CERES VIIRS Multi-layered Cloud Property Retrieval

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CERES Fall Science Team Meeting
29-31 Oct 2013, Scripps institution of Oceanography, La Jolla, CA

Outline

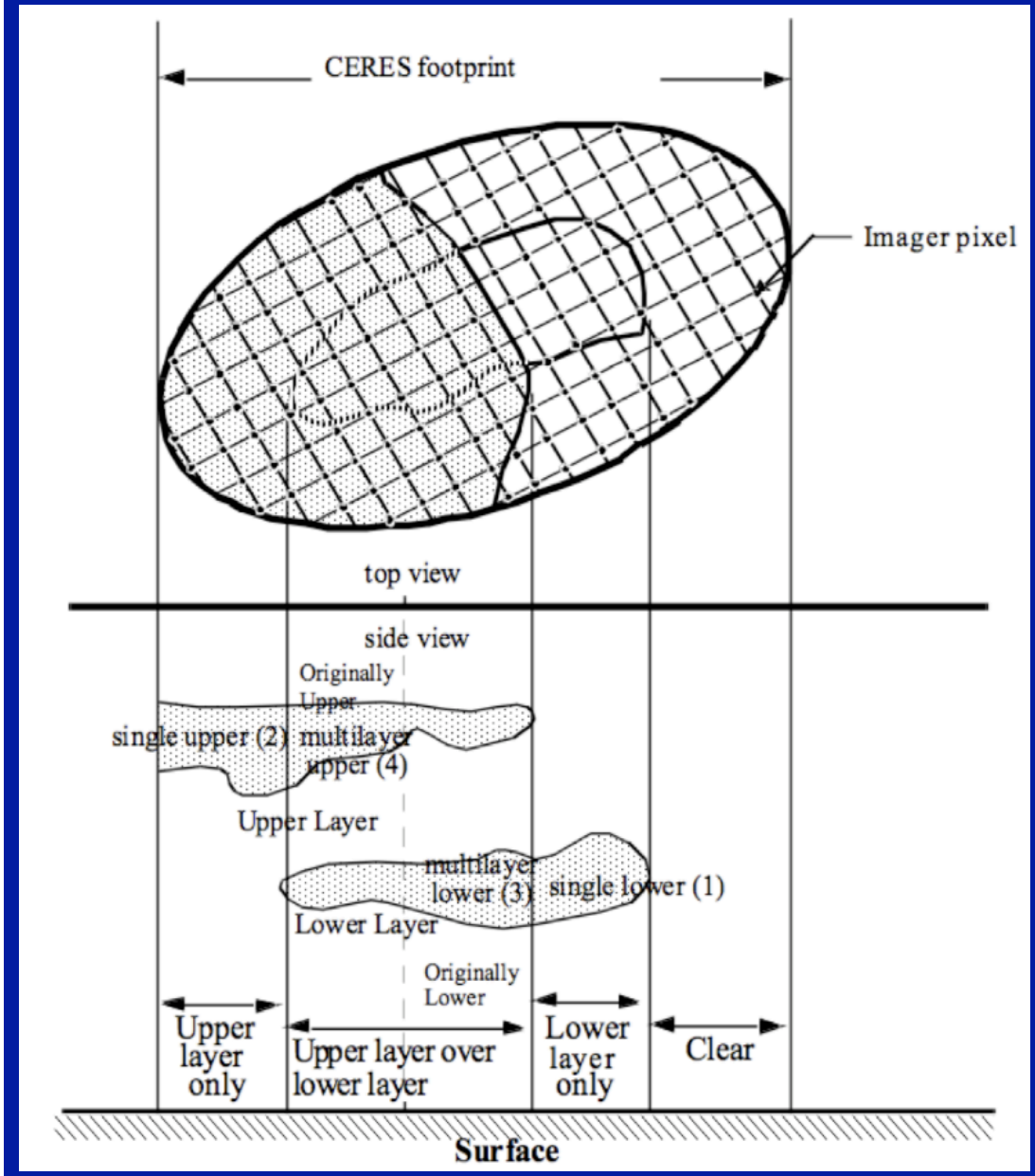
- Differences between VIIRS and MODIS data.
- Development of a CO_2-replacement method for CERES VIIRS for identifying cirrus clouds.
- Cirrus cloud property retrievals including both single and multi-layered situations.
- CERES VIIRS multi-layered cloud property retrieval.

CERES and VIIRS Data Spatial Resolution

VIIRS Multi-spectral Bands

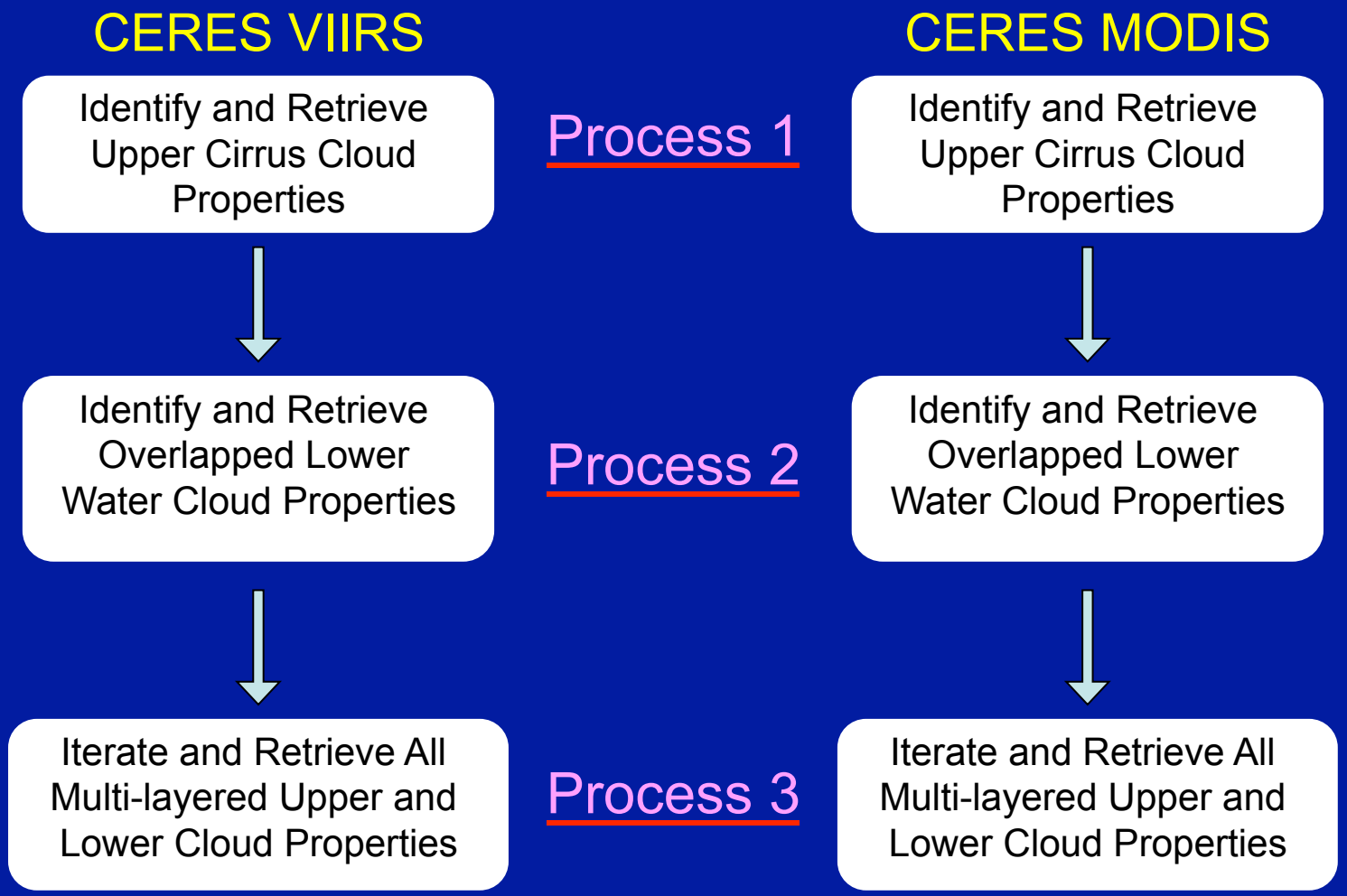
VIIRS Band	Central Wavelength (μm)	Wavelength Range (μm)	Spatial Resolution
I1	0.64	0.6-0.68	
I3	1.61	1.58-1.64	0.375 km
I4	3.74	3.55-3.93	& 0.75 km
I5	11.45	10.5-12.4	
M3	0.488	0.478-0.488	
M4	0.555	0.545-0.565	
M5	0.672	0.662-0.682	
M7	0.865	0.846-0.885	
M8	1.24	1.23-1.25	
M9	1.378	1.371-1.386	
M10	1.61	1.58-1.64	
M11	2.25	2.23-2.28	
M12	3.70	3.61-3.79	
M14	8.55	8.4-8.7	0.75 km
M15	10.763	10.26-11.26	0.75 km
M16	12.013	11.54-12.49	0.75 km
DNB	0.7	0.5-0.9	

CERES VIIRS Multi-layered Cloud Properties



- CERES VIIRS Multi-layered Cloud Products are produced to be consistent with the CERES MODIS Multi-layered Cloud Products.
- Multi-layered cloud fractions with 2-layer-model retrieved upper ice and lower water cloud properties.

CERES VIIRS and MODIS Multi-layered Algorithms



CERES VIIRS Multi-layered Cloud Properties

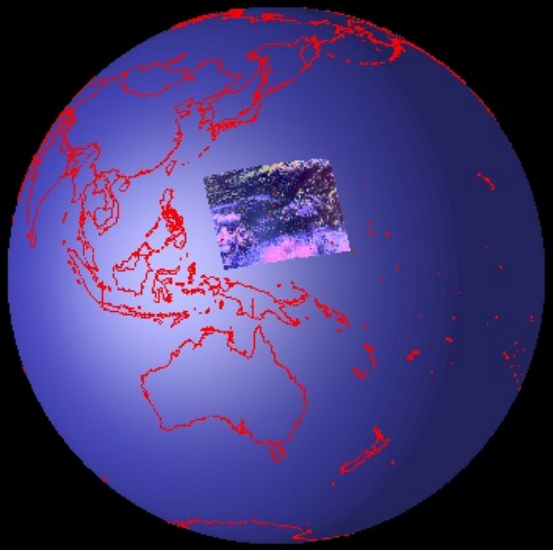
Upper Layer (Ice Cloud)	Lower Layer (Water Cloud)
Cloud Top Pressure	Cloud Top Pressure
Cloud Top Temperature	Cloud Top Temperature
Cloud Top Height	Cloud Top Height
Cloud Visible Optical Depth	Cloud Visible Optical Depth
Cloud IR Emissivity	Cloud IR Emissivity
Ice Particle Effective Radius	Water Droplet Effective Radius

CERES VIIRS Multi-layered Cloud Retrieval Status

- (Last STM) Used CERES MODIS data and demonstrated:
  1) Good VIIRS-like multi-layered simulations and
  2) Good consistencies between VIIRS and MODIS simulations.
- Delivered the Ed-1-β CERES VIIRS multi-layered code, including the pseudo-CO_2 method, for identifying upper cirrus and multi-layered clouds and retrieving their properties.
  - > Reduced our old constraints on tropopause pressure level, which have increased the CERES VIIRS cirrus cloud top heights.
  - > Upgraded cirrus cloud top height retrieval and improved 2-layered cloud retrieval algorithms, which have increased the CERES VIIRS multi-layered cloud fractions.
  - > Eliminated the CERES VIIRS multi-layered cloud retrieval over snow/ice covered surfaces, due to considerable uncertainty in large snow/ice albedos (mostly occurred in high latitude, winter regions).

