

Updates on NUCAPS Operational Products and Services

A.K. Sharma

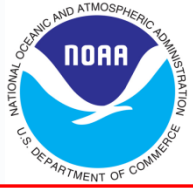
Sounding Product Area Lead

May 14, 2014

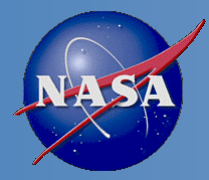




Outline



- Overview
 - Products, Requirements, Team Members, Users, Accomplishments
- SNPP Algorithms Evaluation:
 - Algorithm Description, Validation Approach and Datasets, Performance vs. Requirements, Risks/Issues/Challenges, Quality Monitoring, Recommendations
- Future Plans
 - Plan for JPSS-1 Algorithm Updates and Validation Strategies, Schedule and Milestones
- Summary



NUCAPS Team Members

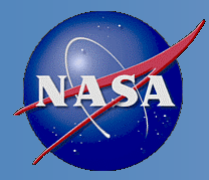


Team Members:

STAR: Walter Wolf, Thomas King, Chris Barnet, Antonia Gambacorta, Letitia Soulliard, Larisa Koval, Haibing Sun, Kexin Zhang, Xingpin Liu, Yunhui Zhao, Peter Keehn

OSPO: A.K. Sharma, Oleg Roytburd, William Oconnor

NDE: Tom Schott, Geoff Goodrum, Kevin Berberich, Peter MacHarrie, Dylan Powell



NUCAPS Users



- **U.S. Users:**
 - NCEP (John Deber, Andrew Collard, Dennis Keyser)
 - GMAO (Emily Liu)
 - AWIPS (Jim Heil)
 - STAR (Tony Reale, Murty Divakarla, Kexin Zhang, Xingpin Liu)
 - CLASS (Phil Jones)
- **International Users:**
 - EUMETSAT (Simon Elliott)
 - UK Met Office (Nigel Atkinson)
 - ECMWF (Tony McNally)
 - DWD (Reinhold Hess)
 - Meteo-France (Lydie Lavanant)
 - Plus other EUMETSAT members states
 - CMC (Louis Garand)
 - EC (Sylvain Heilliette)
 - JMA (Hidehiko Murata)
 - BOM (John Le Marshall)



NUCAPS Products and Services



- Objectives

- Provide CrIS/ATMS NOAA Unique Products within three hours of observation (or 20 minutes of data receipt from IDPS) to NWS and DOD.

Products:

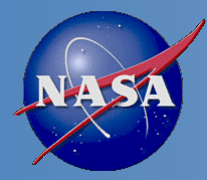
- Temperature, moisture, pressure profiles
- Cloud cleared radiances
- Atmospheric trace gas products
- Principal components
- QA/QC Science products for Operational Monitoring
- EDR Validation Products: Global Grids, Matchups, and Binaries



NUCAPS System Requirements



- *The NUCAPS shall generate CrIS thinned radiance products for NWP center users. (product, functional)*
- *NUCAPS shall generate CrIS full spatial resolution granule files containing all CrIS FOVs and FORs for all 1305 channels.*
- *The NUCAPS shall generate trace gas profile products for U.S users. (product, functional)*
- *The NUCAPS software shall generate atmospheric temperature and moisture profiles for AWIPS derived from CrIS/ATMS radiances.*
- *The NUCAPS shall write the retrieval products for AWIPS in netCDF4 format.*
- *The NUCAPS shall generate CrIS Cloud-clear Radiance (CCR) products for NWP centers and CLASS. (product, operational)*
- *The NUCAPS shall generate daily global products for system validation, maintenance, and development. (product, operational)*
- *The NUCAPS software shall produce data files for science quality monitoring of SDR and EDR data.*
- *The product s shall be available within three hours of observation. (performance)*



NUCAPS System Requirements



- The BUFR table shall contain the following variables. Variables with parentheses indicate dimensionality. (product)***

Satellite ID

ID of originating center

Satellite instrument

Satellite classification

Year

Month

Day

Hour

Minute

Second

Subsatellite Latitude

Subsatellite Longitude

Latitude

Longitude

Satellite Height

Satellite Zenith

Satellite Azimuth

Solar Zenith

Solar Azimuth

Orbit Number

Granule Number

Scan Line

CrIS FOR

CrIS FOV

Land Fraction

Land-Sea-Coast-Flag

Cloud Fraction

Cloud Height

CrIS Channels(1305)

CrIS Radiances(1305)

CrIS Quality Flag 1

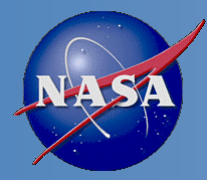
CrIS Quality Flag 2(3)

CrIS Quality Flag 3(3)

CrIS Quality Flag 4(3)

CrIS Quality Flag 5

CrIS Quality Flag 6



NUCAPS System Requirements



The NUCAPS shall generate profiles of following trace gases derived from a retrieval of CrIS/ATMS radiances: (product, functional)

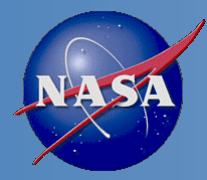
- Ozone
- Carbon Monoxide
- Carbon Dioxide
- Methane
- Volcanic Sulfur Dioxide Product
- Nitric Acid
- Nitrous Oxide

Trace gas profiles shall have the following accuracy

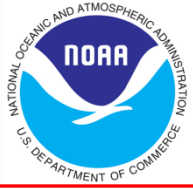
- O3: 20%/5-km near tropopause*
- O3: 10% total column*
- CO: 40% mid-trop column (w/ 0.2 cm OPD SW band)*
- CH4: 1% mid-trop column*
- CO2: 1% mid-trop column*
- HNO3: 50% mid-trop column. (product, performance)*

Trace gas profiles shall meet the following spatial specifications:

- Global coverage.*
- Horizontal resolution of ≈ 50 km (Set of 9 CrIS FOV's collocated with ATMS FOR).*



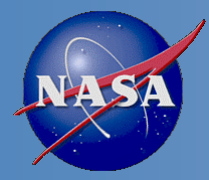
NUCAPS System Requirements



The retrieval product for AWIPS shall contain the following variables.

CrIS FOR	Time
Latitude	Longitude
View Angle	Ascending/Descending Status
Topography	Surface Pressure
Skin Temperature	Quality Flag
Pressure (at 100 levels)	Effective Pressure (at 100 levels)
Temperature (Kelvin at 100 levels)	H2O (g/g at 100 levels)
O3 (ppb at 100 levels)	Liquid H2O (g/g at 100 levels)
Ice/Liquid Flag (at 100 levels)	SO2 (g/g at 100 levels)
Stability parameters	

- *Note: This is a subset of the existing set of variables produced by the retrieval. It is our understanding that NDE will extract this subset of variables.*

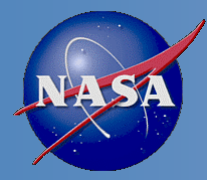


NUCAPS System Requirements



The EDR product shall contain the following variables calculated on each CrIS FOR:

- Ice/liquid flag (at 100 levels)
- CH₄ layer column density (at 100 levels)
- CH₄ mixing ratio (at 100 levels)
- CO₂ mixing ratio (at 100 levels)
- HNO₃ layer column density (at 100 levels)
- HNO₃ mixing ratio (at 100 levels)
- N₂O layer column density (at 100 levels)
- N₂O mixing ratio (at 100 levels)
- SO₂ layer column density (at 100 levels)
- SO₂ mixing ratio (at 100 levels)
- Microwave emissivity
- MIT microwave emissivity
- Infrared emissivity
- MIT infrared emissivity
- Infrared surface emissivity
- First Guess infrared surface emissivity
- Infrared surface reflectance
- Atmospheric Stability
- Cloud infrared emissivity
- Cloud reflectivity

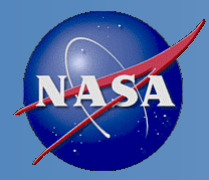


NUCAPS System Requirements



The EDR product shall contain the following trace gas profiles and surface and cloud properties calculated on each CrIS FOR:

Time	Cloud Top Pressure
Latitude	Cloud Top Fraction
Longitude	Pressure (at 100 levels)
View Angle	Effective Pressure (at 100 levels)
Satellite Height	Temperature (at 100 levels)
Mean CO ₂	MIT Temperature (at 100 levels)
Solar Zenith	First Guess Temperature (at 100 levels)
Ascending/Descending Status	H ₂ O layer column density (at 100 levels)
Topography	H ₂ O mixing ratio (at 100 levels)
Land-Sea-Coast Flag	First Guess H ₂ O layer column density (at 100 levels)
Surface Pressure	First Guess H ₂ O mixing ratio (at 100 levels)
Skin Temperature	MIT H ₂ O layer column density (at 100 levels)
MIT Skin Temperature	MIT H ₂ O mixing ratio (at 100 levels)
First Guess Skin Temperature	O ₃ layer column density (at 100 levels)
Microwave Surface Class	O ₃ mixing ratio (at 100 levels)
Microwave Surface Emissivity	First Guess O ₃ layer column density (at 100 levels)
Number of Cloud Layers	First Guess O ₃ mixing ratio (at 100 levels)
Retrieval Quality Flag	Liquid H ₂ O layer column density (at 100 levels)
	Liquid H ₂ O mixing ratio (at 100 levels)



CrIS Requirements



Caveat:

The current CrIS instrument's spectral resolution in the short-wave band is too low for retrieval of carbon monoxide and carbon dioxide within requirements.



NUCAPS Plan Schedules



Schedule (key milestones):

- Preliminary Design Review – May , 2007
- Critical Design Review – Sept, 2008
- Test Readiness Review – Sept, 2010
- Code Unit Test Review – Oct, 2010
- Phase 1 Algorithm Readiness Review – March, 2012
- NUCAPS Phase 1 Delivery – Mar, 2012
- NUCAPS Phase 2 Delivery – Dec, 2012
- Phase 2 Algorithm Readiness Review – Jan, 2013
- NDE Implementation of NUCAPS Phase 2 – Jan 2013
- SPSRB Briefing – September 2013
- Operations Commence – Oct, 2013

SNPP Activities

Suomi NPP EDR Cal/Val Milestones					
Date	Milestone				
28 Oct 2011	Suomi NPP Launch				
08 Nov 2011	ATMS First Light				
17 Nov 2011	NPP reaches mission orbit				
21 Nov 2011	VIIRS First Light				
Dec 2011 – Jan 2012	ATMS Tuning				
18 Jan 2012	CrIS First Light				
Feb 2012	Beta ATMS SDR				
Feb–Jun 2012	CrIS Tuning				
Apr 2012	Beta CrIS SDR				
Apr–May 2012	Segue into ICV phase				
31 Jul 2012	Beta Maturity EDR Validation Report				
Nov 2012	Provisional Maturity EDR				
Apr 2013	Stage 1 Validated EDR				

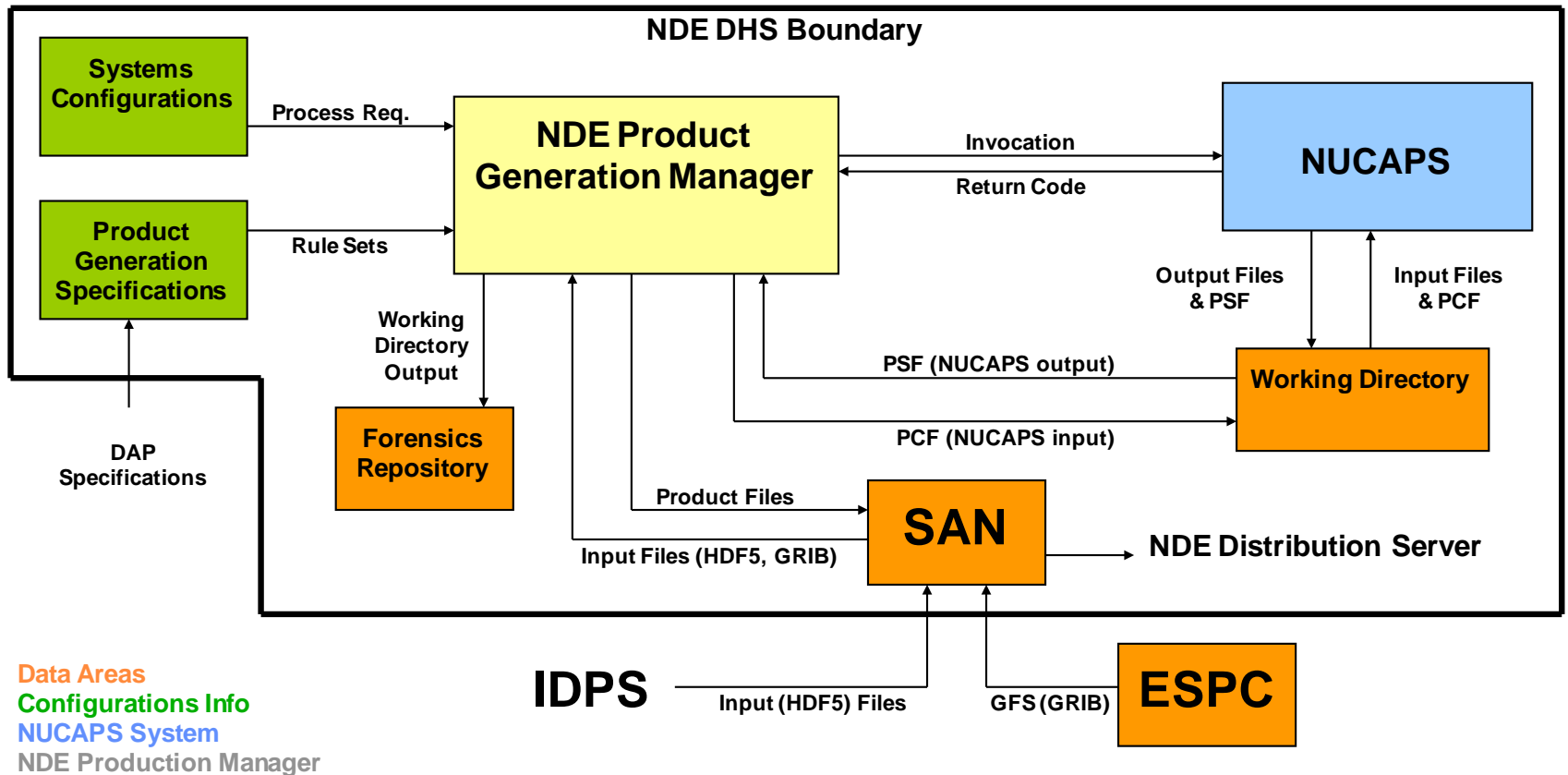
Suomi NPP CrIMSS EDR Maturity					
Algorithm	Beta	Provisional	Val 1	Val 2	Val 3
AVTP	L + 9m	L + 12m	L + 18m	L + 24m	L + 36m
AVMP	Jul	Oct	Apr	Oct	Oct
AVPP	2012	2012	2013	2013	2014

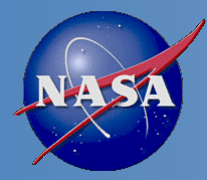


NUCAPS External Interfaces

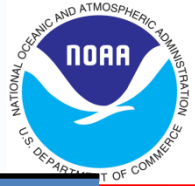


NUCAPS External Interfaces





JPSS Specification Performance Requirements



- **NGAS Algorithm:** Optimal Estimation (OE) method, no front-end regression
 - AVTP, AVMP, AVPP, O₃-IP, surface skin temperature and emissivity retrieved simultaneously
 - **Non-precipitating scenes**
 - **Code implementations**
 - IDPS operational product (42/22 layer)
 - NGAS science code (100 layer)
- **NUCAPS Algorithm:** AIRS approach, multi-step iterative method, front-end regression
 - NUCAPS science code (100 layer)
 - Operational product in Sept 2013

“Partly Cloudy” – ≤50% cloudiness

“Cloudy” – >50% cloudiness

- *Clear* – the CrIMSS EDR retrieval algorithm detected no cloud within a FOR;
- *Cloudy* – the CrIMSS EDR algorithm detected overcast cloud or more than three layers of clouds within a FOR;
- *Partly Cloudy* – the CrIMSS algorithm detected one to three layers of clouds.

Atmospheric Vertical Temperature Profile (AVTP)

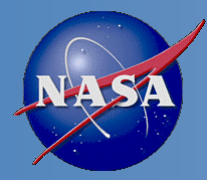
Measurement Uncertainty – Layer Average Temperature Error

PARAMETER	THRESHOLD
AVTP Clear, surface to 300 mb	1.6 K / 1-km layer
AVTP Clear, 300 to 30 mb	1.5 K / 3-km layer
AVTP Clear, 30 mb to 1 mb	1.5 K / 5-km layer
AVTP Clear, 1 mb to 0.5 mb	3.5 K / 5-km layer
AVTP Cloudy , surface to 700 mb	2.5 K / 1-km layer
AVTP Cloudy, 700 mb to 300 mb	1.5 K / 1-km layer
AVTP Cloudy, 300 mb to 30 mb	1.5 K / 3-km layer
AVTP Cloudy, 30 mb to 1 mb	1.5 K / 5-km layer
AVTP Cloudy, 1 mb to 0.5 mb	3.5 K / 5-km layer

Atmospheric Vertical Moisture Profile (AVMP)

Measurement Uncertainty – 2-km Layer Average Mixing Ratio % Error

PARAMETER	THRESHOLD
AVMP Clear, surface to 600 mb	Greater of 20% or 0.2 g/kg / 2-km layer
AVMP Clear, 600 to 300 mb	Greater of 35% or 0.1 g/kg / 2-km layer
AVMP Clear, 300 to 100 mb	Greater of 35% or 0.1 g/kg / 2-km layer
AVMP Cloudy, surface to 600 mb	Greater of 20% of 0.2 g/kg / 2-km layer
AVMP Cloudy, 600 mb to 400 mb	Greater of 40% or 0.1 g/kg / 2-km layer
AVMP Cloudy, 400 mb to 100 mb	Greater of 40% or 0.1 g/kg / 2-km layer



NUCAPS Algorithms Evaluation

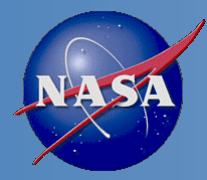


The NOAA Unique CrIS/ATMS Processing System (NUCAPS) is an inversion algorithm, heritage of the AIRS Science Team and NOAA IASI inversion algorithm (same code, same underlying spectroscopy) applied to the CrIS and ATMS Sounding System data.

- Inputs: CrIS and ATMS radiances
- Outputs: Temperature, Water Vapor, cloud cleared radiance, trace gases, cloud parameters

Outline of the validation results presented in this review:

- **Part I: Temperature, water vapor , ozone**
 - Global, Tropical, Mid-Latitude, Polar; Day/Night; Ocean/Land regimes validation versus
 - collocated ECMWF and AVN analyses
 - AIRS operational version 6 retrievals (uses same spectroscopy as NUCAPS, neural network first guess)
 - AIRS version 5.9 retrievals (uses same spectroscopy and retrieval algorithm as NUCAPS)
- **Part II: Temperature and geo-potential height**
 - Collocated cal/val RAOBs over Hawaii (tropical ocean regime)
- **Part III: Cloud clearing radiance; cloud fraction and top pressure**
 - OBS – CALC results, comparisons with AIRS
- **Part IV: Trace gases: ozone, methane, CO₂, CO, HNO₃, N₂O**
 - Global map comparisons of NUCAPS and AIRS collocated retrievals

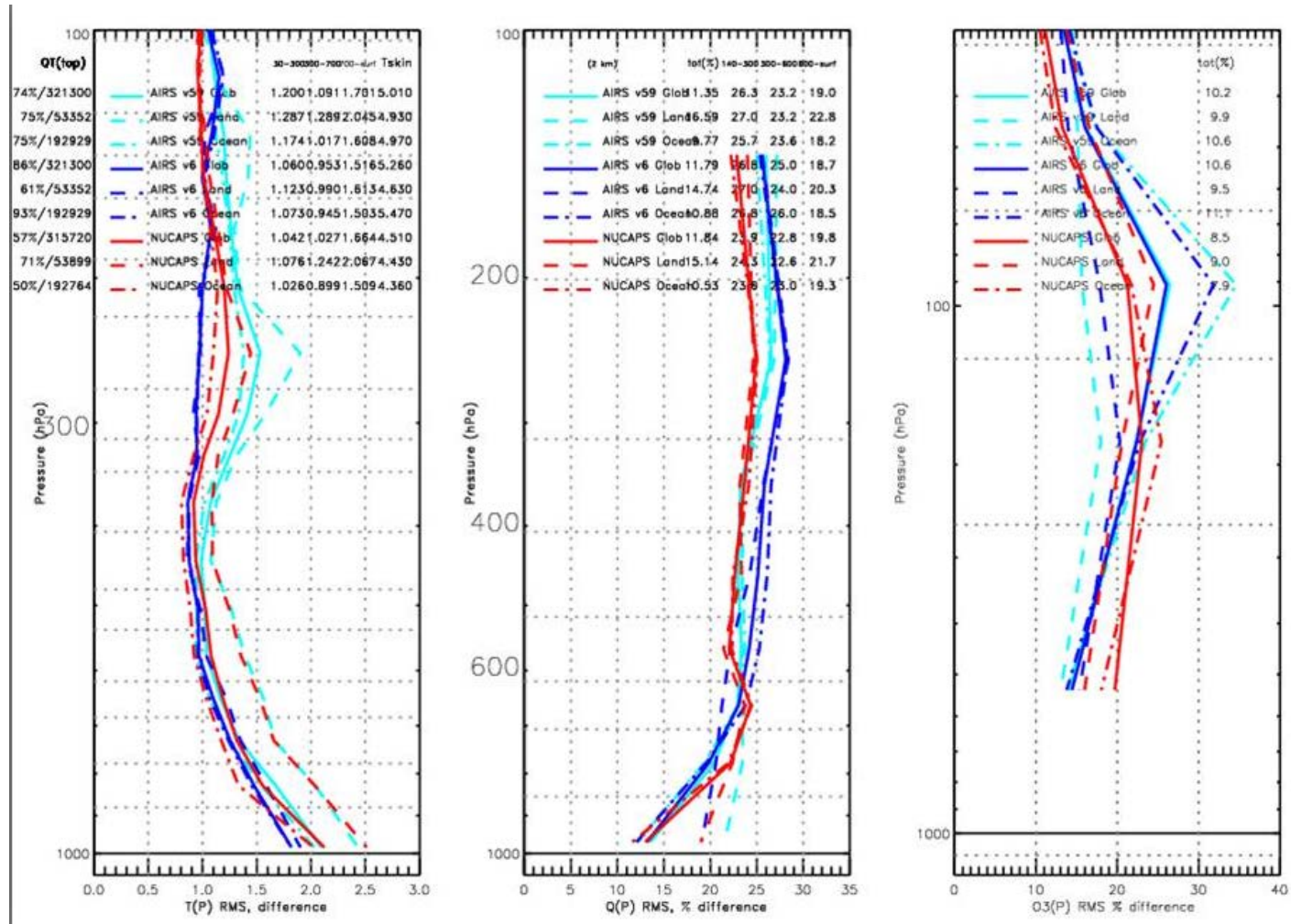


T, q Retrieval Statistics vs ECWMF; o3 vs AVN

NUCAPS: ECMWF trained ccr FG (dash), final RET (solid)

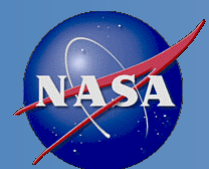
AIRS v5.9: ECMWF trained ccr FG (dash), final RET (solid)

AIRS v6: NN FG (dash), final RET (solid)



ocean only (dash dot), land only (dash), and global (solid)

Courtesy: Antonia Gambacorta



NUCAPS Sounding Products

SNPP Granule Composite Images

Description.

