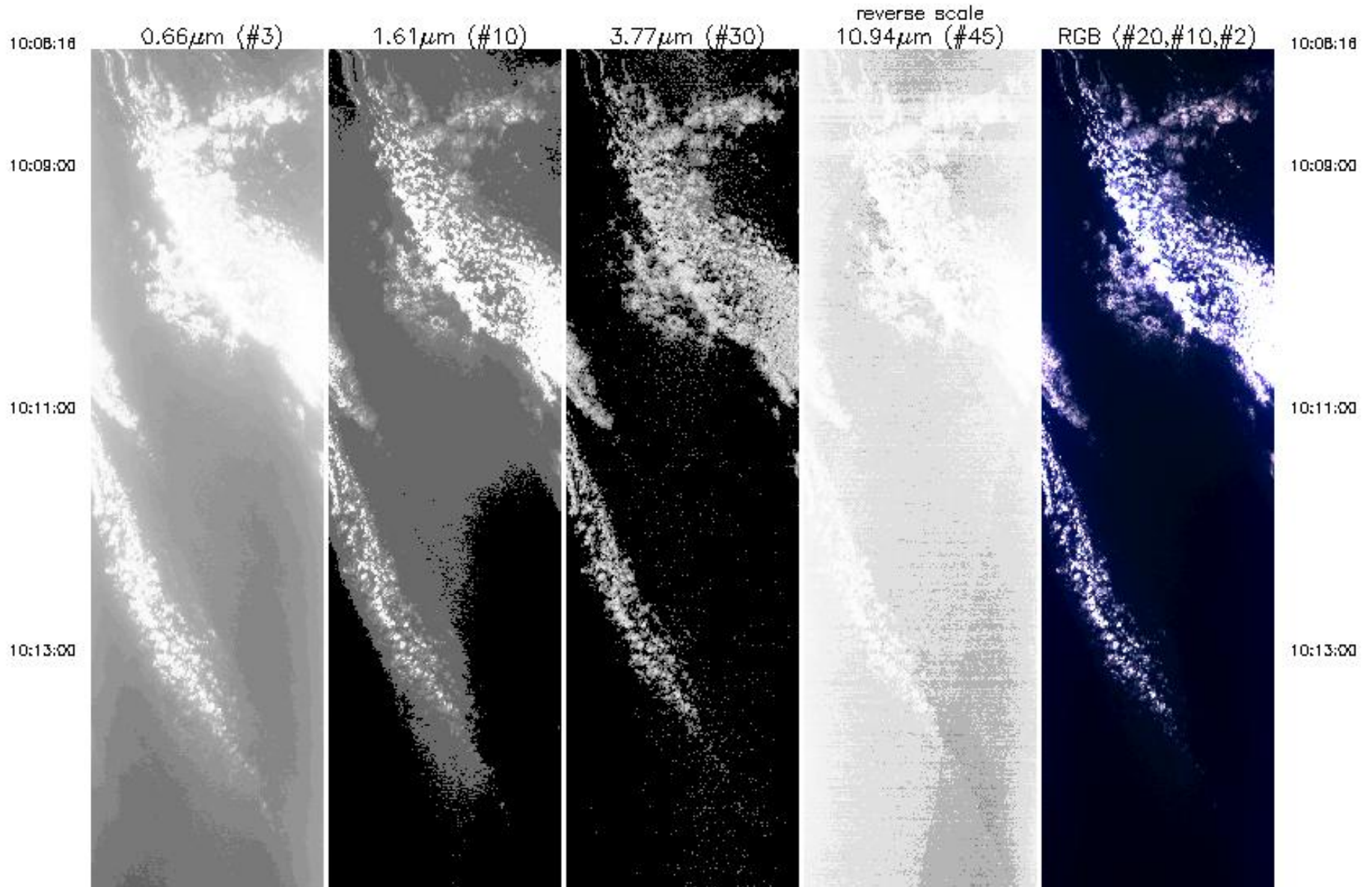


Upper Left Lat, Lon =  $-28.6^\circ$ ,  $32.4^\circ$   
 Lower Right Lat, Lon =  $-29.0^\circ$ ,  $32.8^\circ$   
 Aircraft Heading =  $168.5^\circ$   
 Solar Zenith =  $37.8^\circ$   
 GPS Altitude = 19888. m (MSL)



Upper Left Lat, Lon = 28.0°, 32.8°  
Lower Right Lat, Lon = -29.0°, 32.8°  
Aircraft Heading = 168.5°  
Solar Zenith = 37.8°  
GPS Altitude = 19888. m (MSL)

MODIS Airborne Simulator Browse Imagery  
SAFARI 2000 Campaign - 29 Aug 2000  
Botswana  
Flight #00-153 Track #9





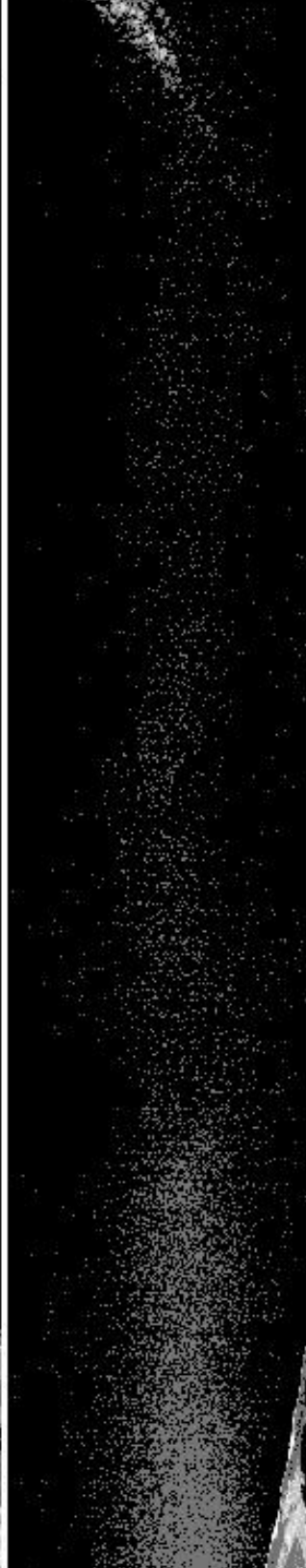
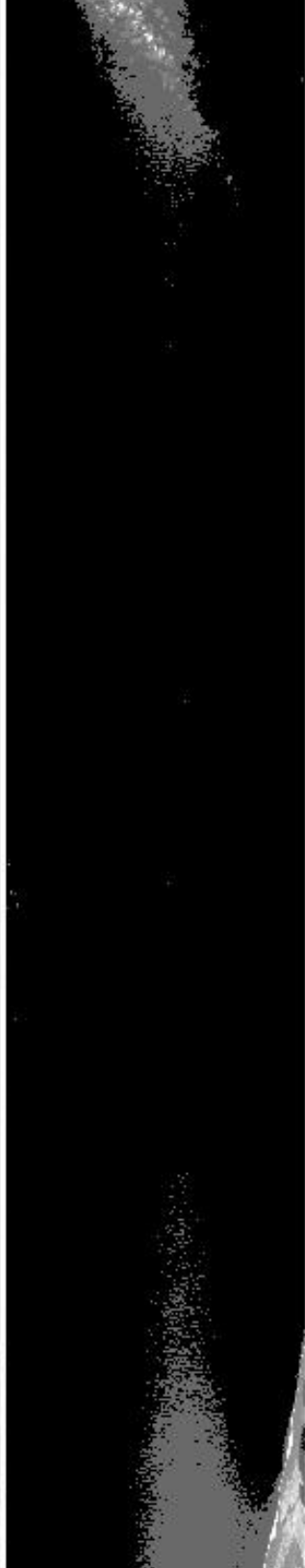
10:15:00