CERES VIIRS Case Studies

2012/11/10 03:30Z



2012/11/10 03:35Z

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Day time RGB

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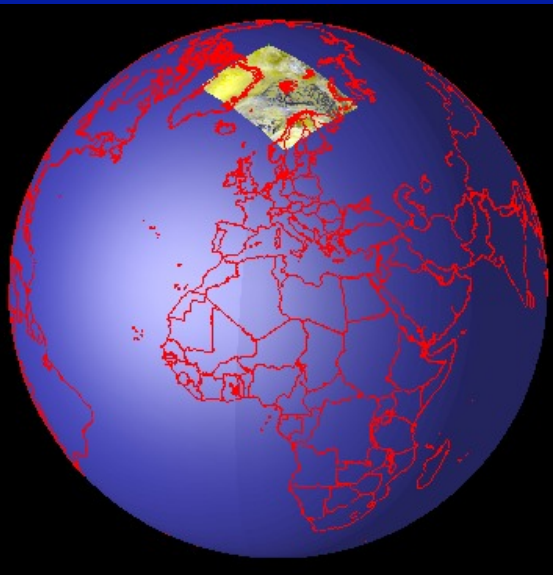
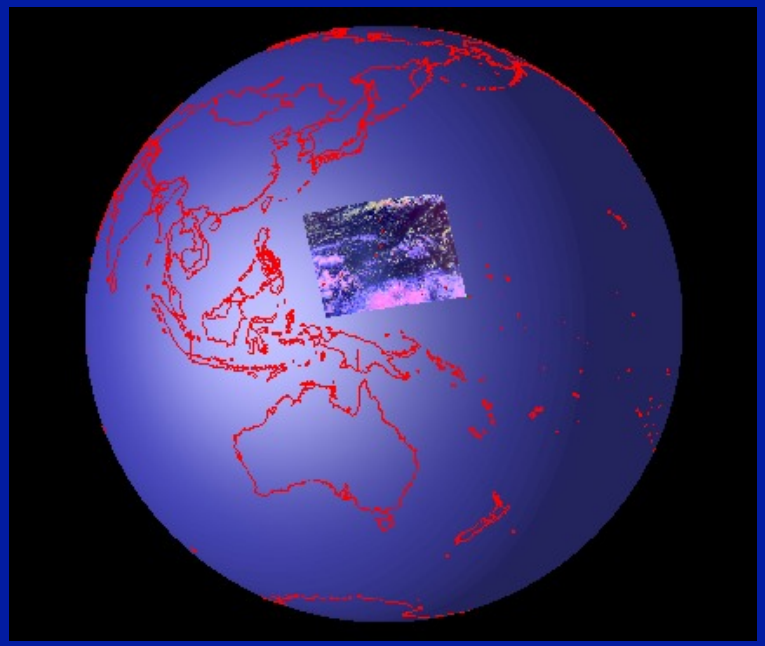
2012/11/10 03:50Z



CERES VIIRS Upper Cloud Top Height Retrieval (2012/11/10, 03:30Z)



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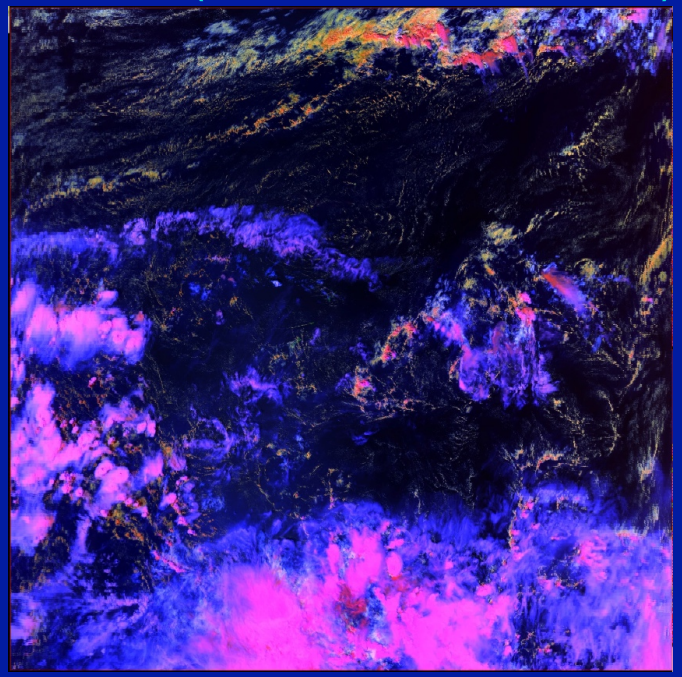

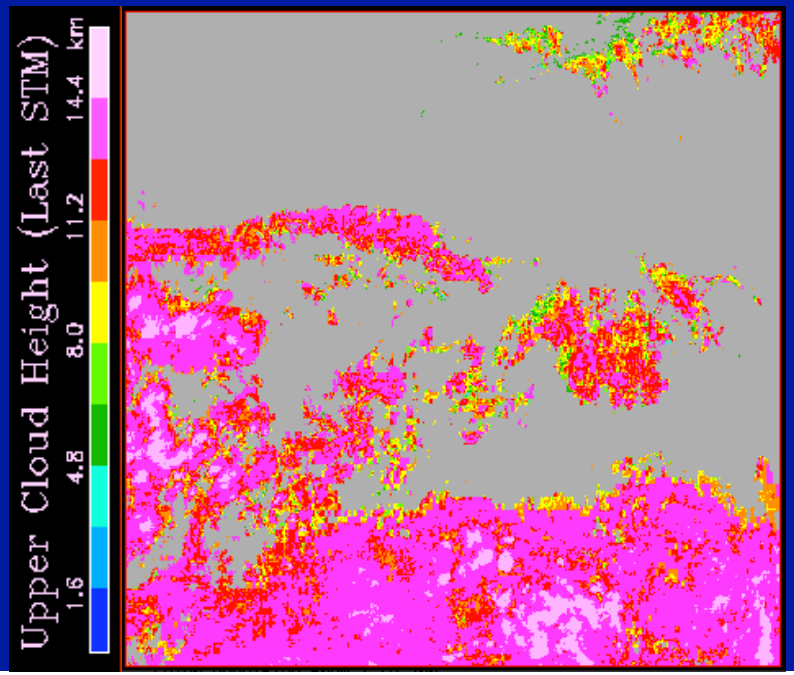

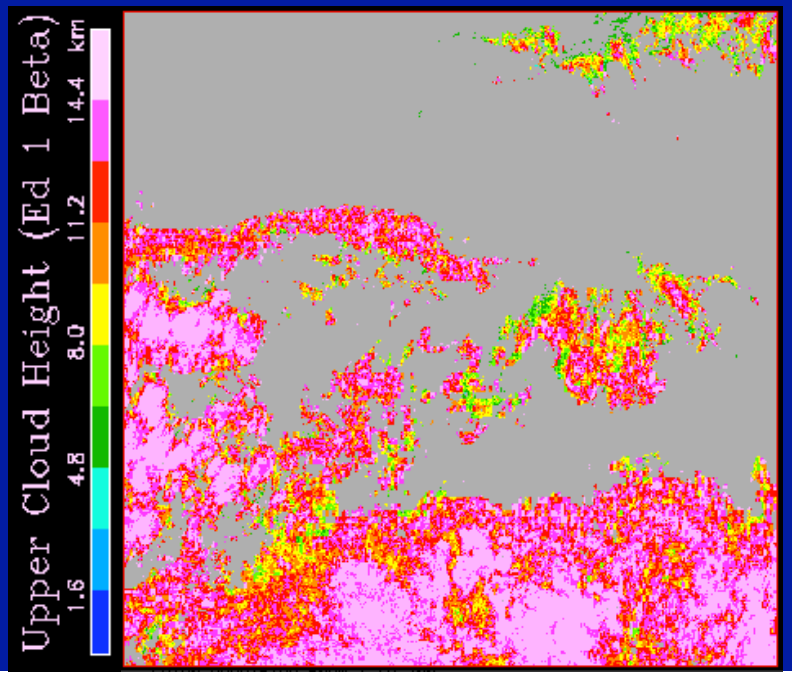

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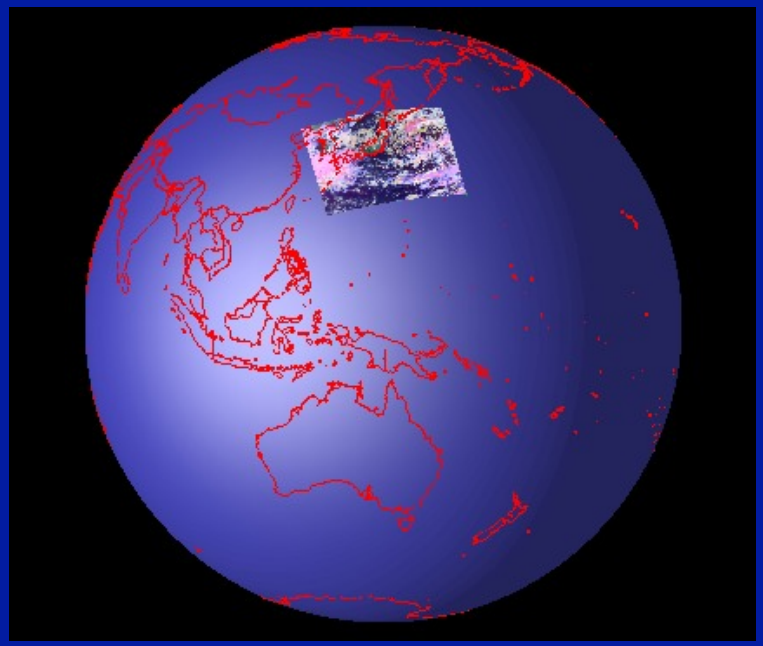