Select an archive date:

Saturday, March 29, 2014 ▼

Go

Sunday, March 30, 2014

	NUCAPS / SNPP	
Temperature	0-12 Z	12-24 Z
Methane (CH ₄)	0-12 Z	12-24 Z
Carbon Monoxide (CO)	0-12 Z	12-24 Z
Carbon Dioxide (CO ₂)	0-12 Z	12-24 Z
Water Vapor (H ₂ O)	0-12 Z	12-24 Z
Ice Liquid Flag	0-12 Z	12-24 Z
Liquid H ₂ O	0-12 Z	12-24 Z
Ozone (O ₃)	0-12 Z	12-24 Z
Quality Flag	0-12 Z	12-24 Z

There are two time periods available for each group of data:

- Time period 1 covers from 00Z to 12Z of the current day.
- Time period 2 covers from 12Z to 24Z of the current day.



NUCAPS Sounding Products

SNPP Global Gridded 0.5 deg lat x 2 deg lon Images

Description.

Select an archive date:

Wednesday, May 7, 2014

Thursday, May 8, 2014

	NUCAPS / SNPP
Temperature	0-24 Z
Methane (CH4)	0-24 Z
Carbon Monoxide (CO)	0-24 Z
Carbon Dioxide (CO2)	0-24 Z
Water Vapor (H2O)	0-24 Z
Liquid H2O	0-24 Z
Ozone (O3)	0-24 Z

Soundings Links

[Soundings Home](#)

[ATOVS Soundings](#)

[GGCP](#)

[IASI](#)

[MIRS Sounding Products](#)

Skew-T Profiles: [GOES](#) | [POES](#)

[Sounder DPI](#)

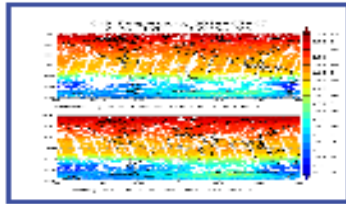
[Satellite Cloud Product](#)



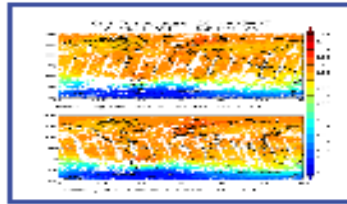
NUCAPS Gridded Temperature



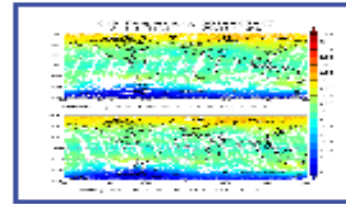
Thursday, May 8, 2014 0-24Z



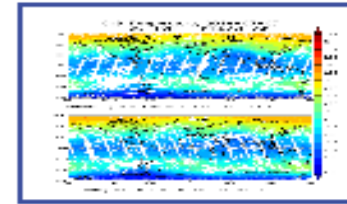
1.0 mb



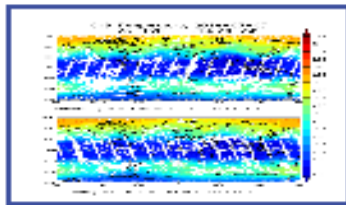
9.5 mb



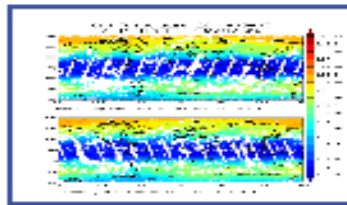
29.1 mb



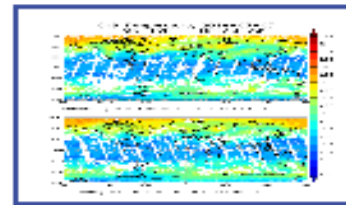
51.1 mb



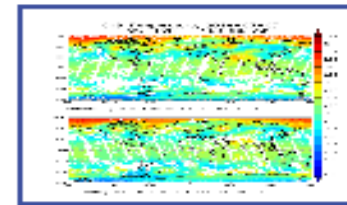
71.5 mb



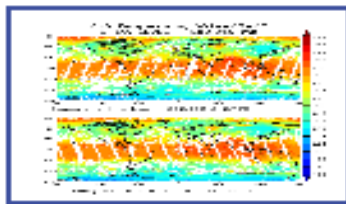
103 mb



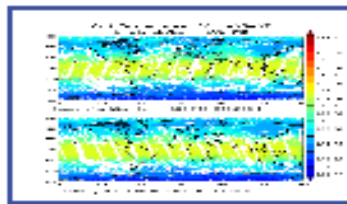
151 mb



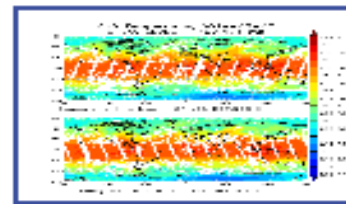
201 mb



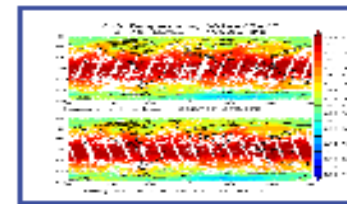
260 mb



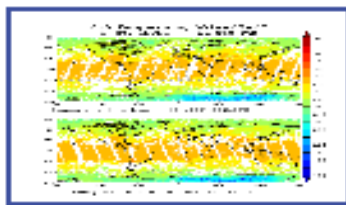
300 mb



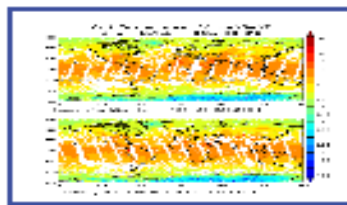
407 mb



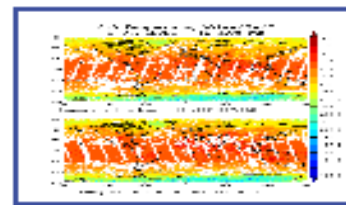
497 mb



707 mb



853 mb



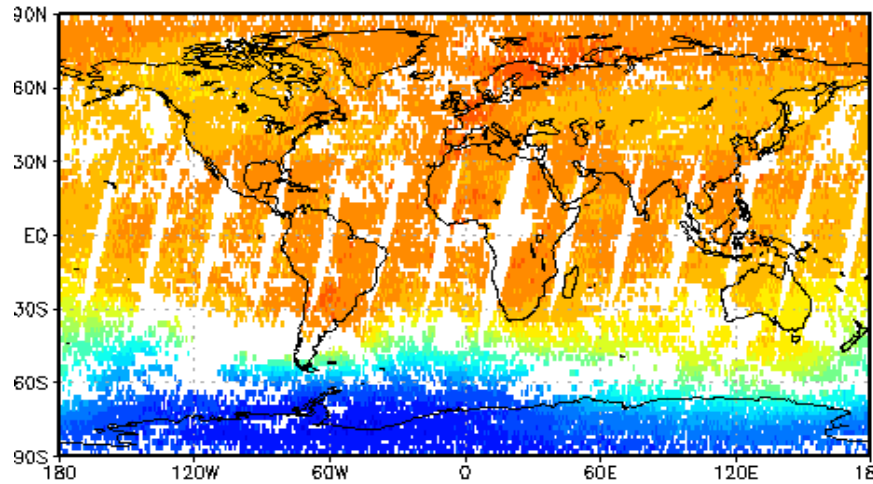
1014 mb



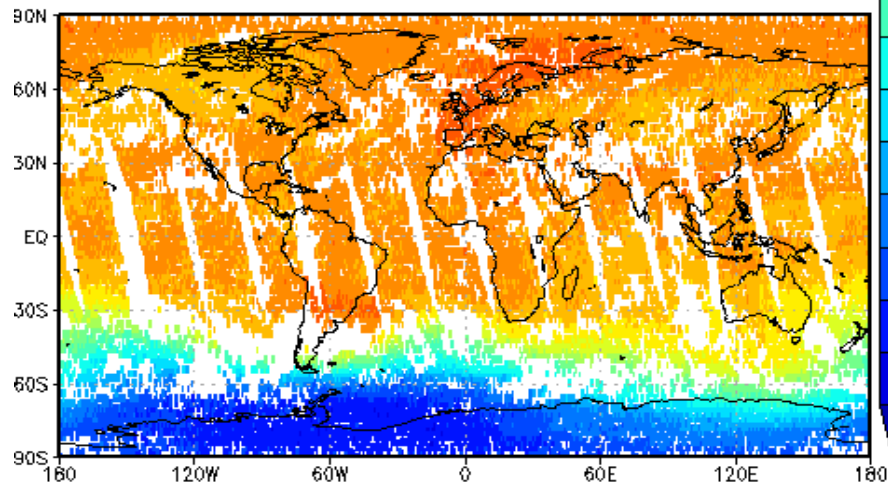
NUCAPS Level Temperatures



CrIS Temperature, 2014-05-07
Z=20, LEVEL = 9.5119 mb

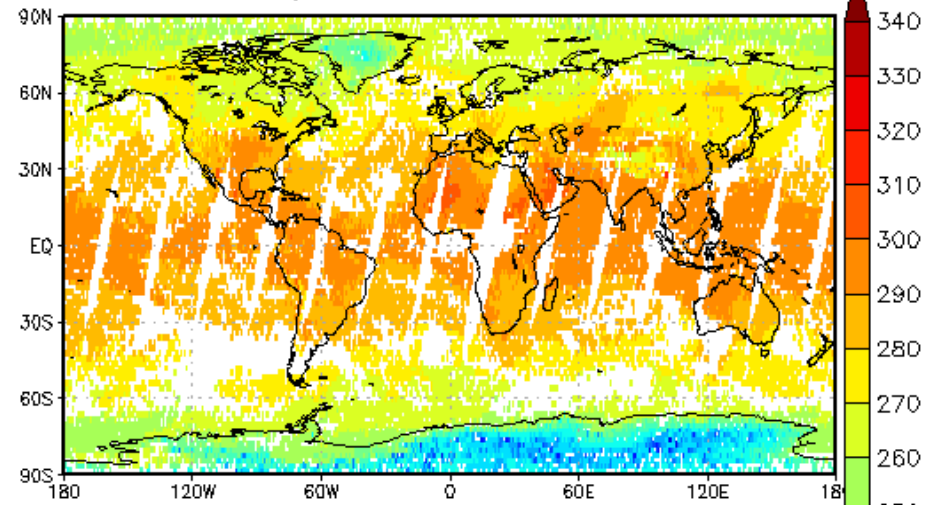


Descending Min, Max = 194.947 238.293 K

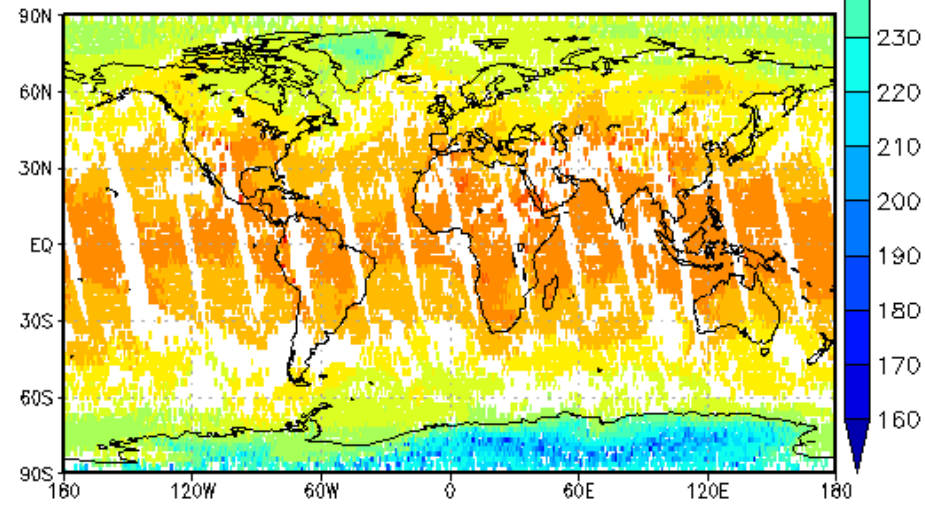


Ascending Min, Max = 194.645 238.407 K

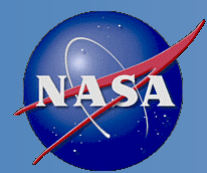
CrIS Temperature, 2014-05-07
Z=91, LEVEL = 852.788 mb



Descending Min, Max = 164.139 330.208 K



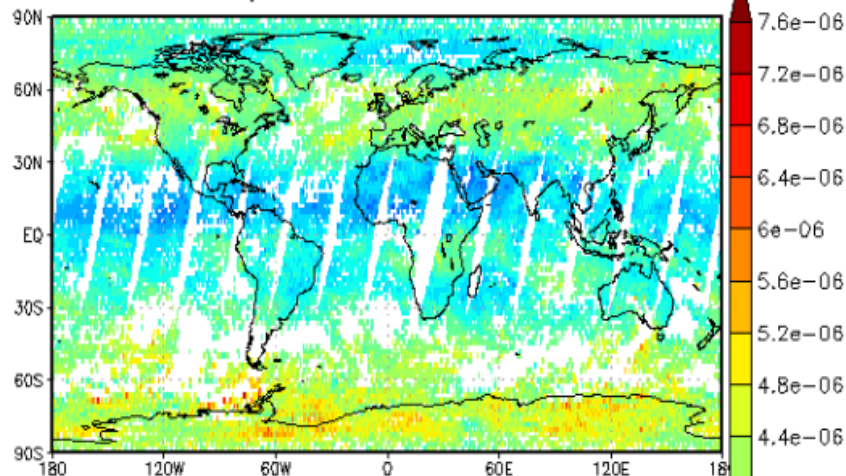
Ascending Min, Max = 159.351 337.831 K



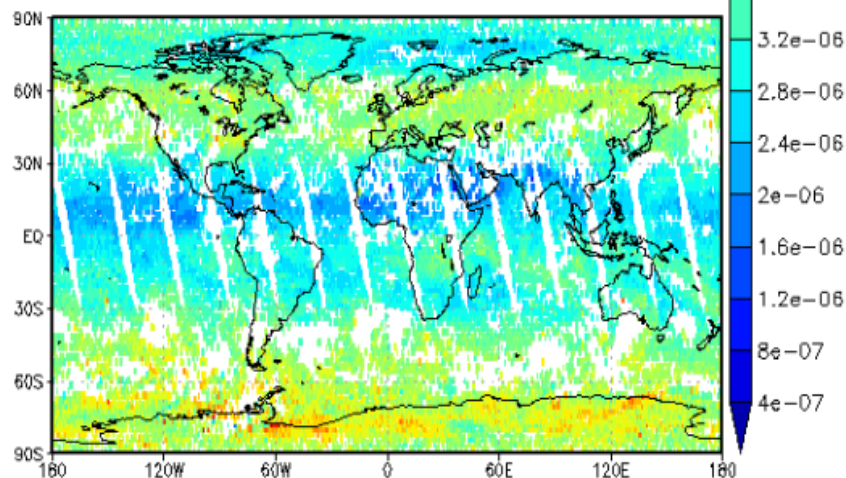
NUCAPS Layer H2O MR



CrIS H2O MR, 2014-05-08
Z=20, LAYER = 8.82158 mb

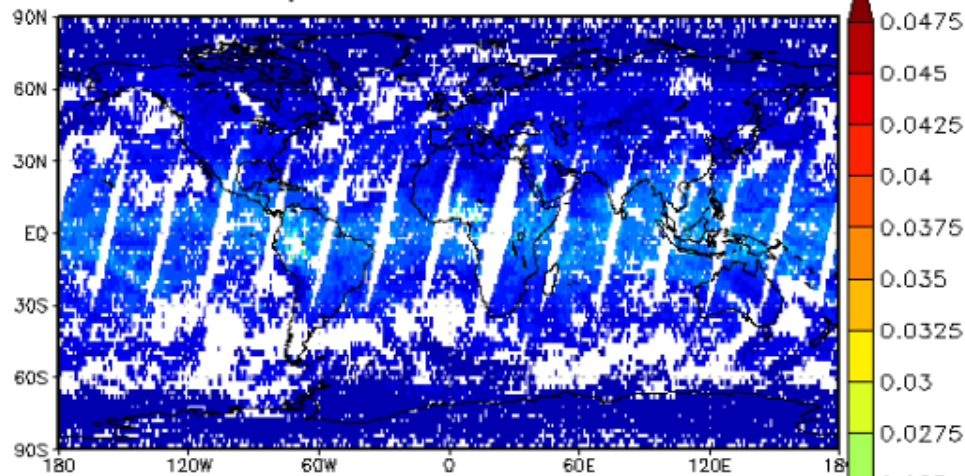


Descending Min, Max = $1.0973e-06$ $7.20811e-06$ gerg

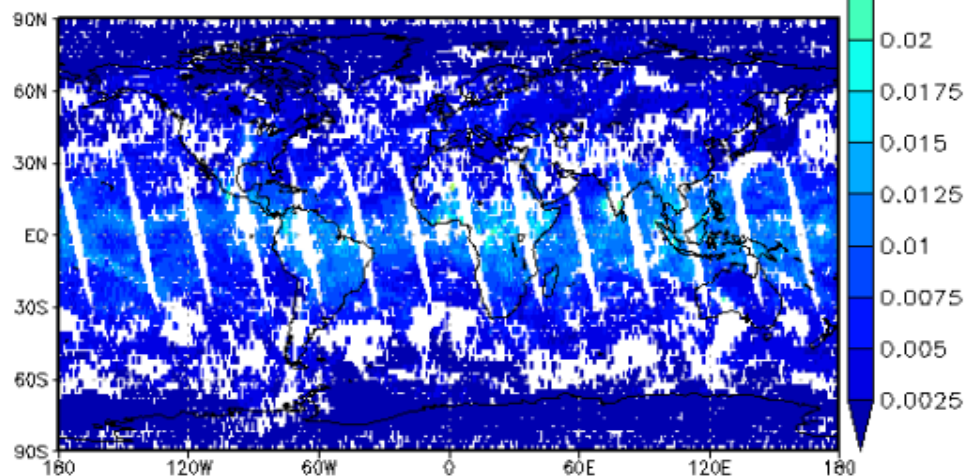


Ascending Min, Max = $9.96018e-07$ $9.30561e-06$ gperg

CrIS H2O MR, 2014-05-08
Z=91, LAYER = 840.016 mb



Descending Min, Max = $9.5353e-09$ 0.0312135 gperg



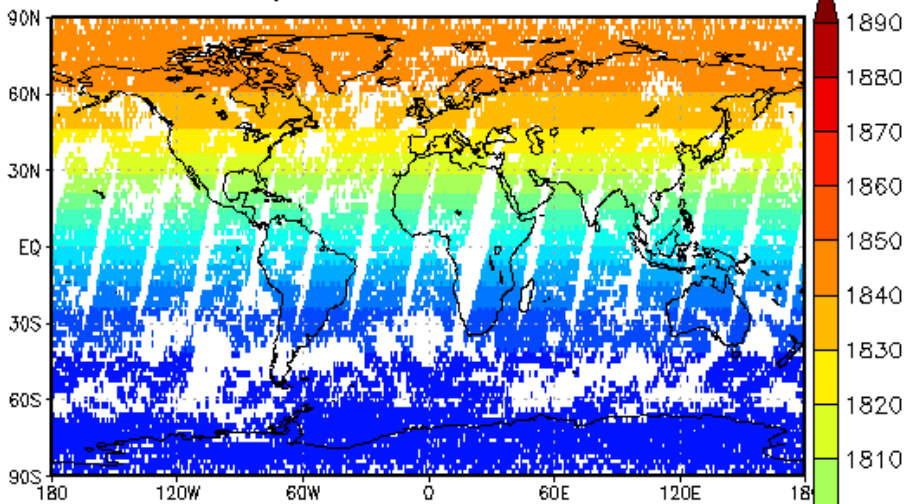
Ascending Min, Max = $5.52356e-09$ 0.027419 gperg



