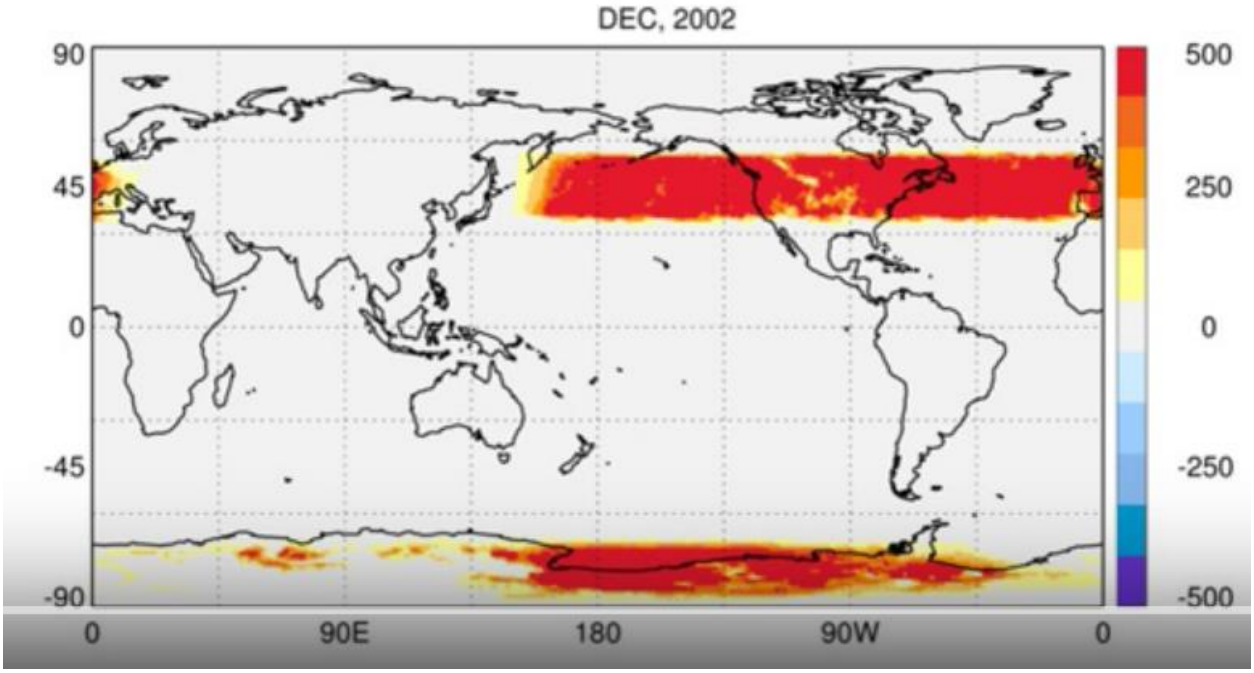
L3 Pixel Count Oddities resulting from Day/Night Determination Issues in some L2 Cloud Top Parameters

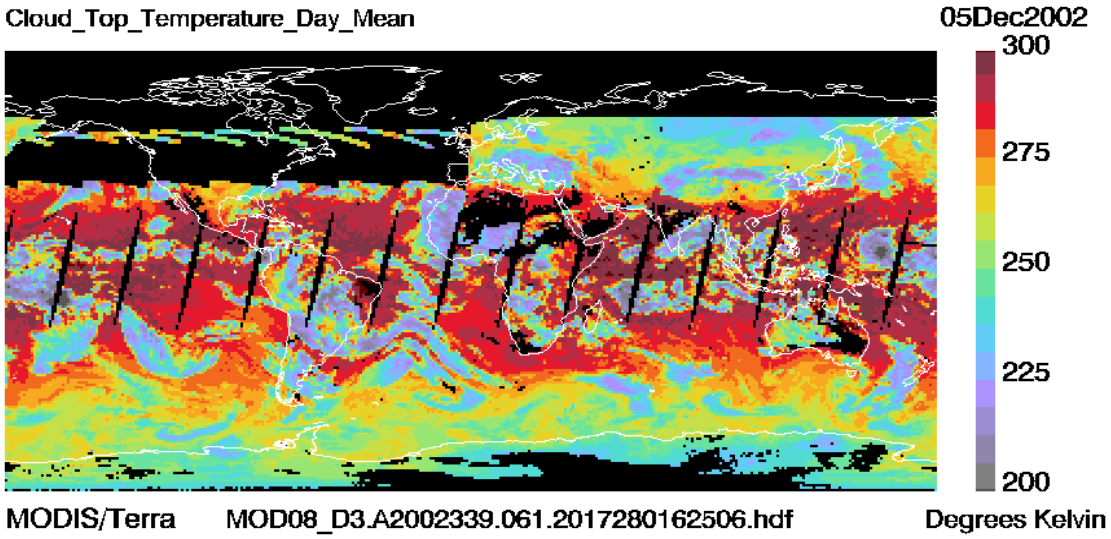
This issue was first noticed by Nandana Amarasinghe and Kerry Meyer when comparing Monthly Pixel Counts of Cloud Top Pressure vs. a pseudo accounting of Pixel Counts of Cloud Top Height by crushing down a joint histogram involving CTH. The image below shows an especially bad case of "pixel count mismatch" which appeared to follow a broad latitude band or zone, which was a very odd looking signature.

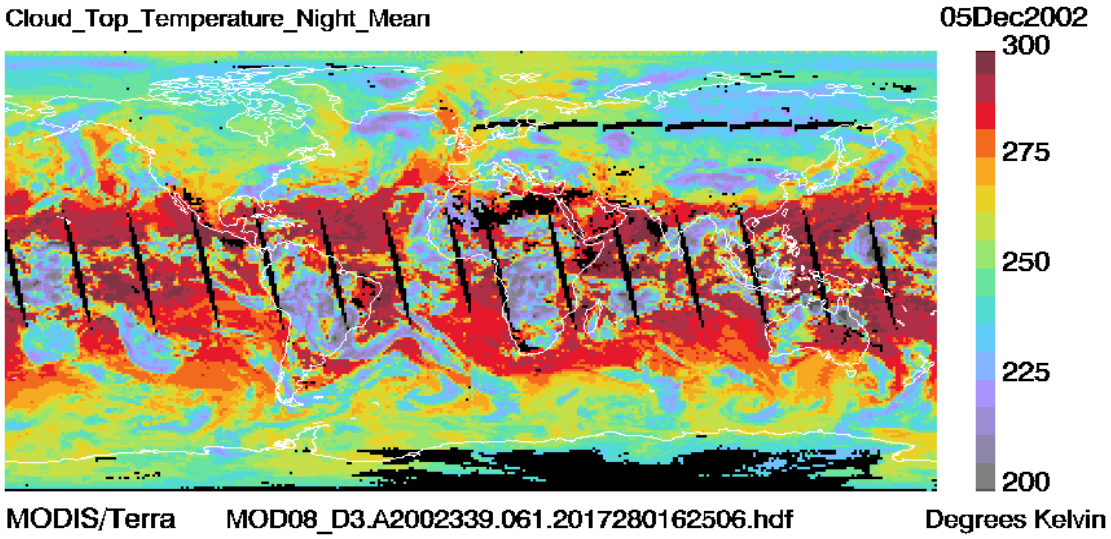


Note that this bad Monthly PC mismatch appeared traceable to a selected (infrequently occurring) single day -- and further traceable to only a few granules in partial orbits on that single day. For example, for this December 2002 Monthly image (shown above), I traced this anomaly to a bad single day on 5 Dec 2002. After I dug into this a bit, I found this issue was always traceable to a chunk of daytime Cloud Top Properties data that was incorrectly assigned night in L2 (within the 06_L2 file). Now, lets see what this issue looks like in the L3 Daily Images for 5 Dec 2002.

Cloud Top Temperature (Day, Night)

So in the Daily images for 5 Dec 2002 (shown below) there was a chunk of Daytime data that was assigned to Night. While the missing day data is easy to see, it's a bit harder to see (due to overlap) that the missing day granules were assigned night (second image below), but it's there.