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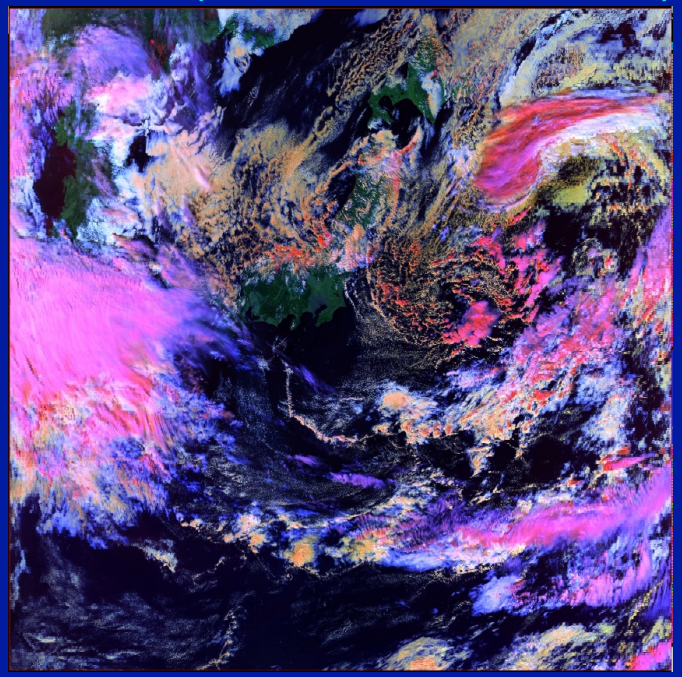

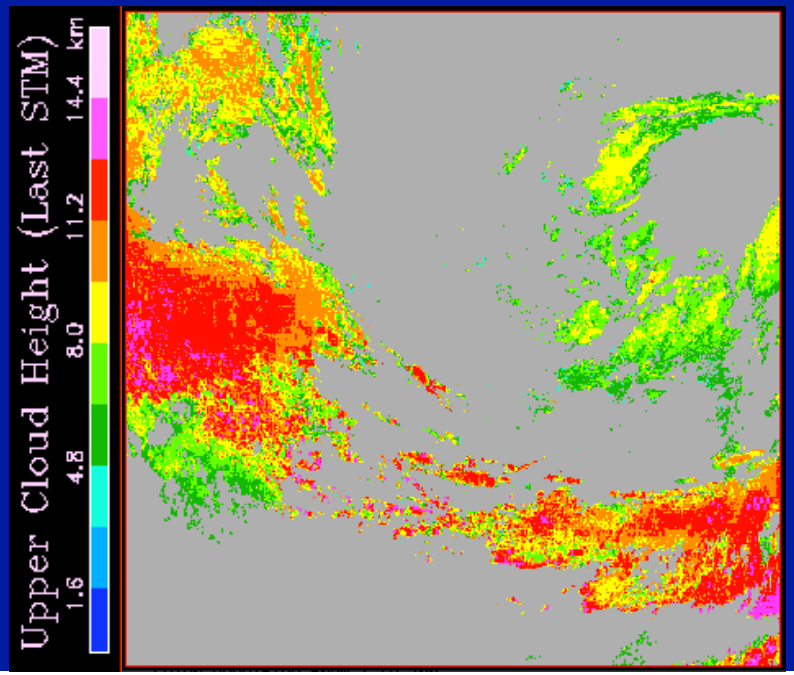

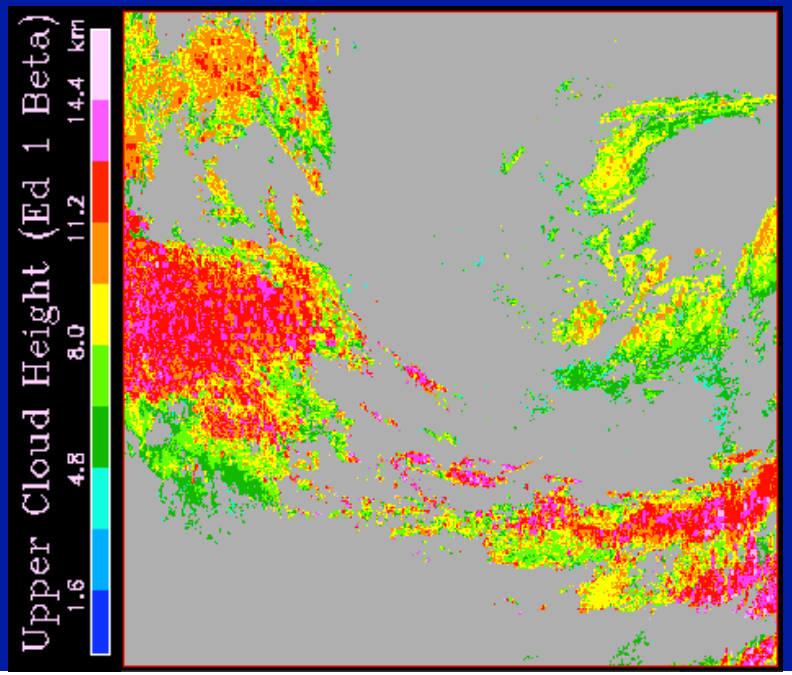

CERES VIIRS Upper Cloud Top Height Retrieval (2012/11/10, 03:40Z)

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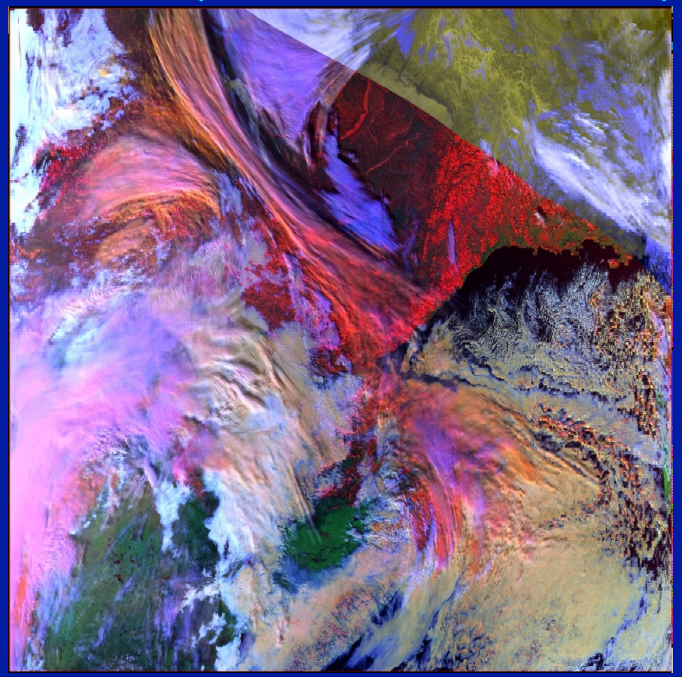

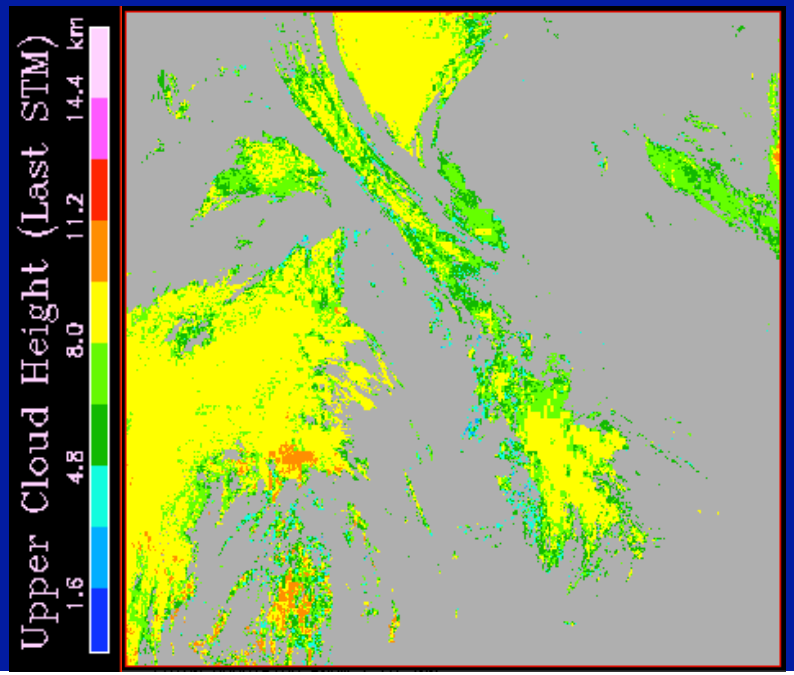

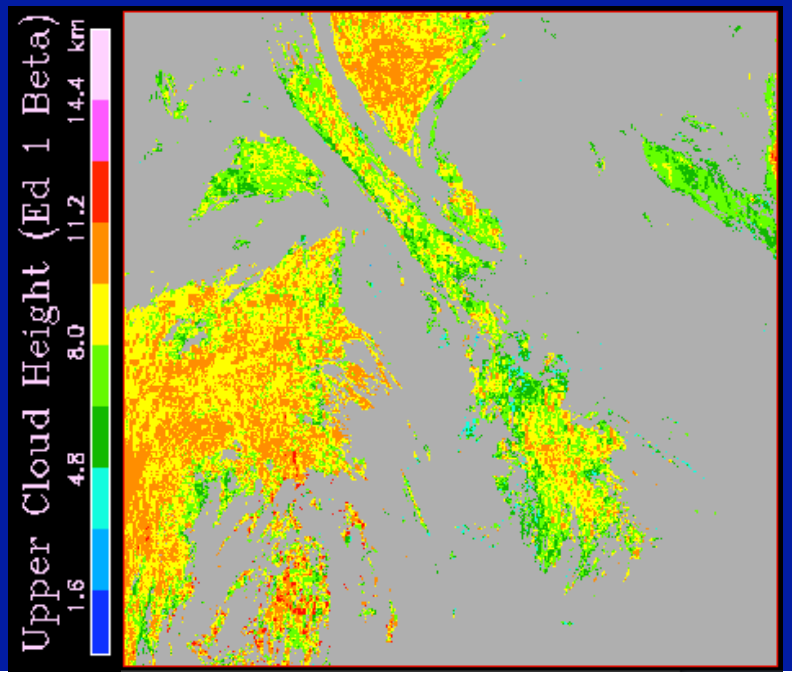

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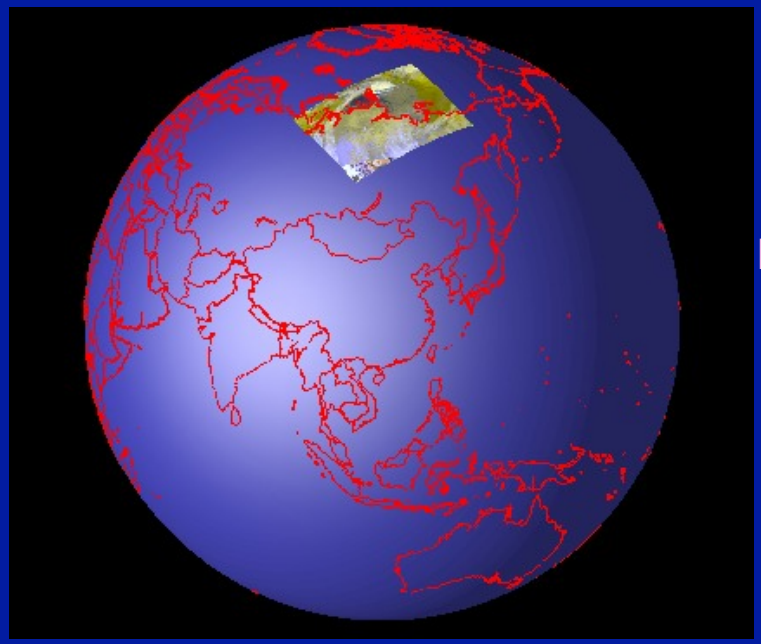