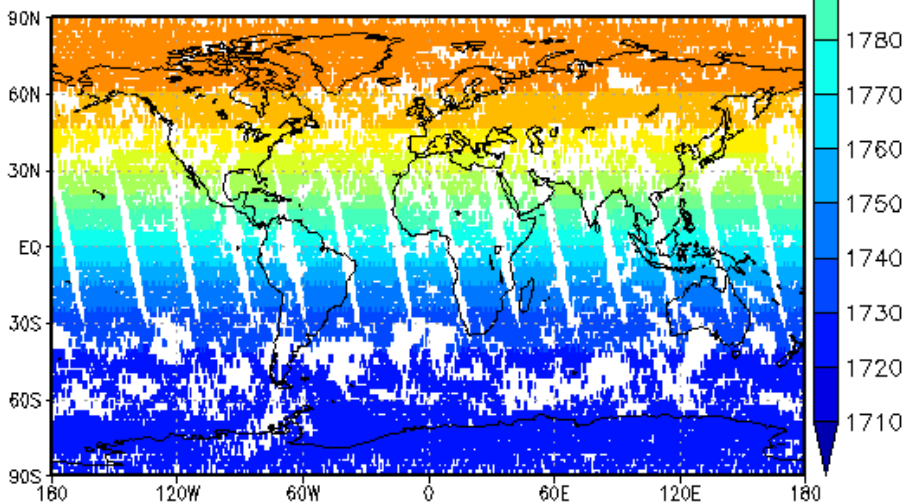
NUCAPS Layer CH4 MR



CrIS CH4 MR, 2014-05-08
Z=75, LAYER = 487.236 mb

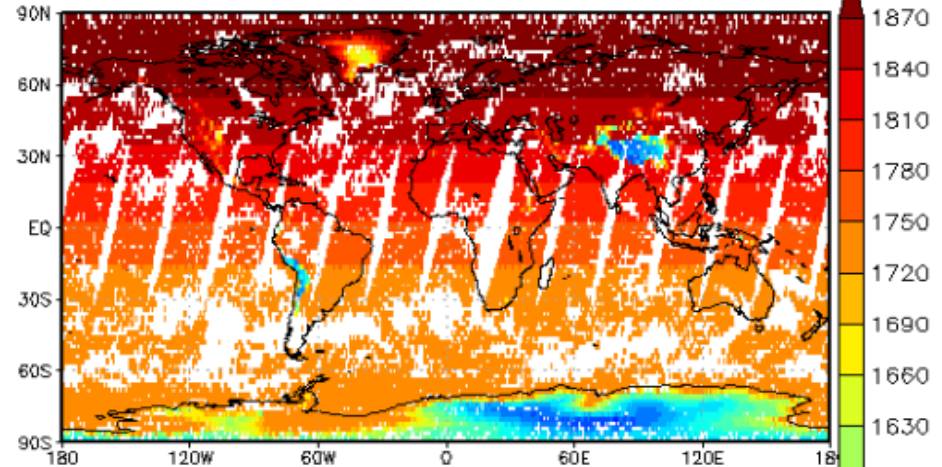


Descending Min, Max = 1727.1 1847.16 ppb

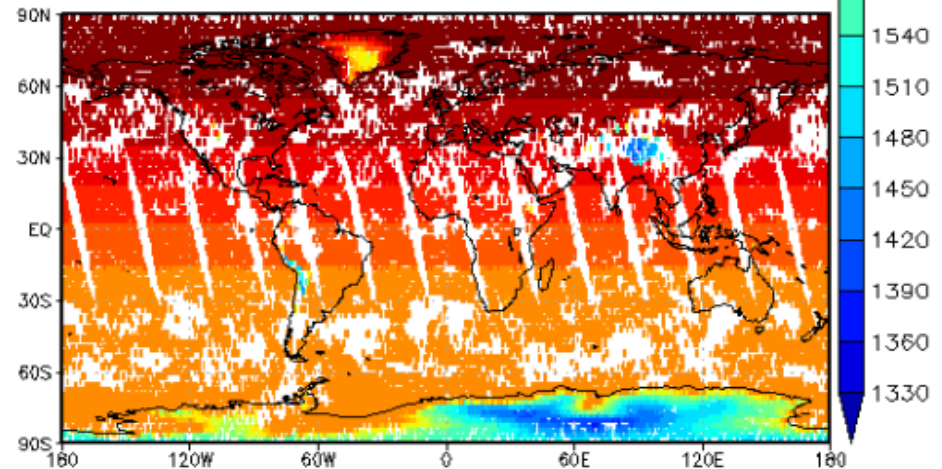


Ascending Min, Max = 1727.09 1847.15 ppb

CrIS CH4 MR, 2014-05-08
Z=91, LAYER = 840.016 mb



Descending Min, Max = 1386.52 1890.99 ppb



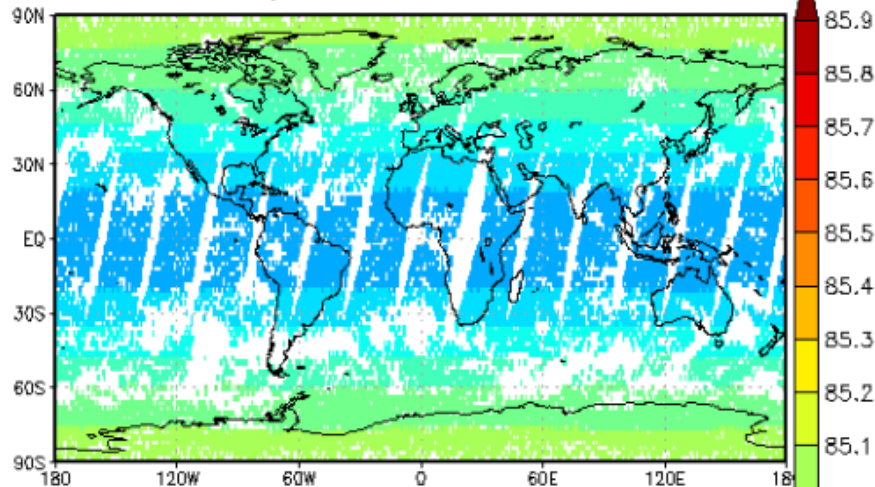
Ascending Min, Max = 1386.51 1890.99 ppb



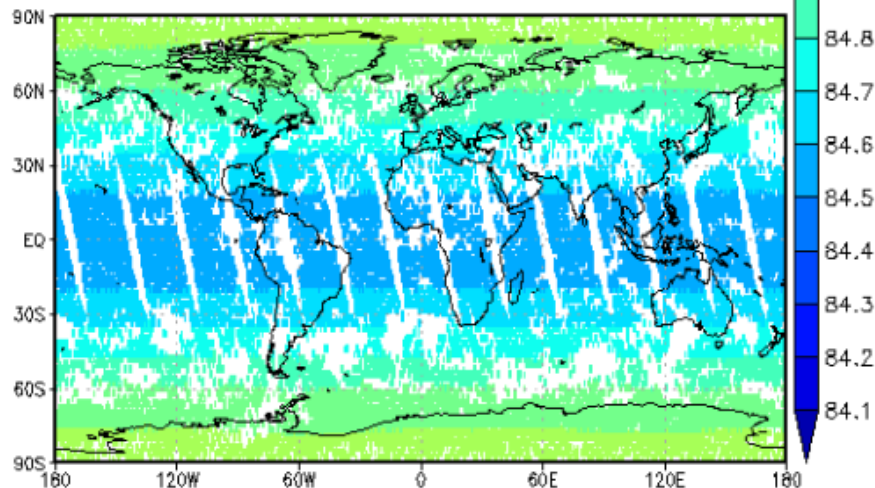
NUCAPS Layer CO MR



CrIS CO MR, 2014-05-08
Z=70, LAYER = 399.126 mb

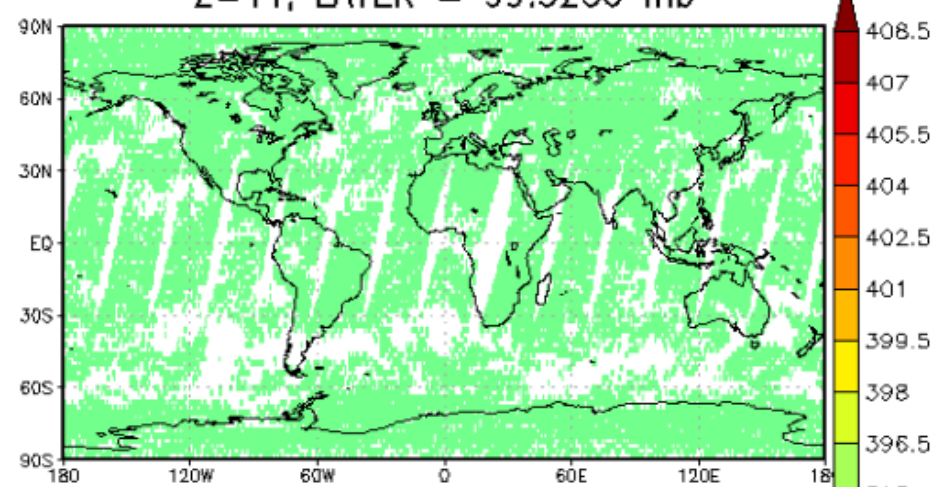


Descending Min, Max = 84.5437 85.0281 ppb

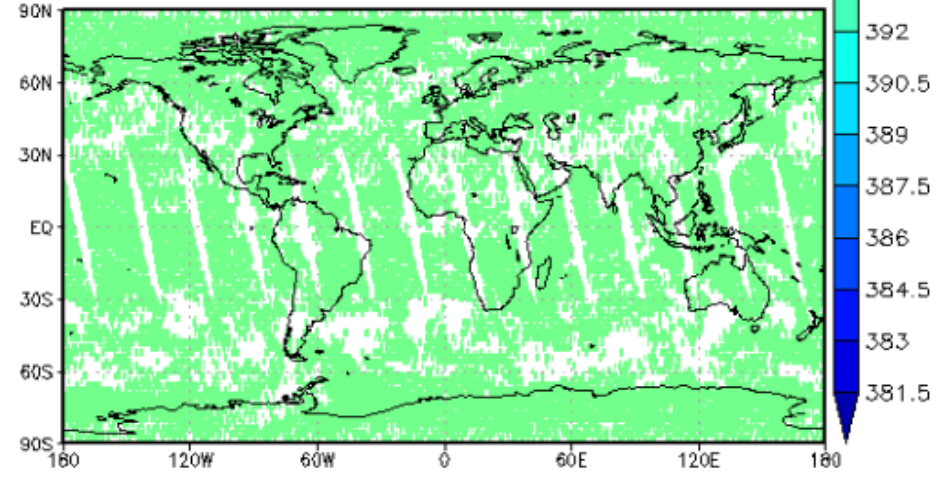


Ascending Min, Max = 84.5443 85.0281 ppb

CrIS CO2, 2014-05-08
Z=44, LAYER = 99.5256 mb



Descending Min, Max = 394.657 394.662 ppm



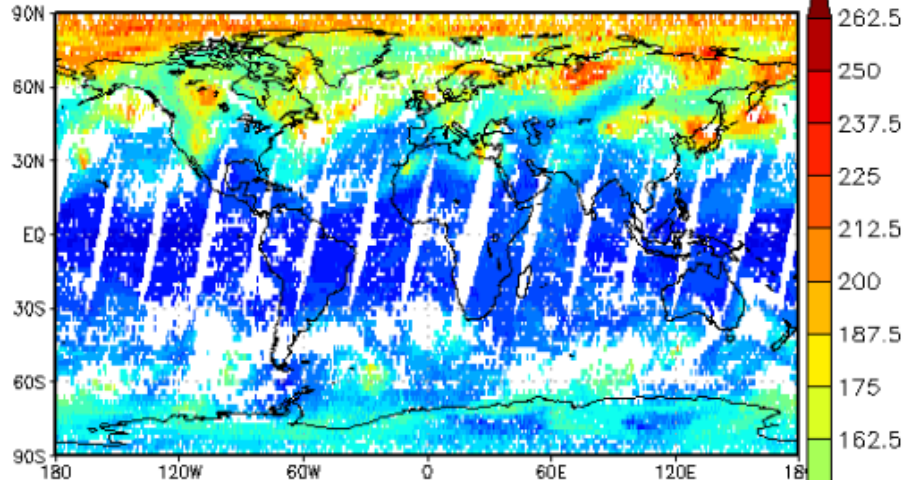
Ascending Min, Max = 394.657 394.662 ppm



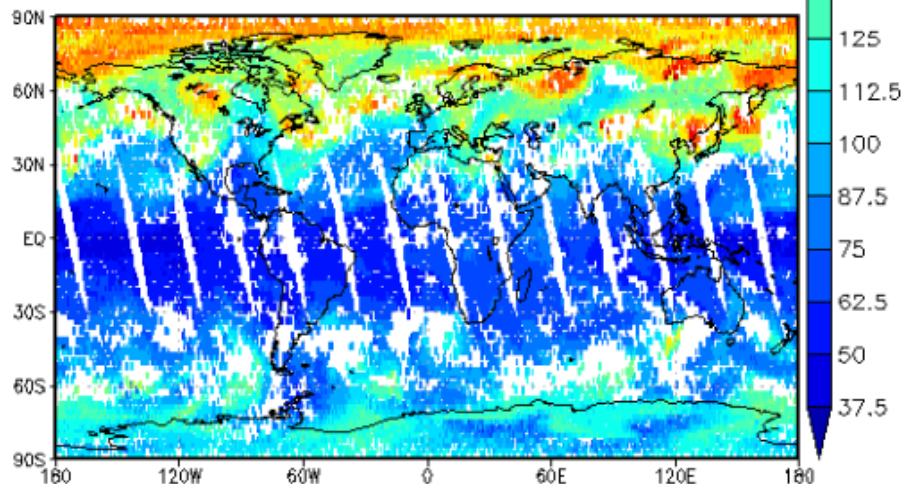
NUCAPS Layer Ozone MR



CrIS O3 MR, 2014-05-08
Z=63, LAYER = 293.077 mb

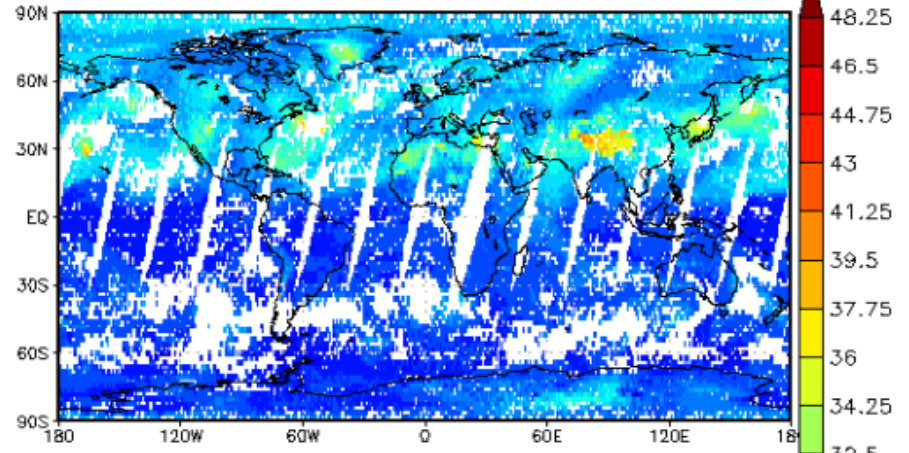


Descending Min, Max = 41.6813 252.334 ppb

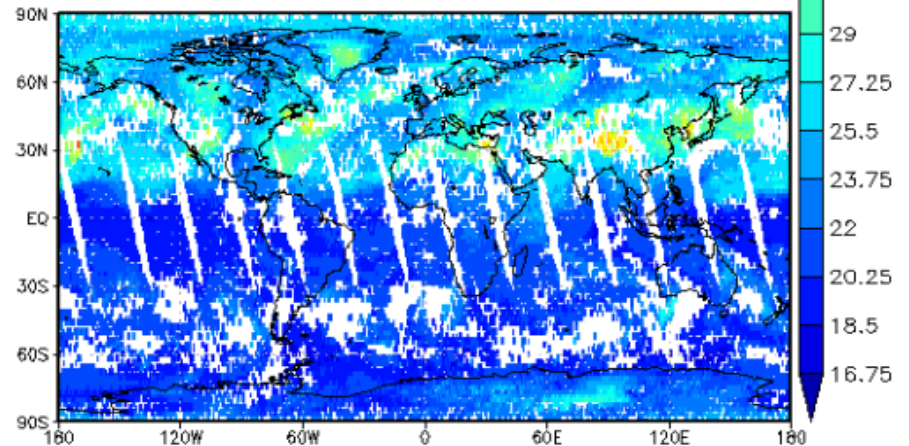


Ascending Min, Max = 41.3457 272.385 ppb

CrIS O3 MR, 2014-05-08
Z=91, LAYER = 840.016 mb



Descending Min, Max = 16.7214 41.913 ppb



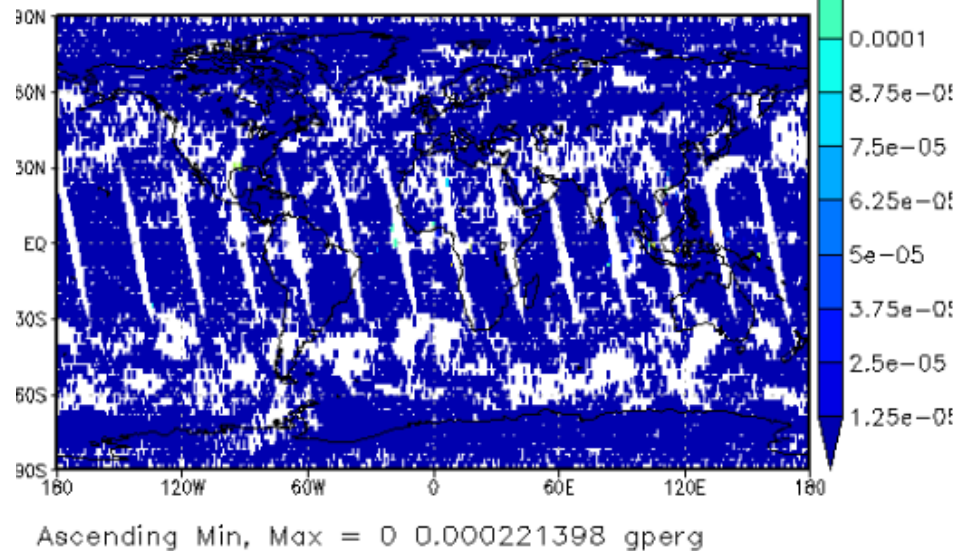
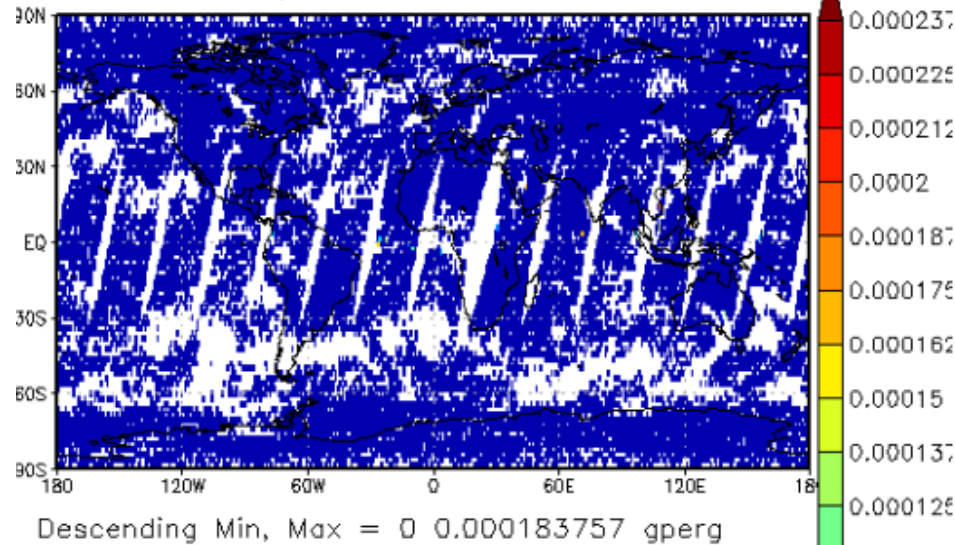
Ascending Min, Max = 16.4796 41.3736 ppb



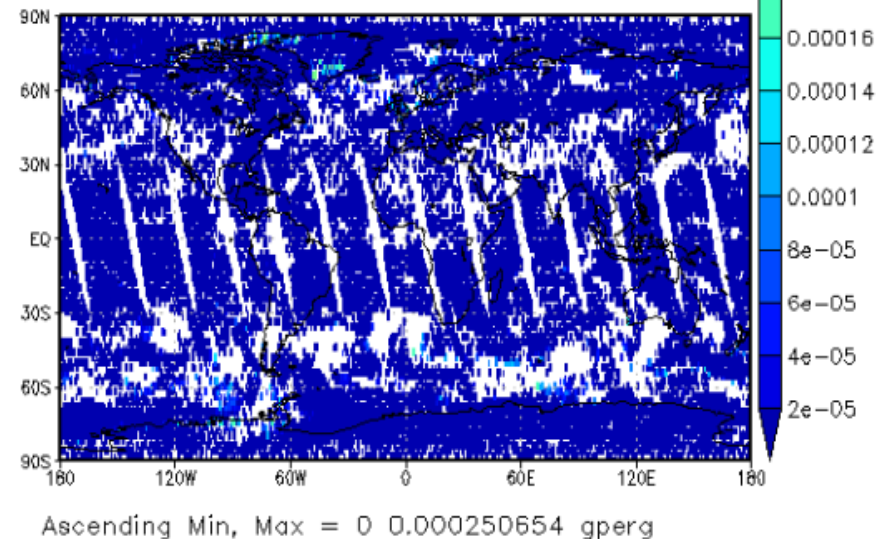
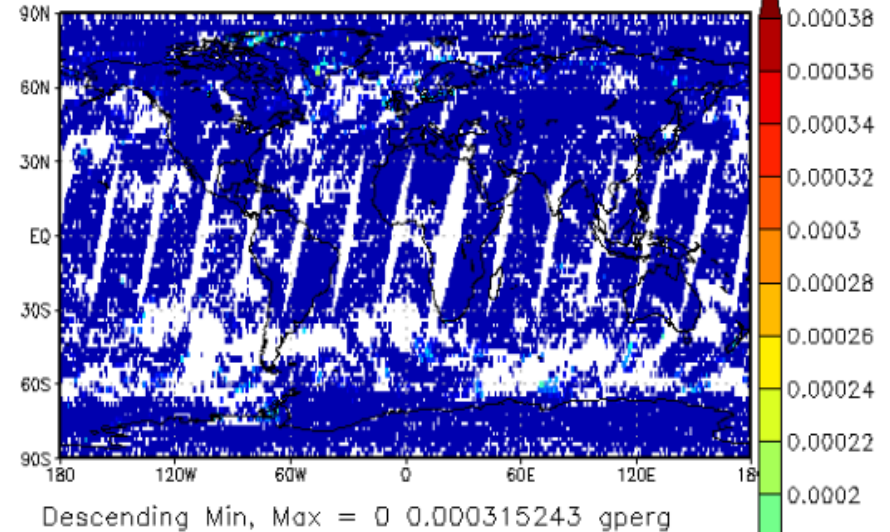
NUCAPS Layer Liquid H₂O MR