10:17:00

10:19:00

10:21:00

10:23:00



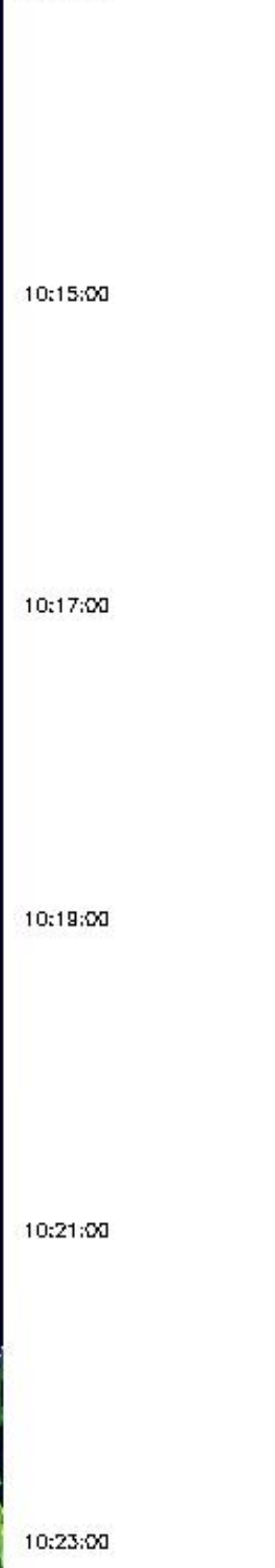
10:15:00

10:17:00

10:19:00

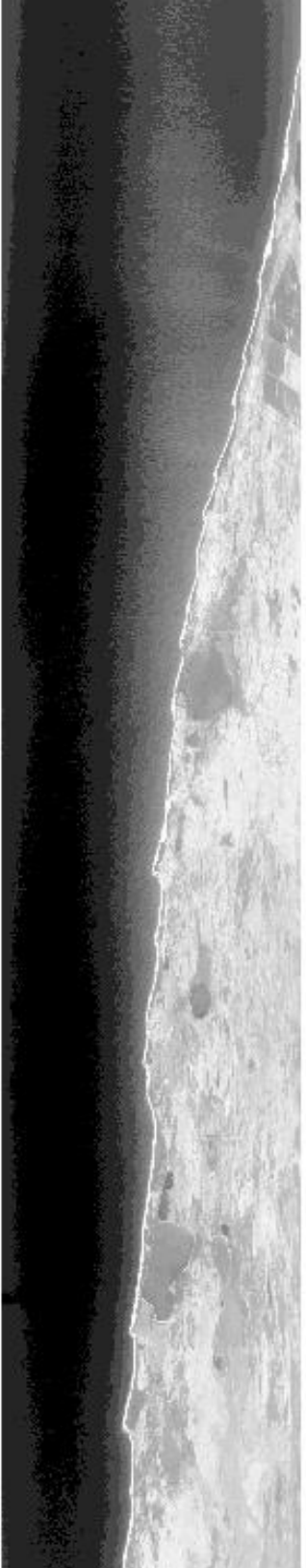
10:21:00

10:23:00

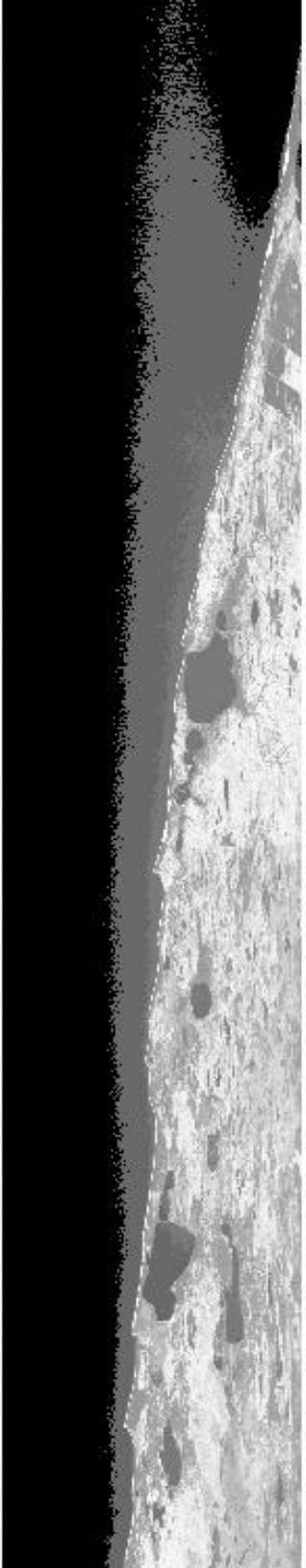




10:23:00



10:25:00



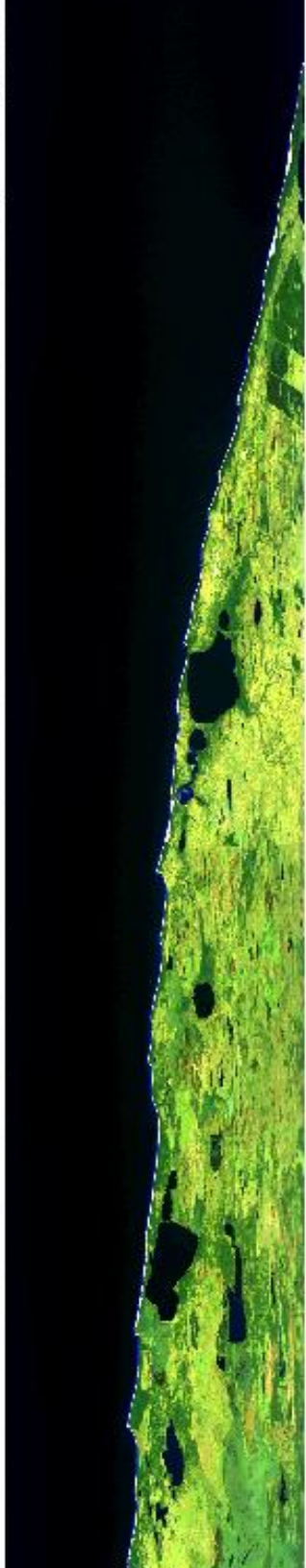
10:27:00



10:29:00



10:31:00



10:23:00

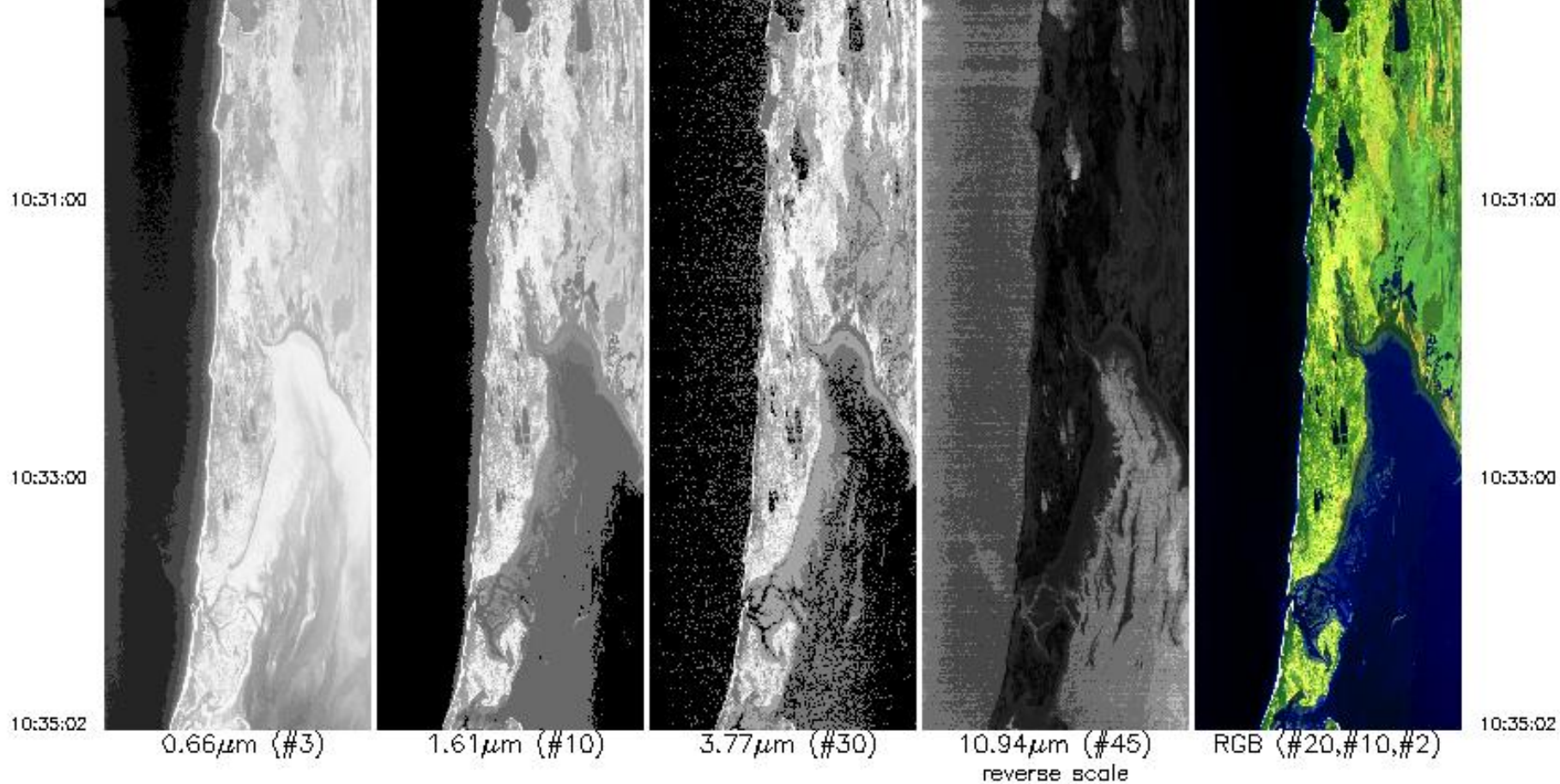
10:25:00

10:27:00

10:29:00

10:31:00

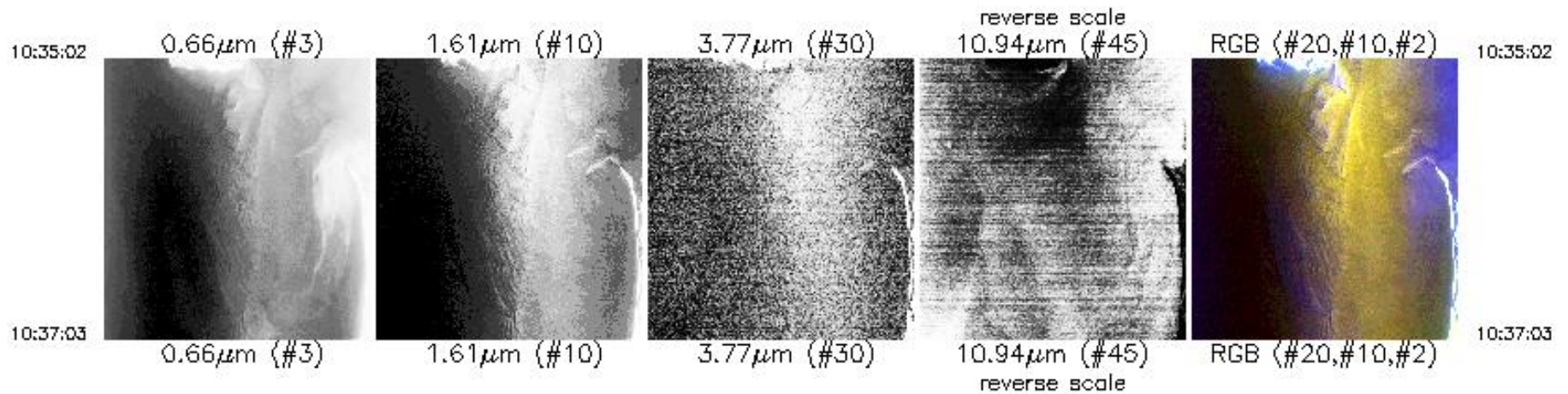




Upper Left Lat, Lon =  $-29.0^\circ$ ,  $33.1^\circ$   
 Lower Right Lat, Lon =  $-26.0^\circ$ ,  $32.7^\circ$   