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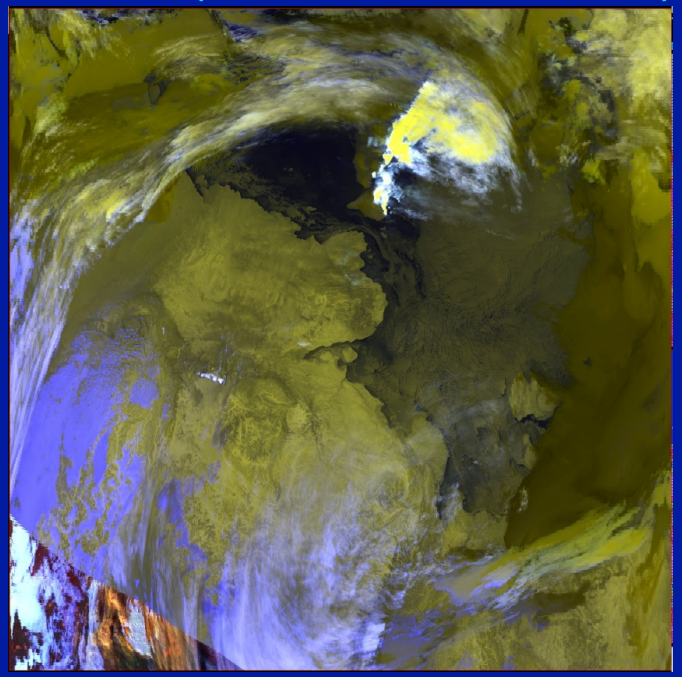
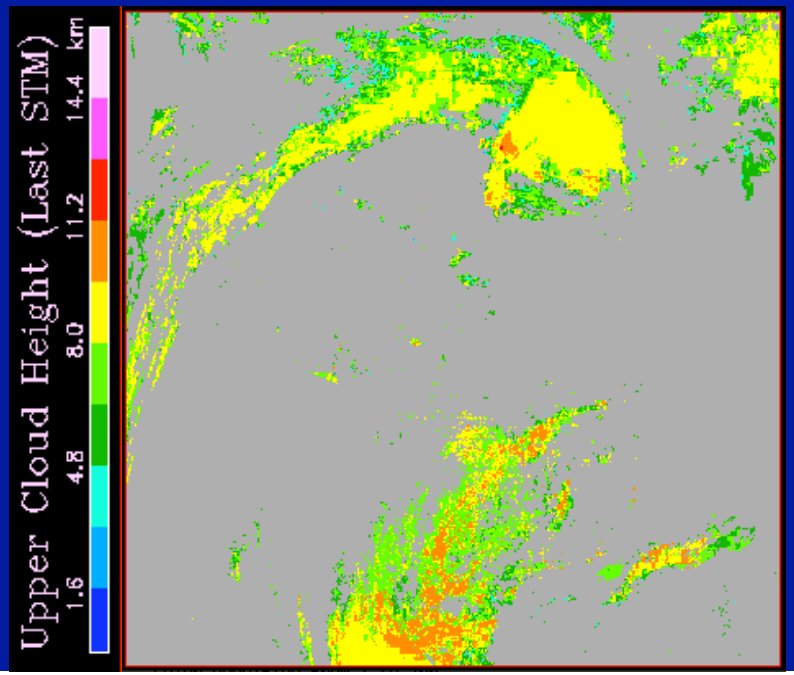
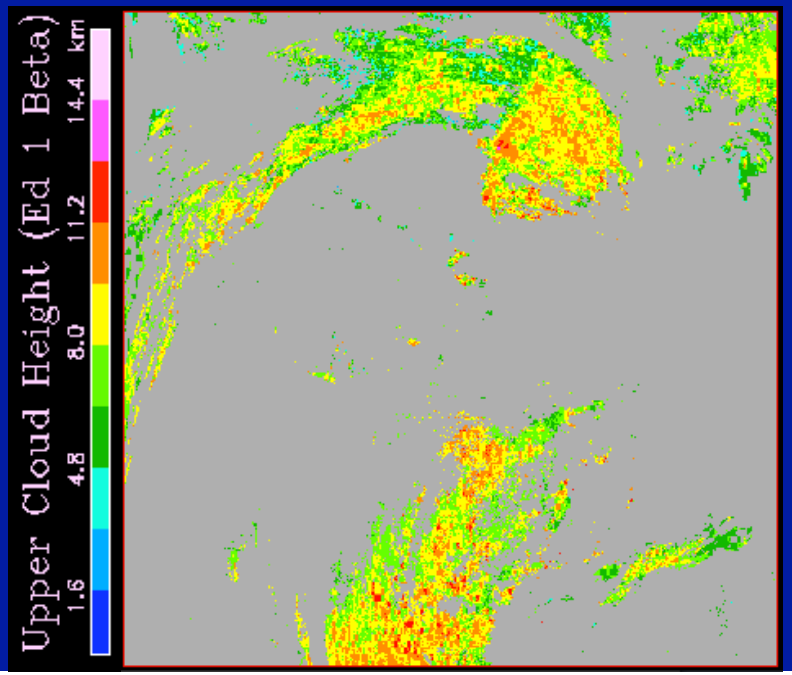
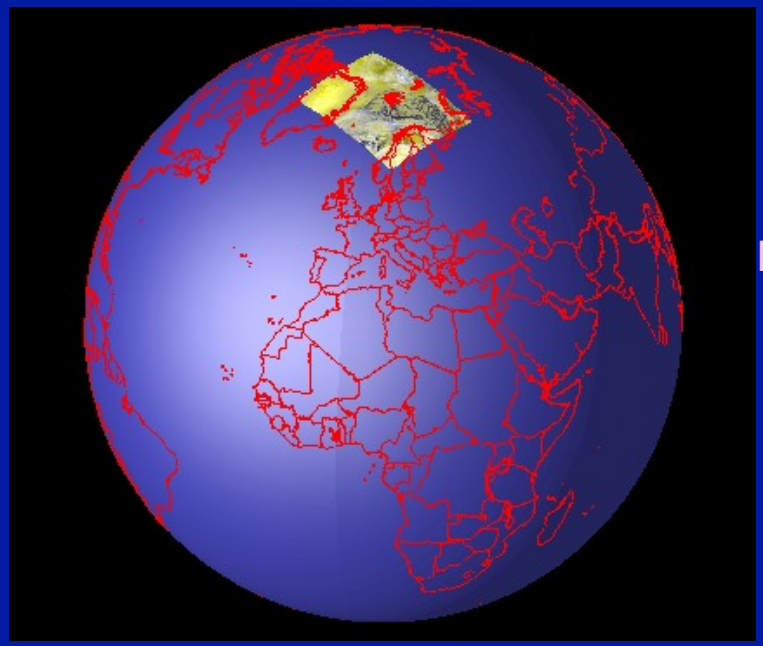






CERES VIIRS Upper Cloud Top Height Retrieval (2012/11/10, 03:50Z)