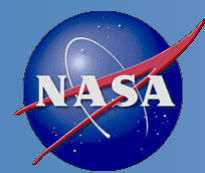


CrIS Liquid_H2O_MR, 2014-05-08
Z=70, LAYER = 399.126 mb



CrIS Liquid_H2O_MR, 2014-05-08
Z=91, LAYER = 840.016 mb



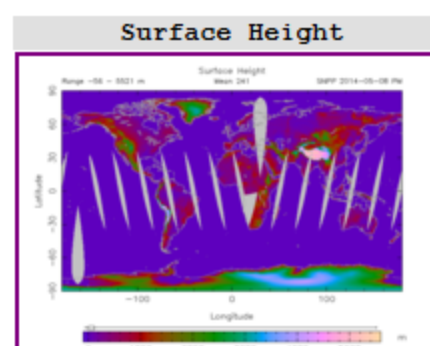
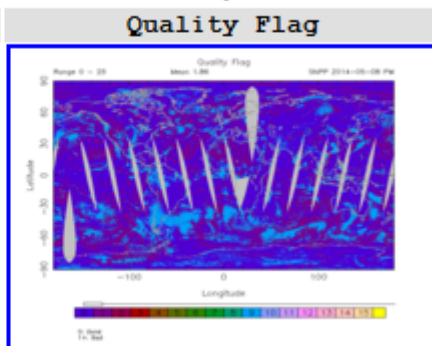
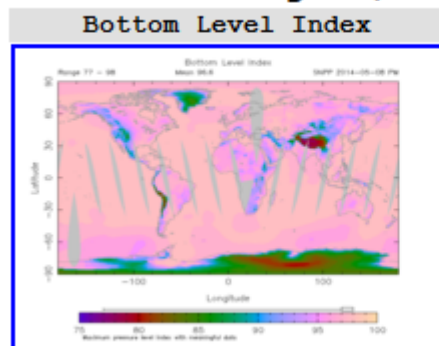


NUCAPS EDR Images for 2014-05-08 PM - SNPP



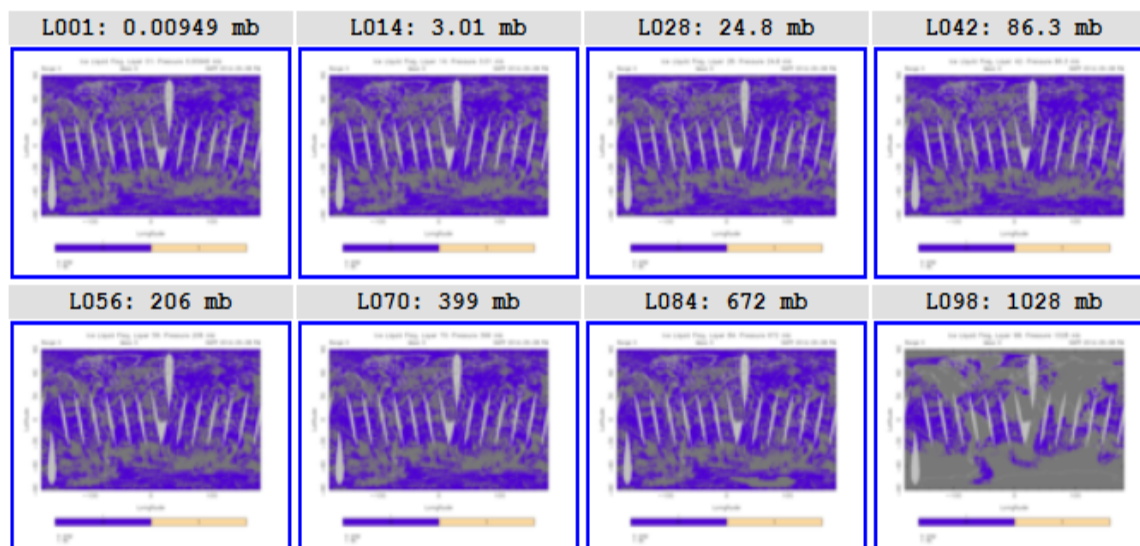
Internal links: [\[Single Level Parameters\]](#) [\[Ice Liquid Flag\]](#) [\[Mixing Ratio of Carbon Dioxide\]](#) [\[Mixing Ratio of Carbon Monoxide\]](#) [\[Mixing Ratio of Liquid Water\]](#) [\[Mixing Ratio of Methane\]](#) [\[Mixing Ratio of Ozone\]](#) [\[Mixing Ratio of Water Vapor\]](#) [\[Temperature\]](#)

Flags (Enumeration)



Single Level Parameters

Ice Liquid Flag

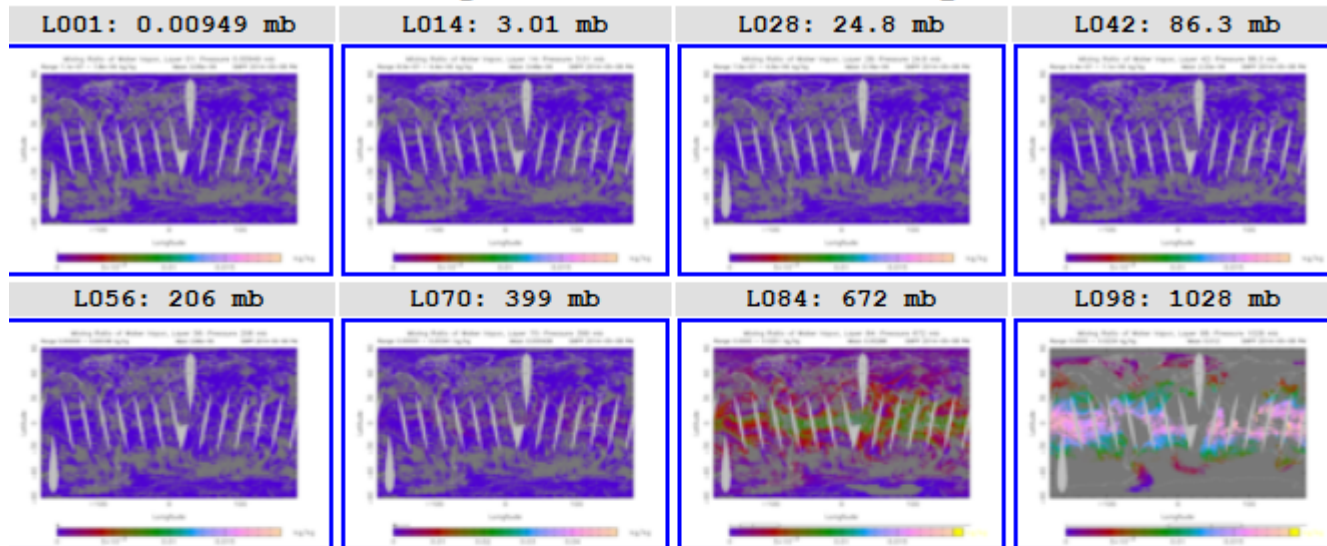




NUCAPS Products Images

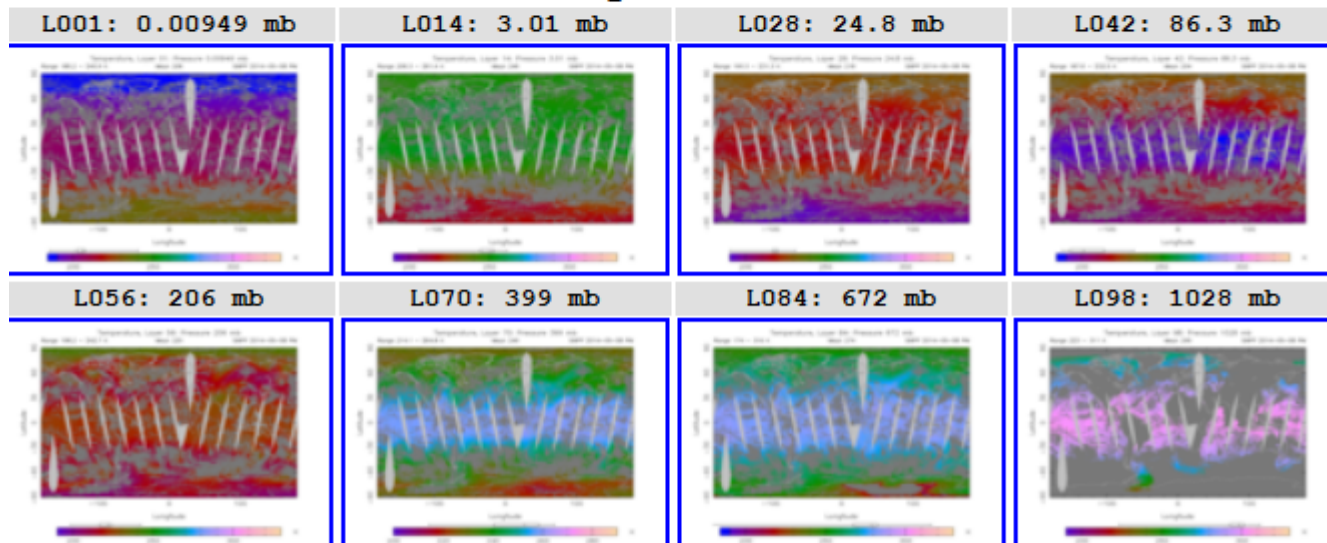


Mixing Ratio of Water Vapor



[More Mixing Ratio of Water Vapor levels](#)

Temperature

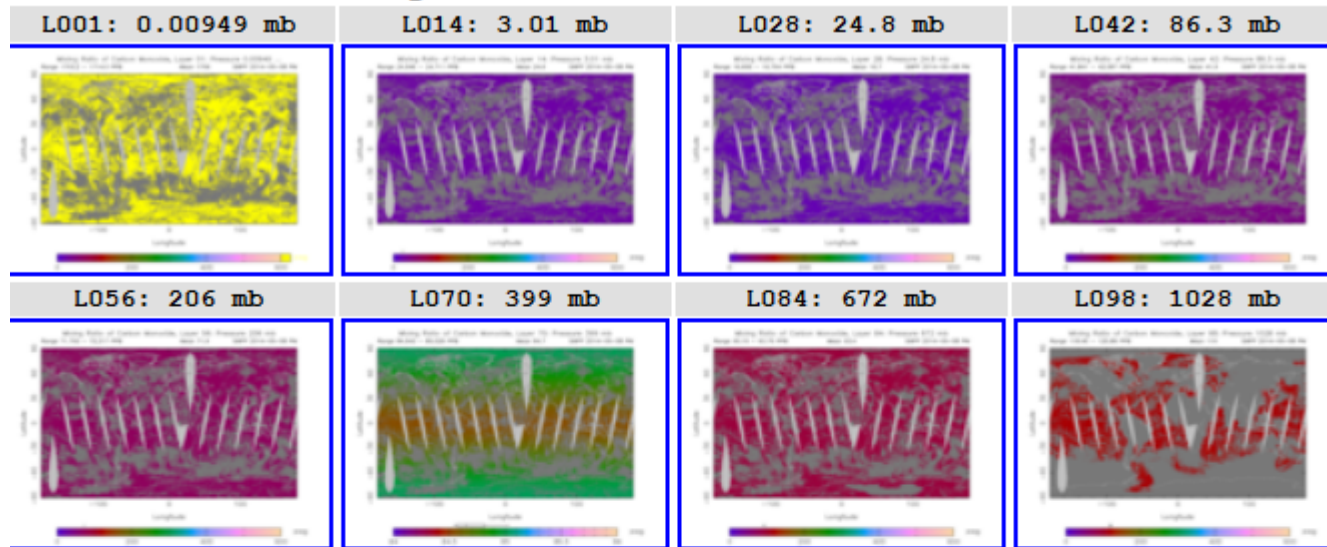




NUCAPS Layer CO, Liquid Water MRs

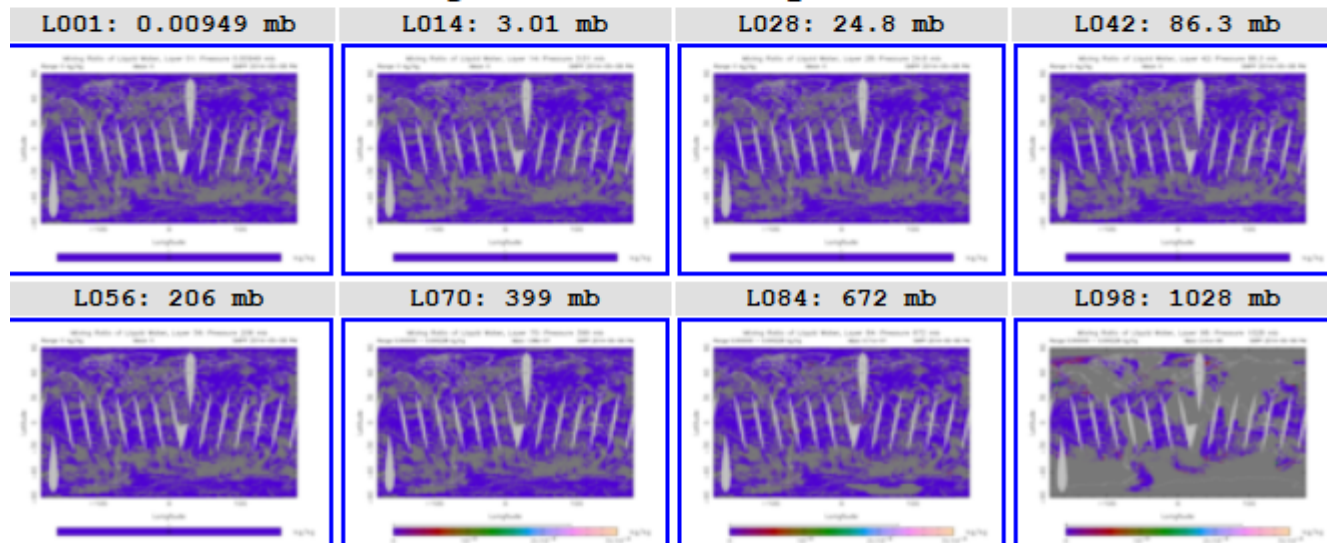


Mixing Ratio of Carbon Monoxide



[More Mixing Ratio of Carbon Monoxide levels](#)

Mixing Ratio of Liquid Water

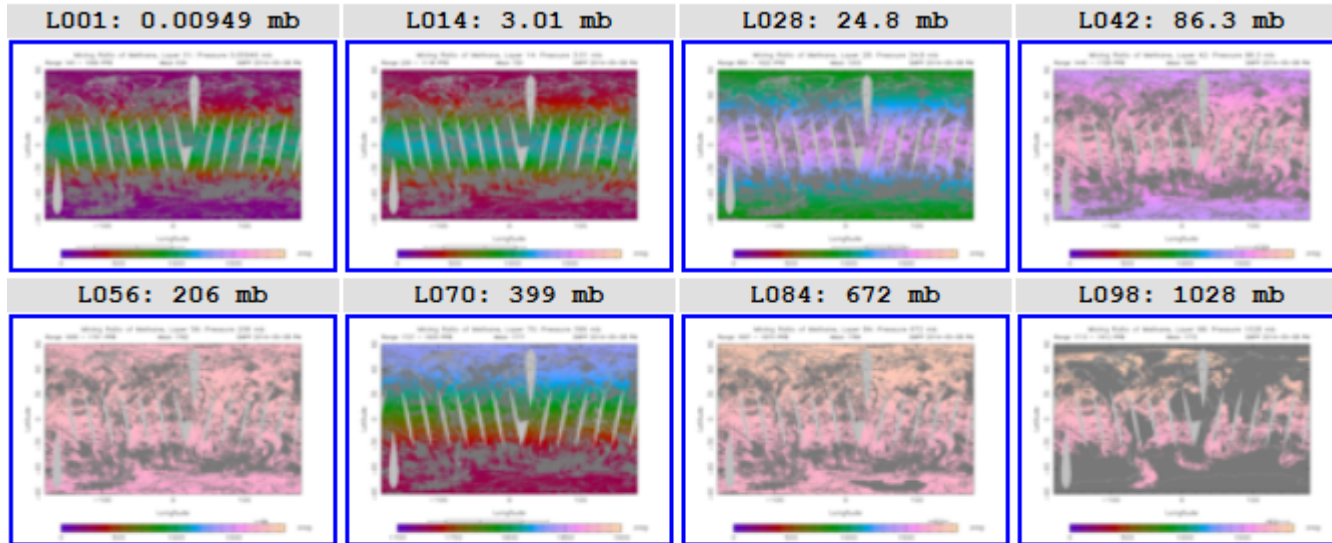




NUCAPS Layer CH₄, O₃ MRs

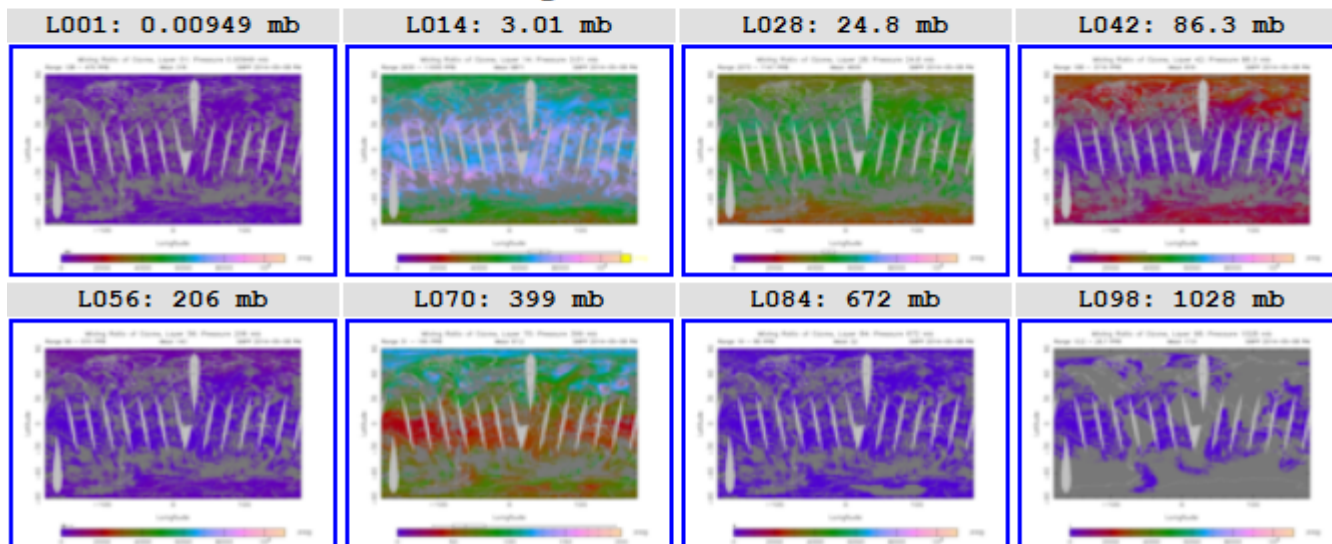


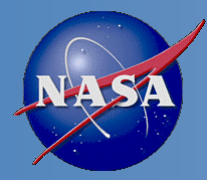
Mixing Ratio of Methane



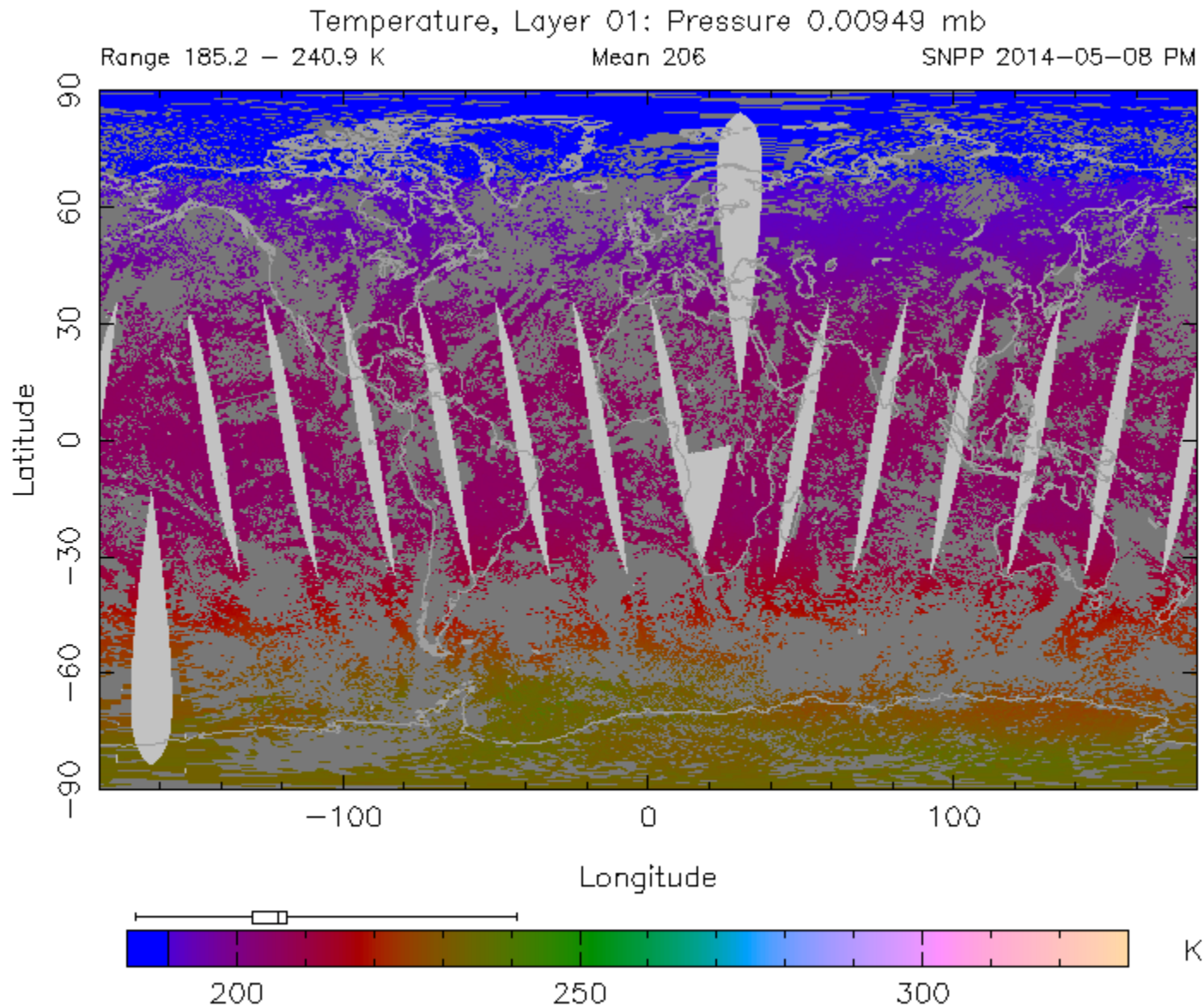
[More Mixing Ratio of Methane levels](#)

