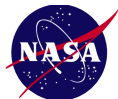


NASA Langley Satellite Products and Archive Darwin 2014 Campaign

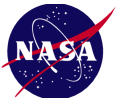
Louis Nguyen, Patrick Minnis, Kris Bedka
Doug Spangenberg, Chris Yost, Rabi Palikonda, and Thad Chee

NASA Langley Research Center
Hampton, VA, USA



Satellite Data Product Archive, Darwin 2014

- Satellite Data: MTSAT-1R, MTSAT-2 (via BOM&Wisc)
 - Every 10min (Mtsat-1), hourly (Mtsat-2)
 - 5 channel: 0.75um, 3.75um, 6.75um, 10.8um, 12um
 - Raw McIDAS Areafiles, GIF imagery
- Pixel-level Satellite Cloud Products (extensive list)
 - NetCDF binary data and GIF imagery
- Cloud Products along flight track
 - Tool to extract data (ASCII) from satellite products
- Visualization
 - Web display tools for imagery and loops
 - Google Earth KML/KML (with embedded imagery, loops)





- + NASA Home
- + NASA LaRC Home
- + Science Directorate
- + Minnis Group Home

High Ice Water Content (HIWC) Darwin

- + High Ice Water
Content (HIWC)
Research Official
Home

- + HIWC-Cayenne

Cloud Products

- + Darwin MT2
- + RapidScan MTSAT-1R

Satellite Imagery

- + G13 Costa Rica
- + Darwin MTS1

Flight Track Overlay

- + Falcon - Sat Imagery
- + Falcon - Product Imagery

Cloud Products Along Track

- + Falcon

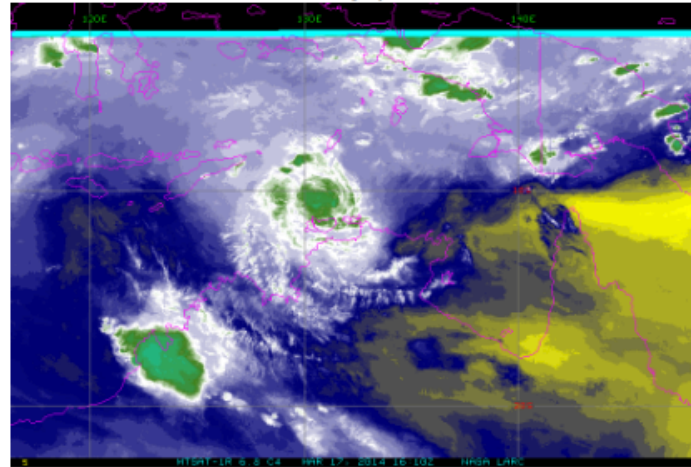
Downloads

- + MTSAT-2 Products
- + RapidScan MTSAT-1R
- + HIWC 2014 KML Files
- + Raw Data

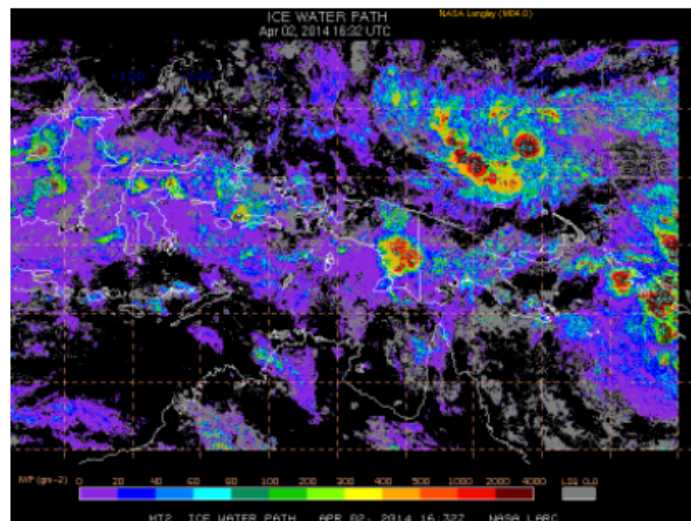
Related Datasets

Langley Satellite Support for High Ice Water Content (HIWC) - Darwin Campaign

Satellite Imagery for HIWC



MTSAT-2 Cloud Products



Quick Links

Satellite Imagery

- + C01
- + C02
- + C04
- + C2RC

Cloud Products

- + Clid Top Height
- + Clid Bot Height
- + RGB
- + ICING
- + DEFF
- + REFF
- + TAU
- + IWP
- + LWP

- + Overshoot. Top

Cloud Product Archive

- + MTSAT-2R
- + MTSAT-1R

Cloud Products Darwin 2014

- + NASA Home
- + NASA LaRC Home
- + Science Directorate
- + Minnis Group Home

High Ice Water Content (HIWC) Darwin

+ High Ice Water Content (HIWC) Research Official Home

+ HIWC-Cayenne

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Satellite Imagery

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Flight Track Overlay

- + Falcon - Sat Imagery
- + Falcon - Product Imagery

Cloud Products Along Track

- + Falcon

Downloads

- + MTSAT-2 Products
- + RapidScan MTSAT-1R
- + HIWC 2014 KML Files
- + Raw Data

Related Datasets

- + HIWC-2015 Florida
- + HIWC-2015 Cayenne

0.65, 1.6 μm Reflectances
3.7, 6.7, 10.8 μm Temp
12 or 13.3 μm Temp
Broadband TOA Albedo
Broadband OLR
Clear-sky Skin Temperature
Icing Potential
Pixel Lat, Lon
Pixel SZA, VZA, RAZ

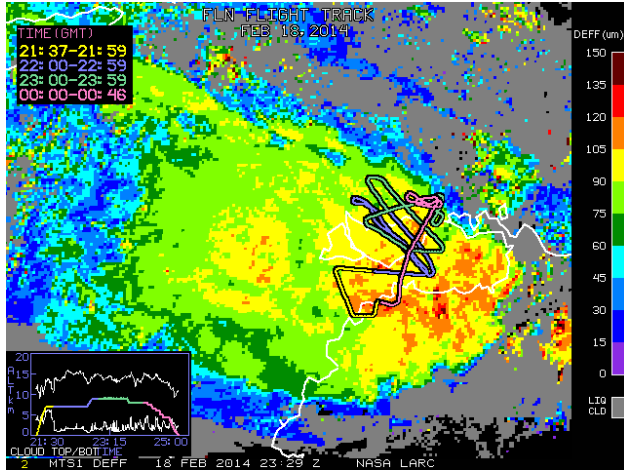
Cloud
Overshooting tops *new
HIWC Probability *new
Mask, Phase
Optical Depth, IR emissivity
Cloud effective particle size
Liquid/Ice Water Path
Effective Temp, hgt, pressure
Top/ Bottom Pressure
Top/ Bottom Height

TEFF (K) 190 200 210 220 230 240 250 260 270 280 290 300 310

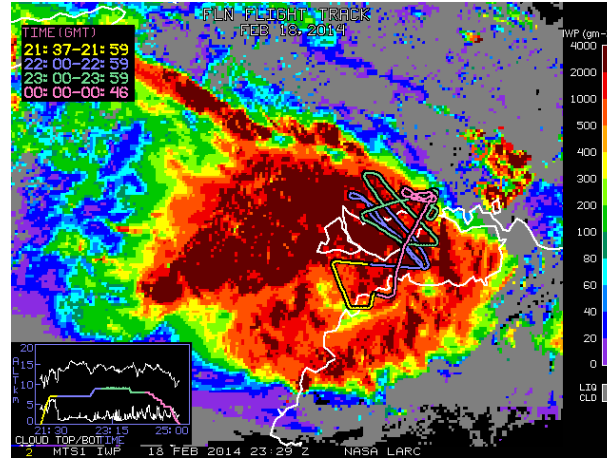
MT2 EFFECTIVE CLOUD TEMPERATURE APR 02, 2014 16:32Z NASA LARC