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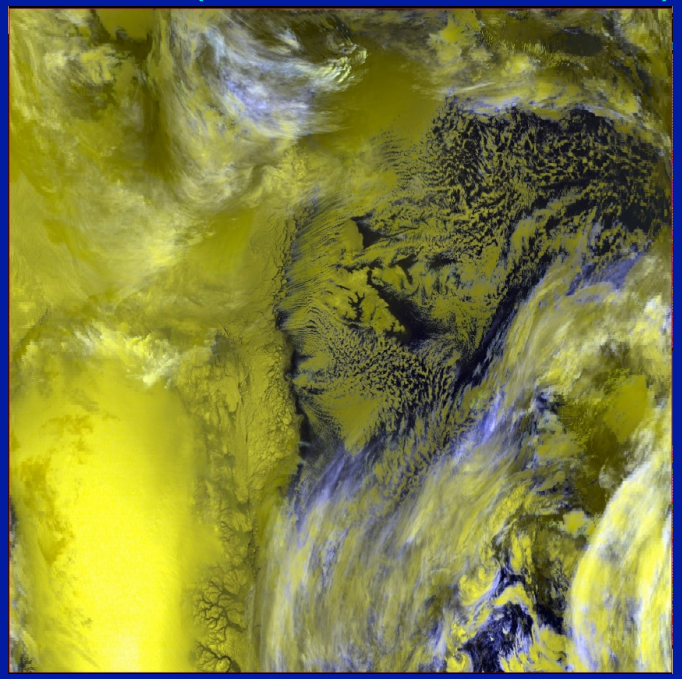
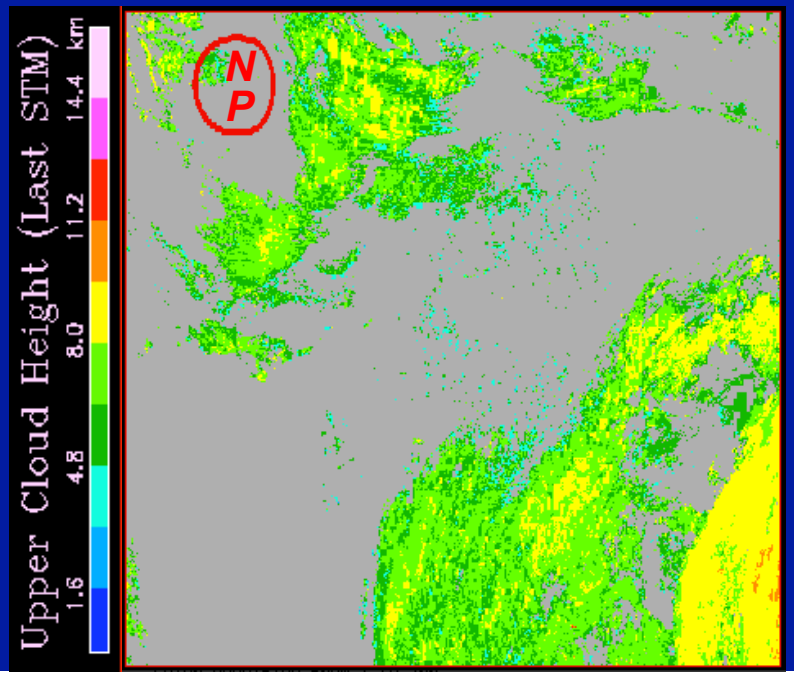
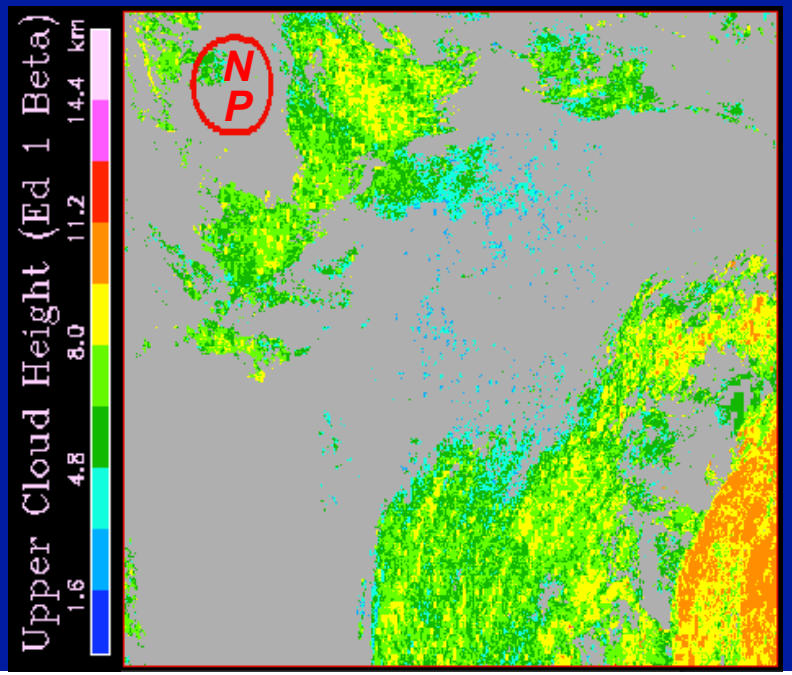
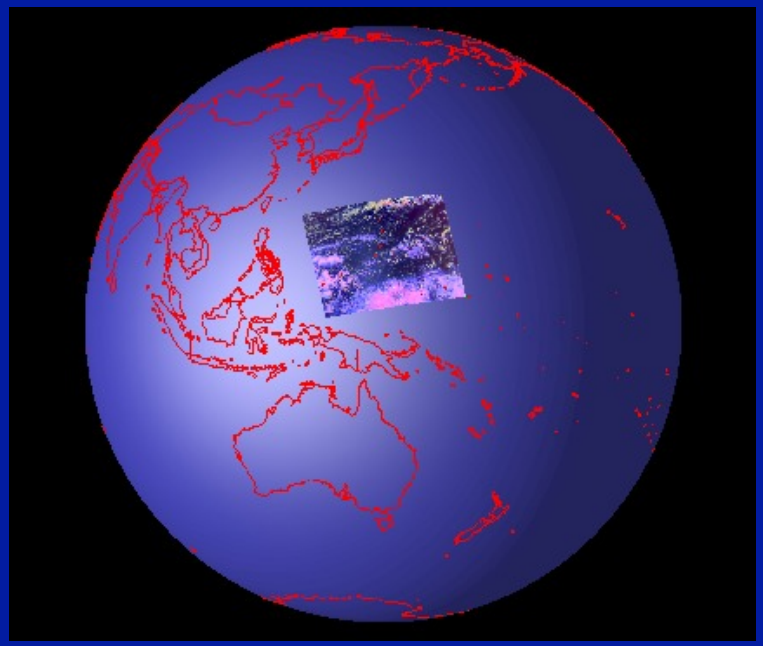






CERES VIIRS Multi-layered Cloud Retrieval (2012/11/10, 03:30Z)



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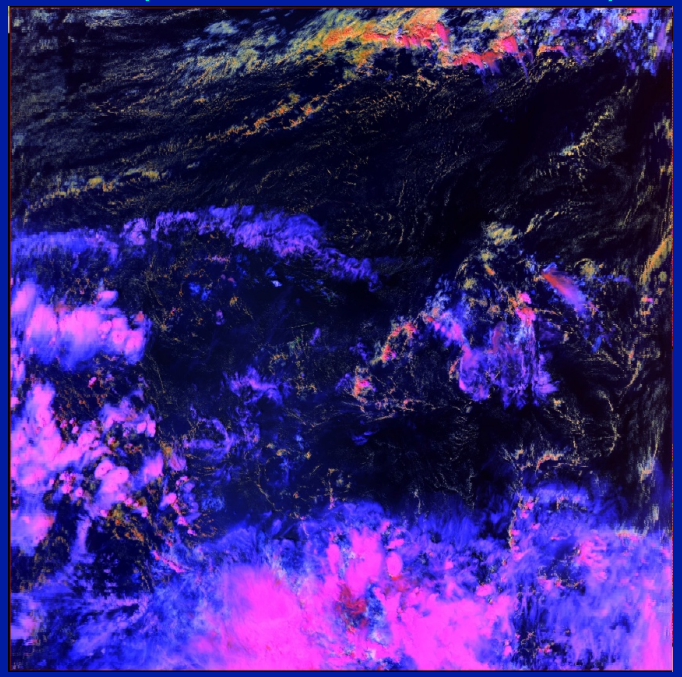

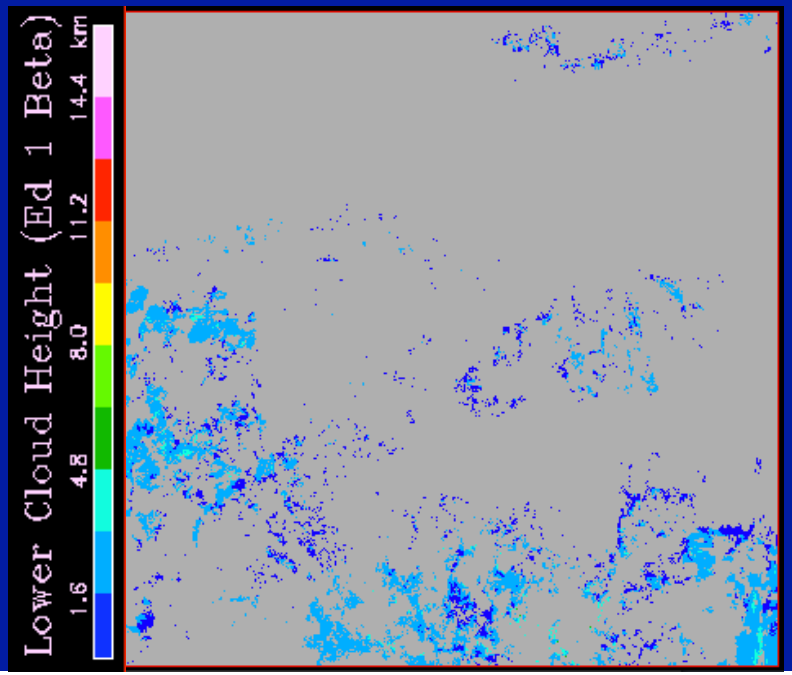

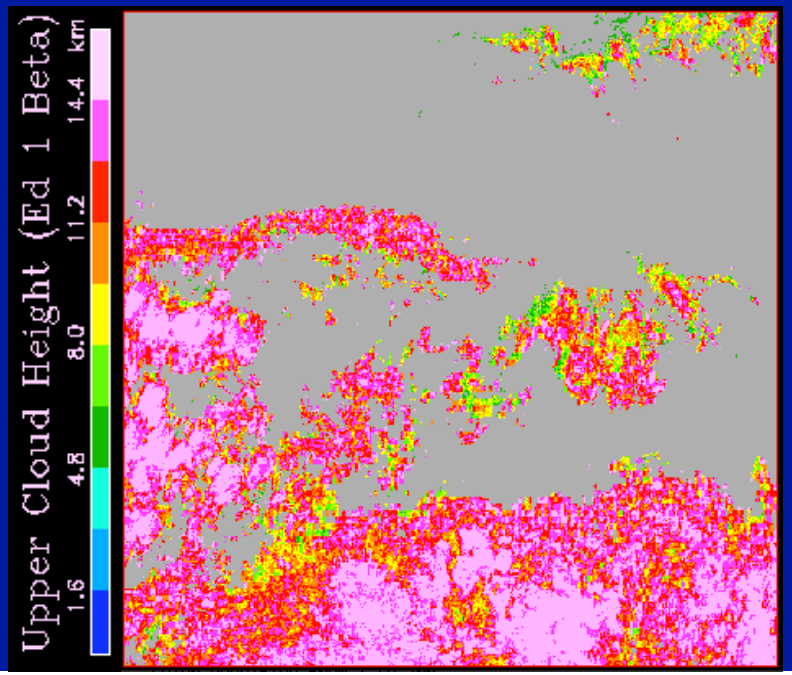

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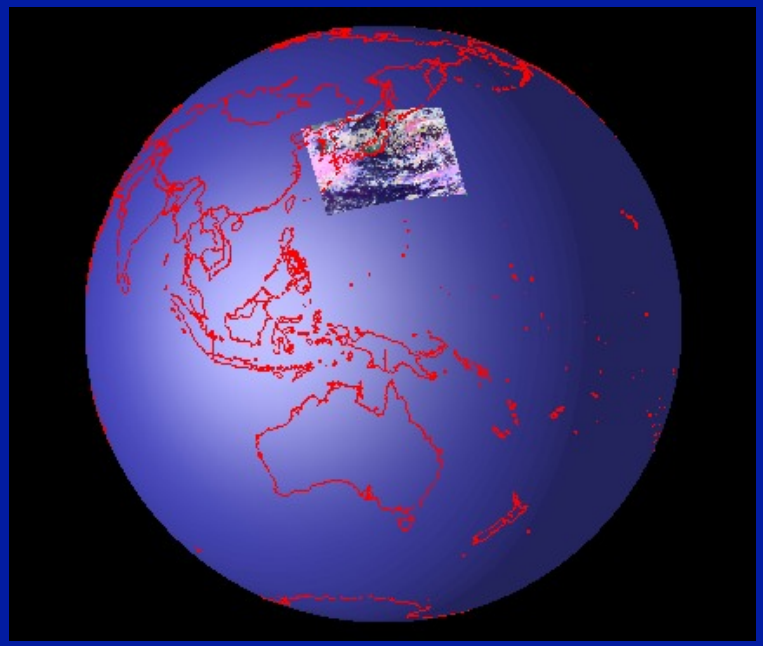