 Aircraft Heading =  $354.2^\circ$   
 Solar Zenith =  $38.4^\circ$   
 GPS Altitude = 1991. m (MSL)

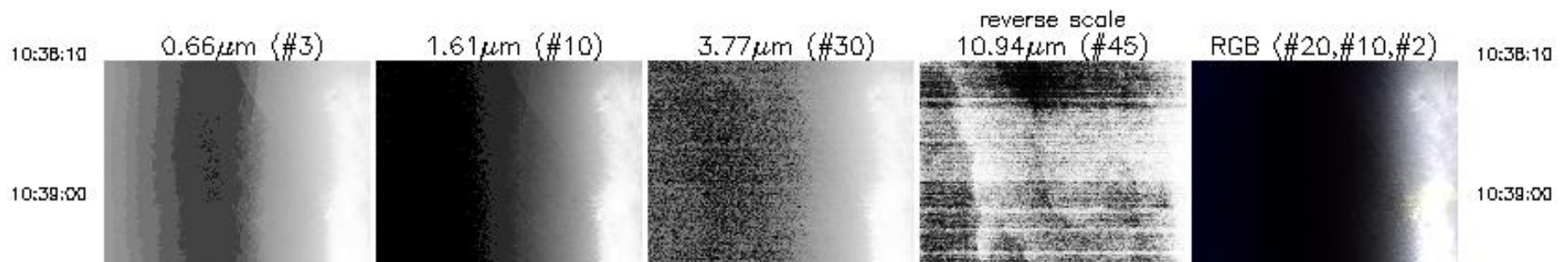


MODIS Airborne Simulator Browse Imagery  
 SAFARI 2000 Campaign – 29 Aug 2000  
 Botswana  
 Flight #00-153 Track #10

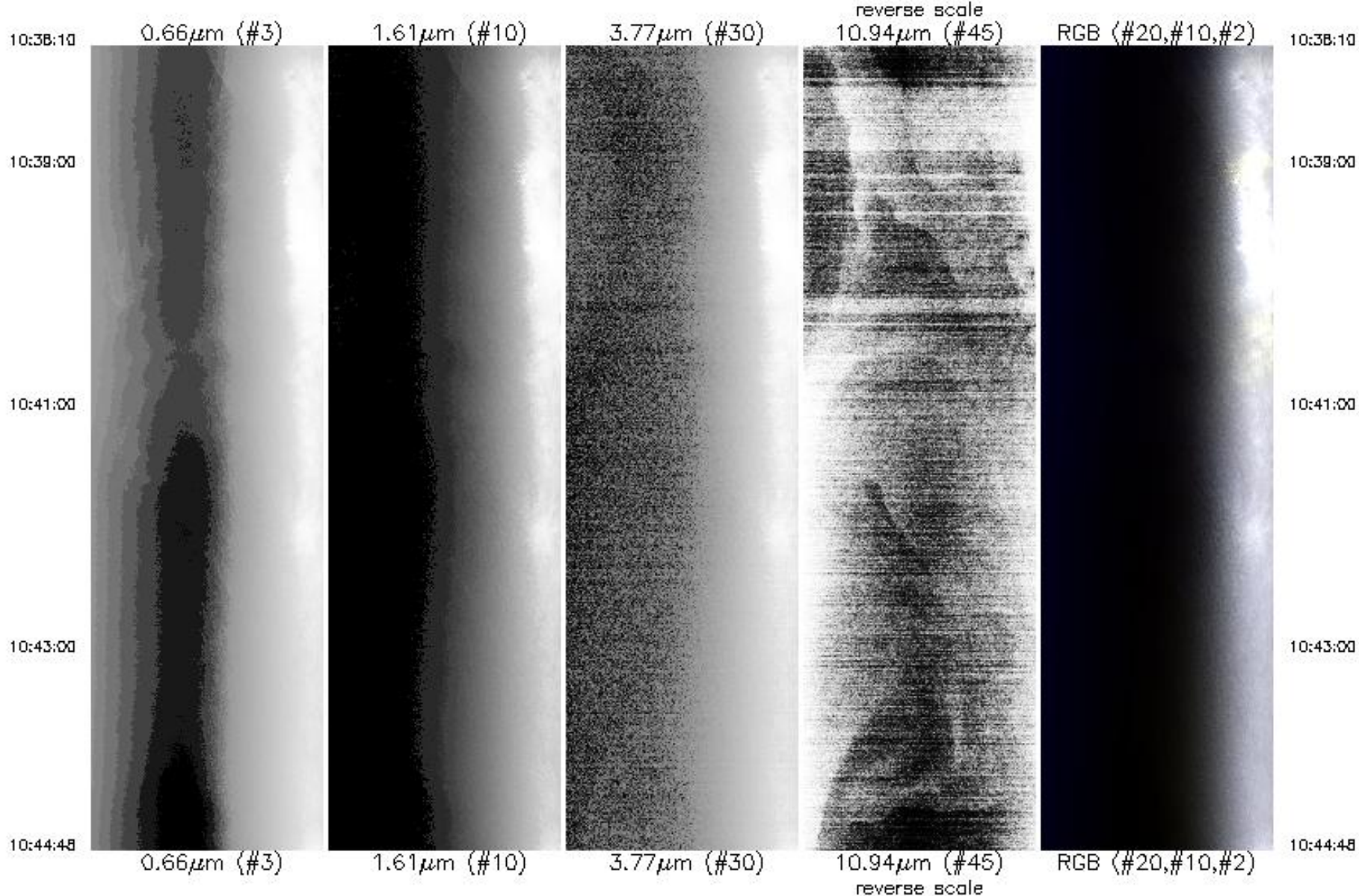


Upper Left Lat, Lon = -26.0°, 33.1°  
 Lower Right Lat, Lon = -25.7°, 32.7°  
 Aircraft Heading = 1.6°  
 Solar Zenith = 36.9°  
 GPS Altitude = 20092. m (MSL)

MODIS Airborne Simulator Browse Imagery  
 SAFARI 2000 Campaign – 29 Aug 2000  
 Botswana/Namibia  
 Flight #00-153 Track #11