Cloud Products Darwin 2014

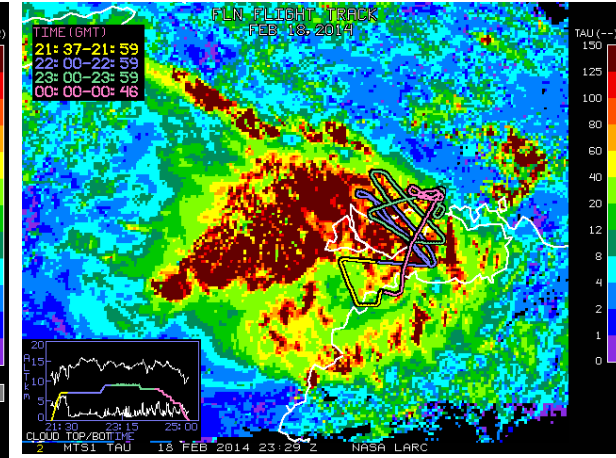
Effective Ice Diameter



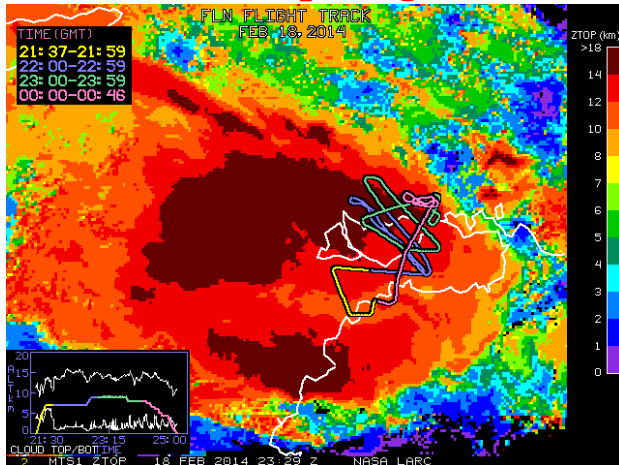
Ice Water Path



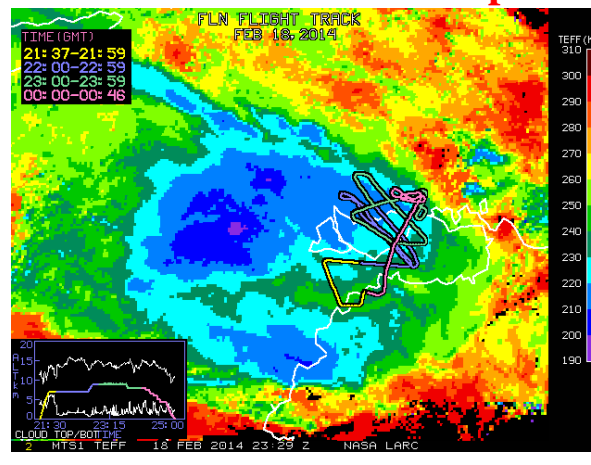
Cloud Optical Depth



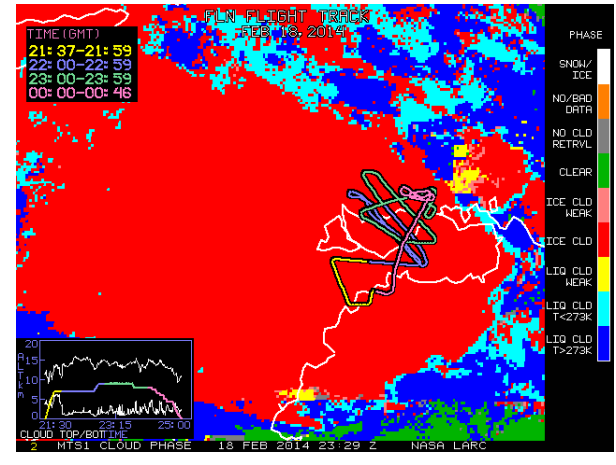
Cloud Top Height



Effective Cloud Temp



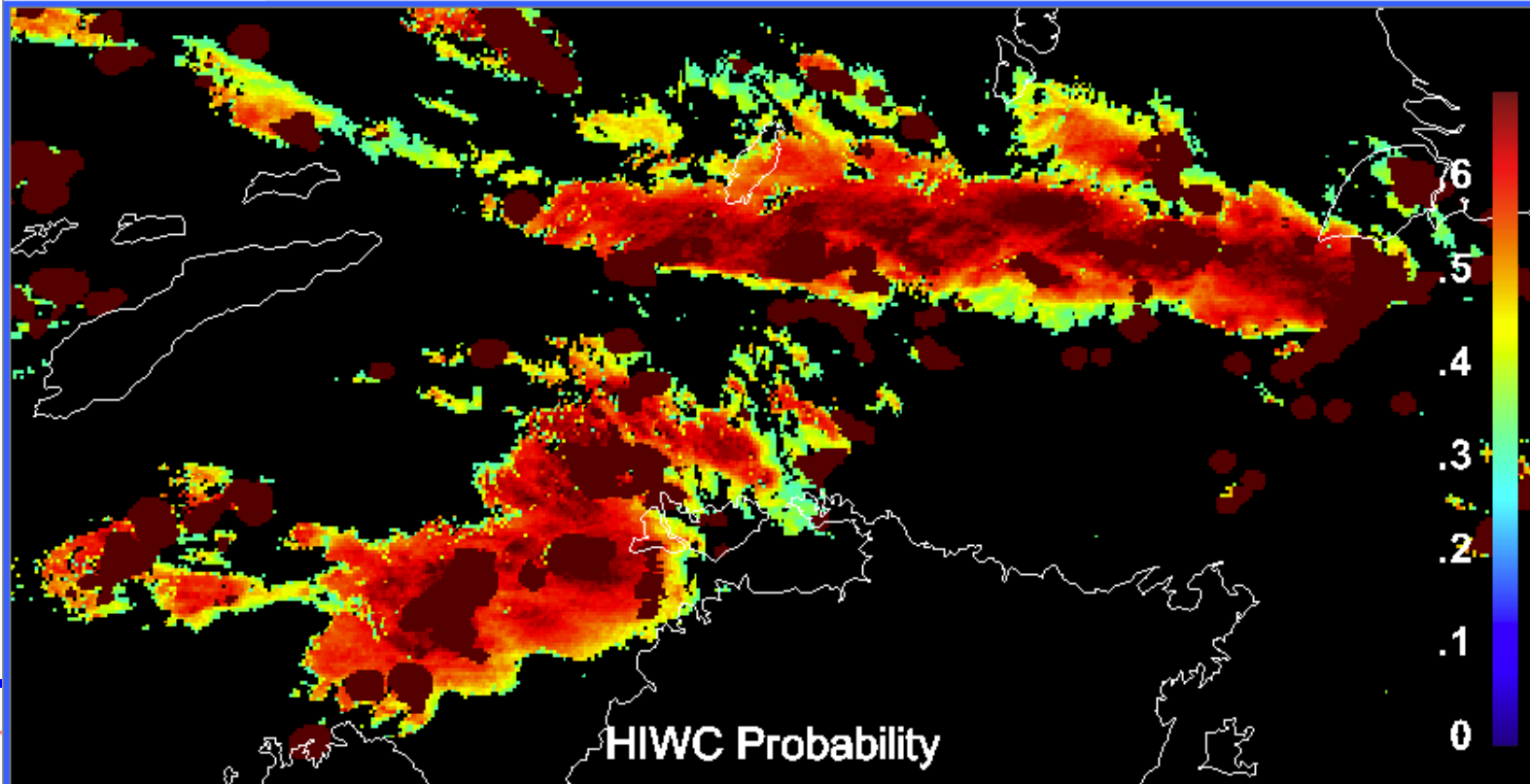
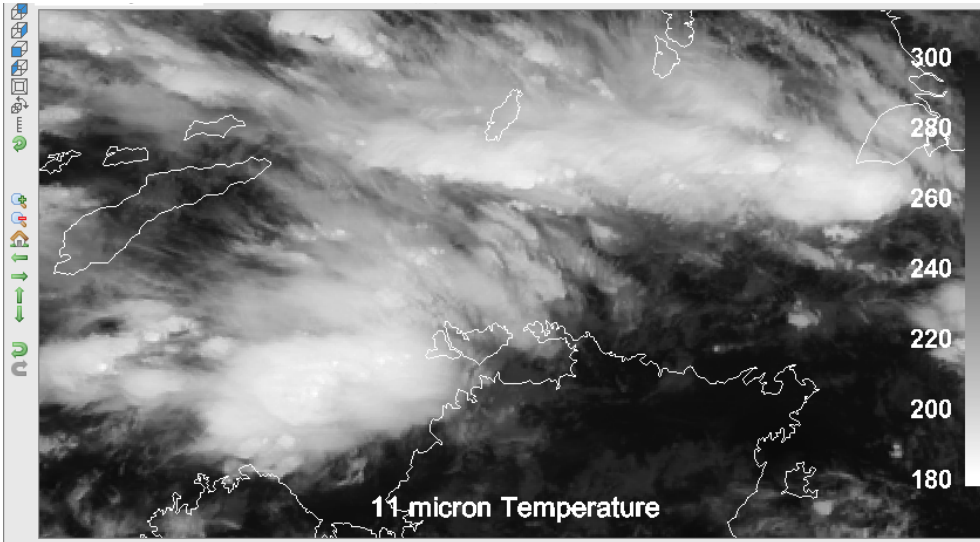
Phase