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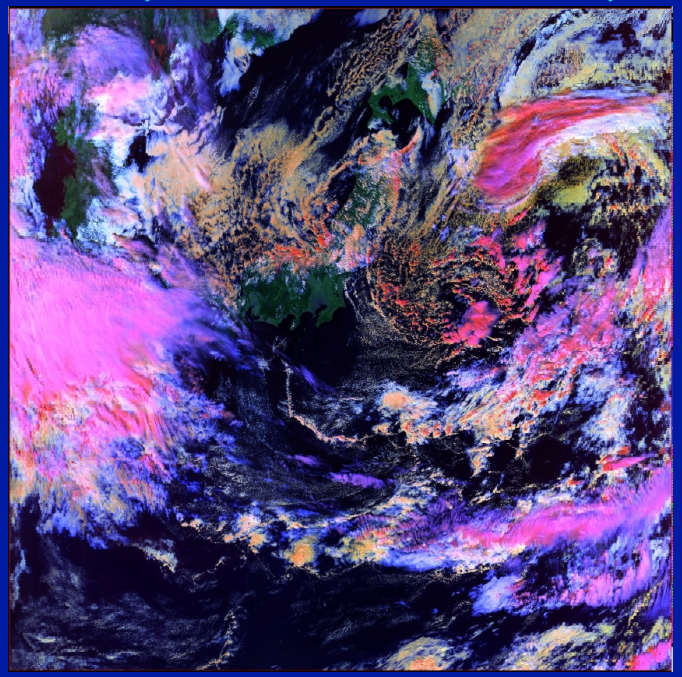

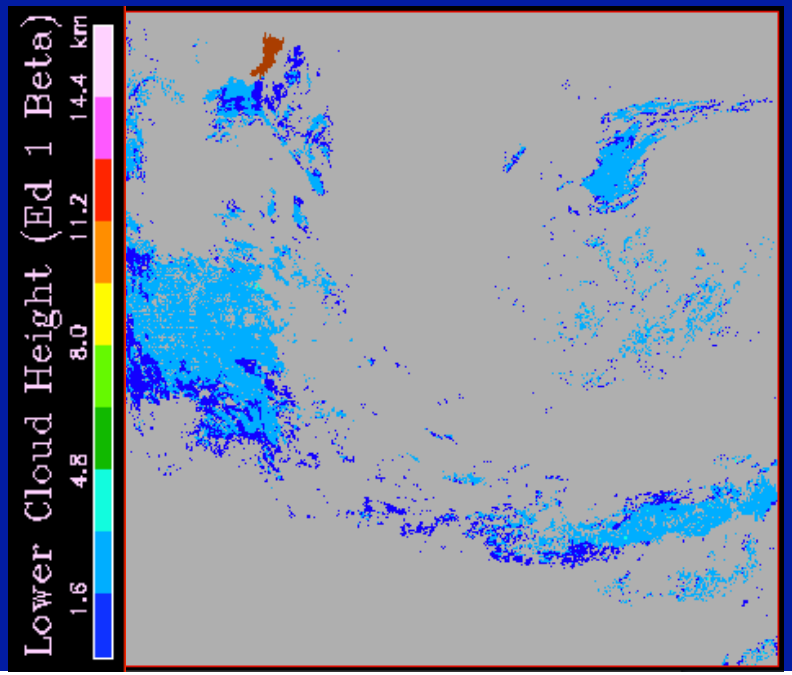

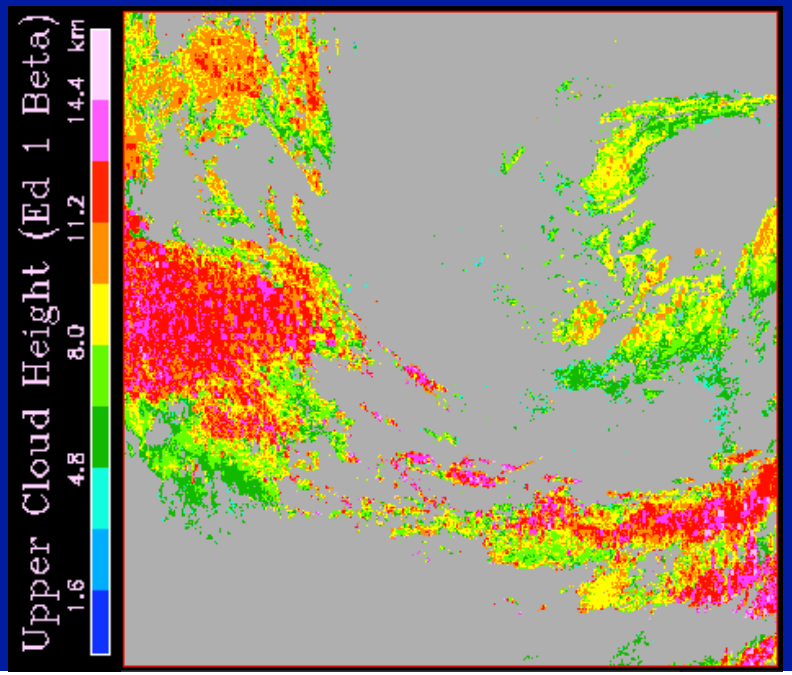

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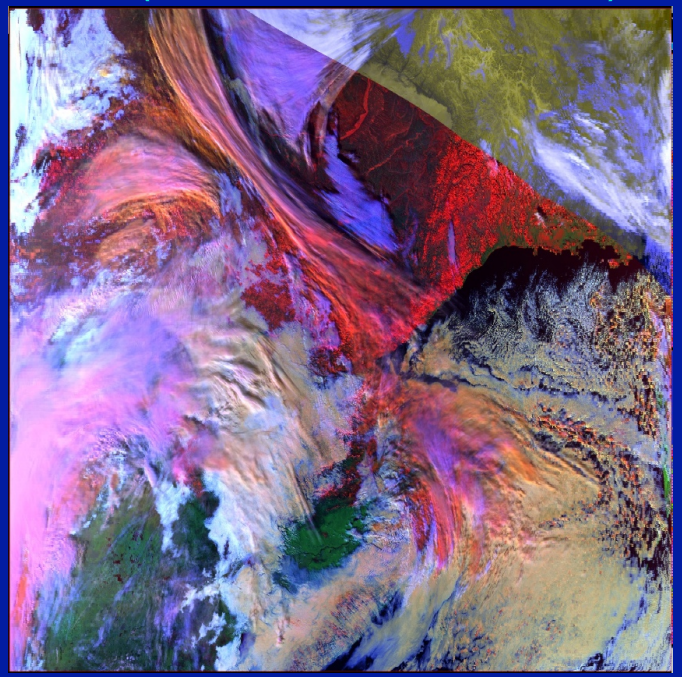

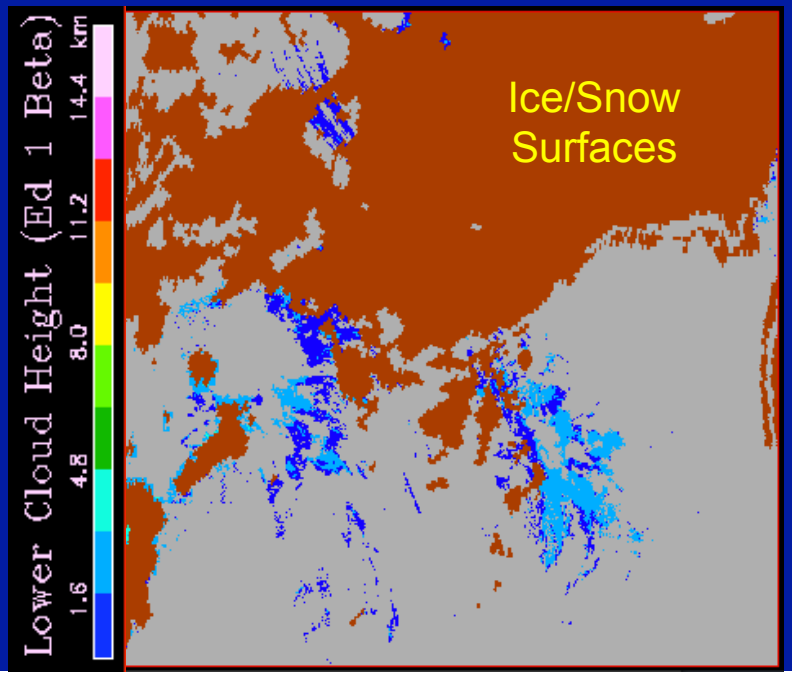

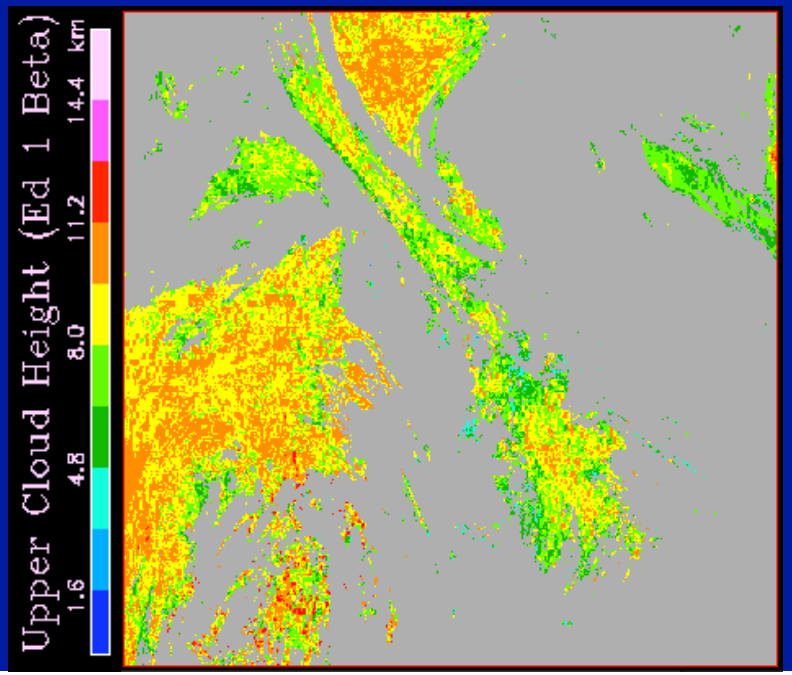

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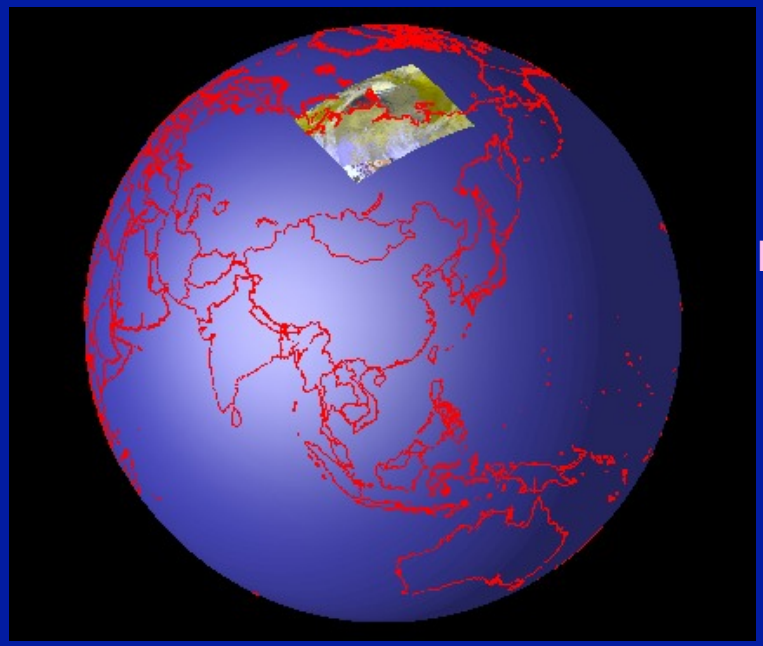