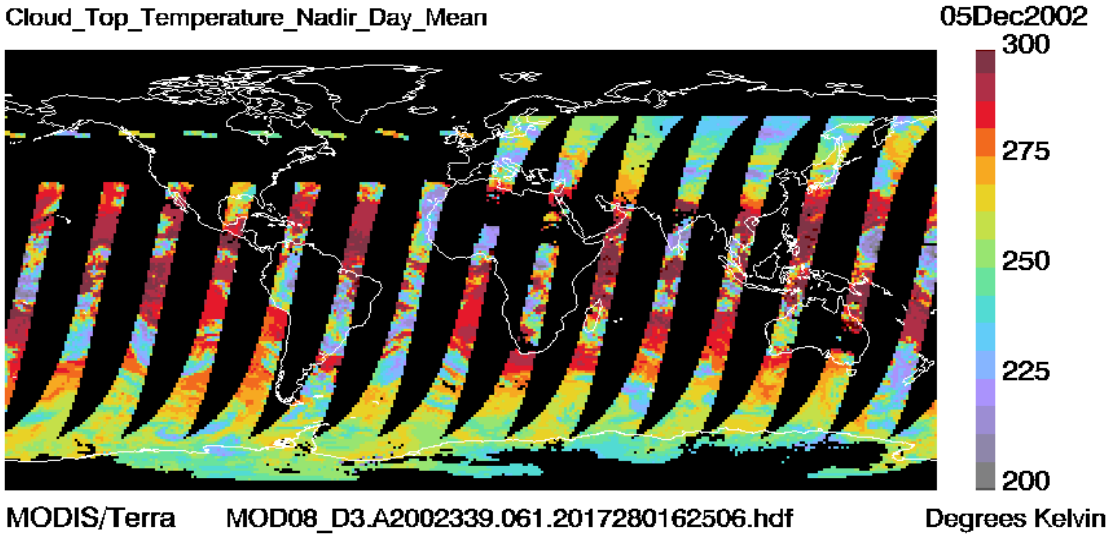


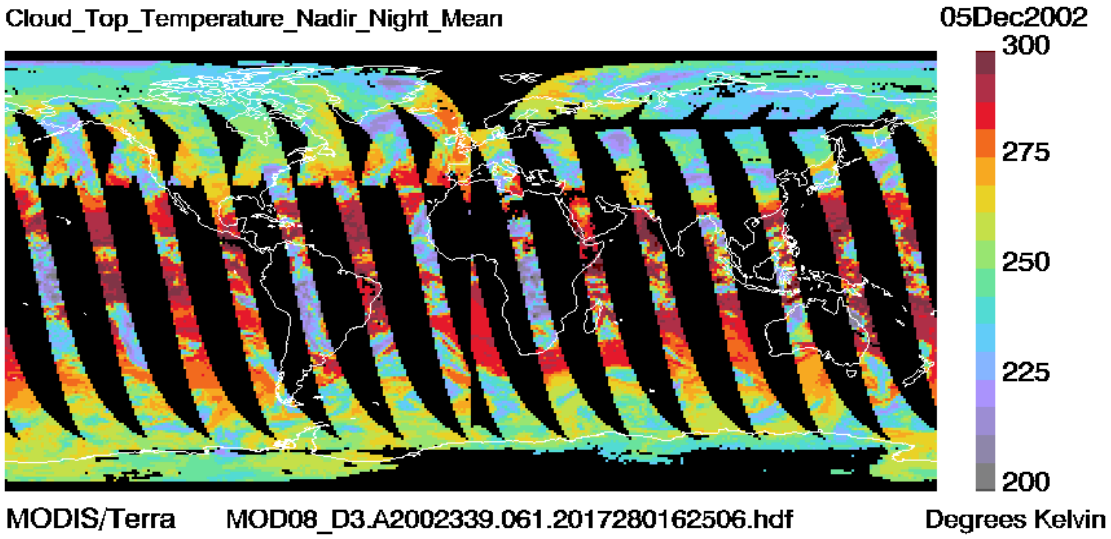


This misclassification of Day granules into Night is more easily seen in the Nadir Products (since it's easier to see the individual orbits) and it doesn't get hidden by overlap.

CTT Near Nadir (Day, Night)

Switching to the Near Nadir L3 Daily SDS's, it's much easier to see the granules that were misplaced into Night in L2 (since it's easier to see the individual orbits) and there is not as much overlap.

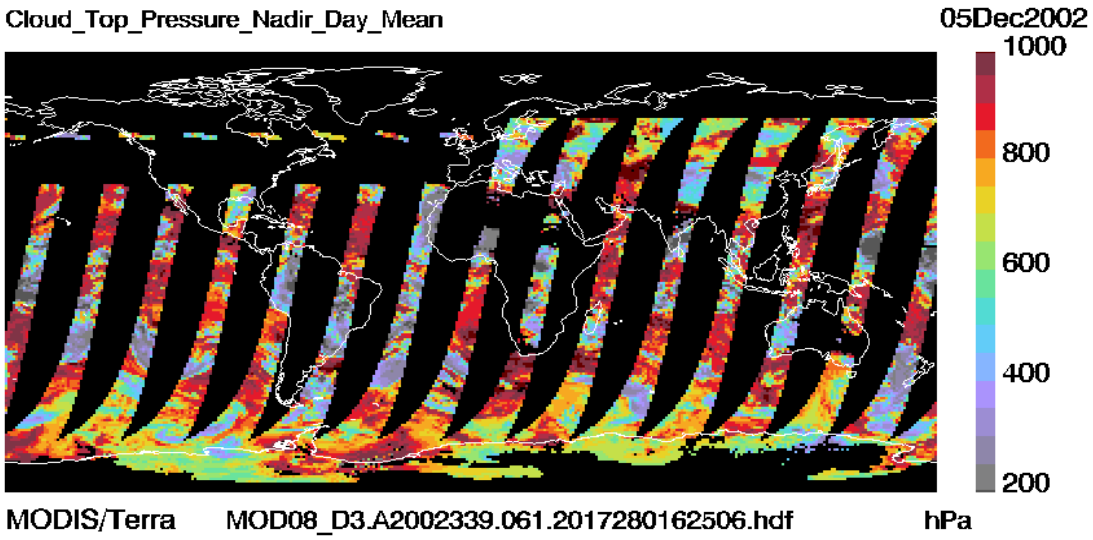


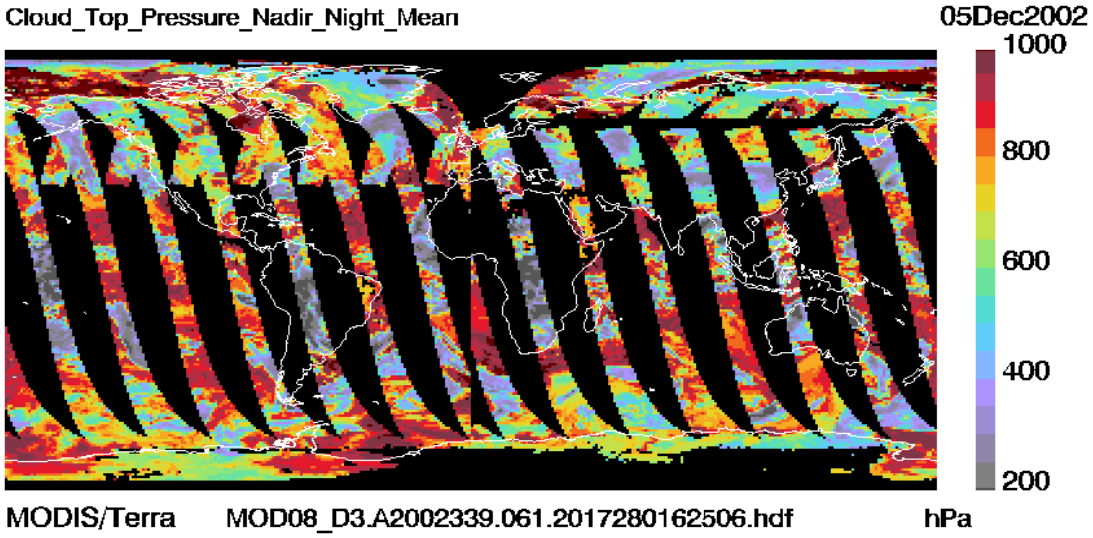


Note that this exact same dynamic D/N misclassification issue is occurring the Cloud Top Pressure, Cloud Effective Emissivity, and Cloud Fraction parameters.