Darwin Falcon Flight FS140023 Feb 18, 2014

HIWC Probability

- MTSAT Rapid Scan
- Available for Darwin & Cayenne



Domain: RapidScan MTSAT-1R

[Download / List Available Dates](#)

Satellite:

MTSAT-1

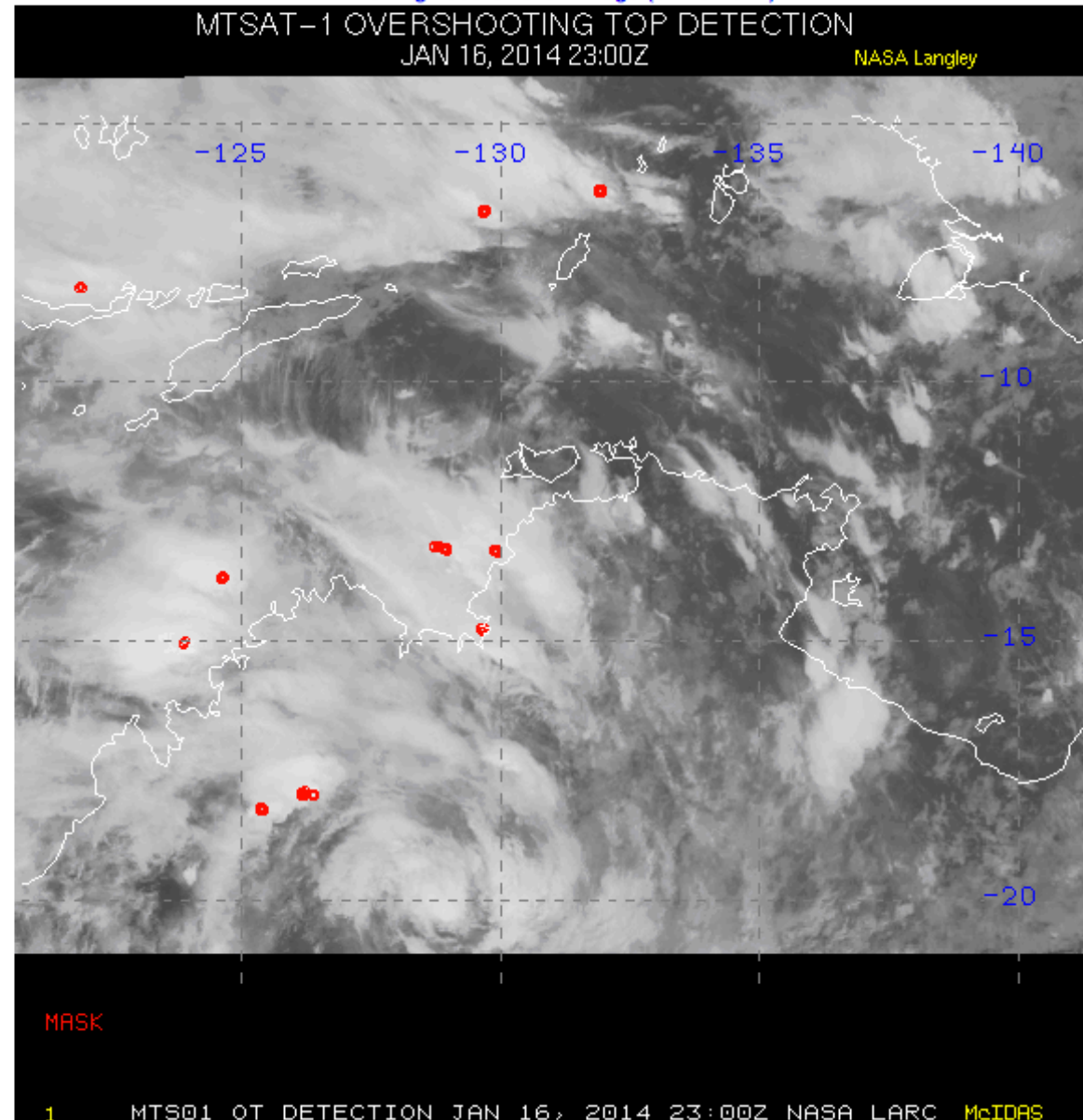
Date: 2014 01 16

Image Time: 23:00 UTC

Image: overshooting tops

Animate: Frames ---

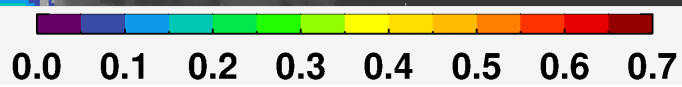
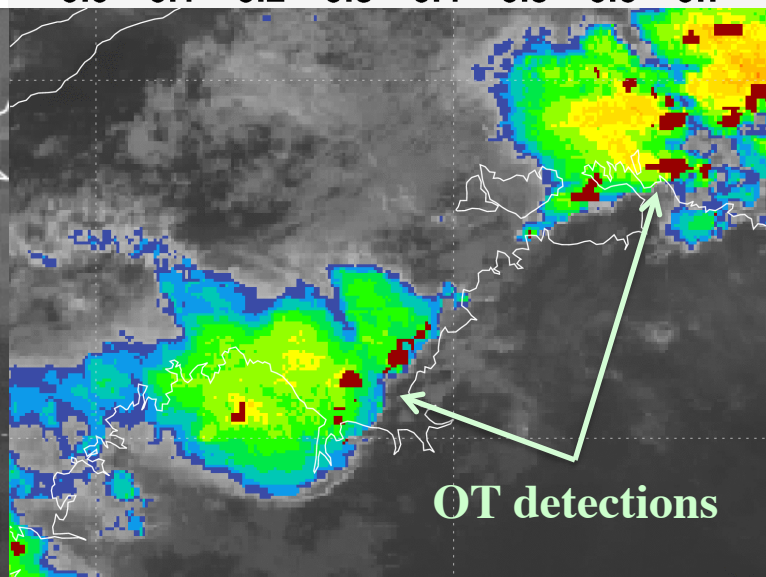
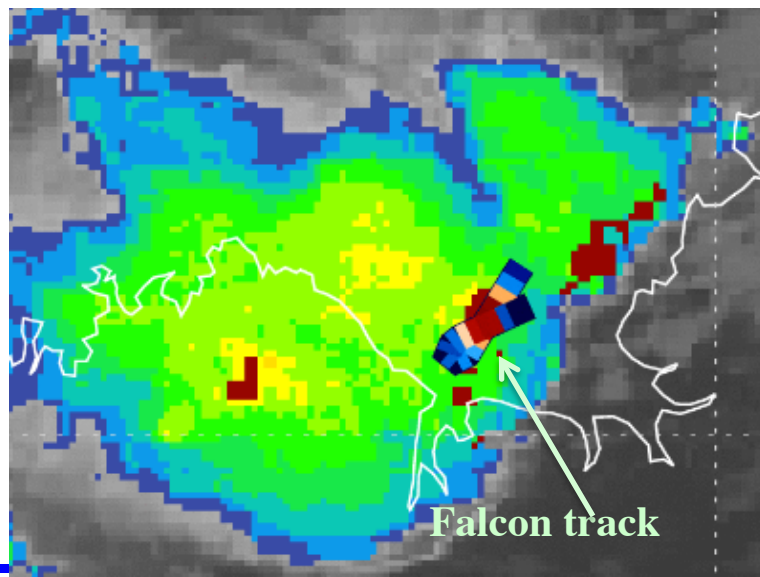
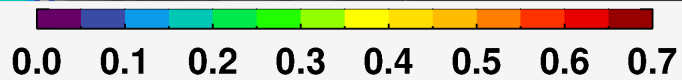
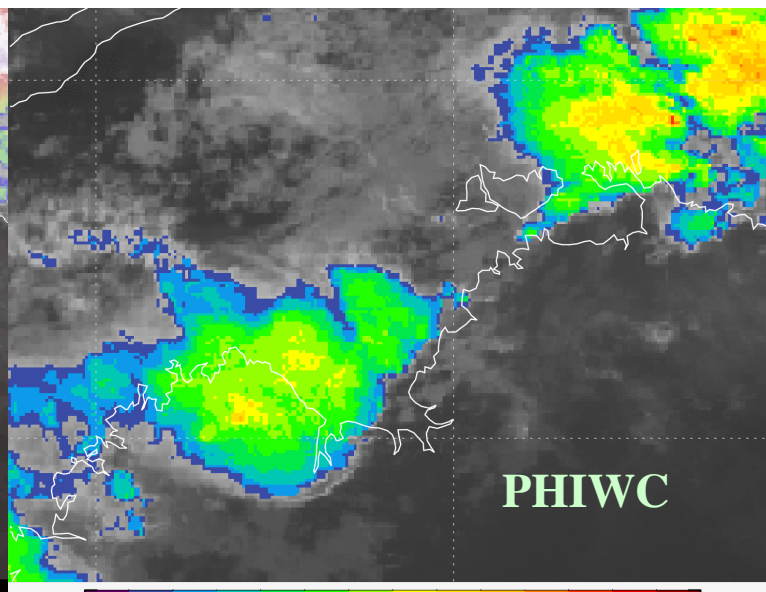
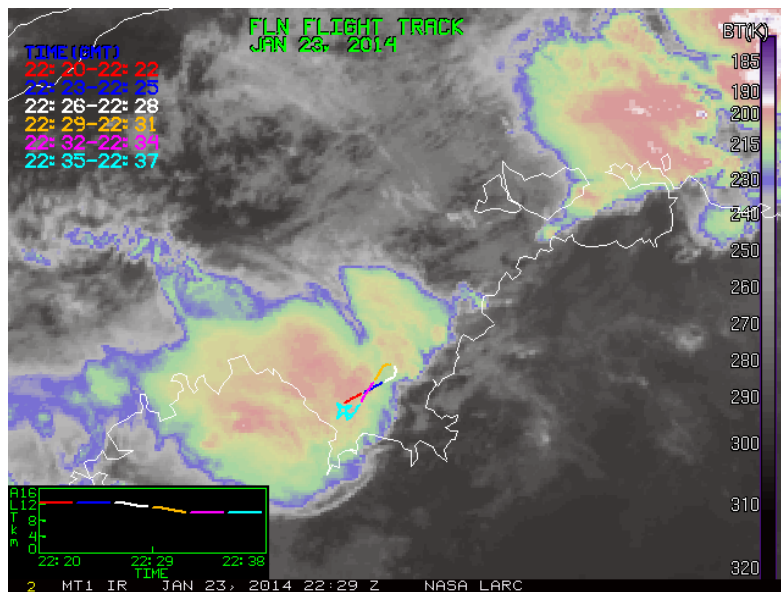
Viewing 2300 UTC OT image (01-16-2014).