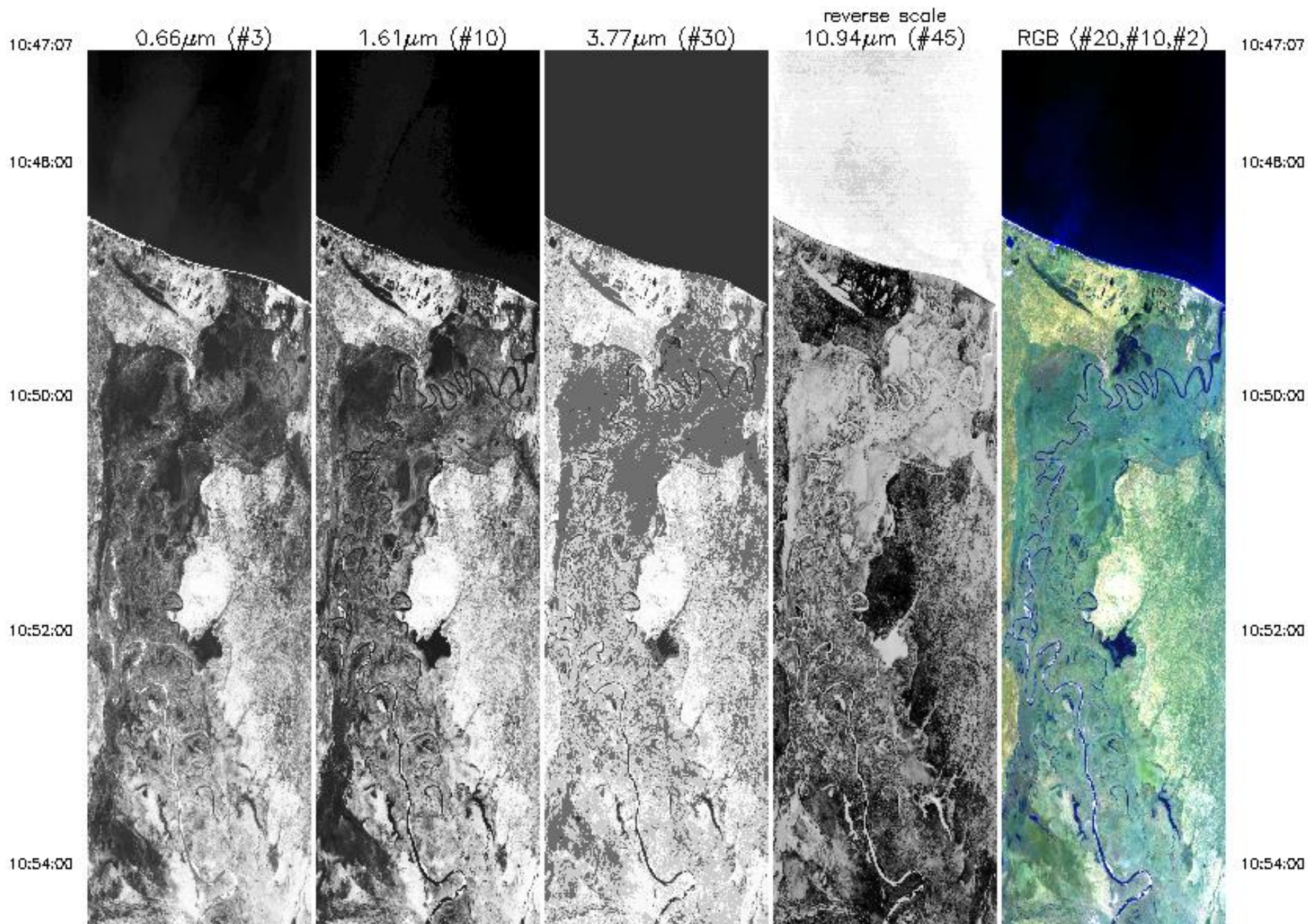


Upper Left Lat, Lon =  $-25.8^{\circ}$ ,  $33.0^{\circ}$   
 Lower Right Lat, Lon =  $-25.3^{\circ}$ ,  $33.8^{\circ}$   
 Aircraft Heading =  $80.3^{\circ}$   
 Solar Zenith =  $37.0^{\circ}$   
 GPS Altitude = 20046. m (MSL)

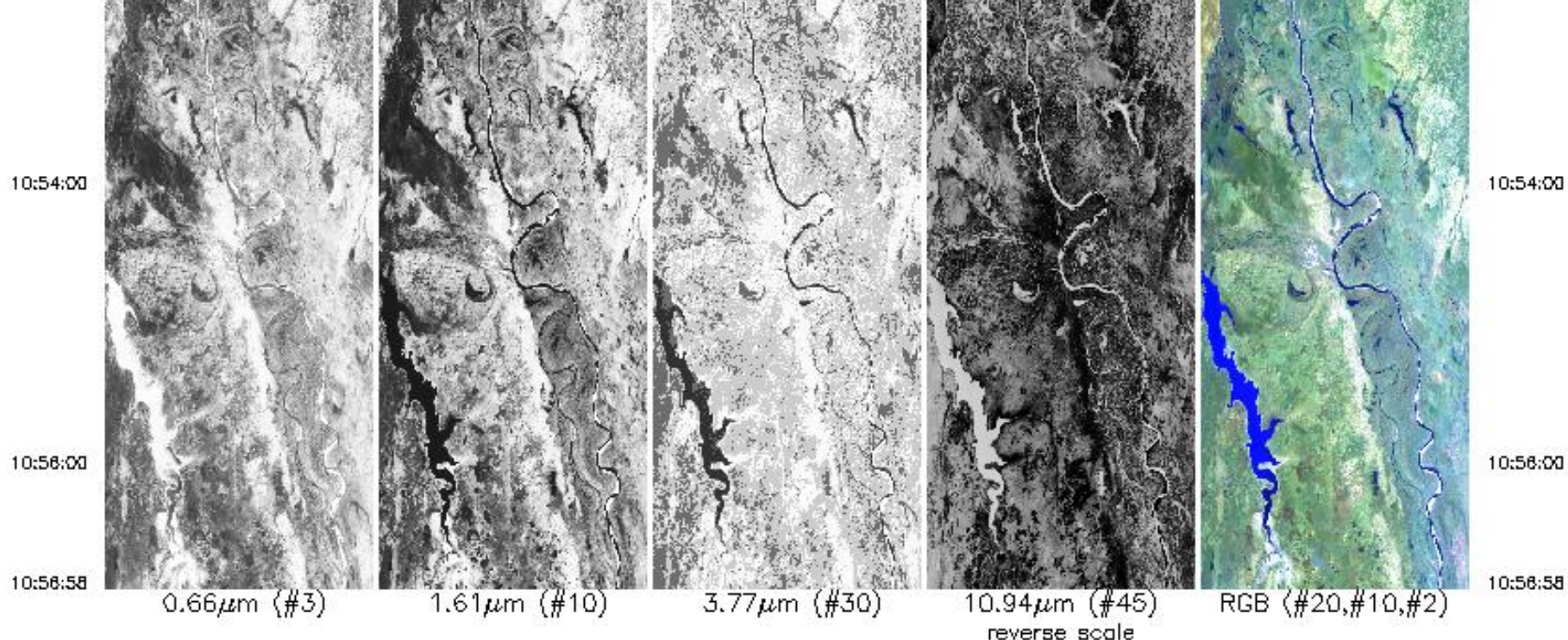
MODIS Airborne Simulator Browse Imagery  
 SAFARI 2000 Campaign - 29 Aug 2000  
 Botswana/Namibia  
 Flight #00-153 Track #12



MODIS Airborne Simulator Browse Imagery  
SAFARI 2000 Campaign - 29 Aug 2000  
Botswana/Namibia  
Flight #00-153 Track #12

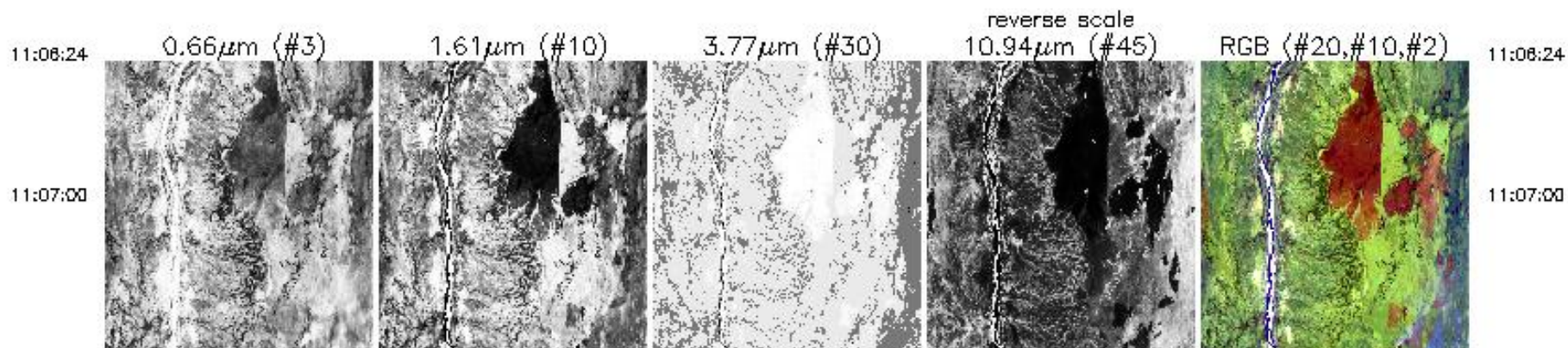






Upper Left Lat, Lon =  $-25.2^\circ$ ,  $34.0^\circ$   
 Lower Right Lat, Lon =  $-24.5^\circ$ ,  $33.0^\circ$   
 Aircraft Heading =  $324.3^\circ$   
 Solar Zenith =  $37.5^\circ$   
 GPS Altitude = 20037. m (MSL)

MODIS Airborne Simulator Browse Imagery  
 SAFARI 2000 Campaign - 29 Aug 2000  
 Botswana  
 Flight #00-153 Track #13