CTP Near Nadir (Day, Night)

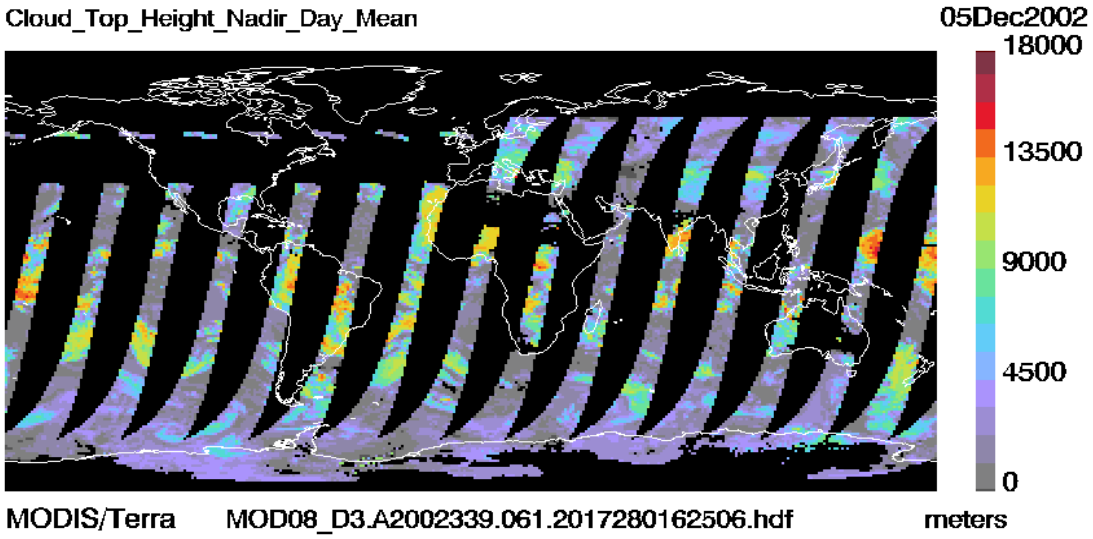
Here is the CTP Nadir Day and CTP Nadir Night which shows the exact same pattern. Daytime granules are getting mis-tagged as night.

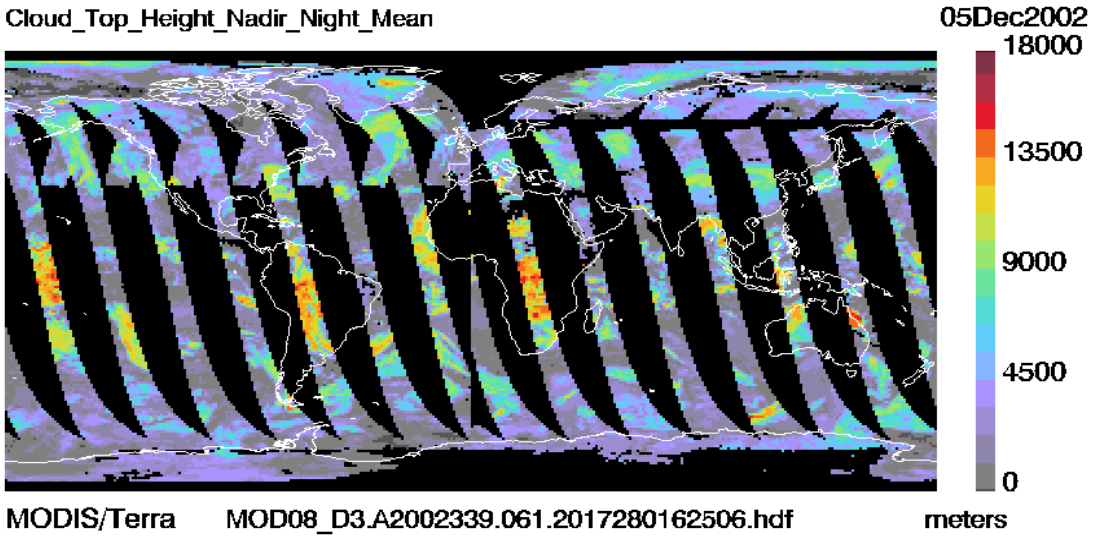




CTH Near Nadir (Day, Night)

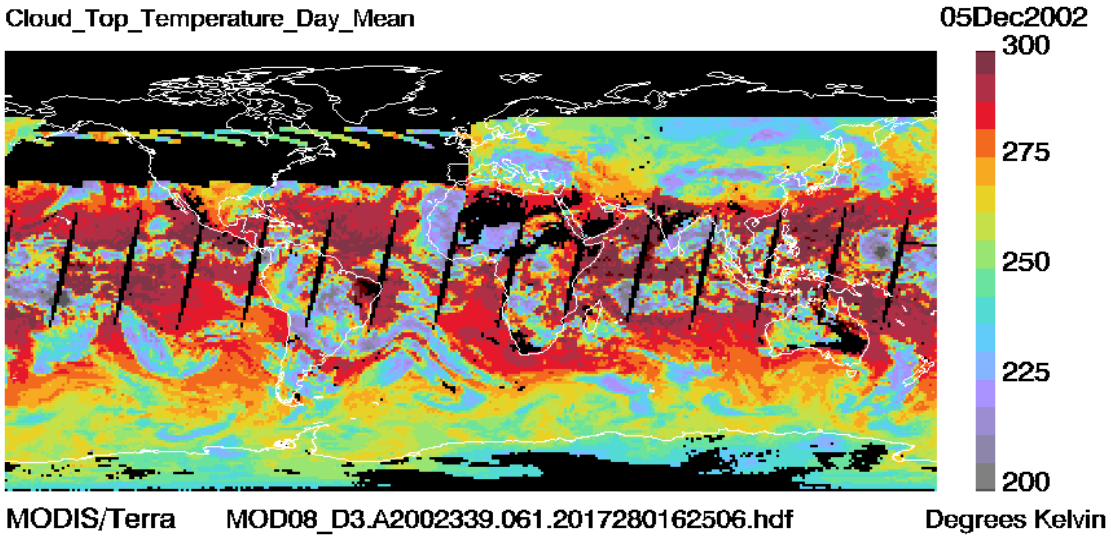
Finally Cloud Top Height **Near Nadir** shows this exact same pattern.