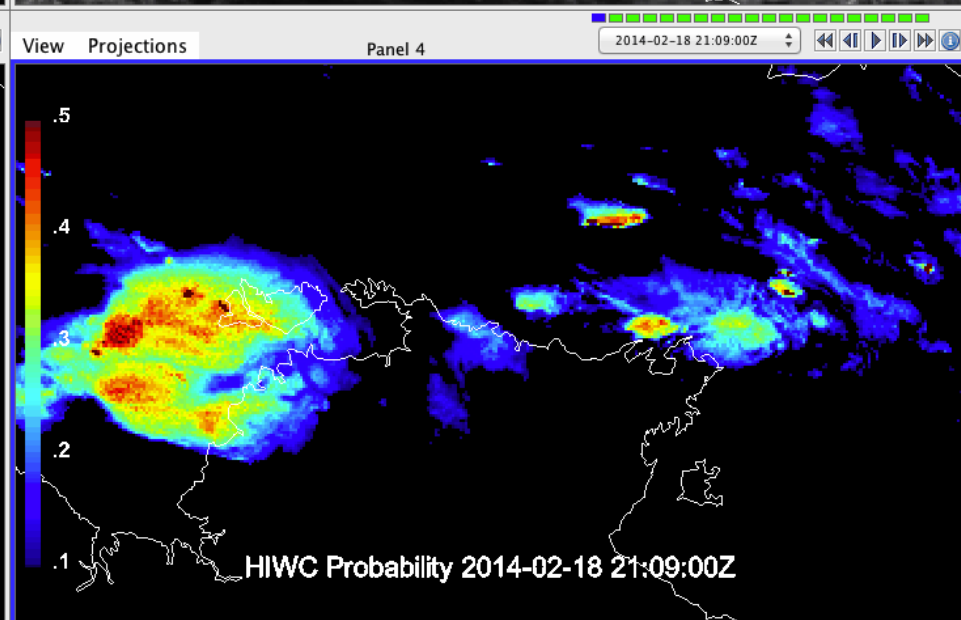
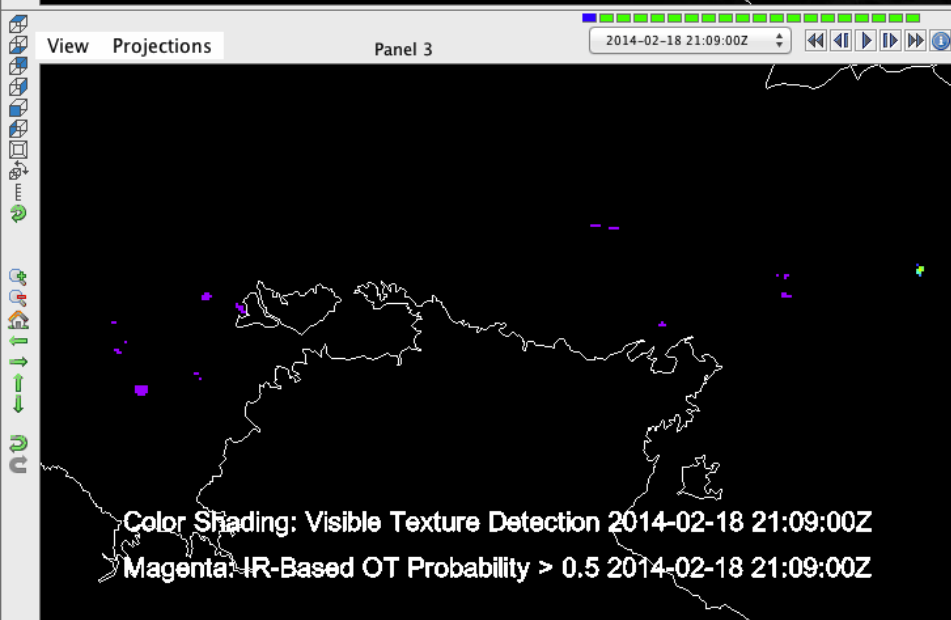
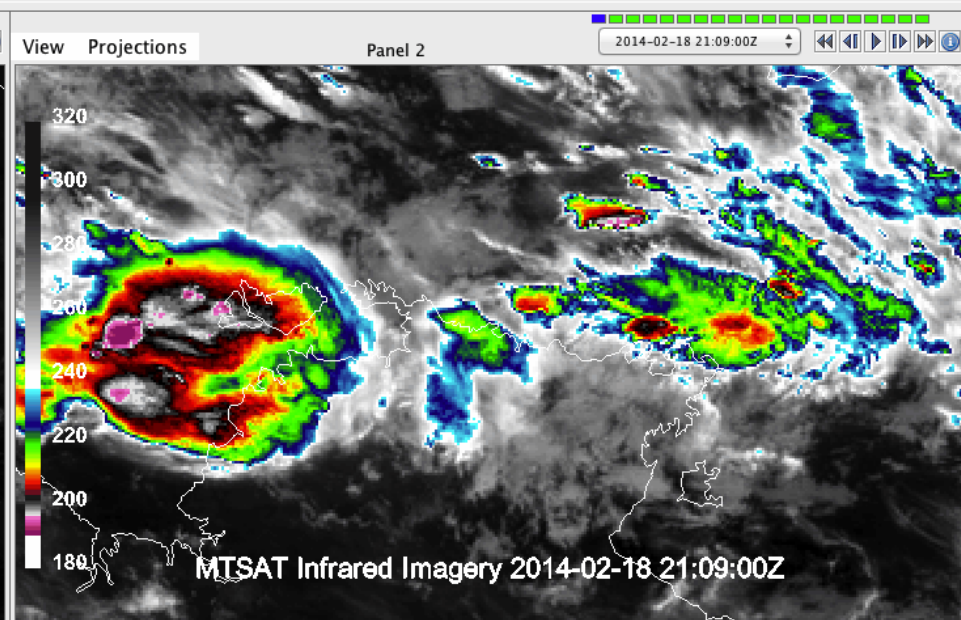
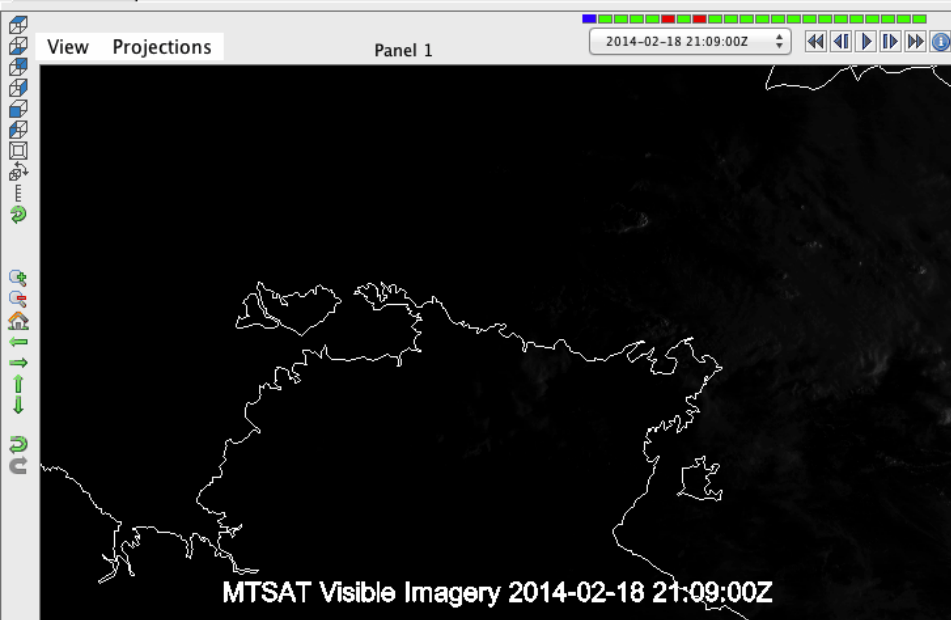


OT was available during Darwin and Cayenne campaigns

Can run on any satellite in near real-time with minimal latency

HIWC Probability Product Enhanced by OT Product





Satellite Imagery

- + NASA Home
- + NASA LaRC Home
- + Science Directorate
- + Minnis Group Home

High Ice Water Content (HIWC) Darwin

+ High Ice Water Content (HIWC) Research Official Home

+ HIWC-Cayenne

Cloud Products

+ Darwin MT2

+ RapidScan MTSAT-1R

Satellite Imagery

+ G13 Costa Rica

+ Darwin MTS1

Flight Track Overlay

+ Falcon - Sat Imagery

+ Falcon - Product Imagery

Cloud Products Along Track

+ Falcon

Downloads

+ MTSAT-2 Products

+ RapidScan MTSAT-1R

+ HIWC 2014 KML Files

+ Raw Data

Related Datasets

+ HIWC-2015 Florida

+ HIWC-2015 Cayenne

NASA NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

+ NASA Portal
+ Preferences

Search: Keywords + GO

Home Cloud Products Satellite Imagery Field Experiments References Options

HIWC MTS1 Satellite Imagery

Domain: HIWC MTS1 Satellite Imagery [Download / List Available Dates](#)

Date: 2014 02 18

Image: C2RC

Satellite: MTSAT-1
Image Time: 16:10 UTC
Animate: Frames ---

Viewing 1610 UTC C2RC image (02-18-2014).

- 0.73um VIS
- 10.8um IR gray
- 10.8um IR color