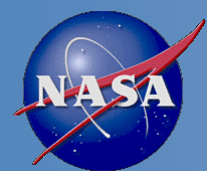
Mixing Ratio of Ozone





NUCAPS Level Temperature





NUCAPS Level Temperature



Temperature,
Layer 90: Pressure
815 mb

Loop Mode:

Forward

Sweep

Animation Mode:

<<

Stop

>>

Speed:

Slower

Faster

Advance:

<

>

Frame No.: 132

Step: 2

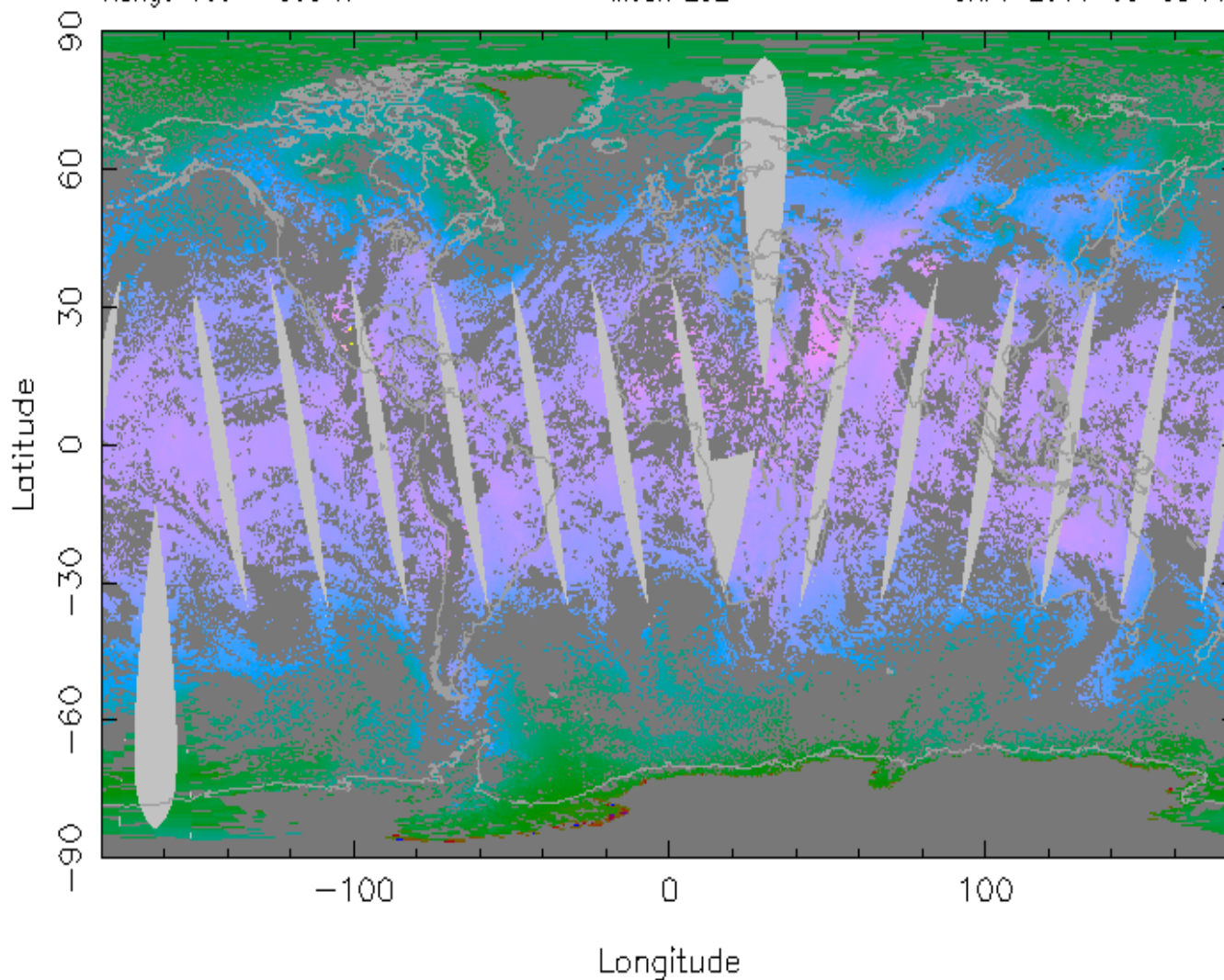
[Animate levels](#)

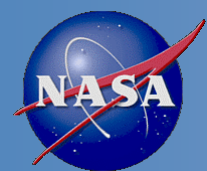
Temperature, Layer 90: Pressure 815 mb

Range 166 - 358 K

Mean 282

SNPP 2014-05-08 PM





NUCAPS Level Temperatures



Temperature,
Layer 29: Pressure
27.6 mb

Loop Mode:

Forward

Sweep

Animation Mode:

<<

Stop

>>

Speed:

Slower

Faster

Advance:

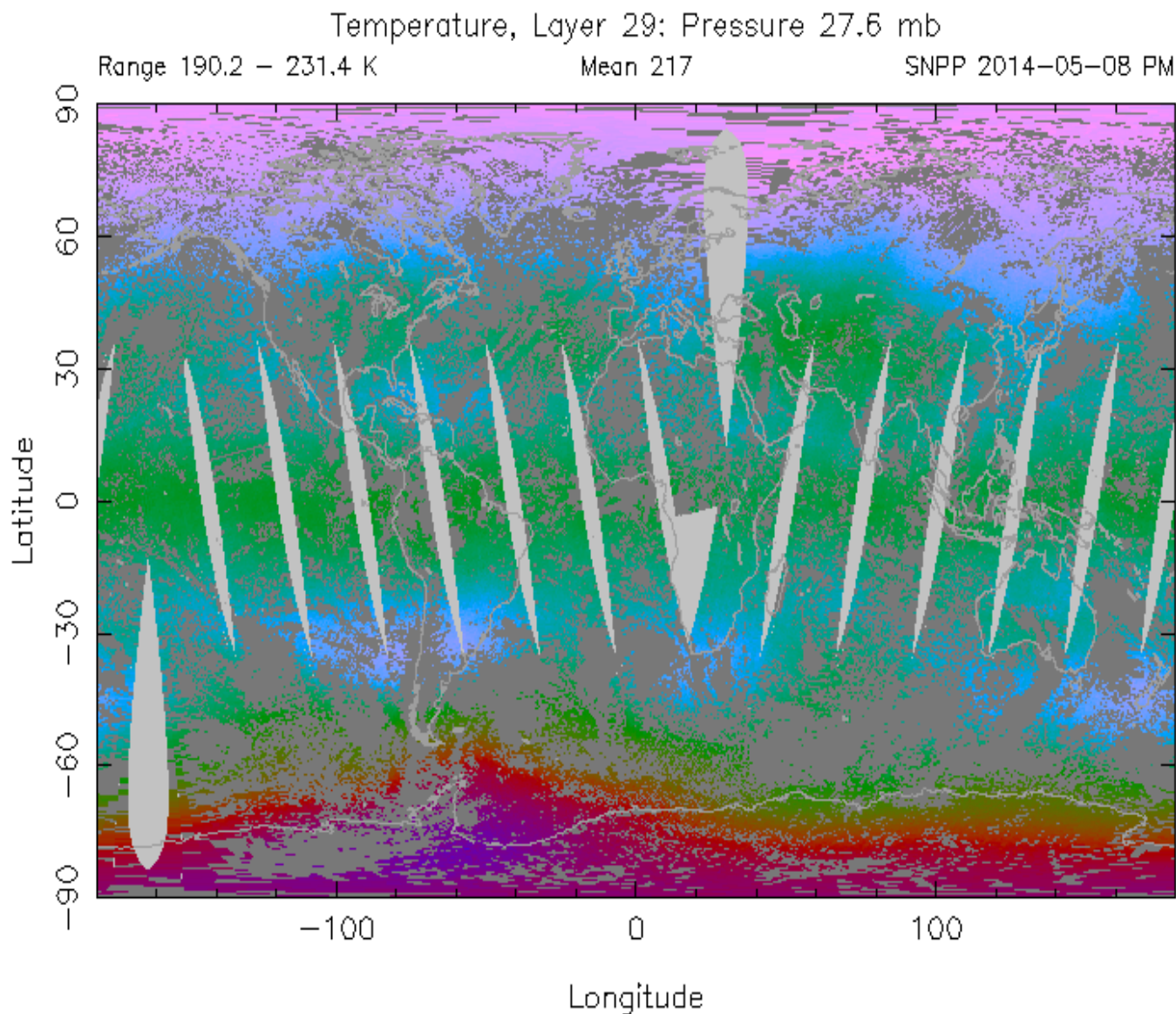
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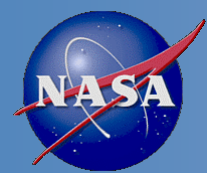
>

Frame No.: 132

Step: 2

[Animate levels](#)





NUCAPS Layer Ozone Mixing Ratio



**Mixing Ratio of
Ozone, Layer 14:
Pressure 3.01 mb**

Loop Mode:

Forward

Sweep

Animation Mode:

<<

Stop

>>

Speed:

Slower

Faster

Advance:

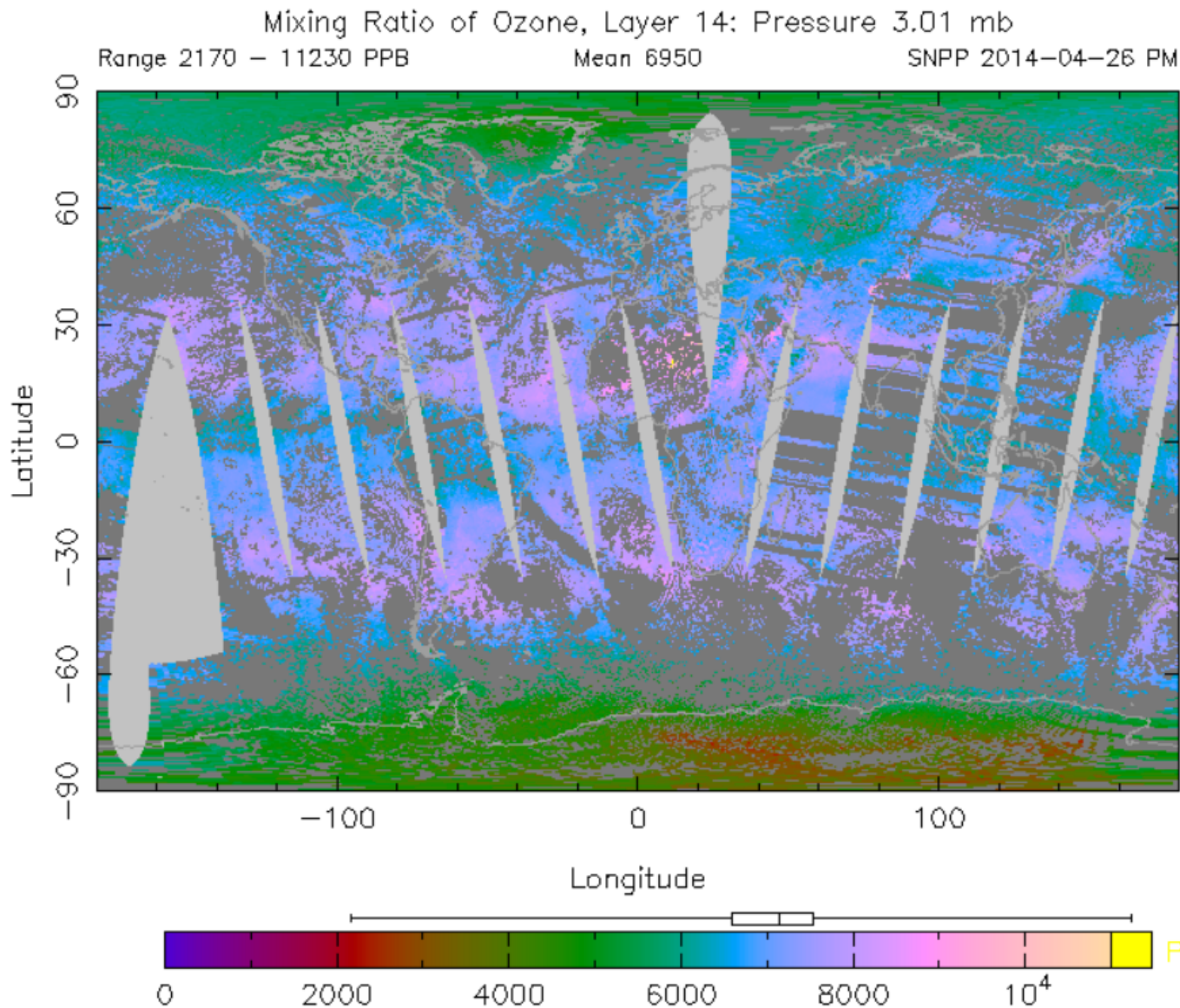
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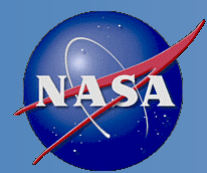
>

Frame No.: 108

Step: 2

[Animate levels](#)





NUCAPS Layer CH4 MR



**Mixing Ratio of
Methane, Layer
10: Pressure 1.13
mb**

Loop Mode:

Forward

Sweep

Animation Mode:

<<

Stop

>>

Speed:

Slower

Faster

Advance:

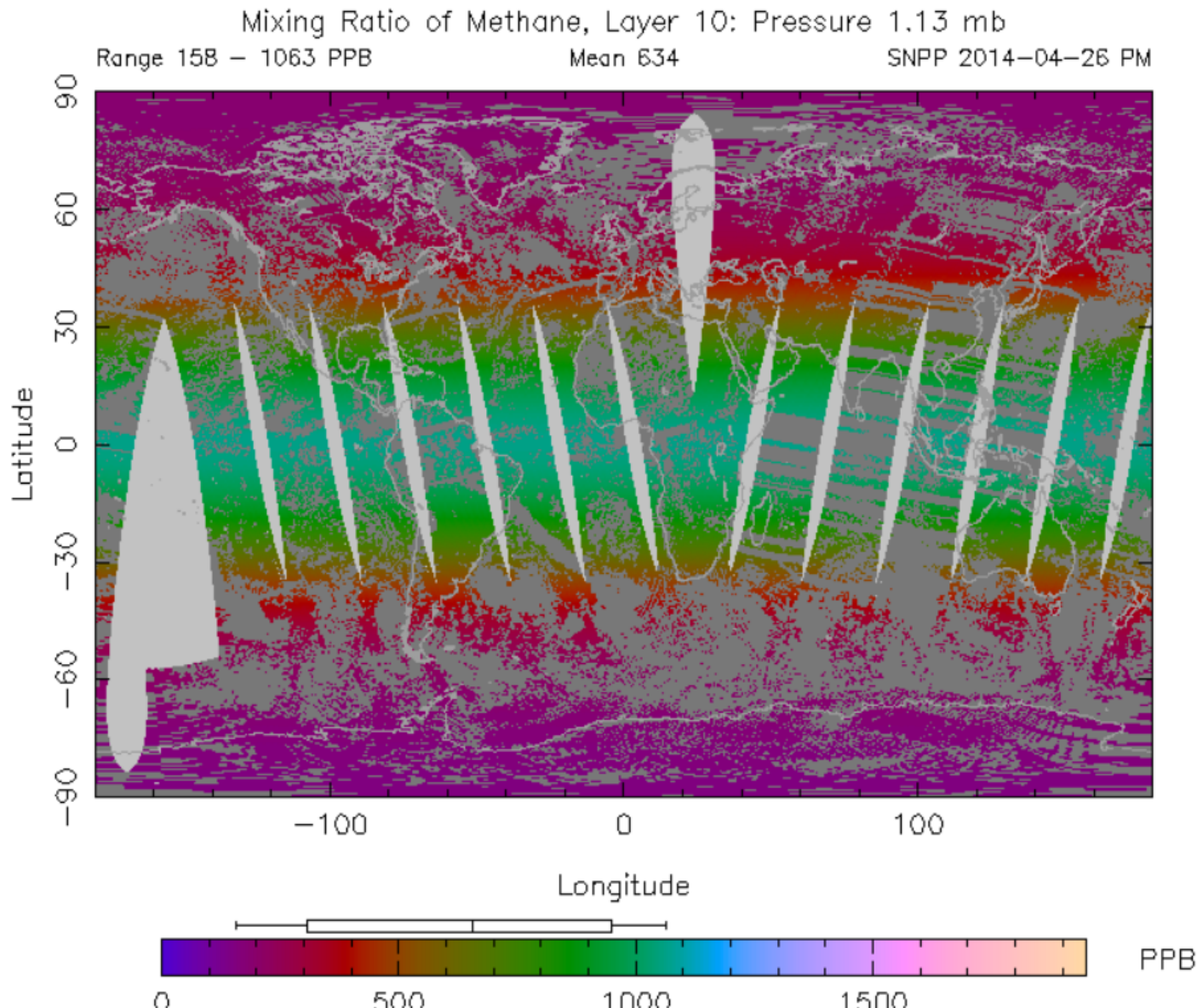
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>

Frame No.: 109

Step: 2

[Animate levels](#)





NUCAPS Layer CO MR



**Mixing Ratio of
Carbon Monoxide,
Layer 91: Pressure
840 mb**

Loop Mode:

Forward

Sweep

Animation Mode:

<<

Stop

>>

Speed:

Slower

Faster

Advance:

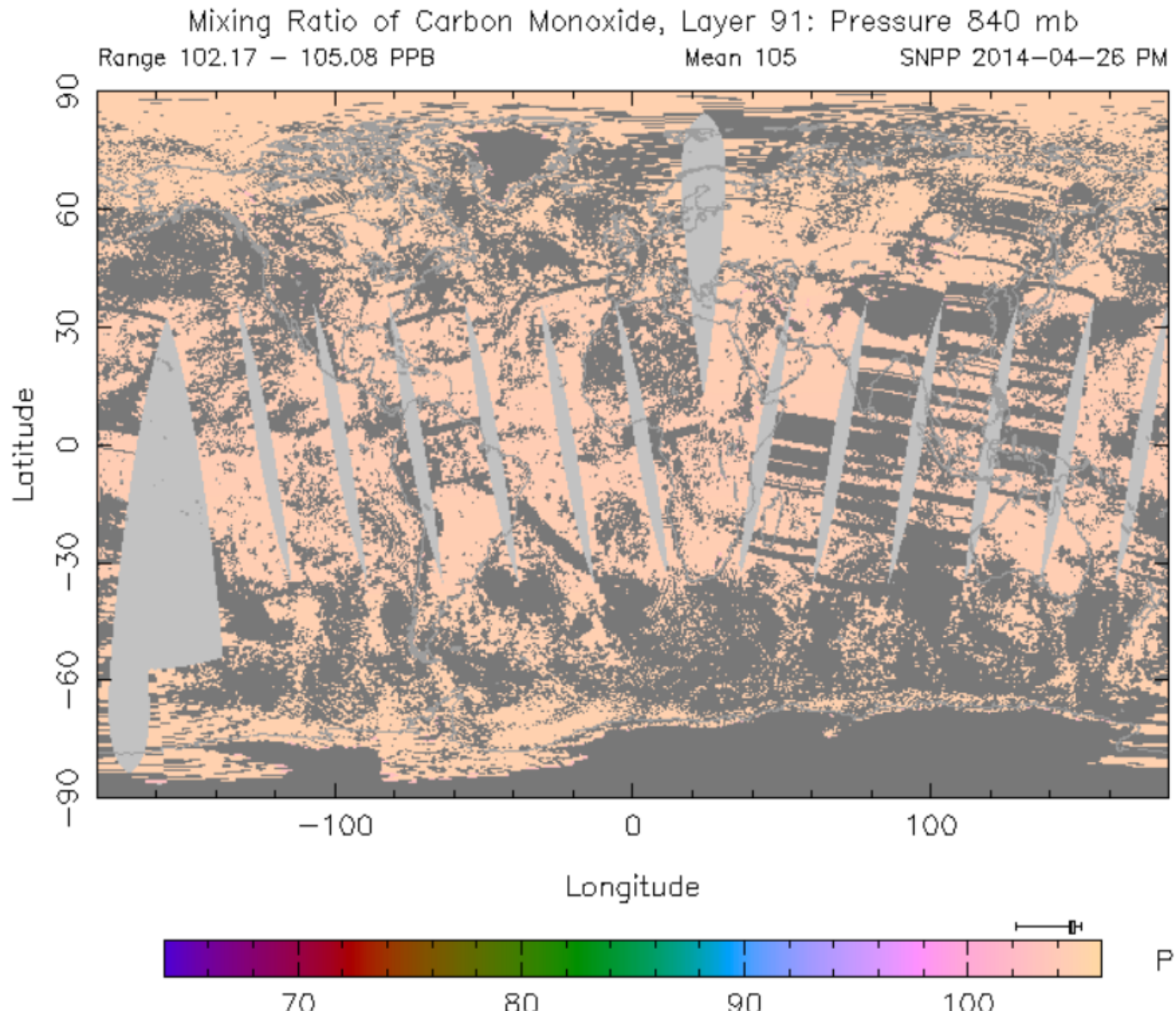
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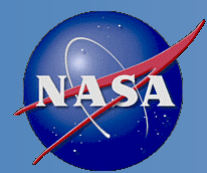
>

Frame No.: 109

Step: 2

[Animate levels](#)





NUCAPS Layer CO2 MR



**Mixing Ratio of
Carbon Dioxide,
Layer 63: Pressure
293 mb**

Loop Mode:

Forward

Sweep

Animation Mode:

<<

Stop

>>

Speed:

Slower

Faster

Advance:

<

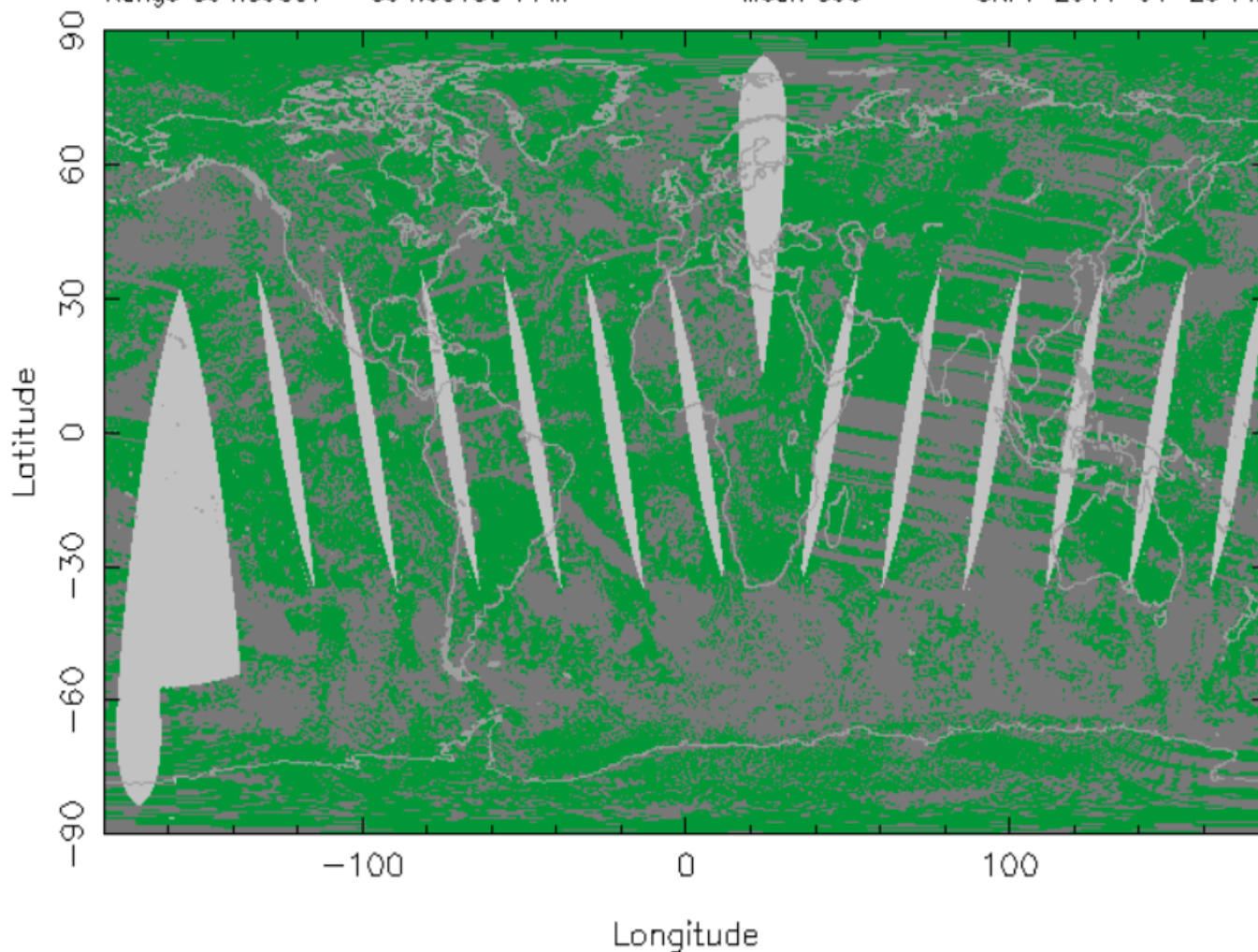
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Frame No.: 109

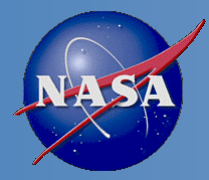
Step: 2

[Animate levels](#)

Mixing Ratio of Carbon Dioxide, Layer 63: Pressure 293 mb
Range 394.59897 – 394.60150 PPM Mean 395 SNPP 2014-04-26 PM



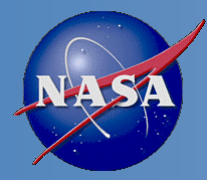
PPM



NUCAPS Accomplishments



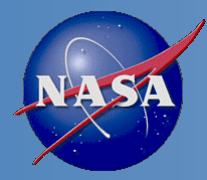
- **STAR EPL process was used for NUCAPS system Development**
- **NUCAPS code met the SPSRB software standards and OSPO security standards**
- **NUCAPS system successfully transition to ESPC operation**
- **NUCAPS QA/QC Monitoring Tools were developed and used for validating the products**



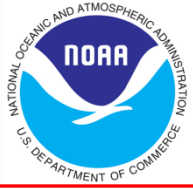
NUCAPS Future Plans



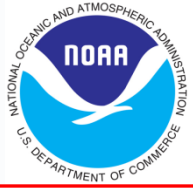
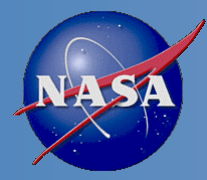
- Ongoing optimization study includes channels, perturbation functions, first guess and damping parameter.
- Use dedicated cal/val field campaign in situ measurements to fully assess NUCAPS retrieval performance of temperature, water vapor, cloud cleared radiance, cloud parameters and trace gases.
- Leverage ongoing scientific collaborations (low cost activities for NOAA) to perform trace gas validation.
- CrIS OLR development and implementation for ESPC operation.
- Full Resolution RDR's for CrIS SW and MW bands to support carbon products.
- Improve the Quality of CO, CO₂, and CH₄ by employing the full-resolution.
- Enhancement of real time NUCAPS Quality Monitoring System for JPSS-1 products validation.
- NPROVS can be operationalized for JPSS-1 for validating the products.
- Plan for JPSS-1 Algorithm Updates and Validation using existing tools developed at OSPO



NUCAPS Summary



- NUCAPS System meets the user requirements.
- Trace Gas products pending validation.
- NUCAPS QA/QC system was developed and is being used for product monitoring
- Compared IASI and NUCAPS products using OSPO QA/QC interactive tool.
- NUCAPS Products maturity demonstrated for prime time use.



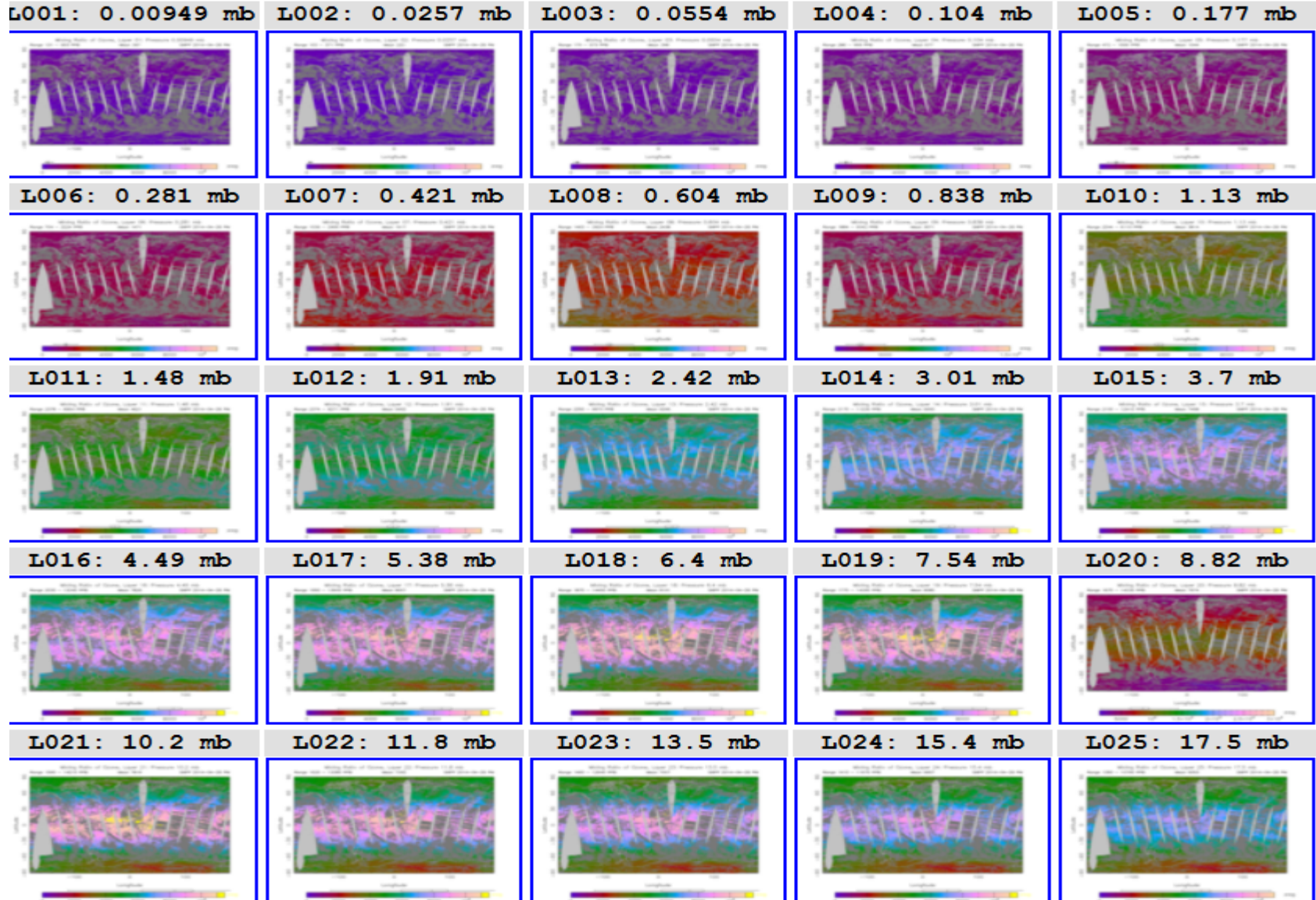
Backup Slides

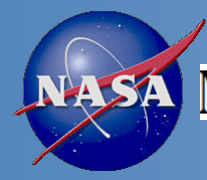


Mixing Ratio of Ozone Images for 2014-04-26 PM - SNPP

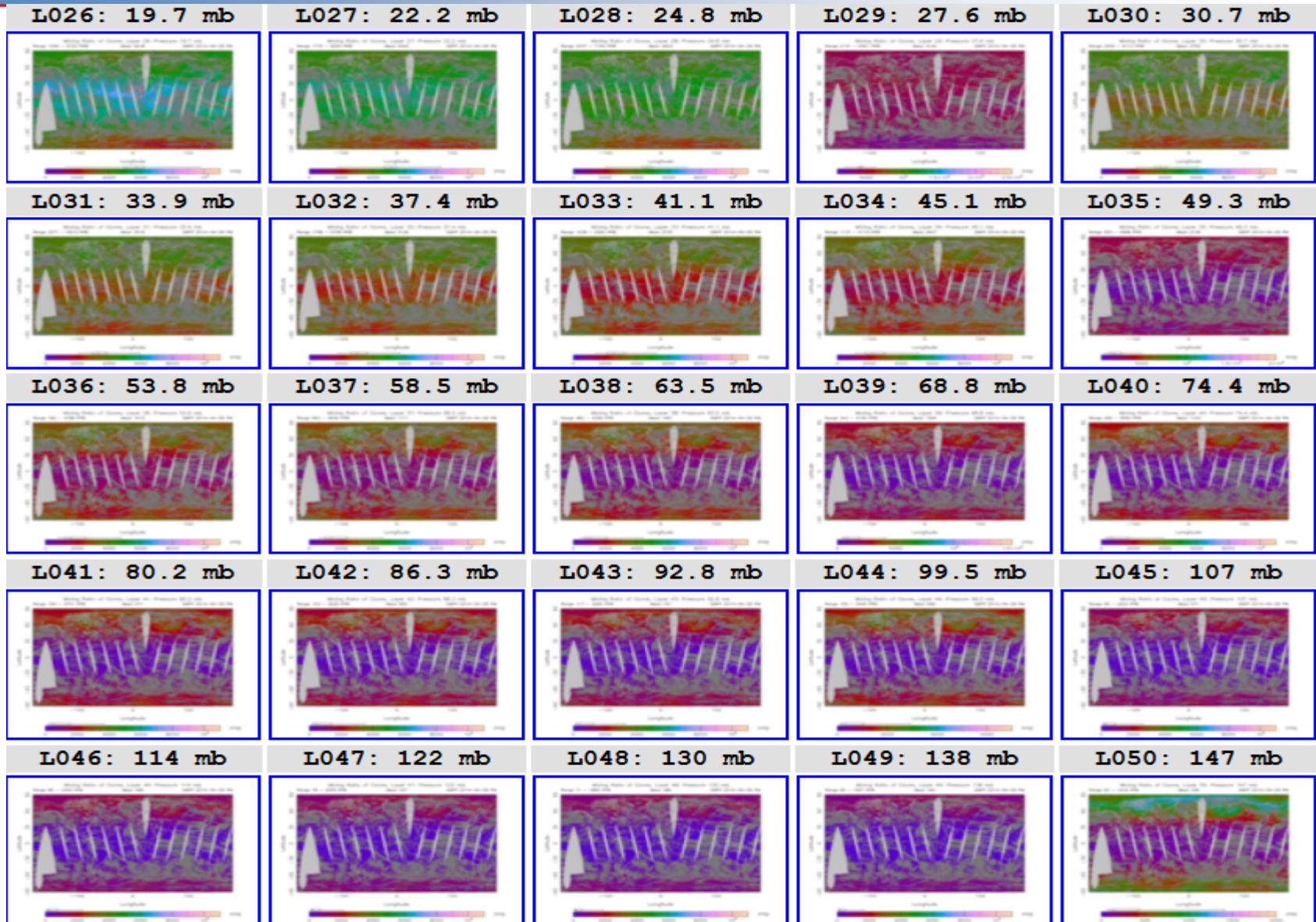


Mixing Ratio of Ozone



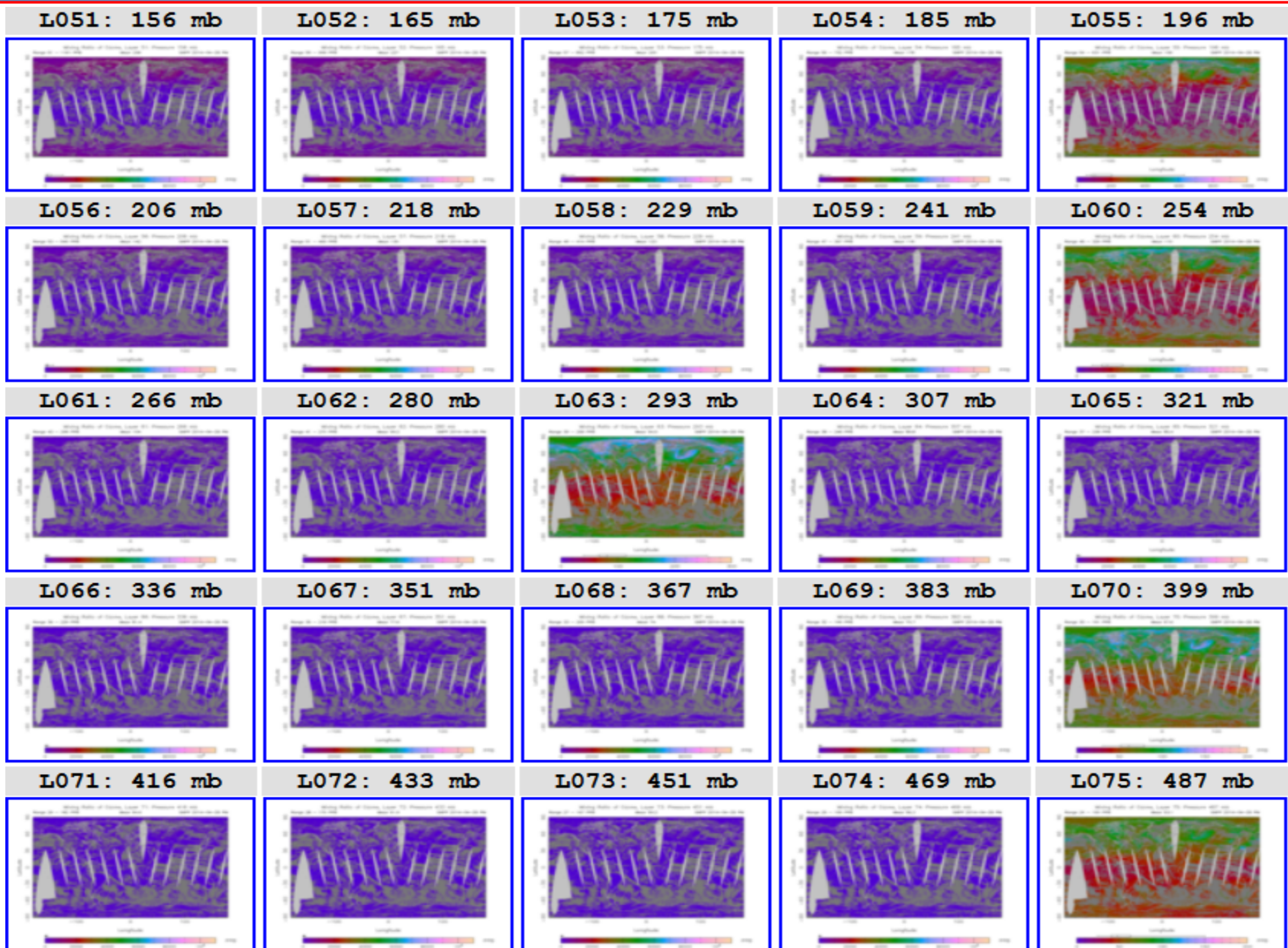


Mixing Ratio of Ozone Images for 2014-04-26 PM - SNPP



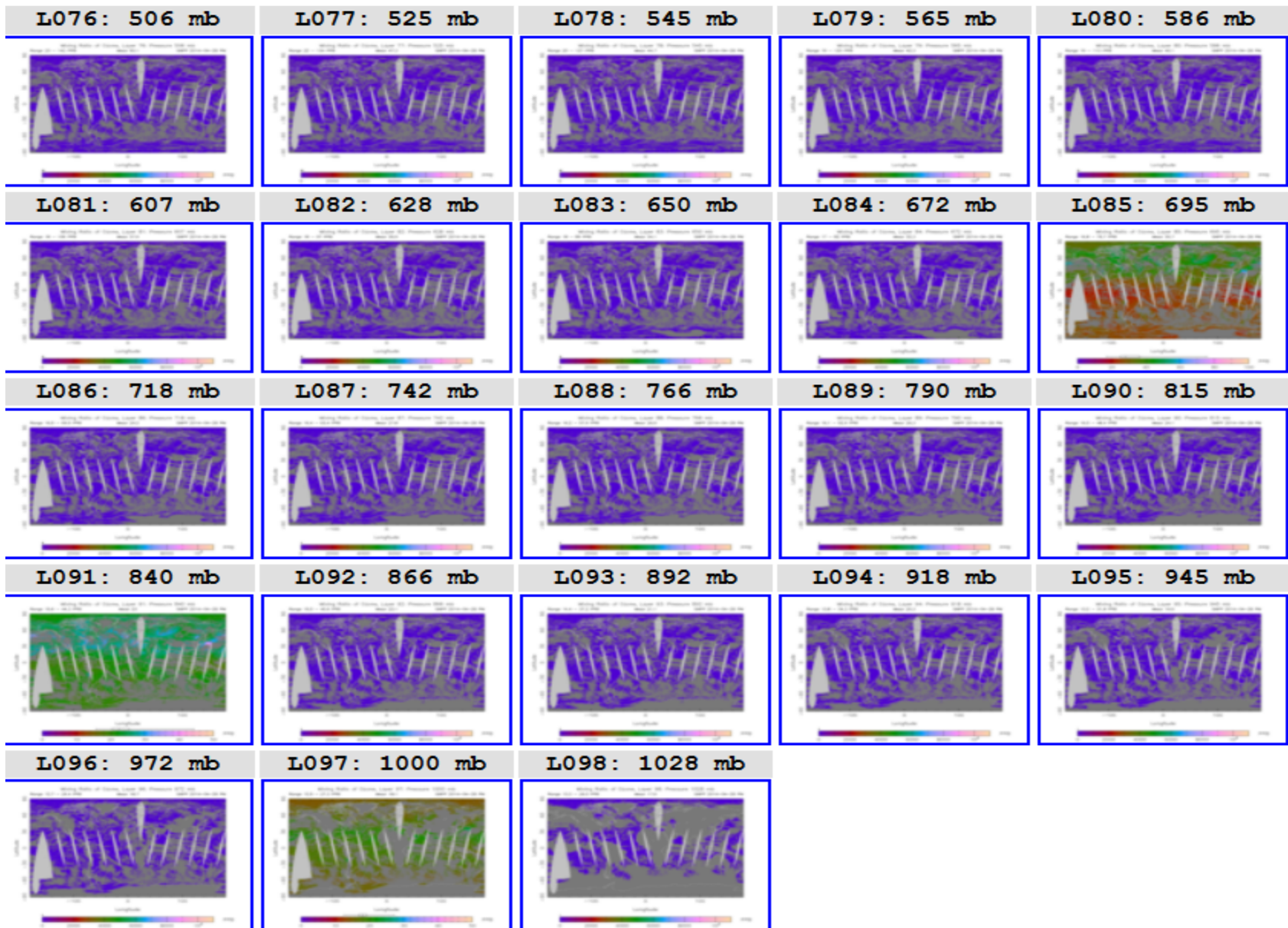


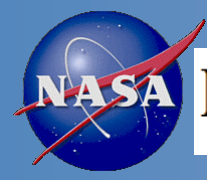
Mixing Ratio of Ozone Images for 2014-04-26 PM - SNPP