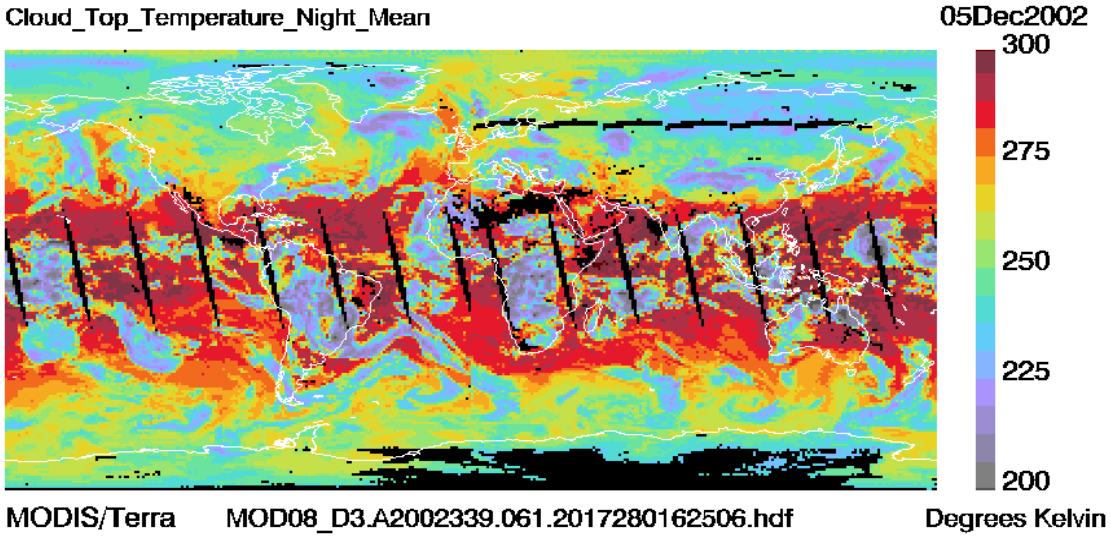




However, next I want to show something interesting with this bug. What is interesting is if you move to the standard Cloud Top Property Parameters, that is the standard full swath parameters (and not the Near Nadir parameters), there is a "**break in the pattern"**.

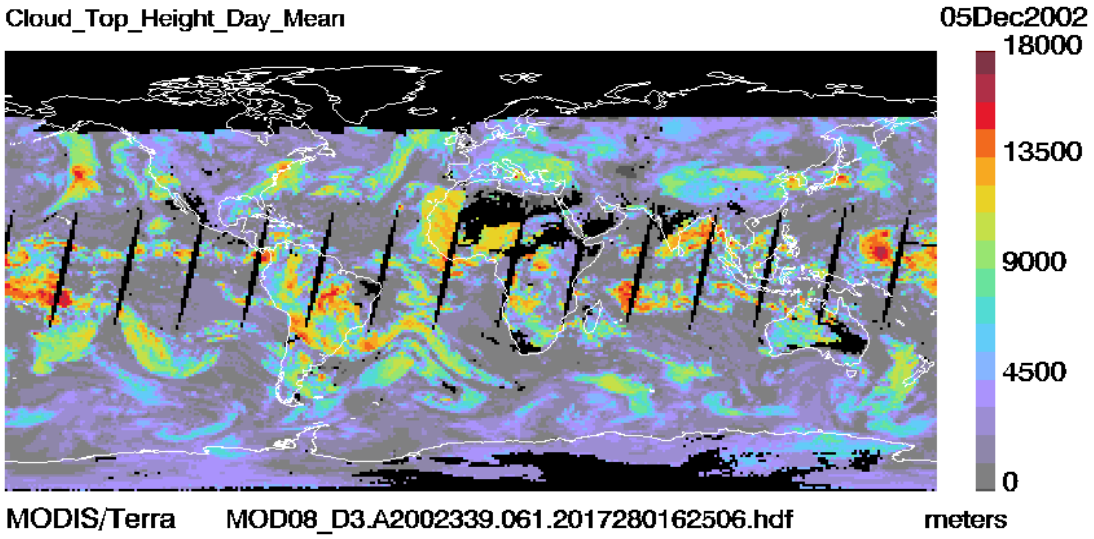
For the Full Orbital Swath CTT (the standard CTT) – you get the same general signature. That is, some of the Daytime granules for a few granules in a few orbits are incorrectly assigned Night.

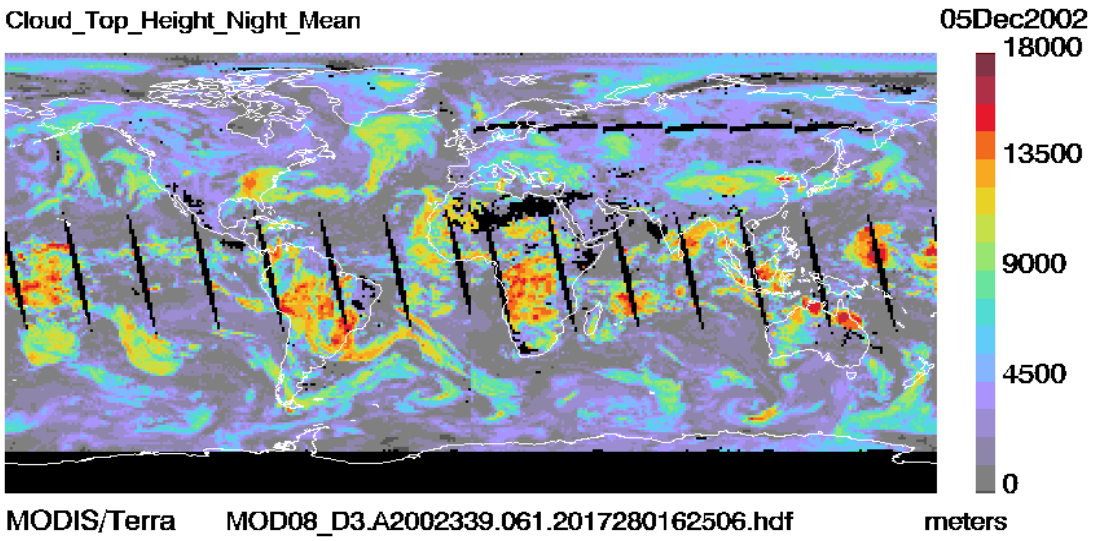




That same pattern REPEATS for the full Orbital Swath Products (the standard Products) for CTP, CEE, CF.

HOWEVER, for Cloud Top Height (CTH), in the standard full swath product, this issue suddenly disappears! That is, there was NO issue seen in L3 where daytime CTH granules were being misclassified as night. CTH Standard looked normal and correct in L3 relative to D/N separation.





This symmetry break between CTH Standard Product and the other Cloud Top Property Standard Products (CTT, CTP, CEE, and CF) is the ultimate cause of the crazy mismatch patterns (the bright red color) that Nandana was seeing in his monthly Pixel Count Difference Images.

Further Investigation

Next, I wanted to investigate if something was different In the L3 Specification as to how the CTH Standard Product was being computed vs. the all other Cloud Top Property related products in L3 (which included all the Near Nadirs and all the Standard Products other than CTH). This was done to see if this break in the pattern in L3 could be attributed to how the Standard CTH SDS was specified to be computed in L3. Was there something different about that specification in L3?

So, lets JUST compare the L3 Specification of the CTH Day Standard product (which appears correct) vs. the CTP Day Near Nadir Product (which shows the Day/Night specification error).

Shown below is the CTH Day Standard Product specification in L3. (The key parts are highlighted in red). So for this CTH Day Standard Product, L3 is reading the regular CTH SDS and using the Day/Night Flag in the Cloud_Mask_5km QA to separate Day and Night. This specification does not show an error. That is, it bypasses the error in L2.

CTH Day Standard Product Spec:

```
short   Cloud_Top_Height_Day_Mean ( YDim:mod08 , XDim:mod08 ) ;
        Cloud_Top_Height_Day_Mean:long_name = "Geopotential Height at Retrieved Cloud Top
Pressure Level (Day): Mean" ;
        Cloud_Top_Height_Day_Mean:units = "meters" ;
        Cloud_Top_Height_Day_Mean:valid_range = 0s, 18000s ;
        Cloud_Top_Height_Day_Mean:_FillValue = -9999s ;
        Cloud_Top_Height_Day_Mean:scale_factor = 1.0d ;
        Cloud_Top_Height_Day_Mean:add_offset = 0.0d ;
        Cloud_Top_Height_Day_Mean:Derived_From_Level_2_Data_Set = "Cloud_Top_Height" ;
        Cloud_Top_Height_Day_Mean:Level_2_Pixel_Values_Read_As = "Real" ;
        Cloud_Top_Height_Day_Mean:Included_Level_2_Nighttime_Data = "False" ;
        Cloud_Top_Height_Day_Mean:Statistic_Type = "Simple" ;
        Cloud_Top_Height_Day_Mean:Masked_With_QA_Usefulness_Flag = "False" ;
        Cloud_Top_Height_Day_Mean:Quality_Assurance_Data_Set = "Quality_Assurance_5km" ;
        Cloud_Top_Height_Day_Mean:QA_Byte = 6s ;
        Cloud_Top_Height_Day_Mean:QA_Useful_Flag_Bit = 0s ;
        Cloud_Top_Height_Day_Mean:QA_Value_Start_Bit = 1s ;
        Cloud_Top_Height_Day_Mean:QA_Value_Num_Bits = 3s ;
        Cloud_Top_Height_Day_Mean:Aggregation_Data_Set = "Cloud_Mask_5km" ;
        Cloud_Top_Height_Day_Mean:Aggregation_Byte = 0s ;
        Cloud_Top_Height_Day_Mean:Aggregation_Value_Start_Bit = 3s ;
```