- 6.8um WV

BT(K) 320 310 300 290 280 270 260 250 240 230 215 200 185
MTSAT-1R 10.8 C2 COLOR FEB 18, 2014 16 10Z NASA LaRC


Flight Track Overlay Satellite Imagery and Products

- + NASA Home
- + NASA LaRC Home
- + Science Directorate
- + Minnis Group Home

- High Ice Water Content (HIWC) Darwin

- + High Ice Water Content (HIWC) Research Official Home

- + HIWC-Cayenne

- Cloud Products
- + Darwin MT2
- + RapidScan MTSAT-1R
- Satellite Imagery
- + G13 Costa Rica
- + Darwin MTS1
- Flight Track Overlay
- + Falcon - Sat Imagery 
- + Falcon - Product Imagery
- Cloud Products Along Track
- + Falcon
- Downloads
- + MTSAT-2 Products
- + RapidScan MTSAT-1R

Langley Satellite Support for High Ice Water Content (HIWC) - Darwin Campaign

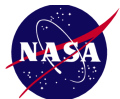
High Ice Water Content (HIWC) Darwin Home → Calendar

Flight track calendar from 2014-01-16 to 2014-03-15

January						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				16 (16)	17 (17)	18 (18)
19 (19)	20 (20)	21 (21)	22 (22)	23 (23)	24 (24)	25 (25)
26 (26)	27 (27)	28 (28)	29 (29)	30 (30)	31 (31)	

February						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1 (32)
2 (33)	3 (34)	4 (35)	5 (36)	6 (37)	7 (38)	8 (39)
9 (40)	10 (41)	11 (42)	12 (43)	13 (44)	14 (45)	15 (46)
16 (47)	17 (48)	18 (49)	19 (50)	20 (51)	21 (52)	22 (53)
23 (54)	24 (55)	25 (56)	26 (57)	27 (58)	28 (59)	