11:07:00



11:08:00



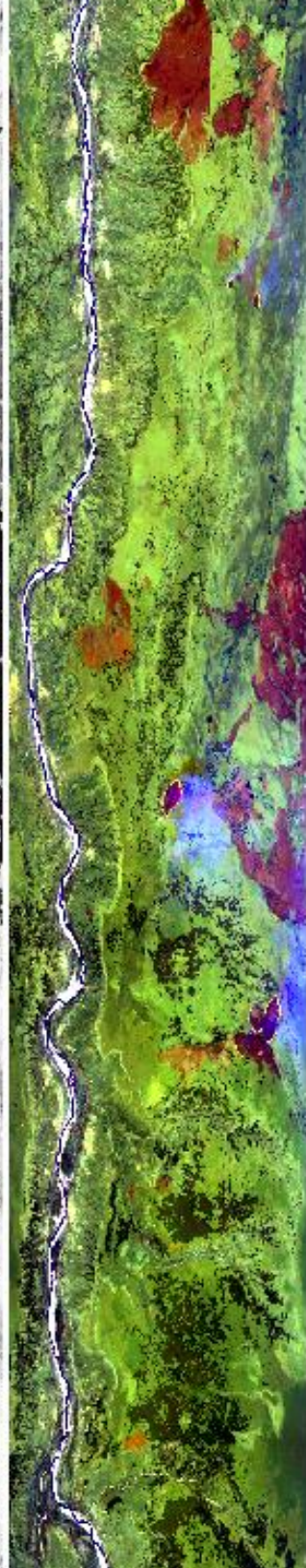
11:11:00



11:13:00



11:15:00



11:07:00

11:08:00

11:11:00

11:13:00

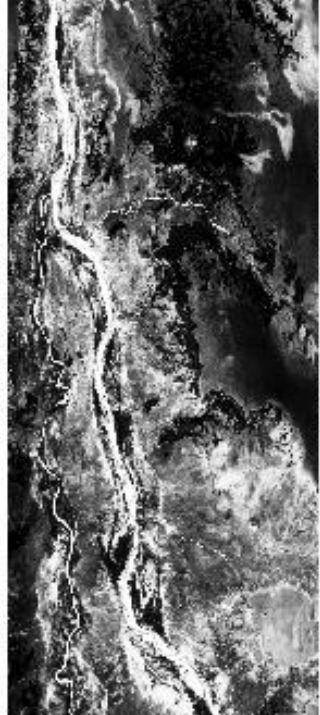
11:15:00



11:15:00

11:17:00

11:18:18



0.66 $\mu$ m (#3)



1.61 $\mu$ m (#10)



3.77 $\mu$ m (#30)



10.94 $\mu$ m (#45)  
reverse scale



RGB (#20,#10,#2)

11:15:00

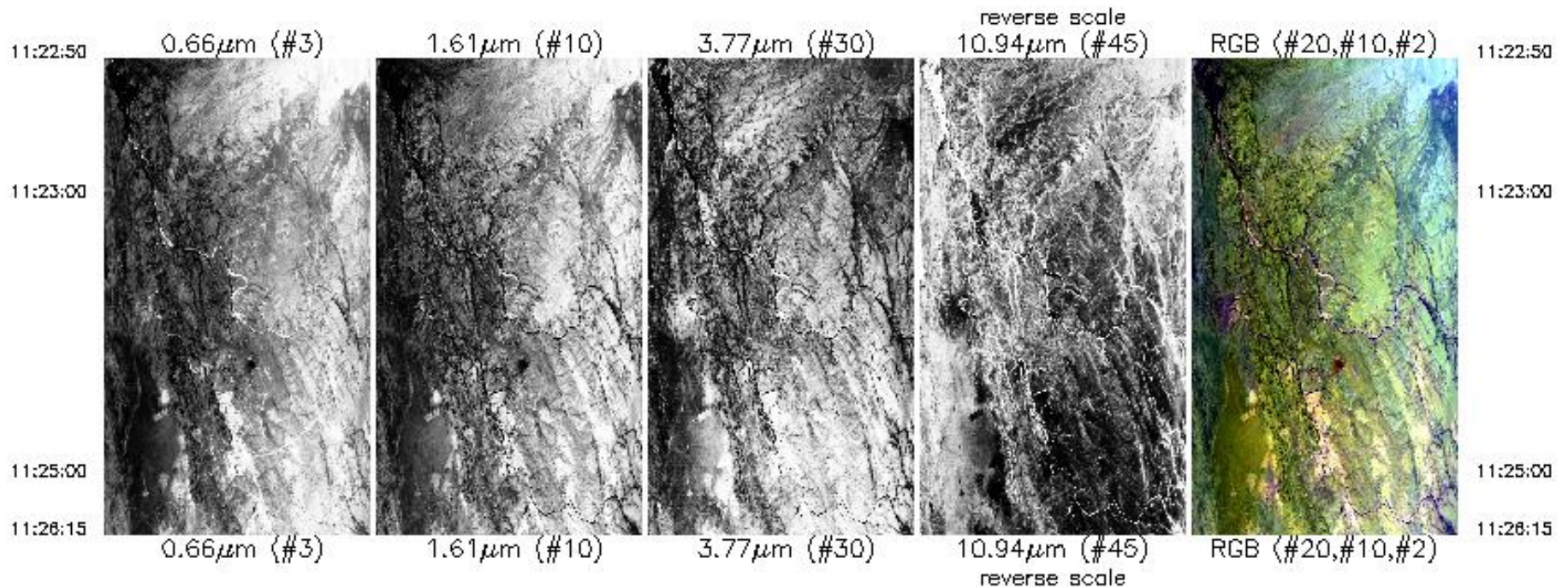
11:17:00

11:18:18

Upper Left Lat, Lon =  $-23.5^\circ$ ,  $32.6^\circ$   
 Lower Right Lat, Lon =  $-22.5^\circ$ ,  $31.4^\circ$   
 Aircraft Heading =  $323.7^\circ$   
 Solar Zenith =  $37.5^\circ$   
 GPS Altitude = 20014. m (MSL)

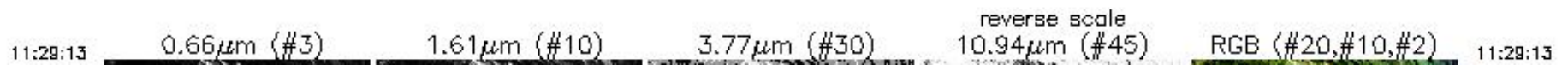


MODIS Airborne Simulator Browse Imagery  
 SAFARI 2000 Campaign – 29 Aug 2000  
 Botswana  
 Flight #00–153 Track #14



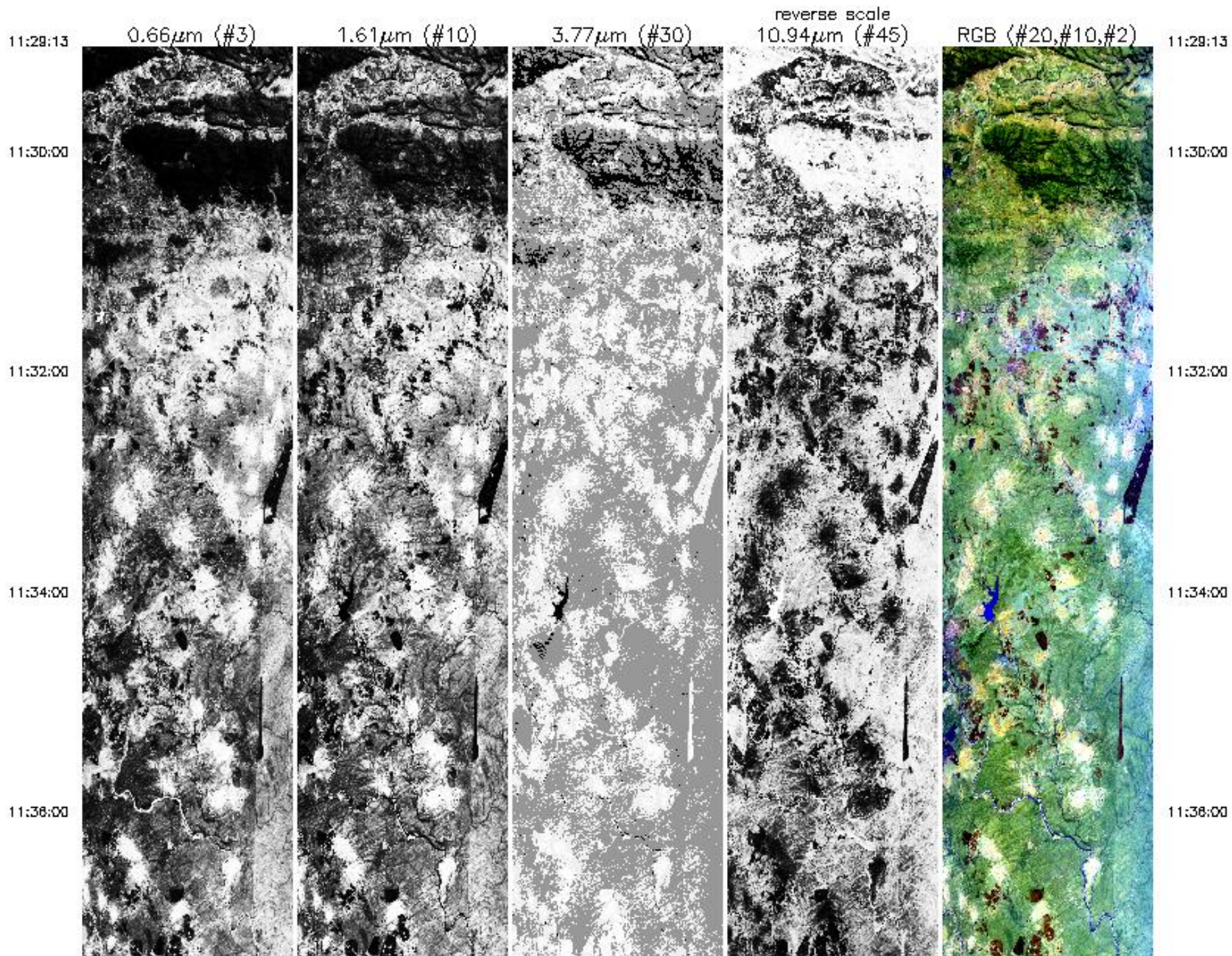
Upper Left Lat, Lon =  $-22.4^{\circ}$ ,  $31.3^{\circ}$   
 Lower Right Lat, Lon =  $-22.6^{\circ}$ ,  $30.8^{\circ}$   
 Aircraft Heading =  $288.5^{\circ}$   
 Solar Zenith =  $38.1^{\circ}$   
 GPS Altitude = 19661. m (MSL)