Cloud_Top_Height_Day_Mean:Aggregation_Value_Num_Bits = 1s ;
Cloud_Top_Height_Day_Mean:Aggregation_Valid_Category_Values = 0s, 1s ;
Cloud_Top_Height_Day_Mean:Aggregation_Category_Values = 1s ;

Next, lets turn to the Near-Nadir CTH File Specification, a specification that is allowing the error in L2 to propagate into L3. This specification shows that the for this L3 SDS the following SDS was being read from L2: "Cloud_Top_Height_Nadir_Day". And further, no aggregation was performed in L3. In other words the L3 code was RELYING ON the L2 input SDS to properly separate Day vs. Night.

CTH Day Near-Nadir Product Spec:

short Cloud_Top_Height_Nadir_Day_Mean (YDim:mod08 , XDim:mod08) ;
Cloud_Top_Height_Nadir_Day_Mean:long_name = "Geopotential Height at Retrieved Cloud Top Pressure Level (Day) Near Nadir (SZA LE 32): Mean" ;
Cloud_Top_Height_Nadir_Day_Mean:units = "meters" ;
Cloud_Top_Height_Nadir_Day_Mean:valid_range = 0s, 18000s ;
Cloud_Top_Height_Nadir_Day_Mean:_FillValue = -9999s ;
Cloud_Top_Height_Nadir_Day_Mean:scale_factor = 1.0d ;
Cloud_Top_Height_Nadir_Day_Mean:add_offset = 0.0d ;
Cloud_Top_Height_Nadir_Day_Mean:Derived_From_Level_2_Data_Set = "Cloud_Top_Height_Nadir_Day" ;
Cloud_Top_Height_Nadir_Day_Mean:Level_2_Pixel_Values_Read_As = "Real" ;
Cloud_Top_Height_Nadir_Day_Mean:Included_Level_2_Nighttime_Data = "False" ;
Cloud_Top_Height_Nadir_Day_Mean:Statistic_Type = "Simple" ;
Cloud_Top_Height_Nadir_Day_Mean:Quality_Assurance_Data_Set = "None" ;
Cloud_Top_Height_Nadir_Day_Mean:Aggregation_Data_Set = "None" ;

So there WAS a difference in how these two SDS's were specified in L3!

The input 06_L2 SDS's that do NOT show the error (and propagate properly to Level-3) are "Cloud_Top_Height" and "Cloud_Top_Height_Nadir" in 06_L2.

And this 100% correct input 06_L2 sdS is what propagates to the L3 Cloud_Top_Height_Day_Mean SDS, which is reading in the combined (all retrieval) SDS from L2 and doing a day/night separation within L3 itself, using the Cloud_Mask_5km Day/Night Flag.

The L3 SDS that DOES show the error (Cloud_Top_Height_Nadir_Day_Mean) is reading in the L2 SDS already separated into day only by the L2 code (Cloud_Top_Height_Nadir_Day) and doing no aggregation at all L3. It is relying on the L2 input file to have performed this D/N separation correctly.

Why was there a Difference in how the Standard CTH was Specified In L3?
Why was that lone SDS an outlier in L3?

The reason I specified the Standard CTH differently from the other Cloud Top Property related L3 parameters, was an anomaly on my part (but not technically a mistake). This CTH Standard parameter in L3 was a last minute addition – added when I noticed that UW asked for a CTH Near Nadir Product to be added to L3 C6, but not a CTH Standard Product.

When I approached UW about this potential oversight, they agreed that adding a CTH Standard Product was fine -- but because of this I added the CTH Standard Product several months after I added the other new additions to C6 L3 (specifically all the Near Nadirs).

Because of this separation in time between modifying the L3 File Specs for Cloud Top Property Products (that is, I added the CTH Standard several months after the other SDS's were added), I specified CTH Standard in a slightly different way (using the D/N QA Flag in Cloud_Mask_5km to do the D/N aggregation for this one product). Note that what I coded in L3 for CTH was NOT AN ERROR, buy simply an alternate acceptable way to specify.

To clarify, there are 2 ways I can code these Cloud Top Property related SDS's in L3. I can either read the separated D/N parameters in L2 and not perform a D/N Aggregation in L3 -- OR -- I can read the non-separated parameters in L2 and perform the D/N aggregation in L3 using the Cloud_Mask_5km D/N QA Flag. Both of these methods would have produced the SAME RESULT in L3 … IF (and that's a big if) all the input L2 SDS's from Cloud Top Properties were correct (however they were not, the D/N separated SDS's were flawed in L2).

At this same time, I believe I asked UW which statistics would be good to add in L3 for this new "add on" (late addition) parameter -- and as I recall this is where the NON INCLUSION of a separate Pixel Counts SDS for CTH happened as well. I believe I was relayed the information from UW that the Pixel Counts (PC's) for CTH will match the Pixel Counts (PC's) for all other Cloud Top Property related SDS's in L3, so that particular SDS (Cloud_Top_Height_*_Pixel_Counts) was unnecessary and redundant.

So bottom line, because this was a very late add-on parameter in L3 (added after I noticed there was an asymmetry in my SDS Inventory Table) -- two anomalies occurred: 1.) I specified this in an alternate, but still correct way, and 2.) I did not add a Pixel Count SDS to this new parameter.

UPSHOT

So the Upshot is, the error in the 06_L2 file is ISOLATED in the separated D/N SDS's for Cloud Top Properties. That is, where there was a separation of Day/Night in the L2 file itself. For example 06_L2 SDS's Cloud_Top_Temperature_Day or Cloud_Top_Height_Nadir_Day, etc. within the L2 file itself.

That being said, the Day/Night QA Flag that is stored in the Cloud_Mask_5km is CORRECT with no issues. That is, this Cloud Mask QA Flag is correctly flagging Day and Night granules.

This means for any L3 parameter where the file spec was reading in a non-separated Cloud Top SDS (such as Cloud_Top_Height) and then using the Cloud_Mask_5km D/N QA Flag to separate Day/Night -- the error in 06_L2 is NOT propagated to L3.

However whenever L3 reads in the "D/M separated" L2 SDS's: For example Cloud_Top_Temperature**_Day** or Cloud_Top_Height**_Nadir_Day** from the 06_L2 file, then the error in L2 propagates into L3.

So it appears to me that L3 can bypass this error by always reading the full (non D/N separated) L2 Cloud Top Property SDS (with both day and night retrievals depending on the granule time) and use the Cloud_Mask_5km D/N QA Flag to separate.

Bottom line is there is a code bug in the Cloud Top Retrieval Algorithm that is mishandling the separation of Day and Night for some selected granules for some selected granules on some selected days, but it's only showing up in the L2 parameters which have Day and Night aggregation done at L2 (For example Cloud_Top_Pressure**_Day** in the 06_L2 file)

The good news is this seems to occur only very occasionally (about 1x a month) and only for a few granules.

One “tell” that I’ve noticed, is you can be alerted to this being an issue by looking at the L1B images (that use bands 1, 3, and 4). When those L1B images go BLACK (go missing) this problem rears its head in the *_Day and *_Night Cloud Top Property SDS’s in 06_L2. It seems to correspond to maneuvers being performed.