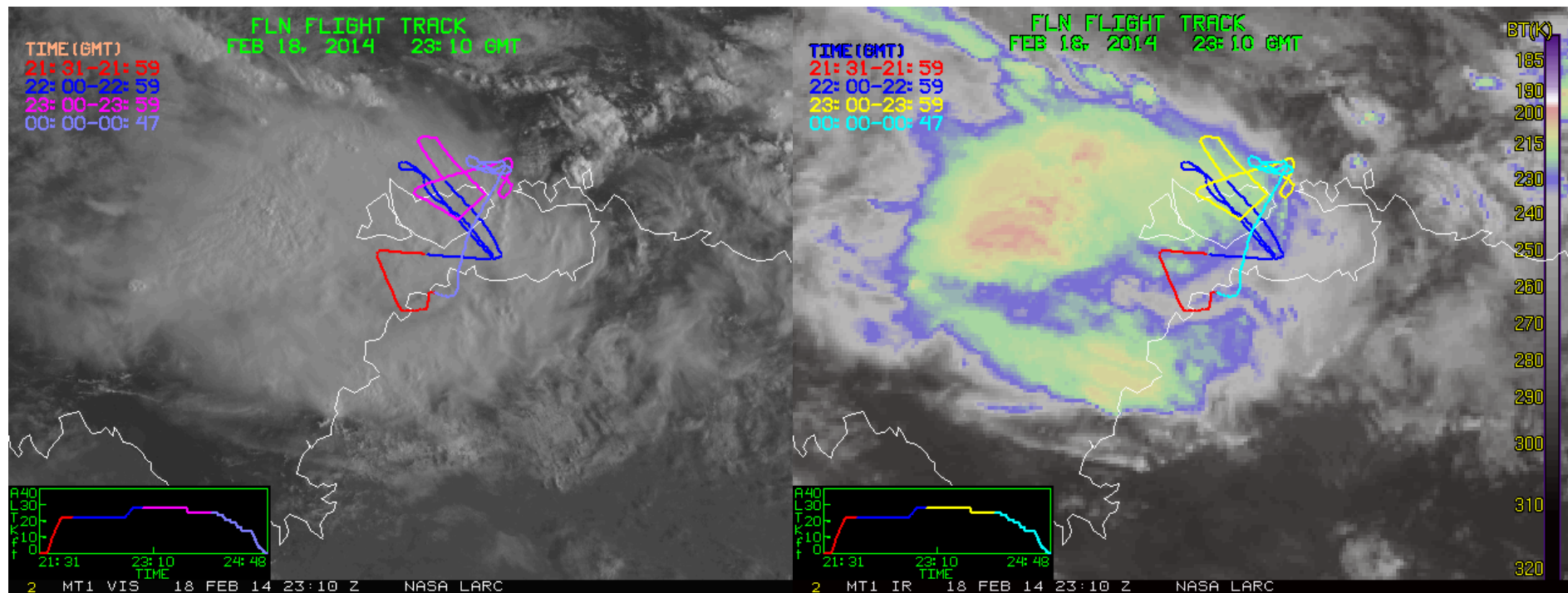
March						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1 (60)
2 (61)	3 (62)	4 (63)	5 (64)	6 (65)	7 (66)	8 (67)
9 (68)	10 (69)	11 (70)	12 (71)	13 (72)	14 (73)	



Flight Track Overlay Satellite Imagery

January						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				16 (16)	17 (17)	18 (18)
19 (19)	20 (20)	21 (21)	22 (22)	23 (23)	24 (24)	25 (25)
26 (26)	27 (27)	28 (28)	29 (29)	30 (30)	31 (31)	

February						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1 (32)
2 (33)	3 (34)	4 (35)	5 (36)	6 (37)	7 (38)	8 (39)
9 (40)	10 (41)	11 (42)	12 (43)	13 (44)	14 (45)	15 (46)
16 (47)	17 (48)	18 (49)	19 (50)	20 (51)	21 (52)	22 (53)
23 (54)	24 (55)	25 (56)	26 (57)	27 (58)	28 (59)	



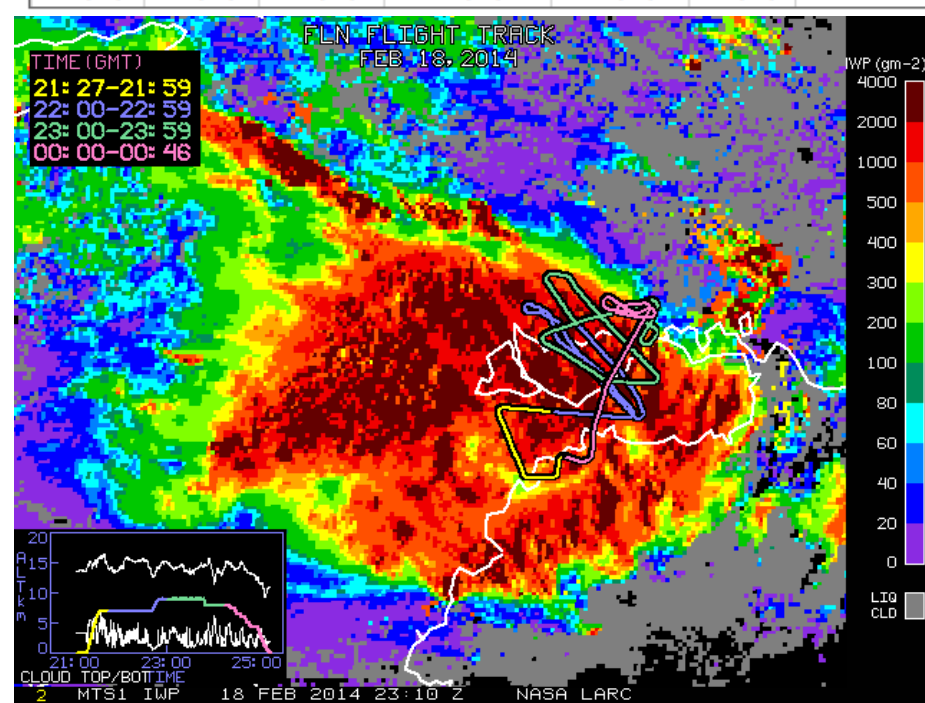
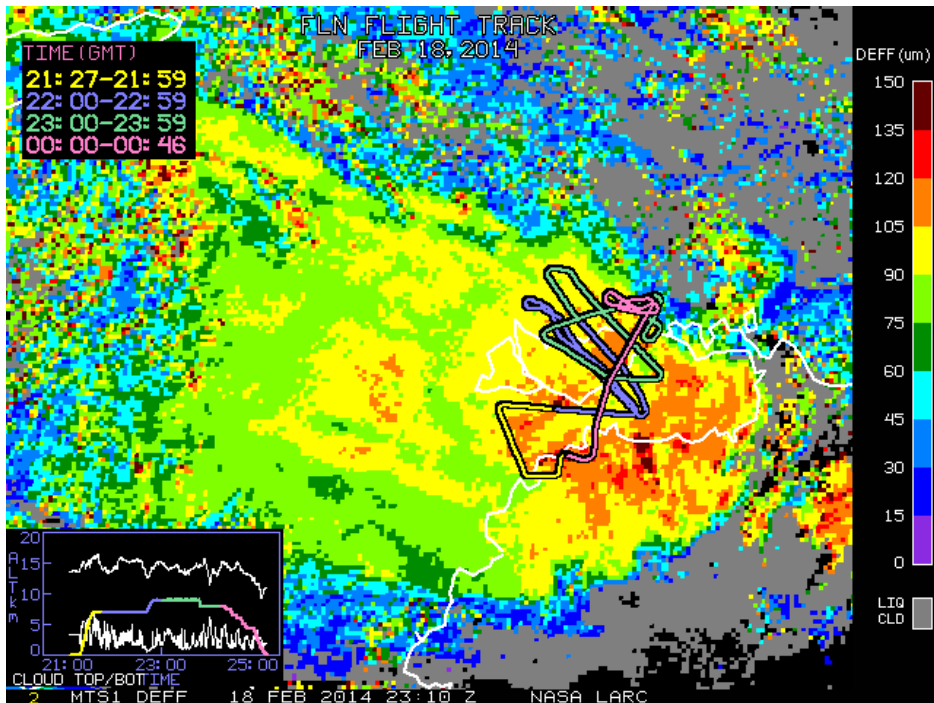
Flight FS140023 Feb 18, 2014 Visible and IR Loop