MODIS Airborne Simulator Browse Imagery  
 SAFARI 2000 Campaign – 29 Aug 2000  
 Botswana  
 Flight #00–153 Track #15



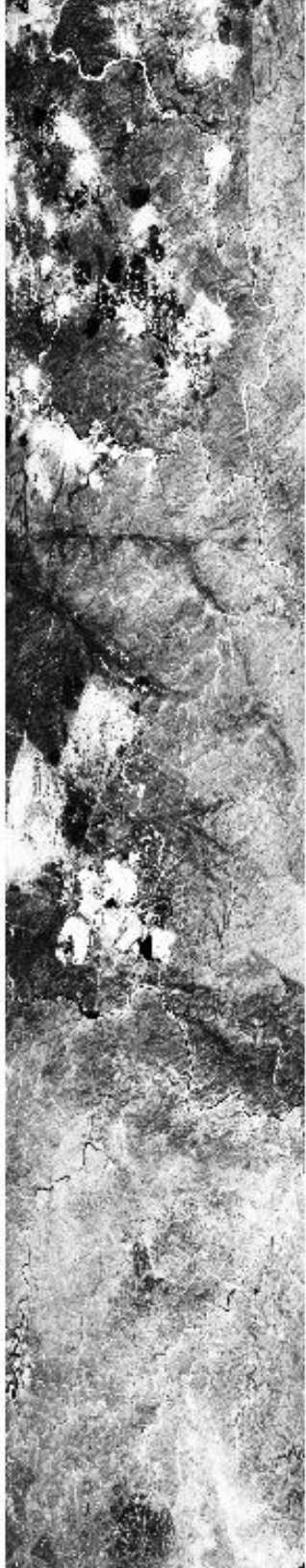


MODIS Airborne Simulator Browse Imagery  
SAFARI 2000 Campaign - 29 Aug 2000  
Botswana  
Flight #00-153 Track #15