If UW could modify their Cloud Top Properties Retrieval Code to always use the Cloud_Mask_5km QA Flags for Day/Night separation instead of whatever algorithm they are doing now, this issue will resolve.

I am not 100% sure WHY whatever algorithm UW is using within the Cloud Top Retrieval code to perform these L2 separations into Day/Night in L2, seems to malfunction from time to time, but if they could switch to using the 5km_Cloud_Mask QA Flag array, this would solve the issue.

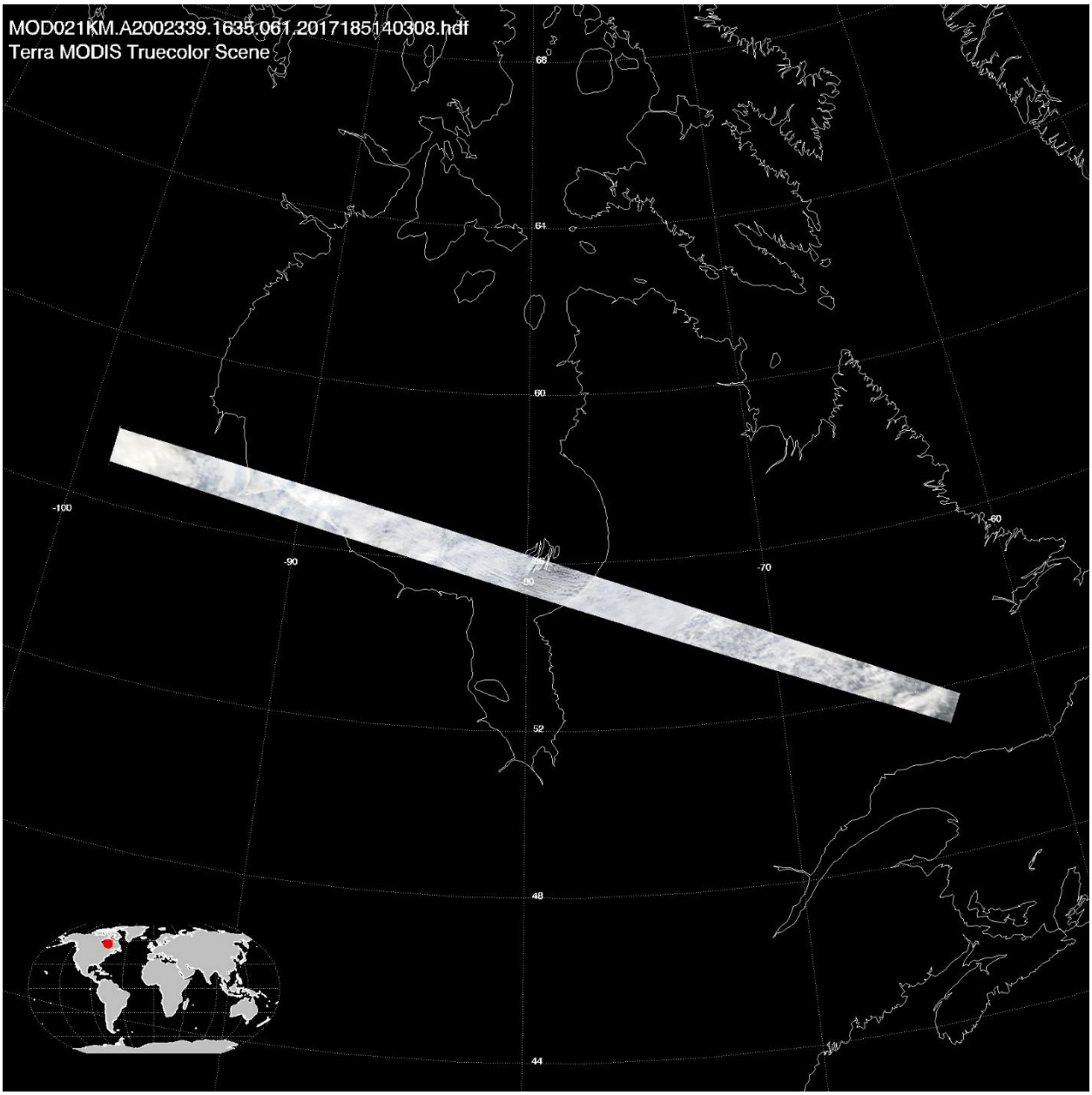
That being said, I offer an alternative to UW “fixing” their retrieval code. See the end of this document! (The alternative is that UW could simply delete these flawed 06_L2 SDS’s since technically I don’t need them in L3 – I can simply use the “alternate method” to compute them in L3 as outlined above)

An aside:

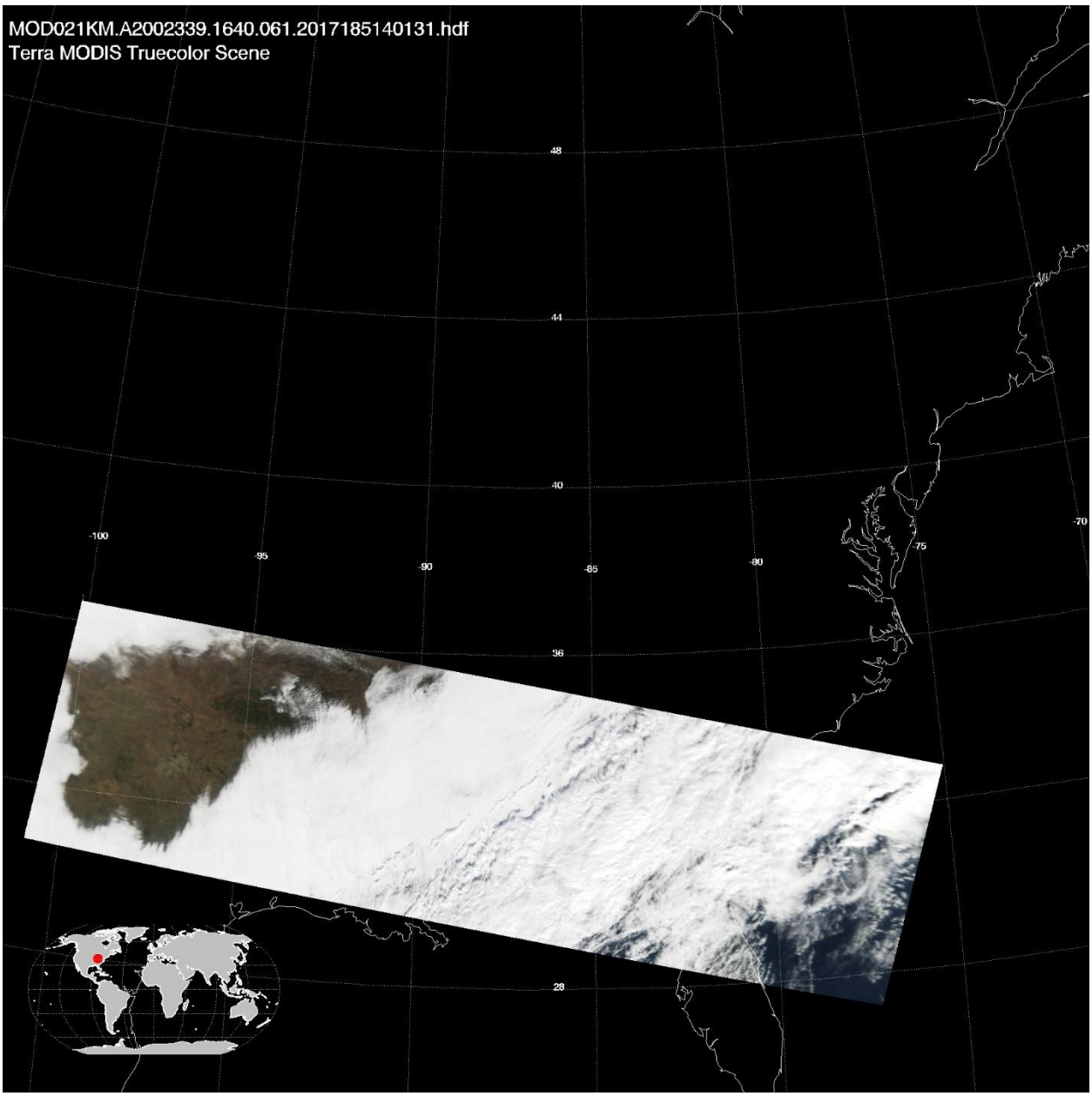
It’s interesting, that the fact that I left out the Pixel Count SDS for CTH started a domino effect when Nandana did his study that helped to diagnose this intermittent error or bug in the Cloud Top Algorithm. If I had included the CTH Pixel Counts in L3 this error would have gone undetected for a longer period of time. The fact that it was so intermittent, made it harder to detect.