Mixing Ratio of Ozone Images for 2014-04-26 PM - SNPP

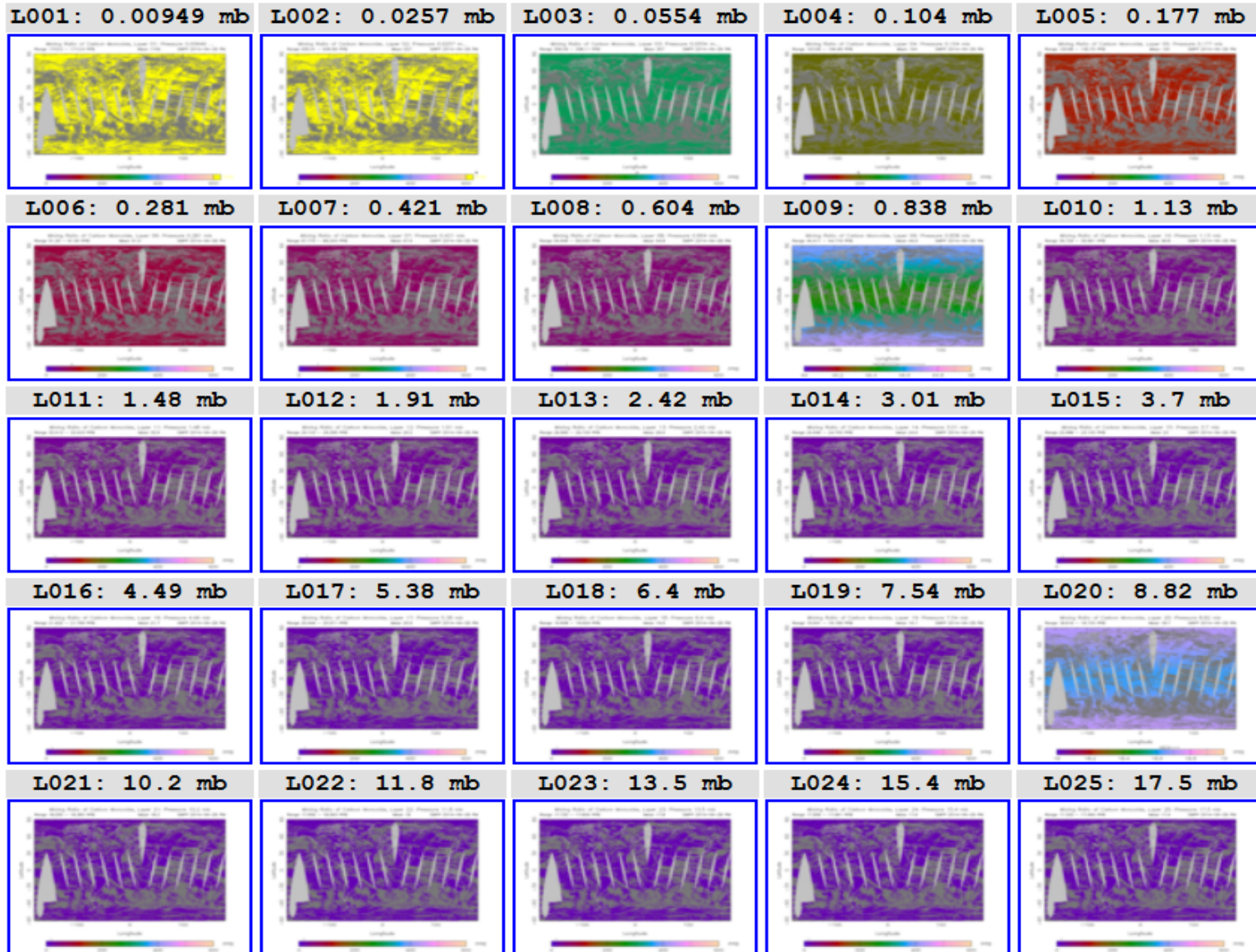


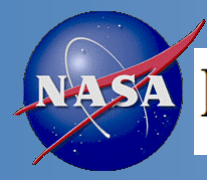


Mixing Ratio of Carbon Monoxide Images for 2014-04-26 PM - SNPP

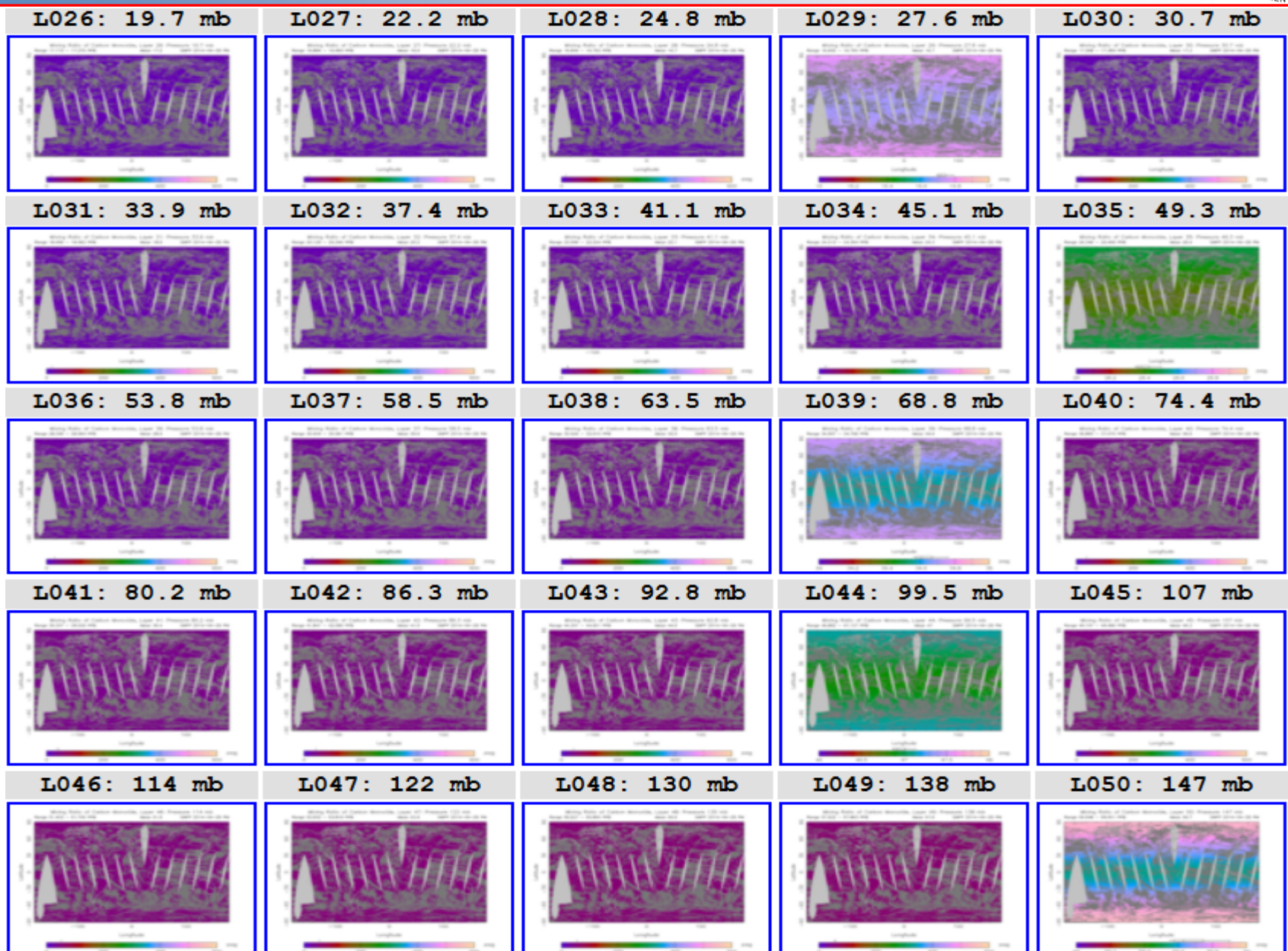


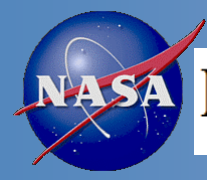
Mixing Ratio of Carbon Monoxide



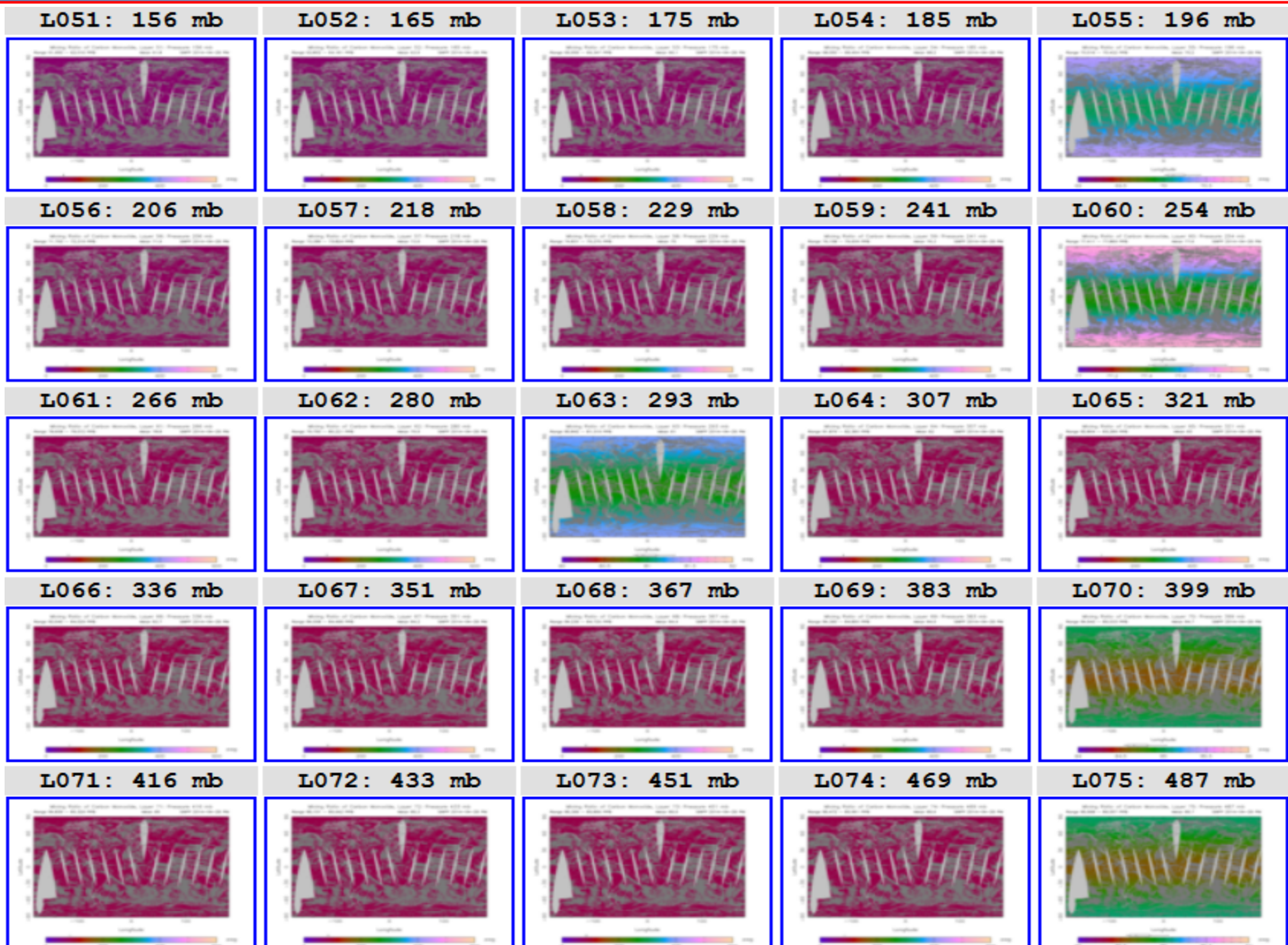


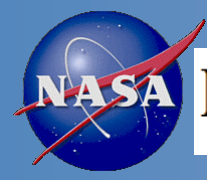
Mixing Ratio of Carbon Monoxide Images for 2014-04-26 PM - SNPP



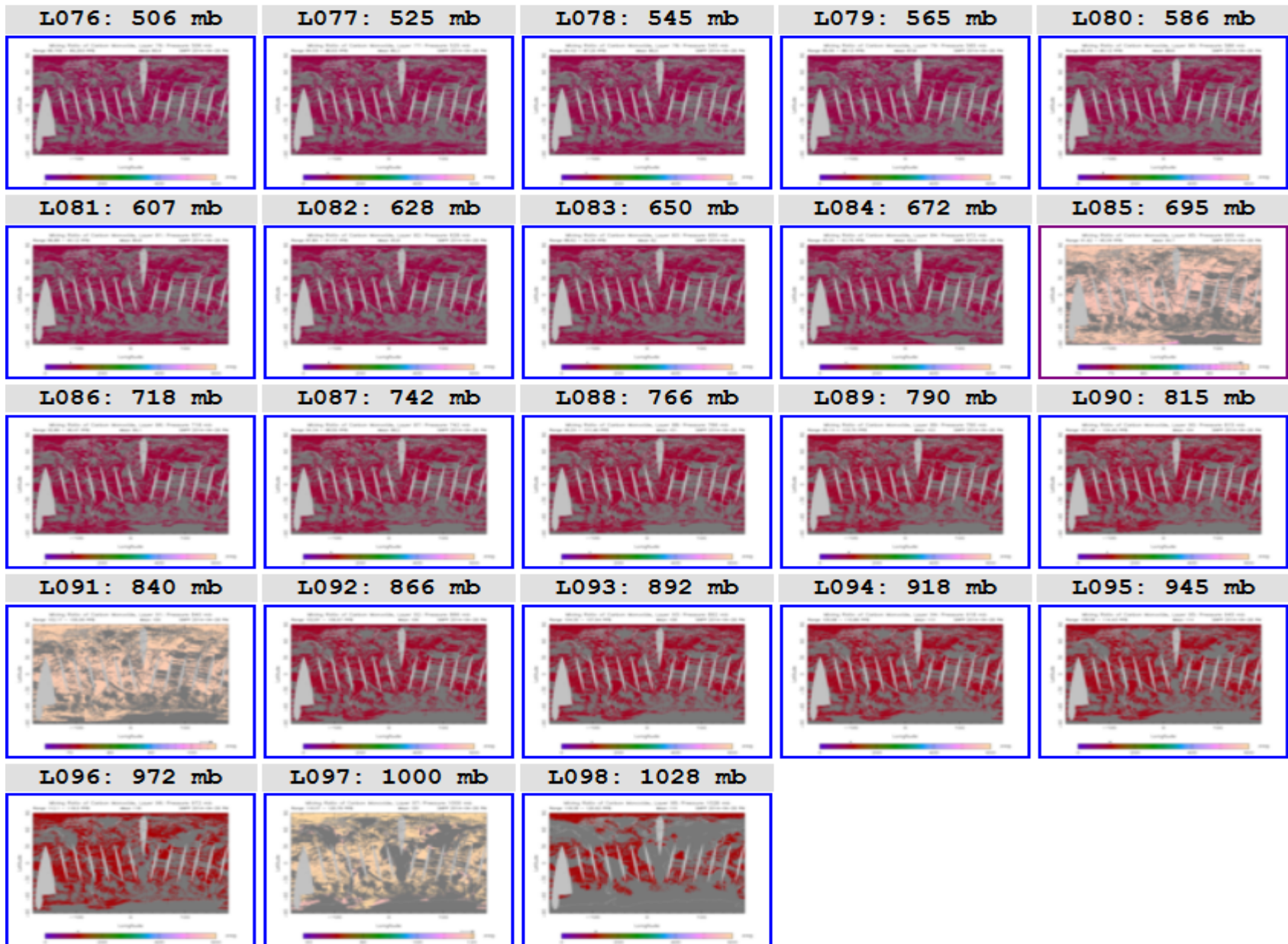


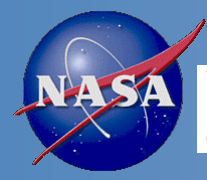
Mixing Ratio of Carbon Monoxide Images for 2014-04-26 PM - SNPP





Mixing Ratio of Carbon Monoxide Images for 2014-04-26 PM - SNPP



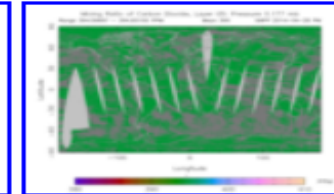
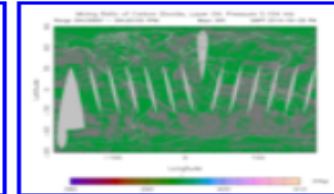
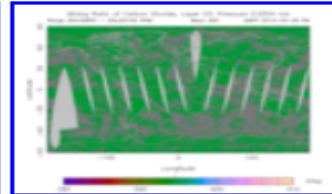
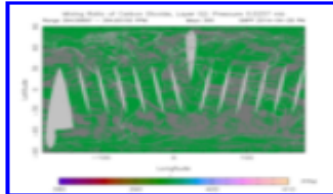
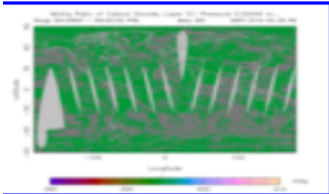


Mixing Ratio of Carbon Dioxide Images for 2014-04-26 PM - SNPP

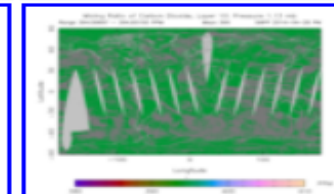
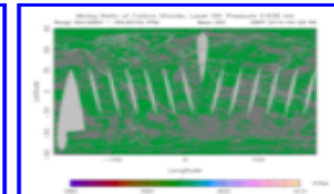
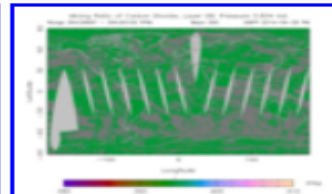
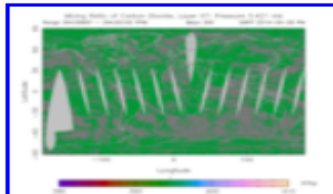
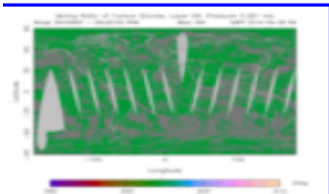


Mixing Ratio of Carbon Dioxide

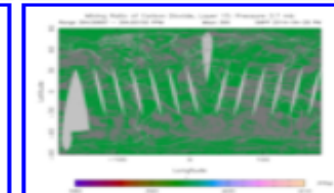
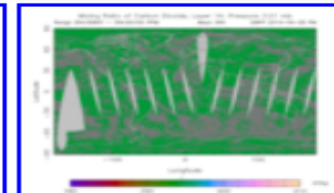
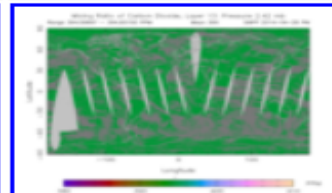
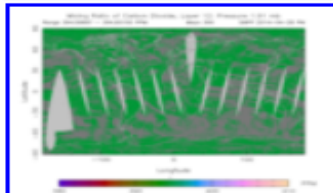
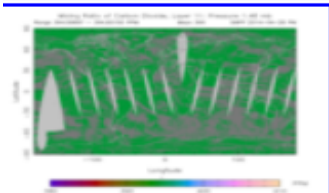
L001: 0.00949 mb L002: 0.0257 mb L003: 0.0554 mb L004: 0.104 mb L005: 0.177 mb



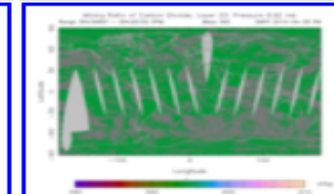
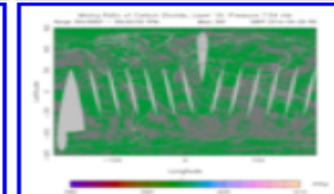
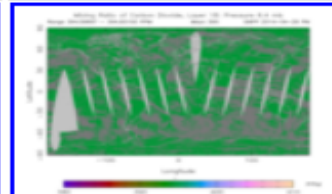
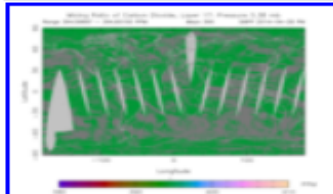
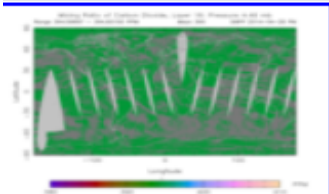
L006: 0.281 mb L007: 0.421 mb L008: 0.604 mb L009: 0.838 mb L010: 1.13 mb



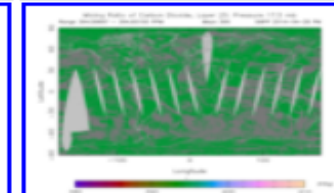
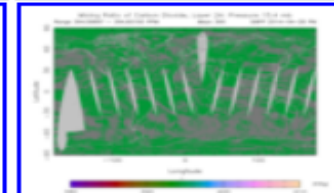
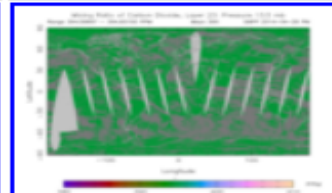
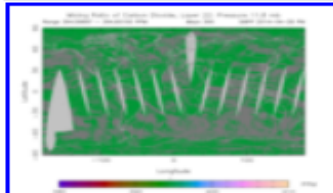
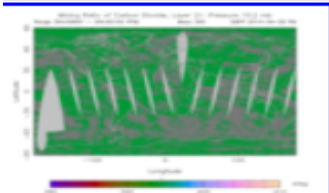
L011: 1.48 mb L012: 1.91 mb L013: 2.42 mb L014: 3.01 mb L015: 3.7 mb

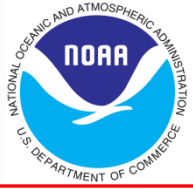
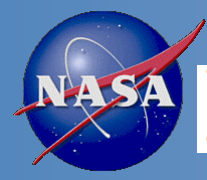