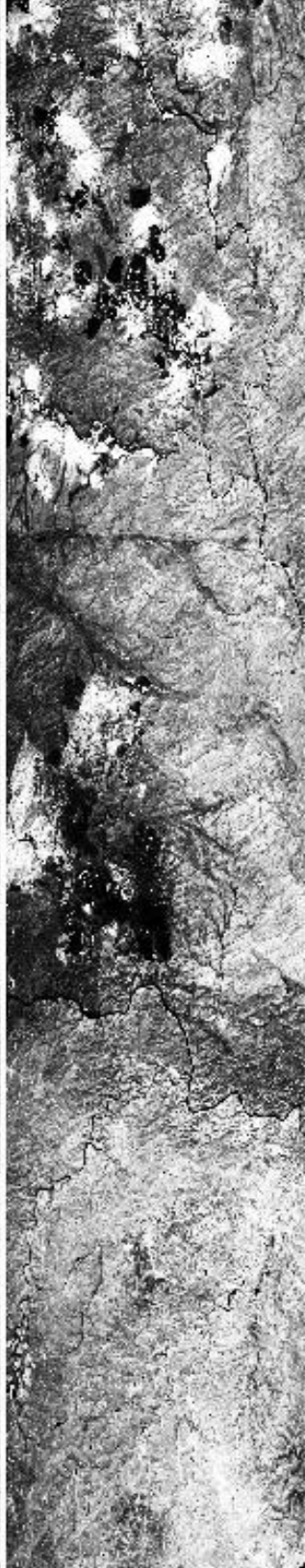




11:36:00



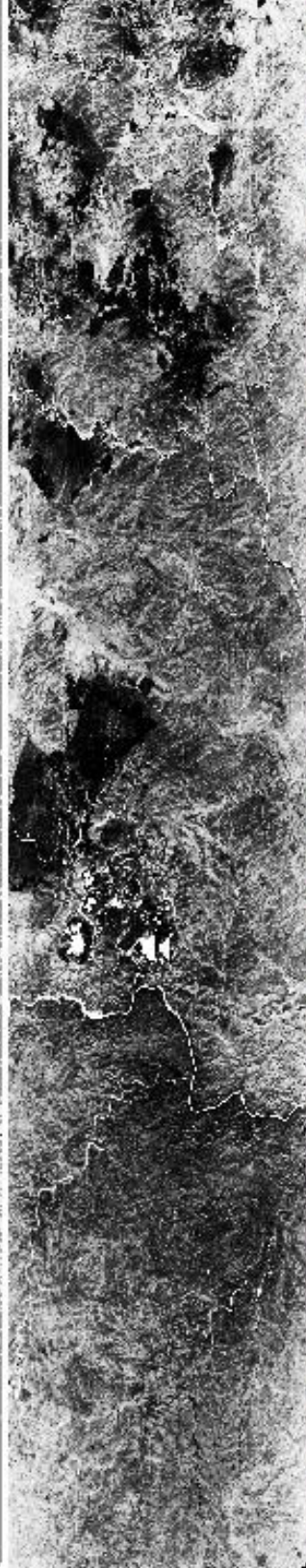
11:38:00



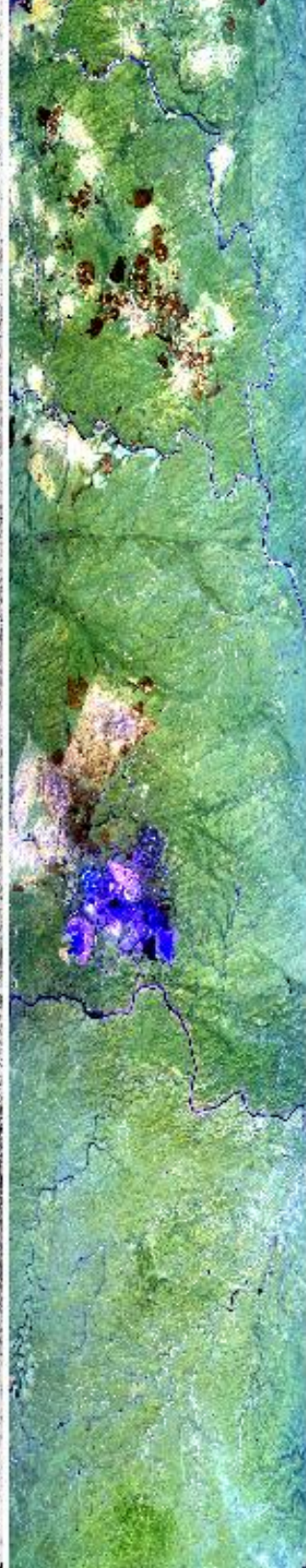
11:40:00



11:42:00



11:44:00



11:36:00

11:38:00

11:40:00

11:42:00

11:44:00



11:44:00



11:46:00



11:48:00



11:50:00



11:52:00



11:44:00

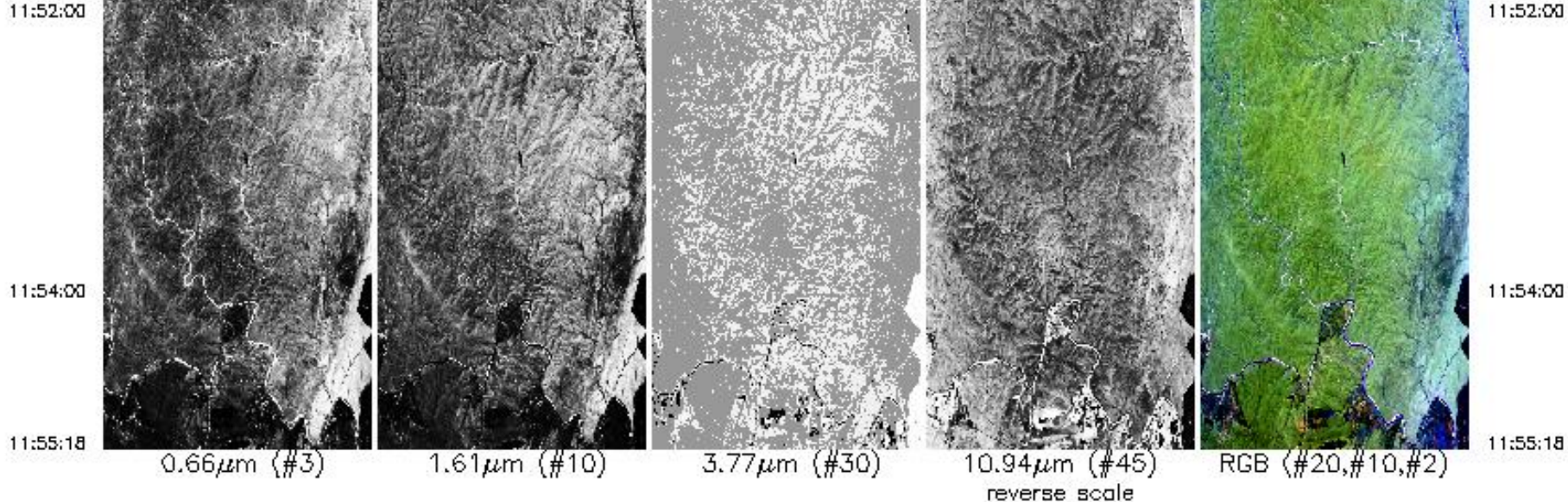
11:46:00

11:48:00

11:50:00

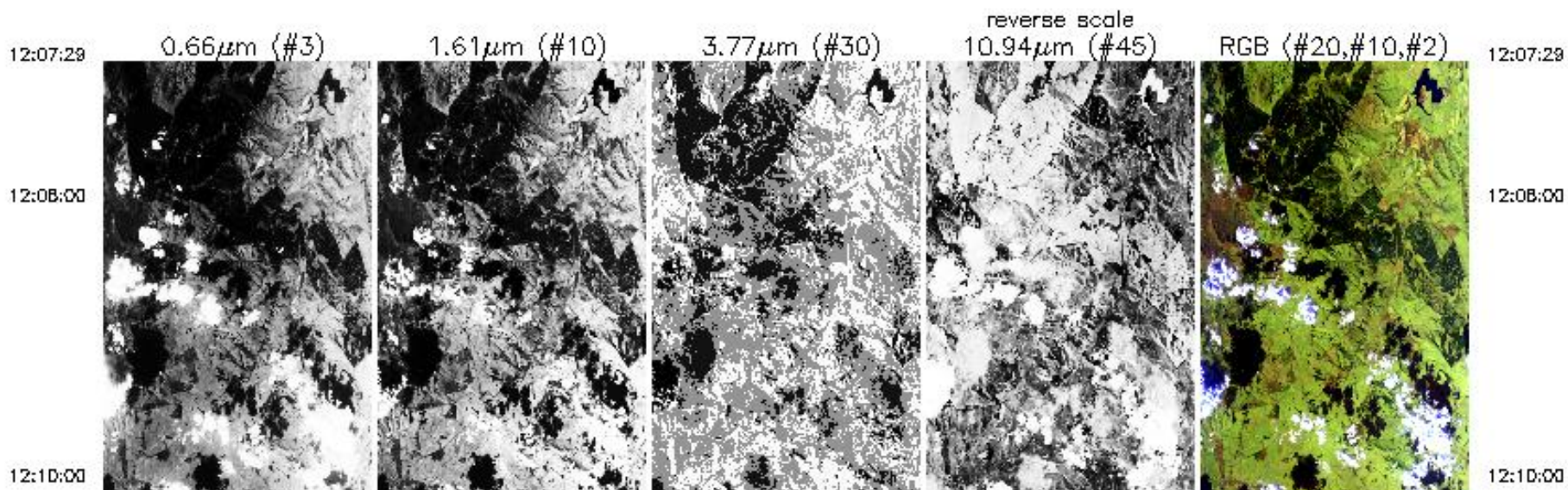
11:52:00





Upper Left Lat, Lon =  $-22.7^\circ$ ,  $30.4^\circ$   
 Lower Right Lat, Lon =  $-25.4^\circ$ ,  $32.0^\circ$   
 Aircraft Heading =  $158.4^\circ$   
 Solar Zenith =  $38.7^\circ$   
 GPS Altitude = 19964. m (MSL)

MODIS Airborne Simulator Browse Imagery  
 SAFARI 2000 Campaign – 29 Aug 2000  
 Botswana  
 Flight #00-153 Track #16





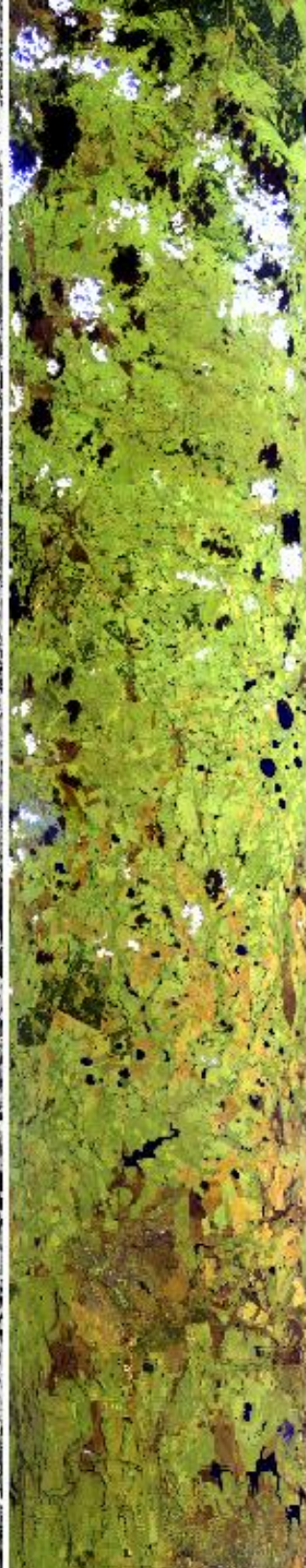
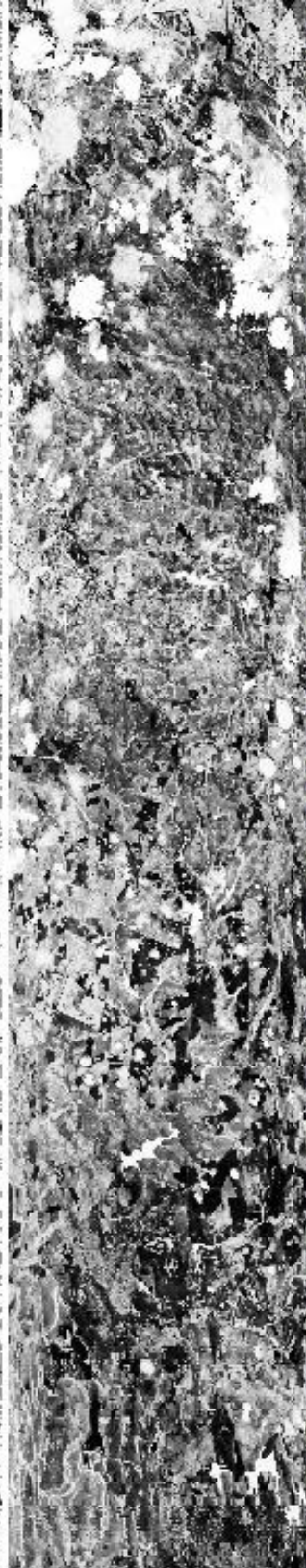
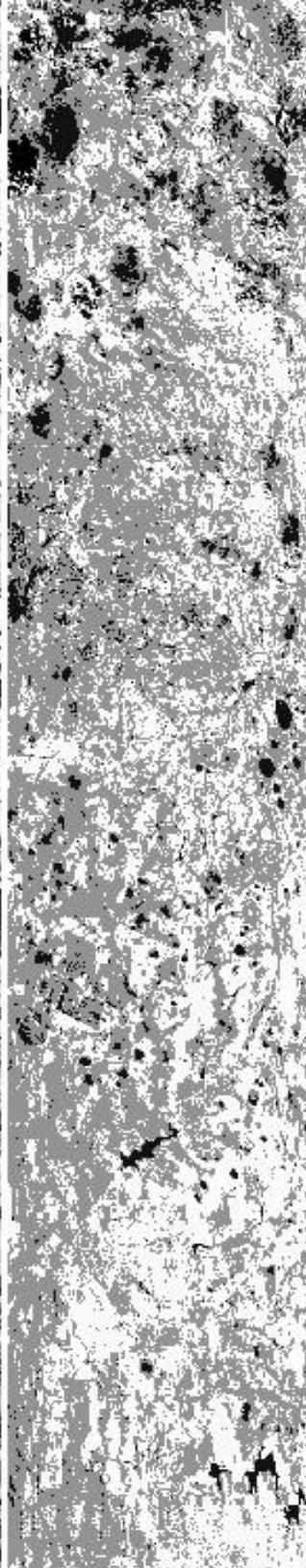
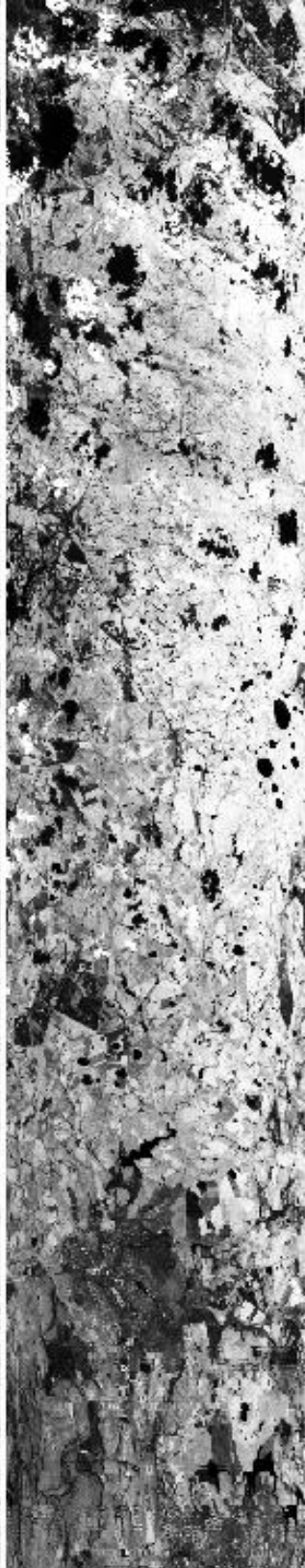
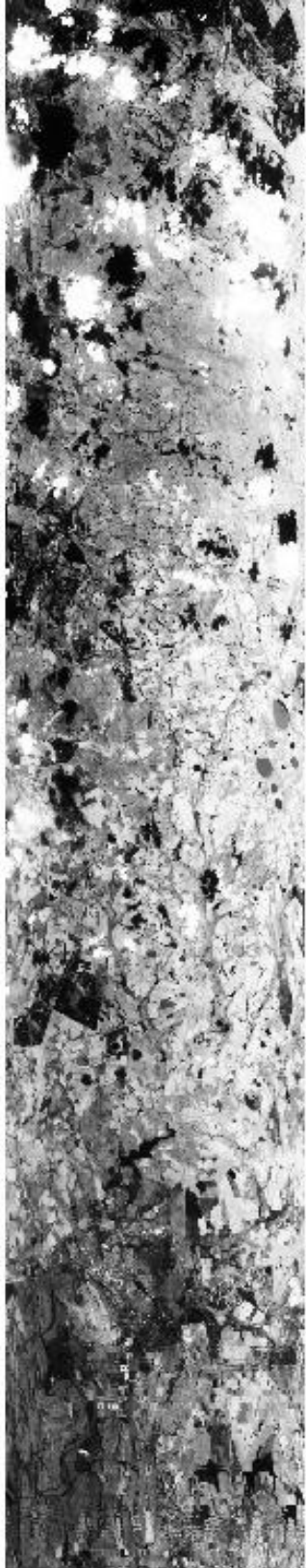
12:10:00