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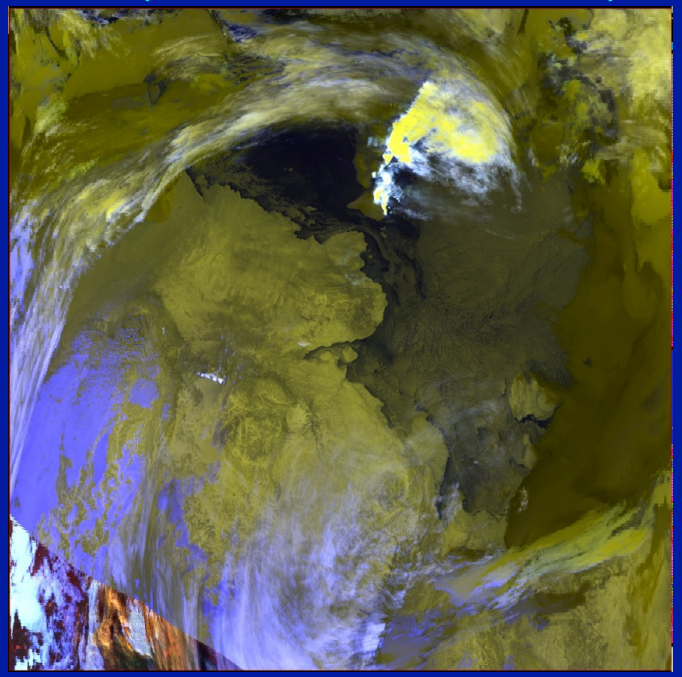

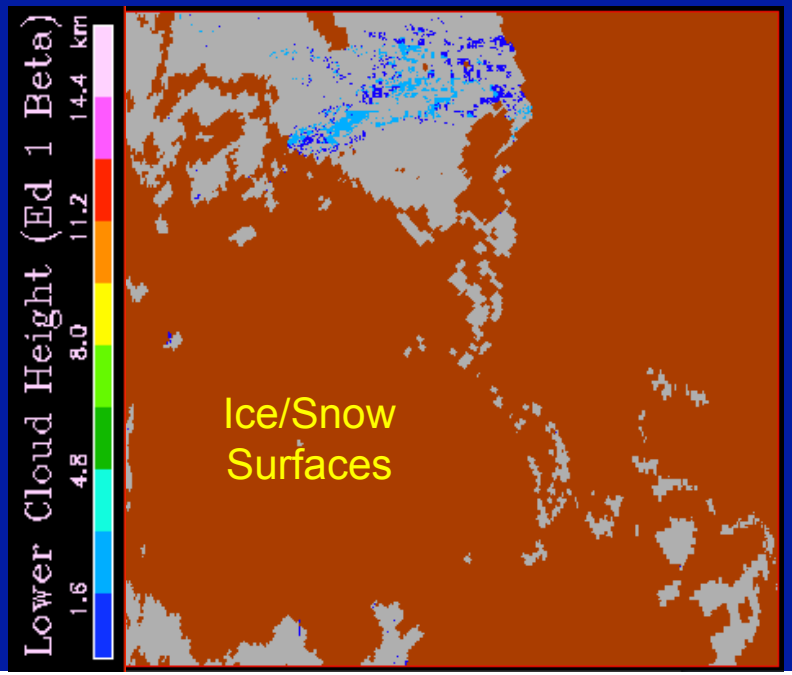

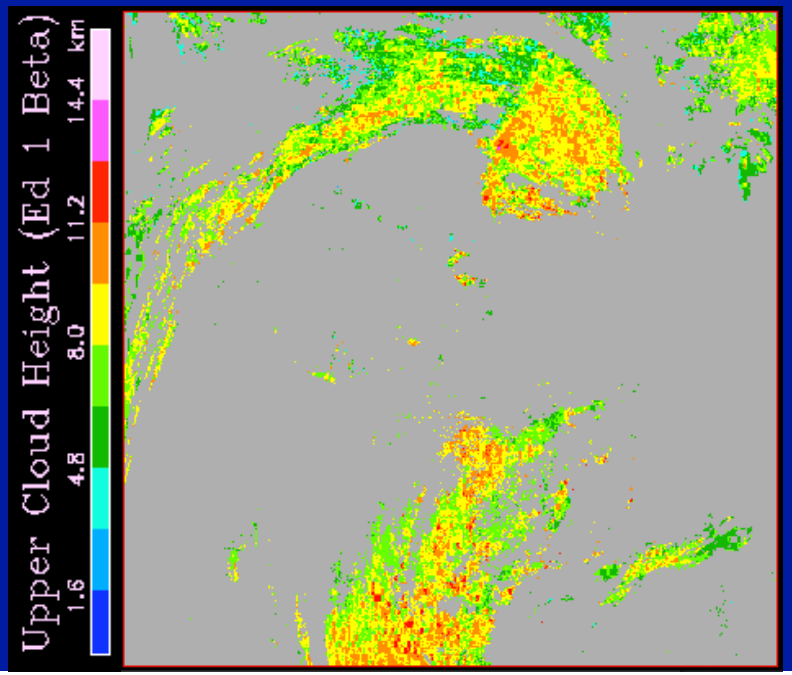

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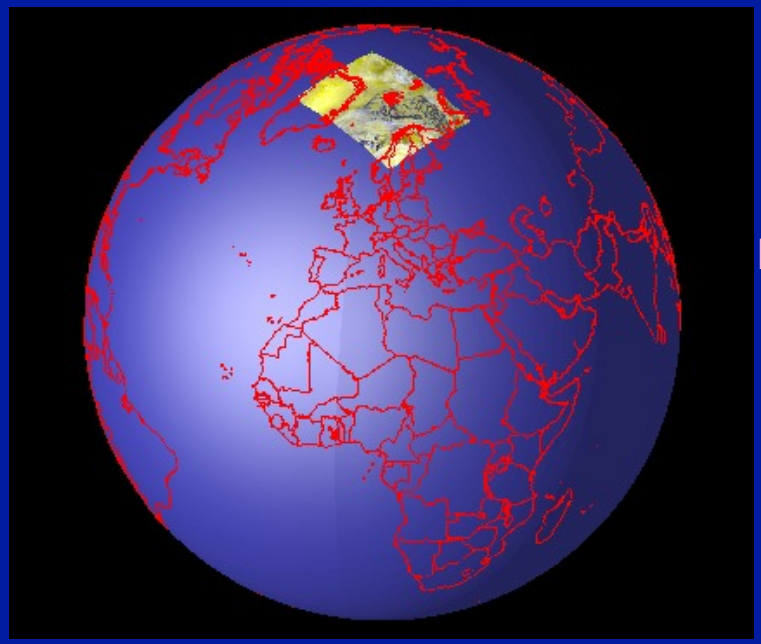