L016: 4.49 mb L017: 5.38 mb L018: 6.4 mb L019: 7.54 mb L020: 8.82 mb

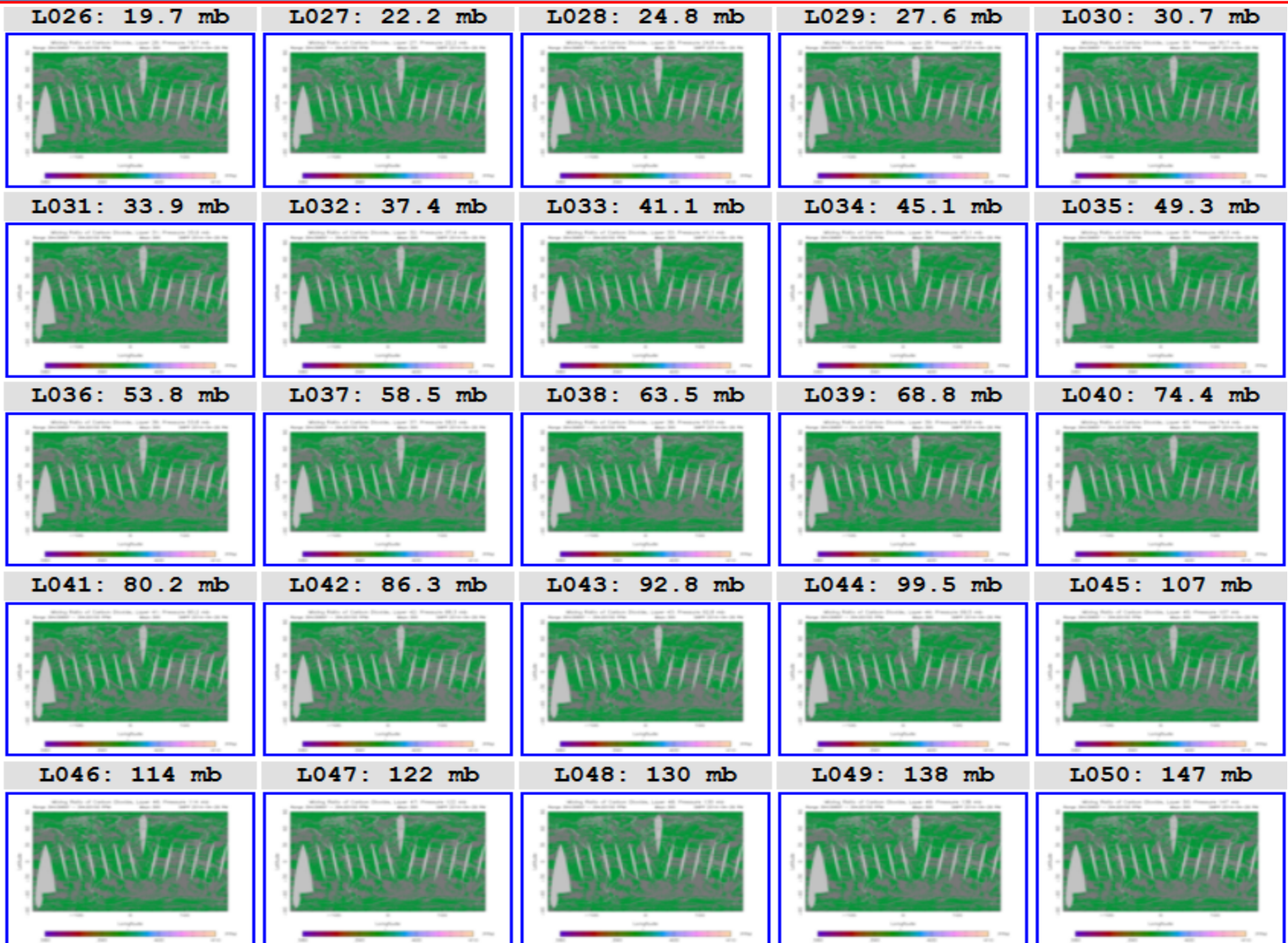


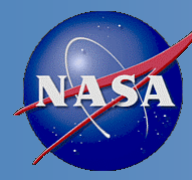
L021: 10.2 mb L022: 11.8 mb L023: 13.5 mb L024: 15.4 mb L025: 17.5 mb



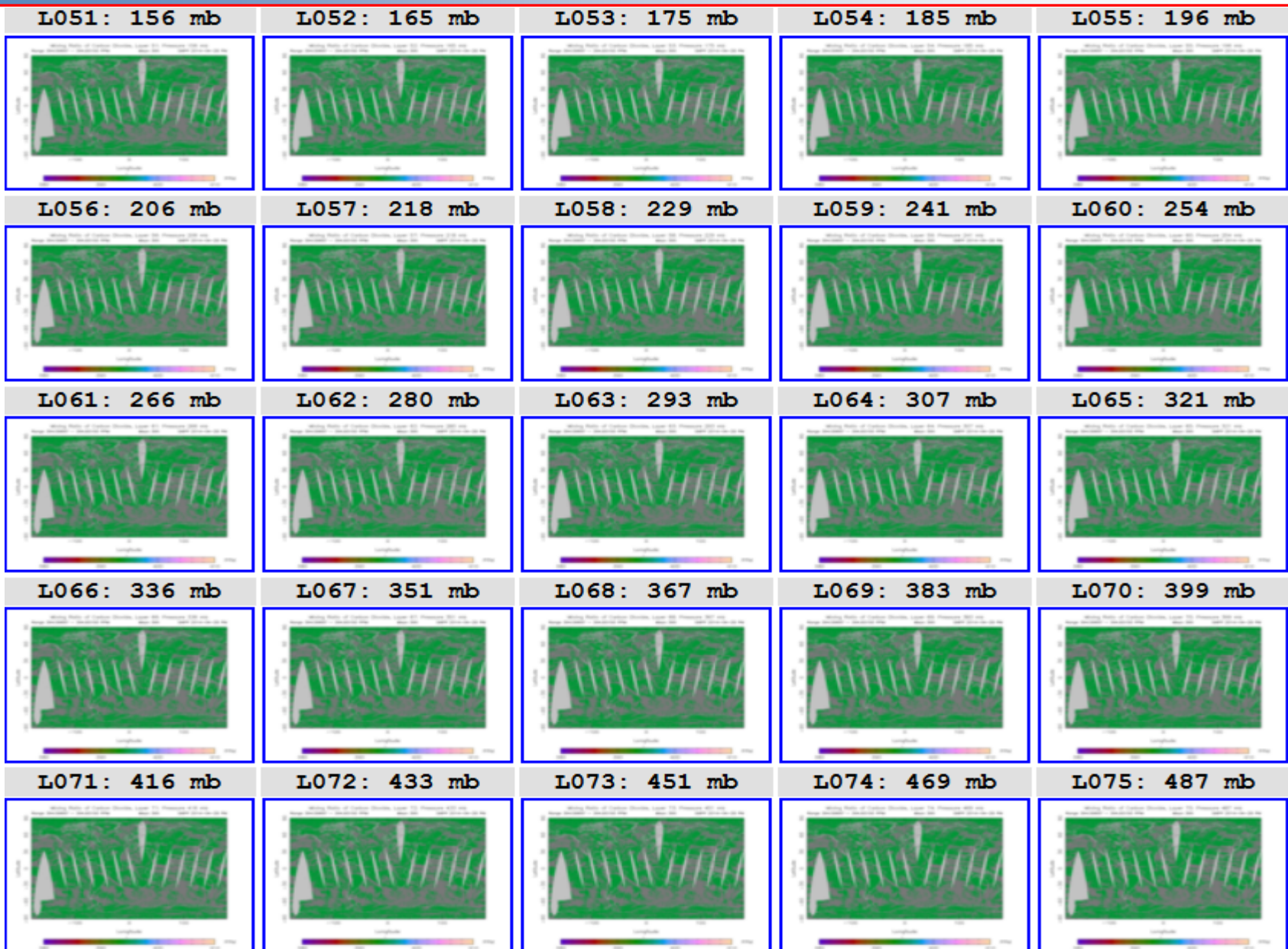


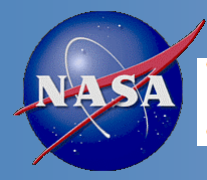
Mixing Ratio of Carbon Dioxide Images for 2014-04-26 PM - SNPP



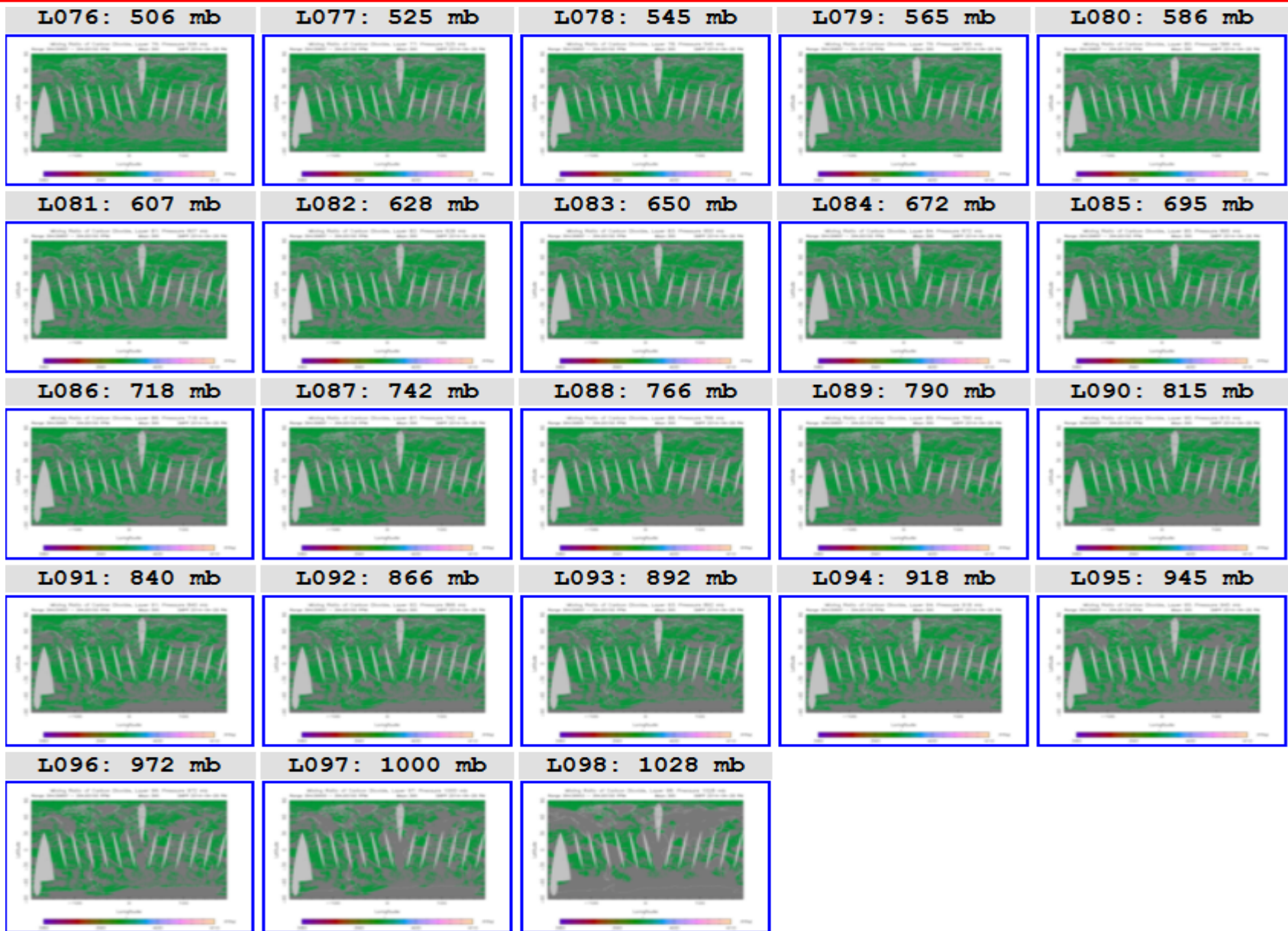


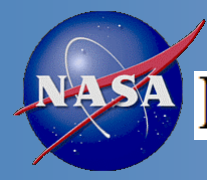
Mixing Ratio of Carbon Dioxide Images for 2014-04-26 PM - SNPP





Mixing Ratio of Carbon Dioxide Images for 2014-04-26 PM - SNPP

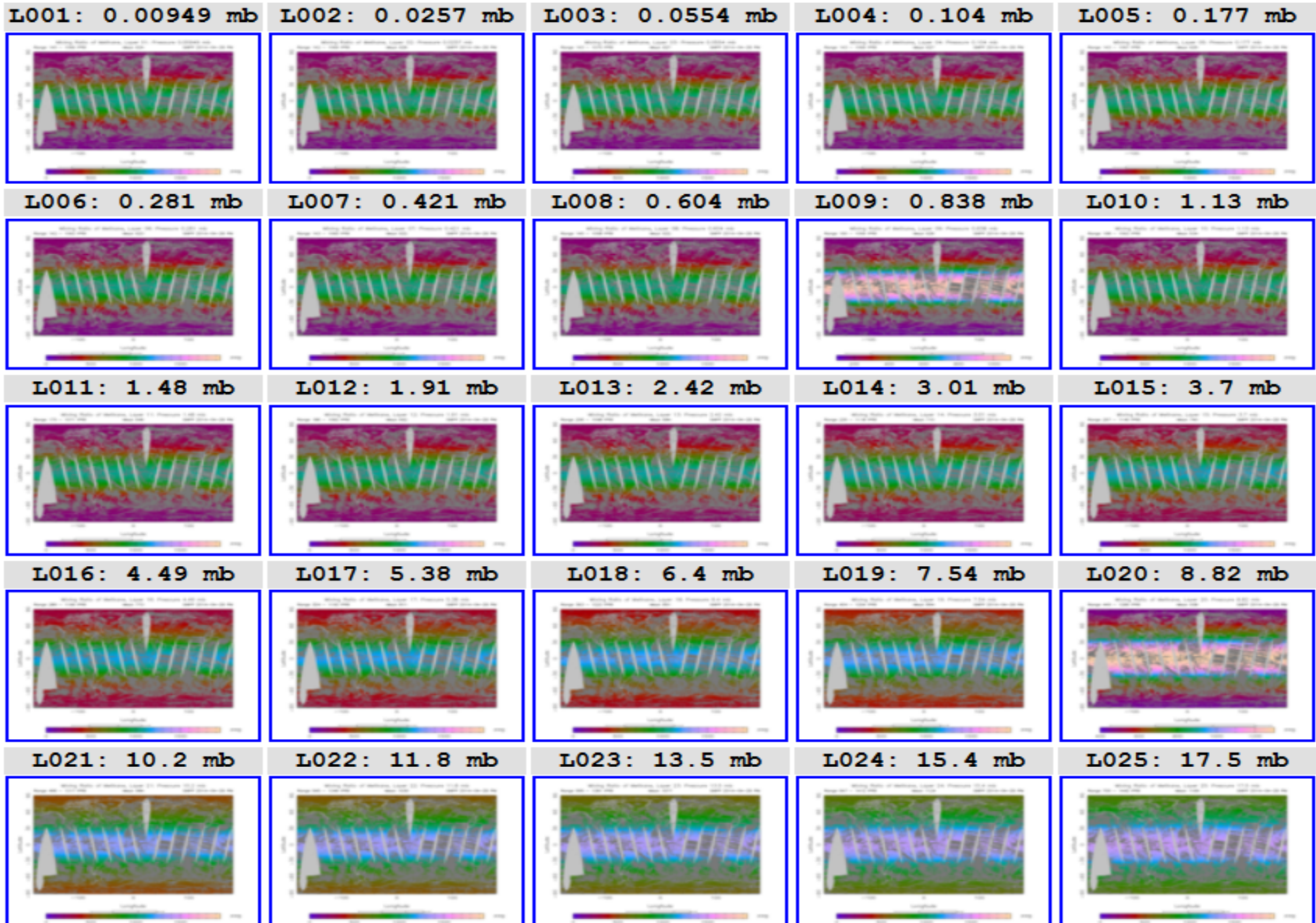


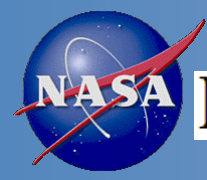


Mixing Ratio of Methane Images for 2014-04-26 PM - SNPP

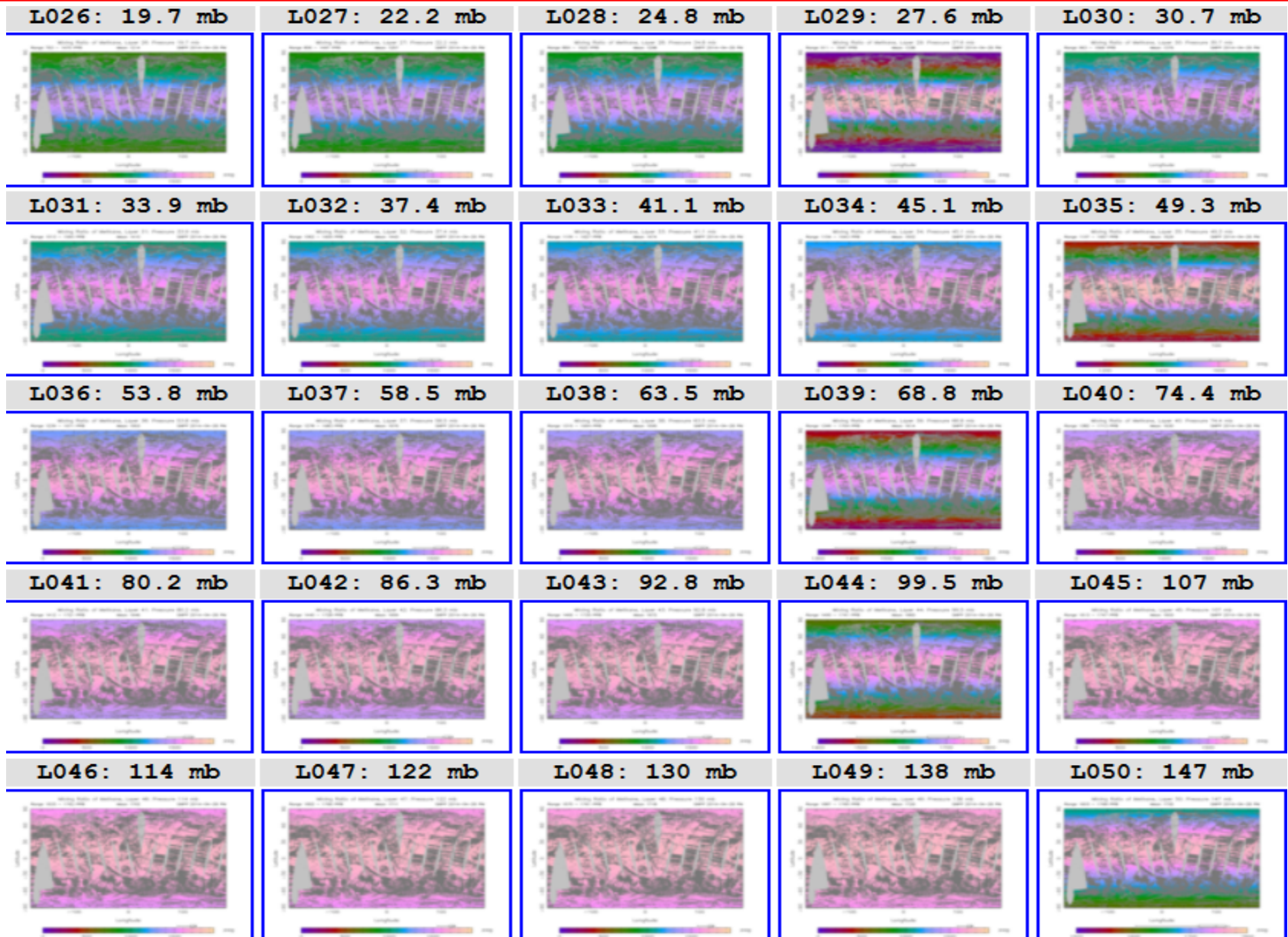


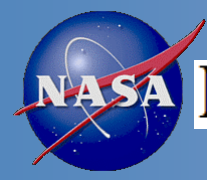
Mixing Ratio of Methane



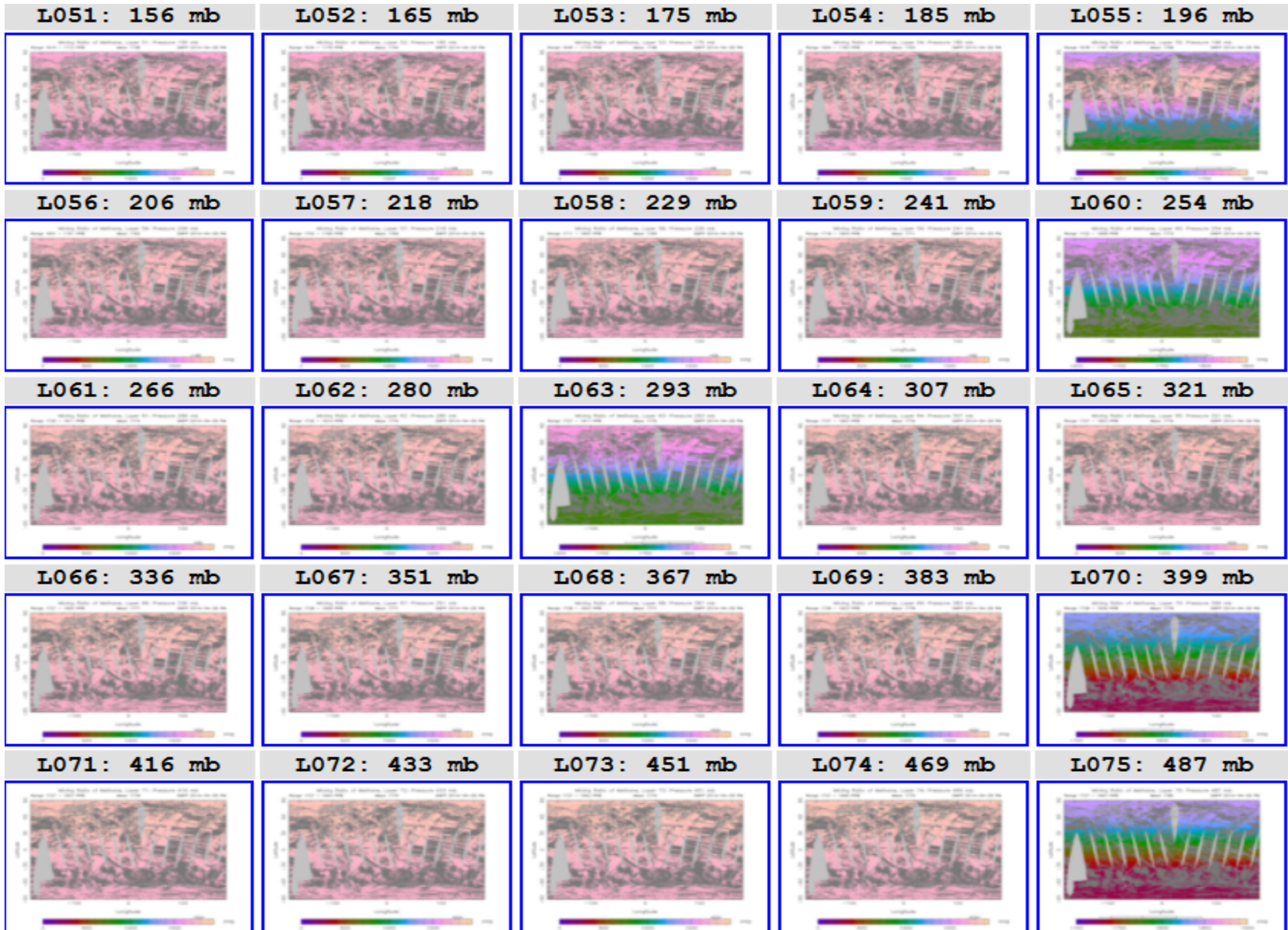


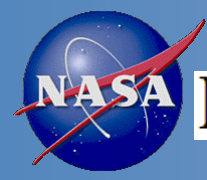
Mixing Ratio of Methane Images for 2014-04-26 PM - SNPP





Mixing Ratio of Methane Images for 2014-04-26 PM - SNPP





Mixing Ratio of Methane Images for 2014-04-26 PM - SNPP