12:12:00

12:14:00

12:16:00

12:18:00



12:10:00

12:12:00

12:14:00

12:16:00

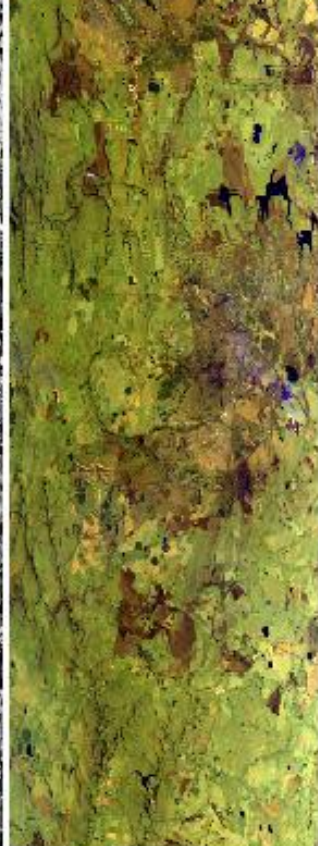
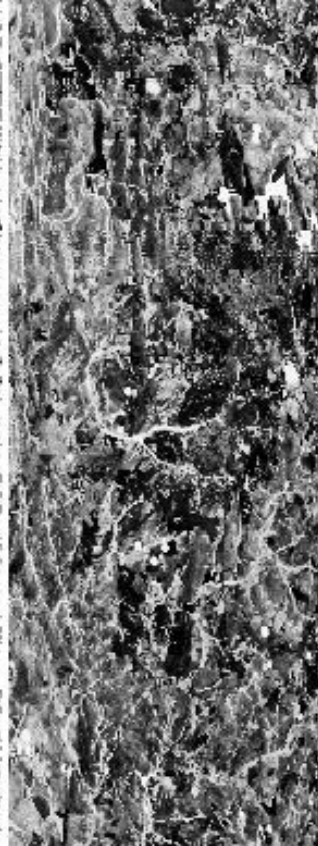
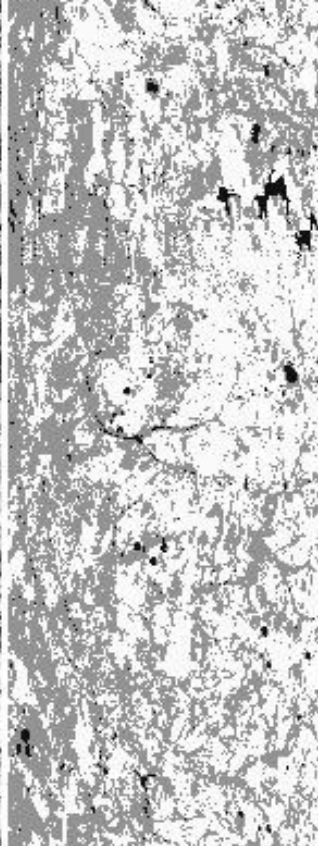
12:18:00



12:18:00

12:20:00

12:22:08



12:18:00

12:20:00

12:22:08

0.66µm (#3)

1.61µm (#10)

3.77µm (#30)

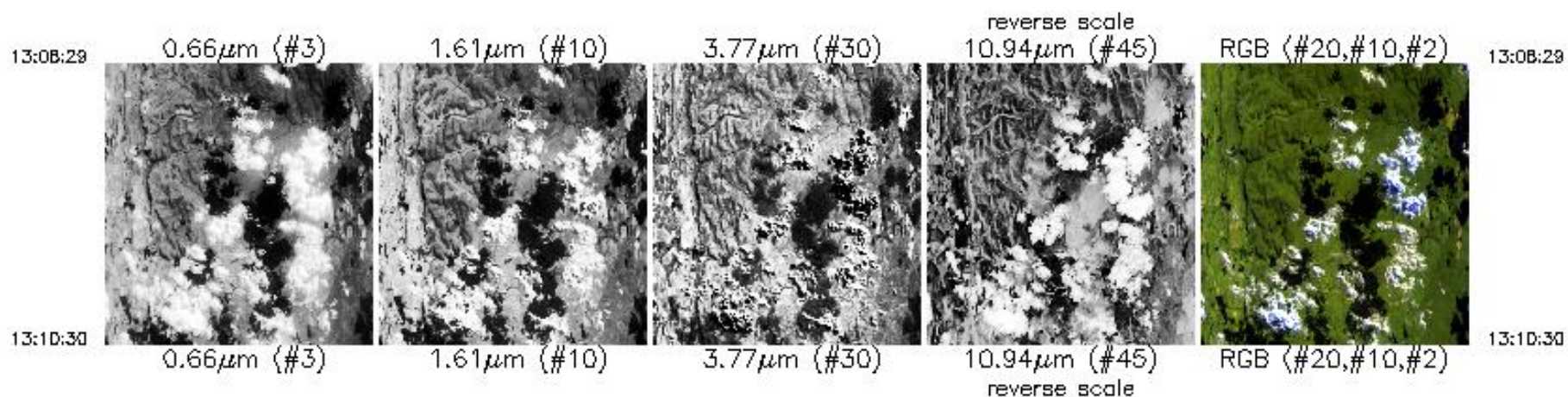
10.94µm (#45)  
reverse scale

RGB (#20,#10,#2)

Upper Left Lat, Lon = -25.6°, 30.6°  
 Lower Right Lat, Lon = -26.0°, 28.8°  
 Aircraft Heading = 268.3°  
 Solar Zenith = 46.8°  
 GPS Altitude = 20072. m (MSL)



MODIS Airborne Simulator Browse Imagery  
SAFARI 2000 Campaign – 29 Aug 2000  
Botswana  
Flight #00-153 Track #17



Upper Left Lat, Lon =  $-24.5^{\circ}$ ,  $27.9^{\circ}$   
Lower Right Lat, Lon =  $-24.2^{\circ}$ ,  $28.1^{\circ}$   
Aircraft Heading =  $83.5^{\circ}$   
Solar Zenith =  $55.2^{\circ}$   
GPS Altitude = 20136. m (MSL)