What the L1B Granule Images look like when this issues rears its head

The L1B granule images that follow are for 1635 and 1640 UTC, which corresponds to a problematic area over North America. In the 1635 granule below there is an isolated swath of good data shown over the Hudson Bay. The area below (south of) the white stripe should have data, instead it's missing/black). I believe some of the area above (north of) the white stripe also should have data as it's not quite to the polar darkness zone. So perhaps some of those VIS NIR bands were cutting in and out during the maneuver?



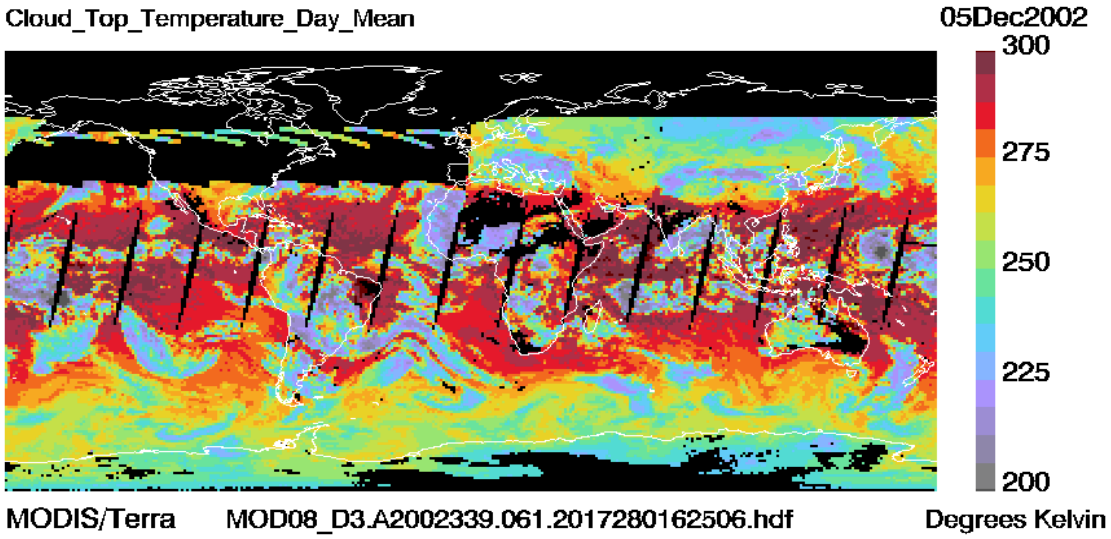
Here is the next L1B in sequence (1640 UTC) image. The area above or north of the visible part should be there but instead its missing or black. Note that the orbital track is moving down the screen (or south).



The two L1B images on the previous 2 pages match the pattern seen in the L3 image below. A thin swath (few scanlines) over the Hudson Bay from a few good scans, then a chunk of missing data on both sides of those few scanlines then a restart or re-appearance of data over the southeastern US. Terra was in descending mode, moving from north to south.

Note that even though the previously shown L1B granule images had missing chunks (due to some intermittently missing VIS or NIR bands) -- the apparent missing data in the L3 image below is not "missing" at all, but instead was misclassified as NIGHT instead of day.

In other words, the missing channels or bands that caused a L1B blackout, interacted with the D/N algorithm used for some Cloud Top SDS's in L2, causing some daytime Cloud Top Properties L2 data to be misclassified as night.



What could cause these transient band dropouts and missing L1B's?

Maneuvers seem to happen on a single day on a once a month timeframe; and it just so happens there WERE MODIS Terra Maneuvers on 5 Dec 2002 – and one of the maneuvers was close to the time (1621-1639) of the previous two L1B images (1635-1640 and 1640-1645). Each of these maneuvers were about 1 hours and 40 minutes apart which could explain the orbital symmetry (Latitude Zone symmetry) in the misplaced (D/N) data in the L2 and downstream L3.

December 2002 Terra Maneuvers

Satellite	Begin LPA	Begin Maneuver	End Maneuver	End LPA	Start Orbit	End Orbit	Degrees	Is Thrust Maneuver	Maneuver Type	Geolocation Error
EOS_AM	2002-12-05 12:00:00.000 (2002339)	2002-12-05 13:01:25.000	2002-12-05 13:23:22.000	2002-12-05 22:10:00.000	15774	15774	8.96	0	MODIS Yaw 13	
EOS_AM	2002-12-05 12:00:00.000 (2002339)	2002-12-05 14:41:22.000	2002-12-05 15:01:11.000	2002-12-05 22:10:00.000	15775	15775	5.76	0	MODIS Yaw 14	
EOS_AM	2002-12-05 12:00:00.000 (2002339)	2002-12-05 16:21:20.000	2002-12-05 16:39:00.000	2002-12-05 22:10:00.000	15776	15776	2.53	0	MODIS Yaw 15	
EOS_AM	2002-12-05 12:00:00.000 (2002339)	2002-12-05 18:00:51.000	2002-12-05 18:17:04.000	2002-12-05 22:10:00.000	15777	15777	-0.65	0	MODIS Yaw 16	
EOS_AM	2002-12-05 12:00:00.000 (2002339)	2002-12-05 19:38:40.000	2002-12-05 19:57:13.000	2002-12-05 22:10:00.000	15778	15778	-3.87	0	MODIS Yaw 17	
EOS_AM	2002-12-05 12:00:00.000 (2002339)	2002-12-05 21:16:28.000	2002-12-05 21:37:11.000	2002-12-05 22:10:00.000	15779	15779	-7.09	0	MODIS Yaw 18	

From:

https://landweb.modaps.eosdis.nasa.gov/cgi-bin/QA_WWW/newPage.cgi?fileName=terra2002&subdir=Maneuvers

List of 06_L2 SDS's that can be
subjected to this Day/Night Separation Bug/Issue
which appear to result from Maneuvers
that occur on a few hour, once a month basis

Any 06_L2 SDS from **Cloud Top Properties** that have the string **_Day** or **_Night** in the SDS name are subjected to this intermittent bug or error. For example, for Cloud_Top_Pressure:

1. Cloud_Top_Pressure_Day
2. Cloud_Top_Pressure_Night
3. Cloud_Top_Pressure_Nadir_Day
4. Cloud_Top_Pressure_Nadir_Night

This same "sequence of 4" grouping of D/N separated 06_L2 SDS's are defined for CTP, CTT, CEE, CF, and CTH.

So there are actually 20 (4 x 5) SDS's in 06_L2 with these _Day or _Night strings in the SDS names which are subject to this intermittent error.