Flight Track Overlay Cloud Products

January						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				16 (16)	17 (17)	18 (18)
19 (19)	20 (20)	21 (21)	22 (22)	23 (23)	24 (24)	25 (25)
26 (26)	27 (27)	28 (28)	29 (29)	30 (30)	31 (31)	

February						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1 (32)
2 (33)	3 (34)	4 (35)	5 (36)	6 (37)	7 (38)	8 (39)
9 (40)	10 (41)	11 (42)	12 (43)	13 (44)	14 (45)	15 (46)
16 (47)	17 (48)	18 (49)	19 (50)	20 (51)	21 (52)	22 (53)
23 (54)	24 (55)	25 (56)	26 (57)	27 (58)	28 (59)	



Flight FS140023 Feb 18, 2014, Effective Ice Diameter (left) and Ice Water Path (Rt)



Cloud Product Along Flight Track

Cloud Matching Tool

VISST Derived Cloud Products Along the Aircraft Track

VISST Derived Cloud Products are computed from the individual aircraft files, where the cloud retrieval parameter is based on the weighted average of 4 imager pixels centered on the aircraft location. The (spatial) standard deviation is based on a weighted distribution of the closest pixel and the 8 surrounding pixels.

Select 4 Cloud Parameters	σ Plot	Aircraft/Sat.	Flight Days	Start/End Hour	
Effective Ice Dia. ▾	<input checked="" type="checkbox"/>	Falcon ▾	2014-02-18 ▾	00.0	24.0
Ice Water Path ▾	<input checked="" type="checkbox"/>	MTSat-1 ▾			
Effective Cloud Temp. ▾	<input checked="" type="checkbox"/>				
Cloud Top Ht. ▾	<input checked="" type="checkbox"/>				
PLOT					



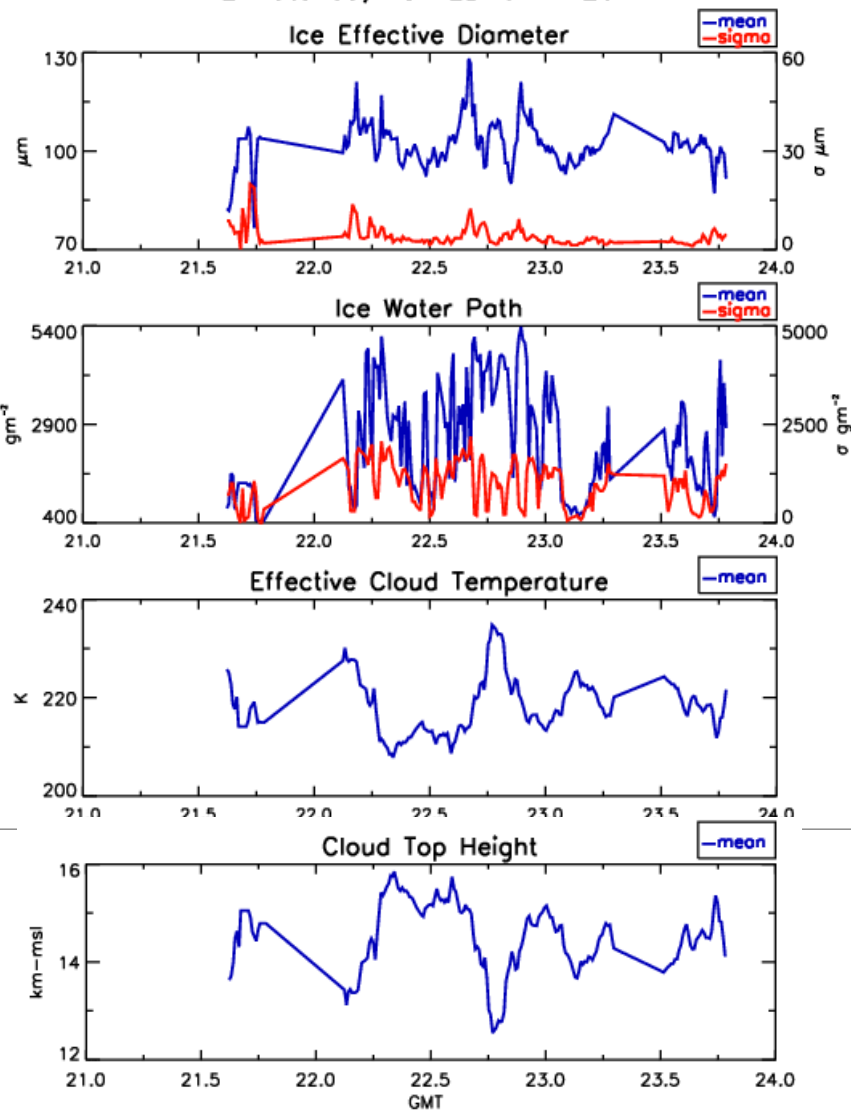
- Cloud Products
 - + Darwin MT2
 - + RapidScan MTSAT-1R
 - + GOES-13
 - + GOES-13 Cayenne
- Satellite Imagery
 - + G13 Costa Rica
 - + Darwin MTS1
 - + GOES-13
 - + GOES-13 Cayenne
 - + MSG Cayenne
- Flight Track Overlay
 - + Falcon - Sat Imagery
 - + Falcon - Product Imagery
- Cloud Products Along Track
 - + Falcon
- Downloads
 - + HIWC Cloud Products
 - + RapidScan MTSAT-1R
 - + GOES-13 Puerto Rico
 - + HIWC 2015 KML Files
- Viewers / Tools
 - + Satellite Prediction Tool

Cloud Product Along Flight Track

[ASCII File](#) • [Plot](#) • [Full Data File](#)

Results:

NASA-Langley MTS1V VISST Derived Cloud Products
FAL Matched, 18 FEBRUARY 2014



Cloud Products
+ Darwin MT2
+ RapidScan MTSAT-1R
+ GOES-13
+ GOES-13 Cayenne
Satellite Imagery
+ G13 Costa Rica
+ Darwin MTS1
+ GOES-13
+ GOES-13 Cayenne
+ MSG Cayenne
Flight Track Overlay
+ Falcon - Sat Imagery
+ Falcon - Product Imagery
Cloud Products Along Track
+ Falcon
Downloads
+ HIWC Cloud Products
+ RapidScan MTSAT-1R
+ GOES-13 Puerto Rico
+ HIWC 2015 KML Files
Viewers / Tools
+ Satellite Prediction Tool



- + NASA Home
- + NASA LaRC Home
- + Science Directorate
- + Minnis Group Home

High Ice Water Content (HIWC) Darwin

+ High Ice Water Content (HIWC) Research Official Home

+ HIWC-Cayenne

Cloud Products

+ Darwin MT2

+ RapidScan MTSAT-1R

Satellite Imagery

+ G13 Costa Rica

+ Darwin MTS1

Flight Track Overlay

+ Falcon - Sat Imagery

+ Falcon - Product Imagery

Cloud Products Along Track

+ Falcon

Downloads

+ MTSAT-2 Products

+ RapidScan MTSAT-1R

+ HIWC 2014 KML Files

+ Raw Data

Data Archive: Download via http

Download Files - Domain: RapidScan MTSAT-1R

Click For Files: → [Image Files](#) • [Pixel NetCDF Files](#)

Available Imagery (Pixel NetCDF Files)

<http://cloudsway2.larc.nasa.gov/prod/exp/hiwc/rscan/visst-pixel-netcdf/2014>

- [01](#)
- [02](#)
- [03](#)

Download Files - Domain: RapidScan MTSAT-1R

Click For Files: → [Image Files](#) • [Pixel NetCDF Files](#)

Available Imagery (Pixel NetCDF Files)