HOW TO FIX

Suggestions for L2

1. Have UW repair their Cloud Top Retrieval Algorithm to use the Cloud Mask 5km Day Night flag to separate D/N in L2. For whatever reason this Is more robust and less error prone than whatever algorithm they are using currently. (some of L3 cannot be fixed until this is done – for example double aggregation parameters like Nadir Day). *This fix could possibly be put into the forward stream in L2. HOWEVER I SEE A PATHWAY TO FIX LEVEL-3 (in the forward stream) WITHOUT REQUIRING ANY CHANGE in 06_L2. See item 2 below. The one thing UW could do is delete or drop any of these flawed *_Day or *_Night SDS's from L2 as I don't need them in L3 (I can use my alternate method to compute the L3 SDS's)*

Suggestions for L3

Modify and Redeliver the Tile, Daily, Eight Day, and Monthly file specs and CDL Structure files with the following changes:

1. include CTH Pixel Counts

2. modify the L3 File Specs and HDF Structure Files to **avoid reading** the intermittently problematic Cloud Top Property *_Day and *_Night SDS's from 06_L2. And instead read only the standard SDS or the near nadir Cloud Top Property SDS's – and then use the Cloud_Mask_5km Day/Night Flag to separate D/N from the L2 Standard and Near-Nadir L2 SDS's.

   This L3 correction could be placed into the forward stream on a month boundary (doing it on a month boundary is both for easier identification for users and also to help with syncing the D3, E3, and M3. The E3 "boundary file" might require a bit of manipulation in operations.

   I would need to carefully document this intermittent anomaly to L2 and L3 to users on the Data Issues page, so that users are aware.

Caveat about an issue we are probably not aware of yet! But needs fixing.

There is one issue related to these anomalies that I don't think anyone is aware of yet. We have Joint Histograms of our Cloud Optical Property SDS's with some DAYTIME Cloud Top Property SDS's.

Since the Daytime Cloud Top Property SDS's can become problematic for a few granules in a few orbits on a once a month basis (around maneuver time), I am guessing that some of our Cloud Optical Property Joint Histograms will be MISSING DATA in these periods where DAYTIME Cloud Top Properties were mistakenly assigned NIGHT in L2.

In other words there will be missing chunks of COP vs. CTP Joint Histogram data on the global map in these isolated areas and at very intermittent times.

To fix, since the Tiling Code is reading induvial granules and the Cloud Optical Property Retrievals that are only computed in the Daytime. I can simply switch the Joint Parameter Data Set specified for use in these Joint Histograms from **Cloud_Top_Temperature_Day** to the more correct (more consistently correct) **Cloud_Top_Temperature** (see the red text in the file spec excerpt below) and let the daytime only nature of the Cloud Optical Property SDS's do the Day only separation for me – since the joint histogram will only compute where both observations (COP and CTP) are non missing.

So it appears to me, I also need to modify all the File Specs and HDF Structure Files for **Cloud Optical Property vs. Cloud Top Property Joint Histograms**, so that I specify a CTP Joint Parameter Data Set that **DO NOT** have a "_Day" or "_Night" suffix. That is, I need to explicitly avoid all those 06_L2 Cloud Top Property related SDS's which have occasional problems in the Day/Night separation.

What follows is the CDL File Spec for COTL vs CTT. As you can see the Joint_Parameter_Data_Set local attribute is set to "Cloud_Top_Temperature_Day" which has this intermittent D/N separation issue. This need to be changed to "Cloud_Top_Temperature" and then I will let the spatial and temporal domain of the COP data do the Daytime only separation for me.

short Cloud_Optical_Thickness_Liquid_JHisto_vs_Temperature (CTT_New_Liquid_JHisto_Intervals:mod08 , COT_New_Liquid_JHisto_Intervals:mod08 , YDim:mod08 , XDim:mod08) ;
Cloud_Optical_Thickness_Liquid_JHisto_vs_Temperature:long_name = "Liquid Water Cloud Optical Thickness vs Cloud Top Temperature: at 12x12 intervals" ;
Cloud_Optical_Thickness_Liquid_JHisto_vs_Temperature:units = "none" ;
Cloud_Optical_Thickness_Liquid_JHisto_vs_Temperature:valid_range = 0s, 15000s ;
Cloud_Optical_Thickness_Liquid_JHisto_vs_Temperature:_FillValue = -9999s ;
Cloud_Optical_Thickness_Liquid_JHisto_vs_Temperature:scale_factor = 1.0d ;
Cloud_Optical_Thickness_Liquid_JHisto_vs_Temperature:add_offset = 0.0d ;
Cloud_Optical_Thickness_Liquid_JHisto_vs_Temperature:Derived_From_Level_2_Data_Set = "Cloud_Optical_Thickness" ;
Cloud_Optical_Thickness_Liquid_JHisto_vs_Temperature:Level_2_Pixel_Values_Read_As = "Real" ;
Cloud_Optical_Thickness_Liquid_JHisto_vs_Temperature:Included_Level_2_Nighttime_Data = "False" ;
Cloud_Optical_Thickness_Liquid_JHisto_vs_Temperature:Statistic_Type = "Joint_Histogram" ;
Cloud_Optical_Thickness_Liquid_JHisto_vs_Temperature:Masked_With_QA_Usefulness_Flag = "False" ;
Cloud_Optical_Thickness_Liquid_JHisto_vs_Temperature:Quality_Assurance_Data_Set = "Quality_Assurance_1km" ;
Cloud_Optical_Thickness_Liquid_JHisto_vs_Temperature:QA_Byte = 2s ;
Cloud_Optical_Thickness_Liquid_JHisto_vs_Temperature:QA_Useful_Flag_Bit = 3s ;
Cloud_Optical_Thickness_Liquid_JHisto_vs_Temperature:QA_Value_Start_Bit = 0s ;
Cloud_Optical_Thickness_Liquid_JHisto_vs_Temperature:QA_Value_Num_Bits = 2s ;
Cloud_Optical_Thickness_Liquid_JHisto_vs_Temperature:Aggregation_Data_Set = "Quality_Assurance_1km" ;
Cloud_Optical_Thickness_Liquid_JHisto_vs_Temperature:Aggregation_Byte = 2s ;
Cloud_Optical_Thickness_Liquid_JHisto_vs_Temperature:Aggregation_Value_Start_Bit = 0s ;
Cloud_Optical_Thickness_Liquid_JHisto_vs_Temperature:Aggregation_Value_Num_Bits = 3s ;
Cloud_Optical_Thickness_Liquid_JHisto_vs_Temperature:Aggregation_Valid_Category_Values = 1s, 2s, 3s, 4s ;
Cloud_Optical_Thickness_Liquid_JHisto_vs_Temperature:Aggregation_Category_Values = 2s ;
Cloud_Optical_Thickness_Liquid_JHisto_vs_Temperature:Wave_Band = 1s ;
Cloud_Optical_Thickness_Liquid_JHisto_vs_Temperature:Histogram_Bin_Boundaries = 0.0f, 2.0f, 4.0f, 6.0f, 8.0f, 10.0f, 15.0f, 20.0f, 30.0f, 40.0f, 50.0f, 100.0f, 150.0f ;
Cloud_Optical_Thickness_Liquid_JHisto_vs_Temperature:Joint_Parameter_Data_Set = "Cloud_Top_Temperature_Day" ;
Cloud_Optical_Thickness_Liquid_JHisto_vs_Temperature:Joint_Parameter_Quality_Assurance_Data_Set = "Quality_Assurance_5km" ;
Cloud_Optical_Thickness_Liquid_JHisto_vs_Temperature:Joint_Parameter_QA_Byte = 0s ;
Cloud_Optical_Thickness_Liquid_JHisto_vs_Temperature:Joint_Parameter_QA_Useful_Flag_Bit = 4s ;
Cloud_Optical_Thickness_Liquid_JHisto_vs_Temperature:Joint_Parameter_QA_Value_Start_Bit = 5s ;

Cloud_Optical_Thickness_Liquid_JHisto_vs_Temperature:Joint_Parameter_QA_Value_Num_Bits = 3s ;
Cloud_Optical_Thickness_Liquid_JHisto_vs_Temperature:Joint_Parameter_Wave_Band = 1s ;

Cloud_Optical_Thickness_Liquid_JHisto_vs_Temperature:Joint_Parameter_Histogram_Bin_Boundaries = 190.0f, 230.0f, 240.0f, 245.0f, 250.0f, 255.0f, 260.0f, 265.0f, 270.0f, 275.0f, 280.0f, 285.0f, 310.0f ;