<http://cloudsway2.larc.nasa.gov/prod/exp/hiwc/rscan/visst-pixel-netcdf/2014/02>

- [01](#)
- [02](#)
- [03](#)
- [04](#)
- [05](#)
- [06](#)
- [07](#)
- [08](#)
- [09](#)
- [10](#)
- [11](#)
- [12](#)

Download Files - Domain: HIWC MTSAT Cloud Pro

• [Gridded NetCDF Files](#) • [Pixel NetCDF](#)

Click to view files in month

MTS01V04.0.RS_HIWC.2014049.0039.PX.04K.CDF.gz

[4049.0019.PX.04K.CDF.gz](#)

- [MTS01V04.0.RS_HIWC.2014049.0029.PX.04K.CDF.gz](#)
- [MTS01V04.0.RS_HIWC.2014049.0039.PX.04K.CDF.gz](#)
- [MTS01V04.0.RS_HIWC.2014049.0049.PX.04K.CDF.gz](#)
- [MTS01V04.0.RS_HIWC.2014049.0059.PX.04K.CDF.gz](#)
- [MTS01V04.0.RS_HIWC.2014049.0109.PX.04K.CDF.gz](#)
- [MTS01V04.0.RS_HIWC.2014049.0119.PX.04K.CDF.gz](#)
- [MTS01V04.0.RS_HIWC.2014049.0129.PX.04K.CDF.gz](#)
- [MTS01V04.0.RS_HIWC.2014049.0139.PX.04K.CDF.gz](#)
- [MTS01V04.0.RS_HIWC.2014049.0149.PX.04K.CDF.gz](#)
- [MTS01V04.0.RS_HIWC.2014049.2109.PX.04K.CDF.gz](#)
- [MTS01V04.0.RS_HIWC.2014049.2119.PX.04K.CDF.gz](#)
- [MTS01V04.0.RS_HIWC.2014049.2129.PX.04K.CDF.gz](#)
- [MTS01V04.0.RS_HIWC.2014049.2139.PX.04K.CDF.gz](#)
- [MTS01V04.0.RS_HIWC.2014049.2149.PX.04K.CDF.gz](#)
- [MTS01V04.0.RS_HIWC.2014049.2209.PX.04K.CDF.gz](#)
- [MTS01V04.0.RS_HIWC.2014049.2219.PX.04K.CDF.gz](#)
- [MTS01V04.0.RS_HIWC.2014049.2229.PX.04K.CDF.gz](#)
- [MTS01V04.0.RS_HIWC.2014049.2239.PX.04K.CDF.gz](#)



Satellite Products on Google Earth

Google Earth

Search

ex: Tokyo, Japan

Get Directions History

Places

- My Places
 - Sightseeing Tour
 - Make sure 3D Buildings
- Temporary Places
 - LaRC-HIWC.kmz
 - 2014-01-17
 - 2014-01-18
 - Flight Track 2...
 - Cloud Product...
 - Sat Imagery 2...
 - Cloud Products 2014-01-...
 - BBAL
 - BBLW
 - DEFF →
 - EMIT
 - ICNG
 - IWP
 - LWP
 - PBOT
 - PEFF
 - 2359 : NASA L...
 - 2359 : NASA L...
 - 2014-01-23
 - 2014-01-24
 - 2014-01-27
 - 2014-01-28

Layers

Primary Database

- Borders and Labels
- Places
- Photos

1/18/2014 10:15:24 pm

9 pm 11 pm

DEFF (mm)

150

120

90

60

30

0

L70 CLD

Cartier Islands

Grapher Northern Territory

Data SIO, NOAA, U.S. Navy, NGA, GEBCO

Google earth

Tour Guide 3 14°49'00.08" S 127°51'53.32" E elev 54 m eye alt 1389.09 km

Satellite Products on Google KML/KMZ

Darwin 2014

The screenshot displays the Google Earth interface with a satellite view of the Pacific Ocean region. The main map area shows a satellite image of the Earth with a yellow outline highlighting the flight paths of the Falcon rocket and the MTSAT1R satellite. A timeline at the top of the map indicates the date and time: 1/27/2014 9:08:25 pm. The interface includes a search bar on the left, a 'Places' list, and a 'Layers' panel. The 'Places' list shows a folder named 'HIWC-Darwin-2014.kmz' containing several flight tracks and satellite imager data. The 'Layers' panel shows various map layers, including 'Primary Database', 'Voyager', 'Borders and Labels', 'Places', 'Photos', 'Roads', '3D Buildings', 'Ocean', 'Weather', 'Gallery', 'Global Awareness', and 'More'. The bottom of the screen displays the Google Earth logo, copyright information, and the current coordinates: 11°05'15.04" N 87°17'20.77" W, along with elevation and altitude information.

Google Earth

Search

ex: Tokyo, Japan

Get Directions History

Places

- HIWC-Darwin-2014.kmz
 - 2014-01-17 Flight
 - 2014-01-18 Flight
 - 2014-01-23 Flight
 - 2014-01-24 Flight
 - 2014-01-27 Flight
 - Falcon: Flight Track 2...
 - Falcon Flight Track
 - Falcon 2014-01-27 ...
 - MTSAT1R Sat Imager...
 - MTSAT1R-C01
 - MTSAT1R-C02

Layers

Earth Gallery >>

- Primary Database
 - Voyager
 - Borders and Labels
 - Places
 - Photos
 - Roads
 - 3D Buildings
 - Ocean
 - Weather
 - Gallery
 - Global Awareness
 - More

US Dept of State Geographer
© 2015 Google
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat

Google earth

Tour Guide 11°05'15.04" N 87°17'20.77" W elev 0 ft eye alt 5878.47 mi

Satellite Products on Google KML/KMZ

Cayenne 2015

The screenshot displays the Google Earth interface with a satellite view of the Americas. A timeline window is open, showing a date of 5/14/2015 at 2:14:46 pm, with a playback bar ranging from 1 pm to 5 pm. The left sidebar contains a search bar with the text 'ex: 94043', a 'Places' list with various GOES-13 satellite products, and a 'Layers' panel with several checked options including 'Primary Database', 'Voyager', 'Borders and Labels', 'Photos', 'Roads', '3D Buildings', 'Ocean', 'Weather', 'Gallery', 'Global Awareness', and 'More'. The main map area shows the Earth with yellow outlines of the continents. At the bottom, there is a copyright notice: 'US Dept of State Geographer © 2015 Google Image Landsat Data SIO, NOAA, U.S. Navy, NGA, GEBCO'. The Google Earth logo is in the bottom right corner, and a 'Tour Guide' button is in the bottom left corner. The bottom status bar shows coordinates: 6°21'56.62" N 76°16'33.58" W, elevation of 0 ft, and eye altitude of 5616.15 mi.

Google Earth

Search

Search

ex: 94043

Get Directions History

Places

- GOES-13-BBLW
- GOES-13-DEFF
- GOES-13-EMIT
- GOES-13-ICNG
- GOES-13-LWP
- GOES-13-IWP
- GOES-13-PBOT
- GOES-13-PEFF
- GOES-13-PHAS
- GOES-13-PTOP
- GOES-13-R_65
- GOES-13-REFF
- GOES-13-RGB
- GOES-13-T-11

Layers

Earth Gallery >>

- Primary Database
- Voyager
- Borders and Labels
- Places
- Photos
- Roads
- 3D Buildings
- Ocean
- Weather
- Gallery
- Global Awareness
- More

5/14/2015 2:14:46 pm

1 pm 5 pm

US Dept of State Geographer
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Image Landsat
Data SIO, NOAA, U.S. Navy, NGA, GEBCO

Google earth

Tour Guide

6°21'56.62" N 76°16'33.58" W elev 0 ft eye alt 5616.15 mi

Summary

- Website: www-pm.larc.nasa.gov
 - Contains complete data archive
- New dataset: OT and HIWC probability products
 - Analyze, evaluate, and improve
- NCAR Catalog has most recent Darwin dataset
 - MTSAT1 rapidscan and MTSAT2 hourly
- Google Earth kml/kmz with embedded images

Contact: L.Nguyen@nasa.gov