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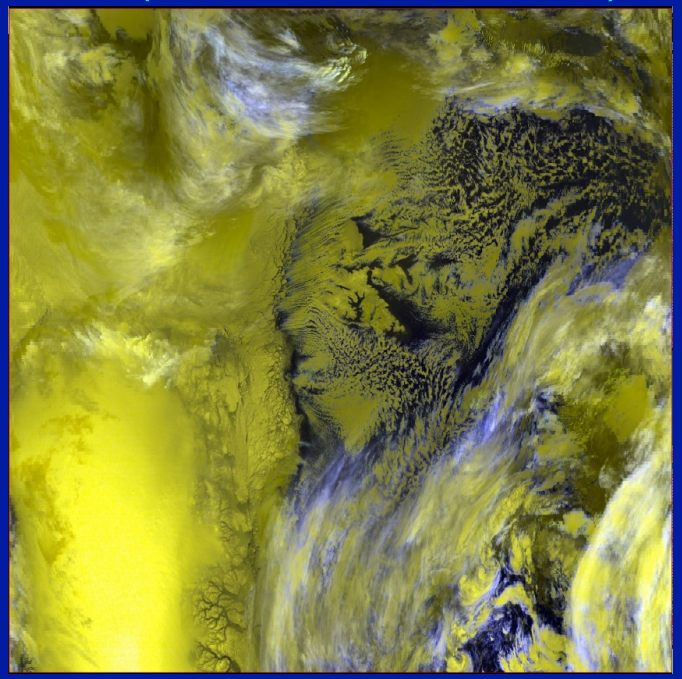
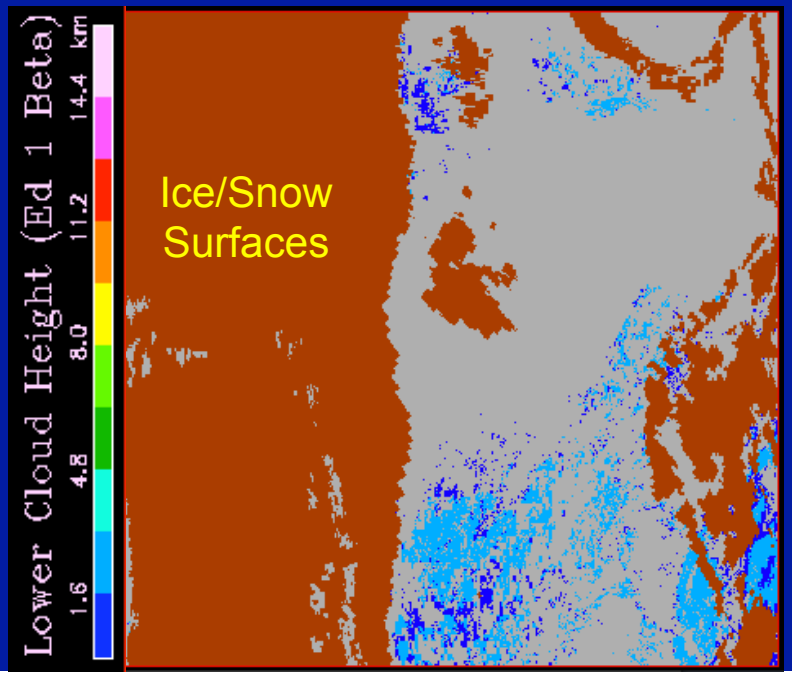
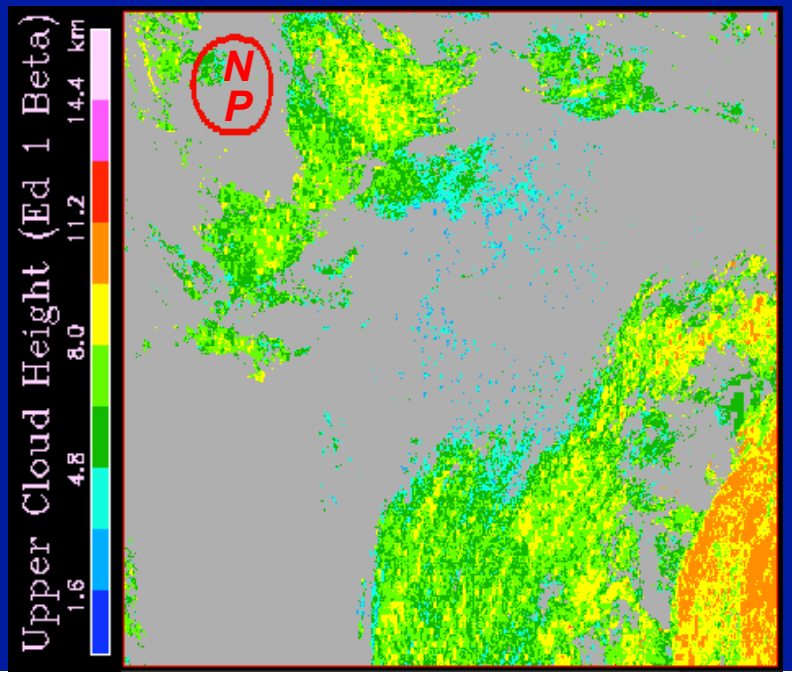
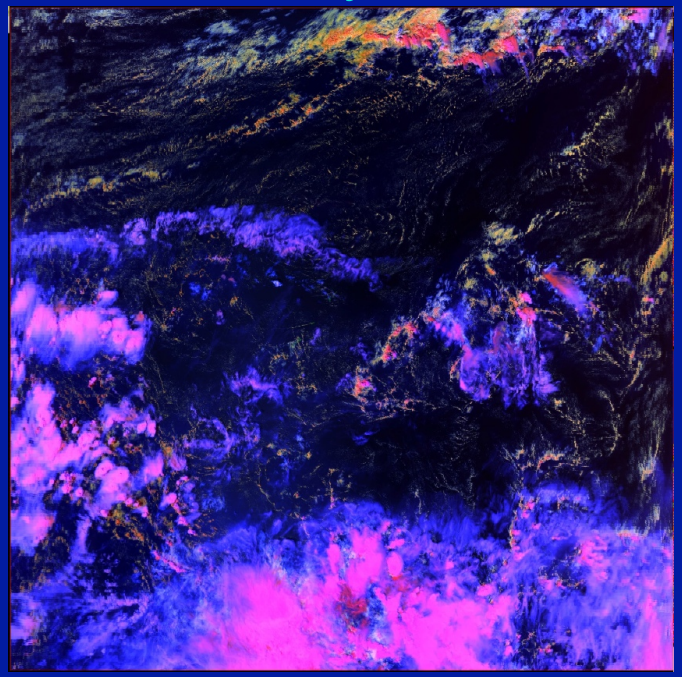
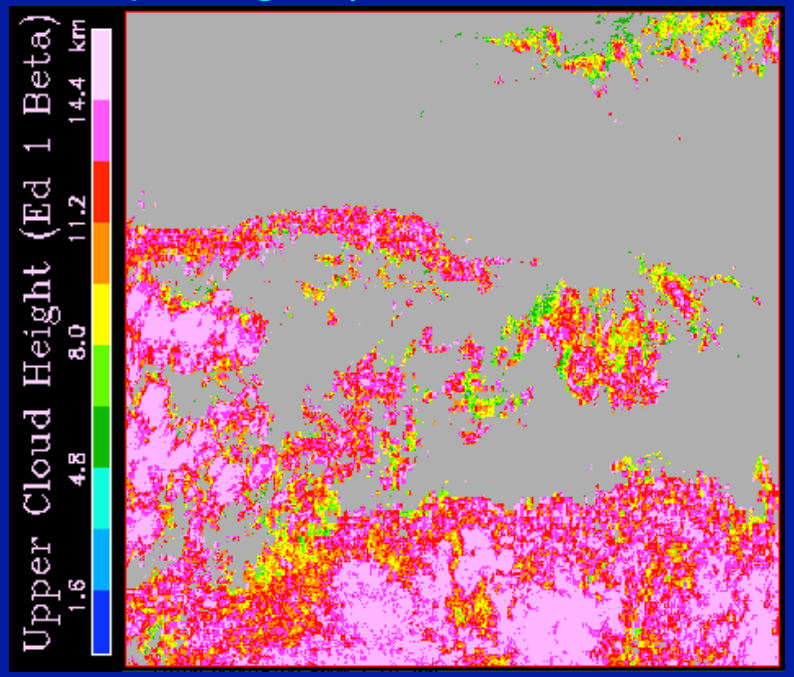


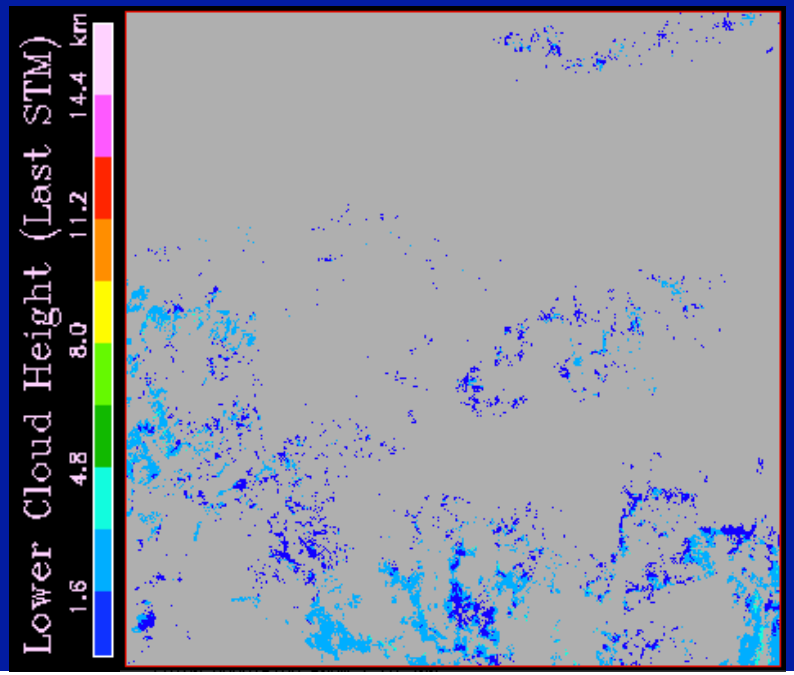


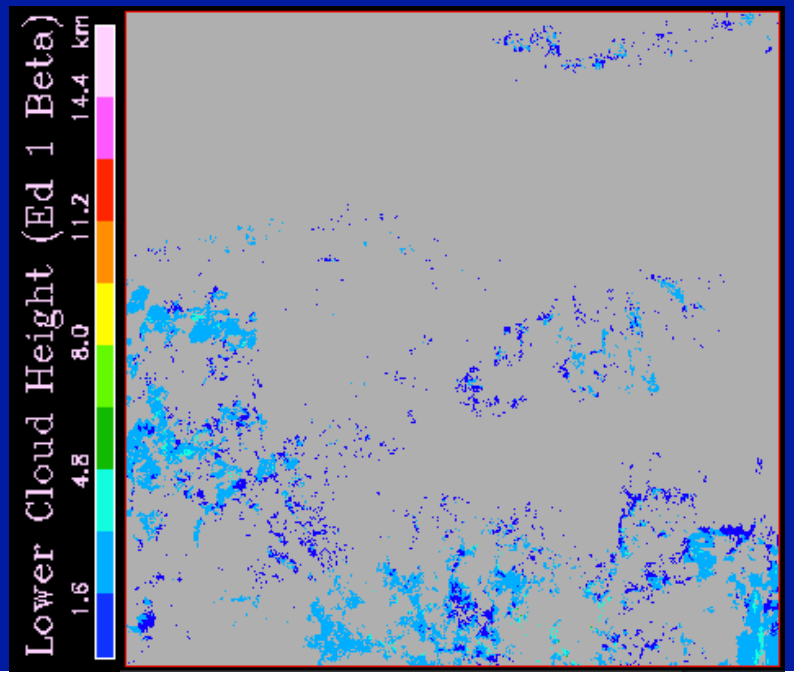


CERES VIIRS Multi-layered Lower Cloud Top Height (2012/11/10, 03:30Z)









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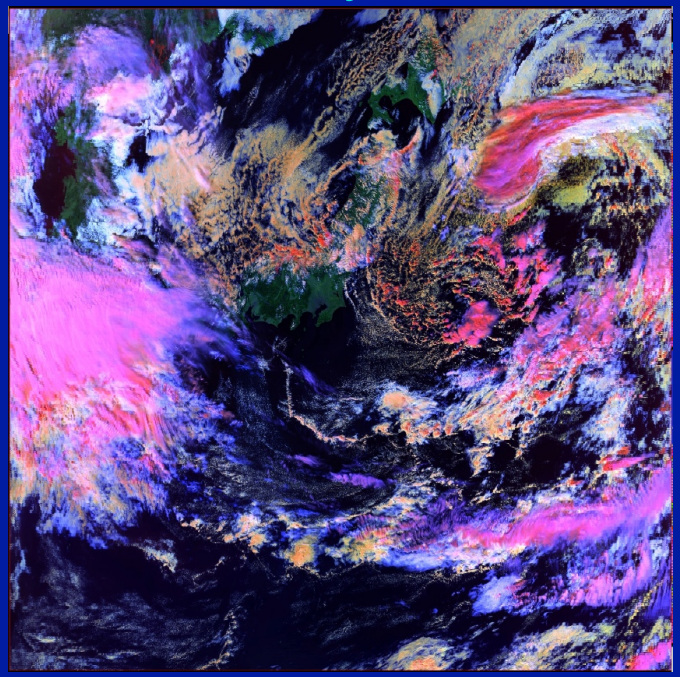
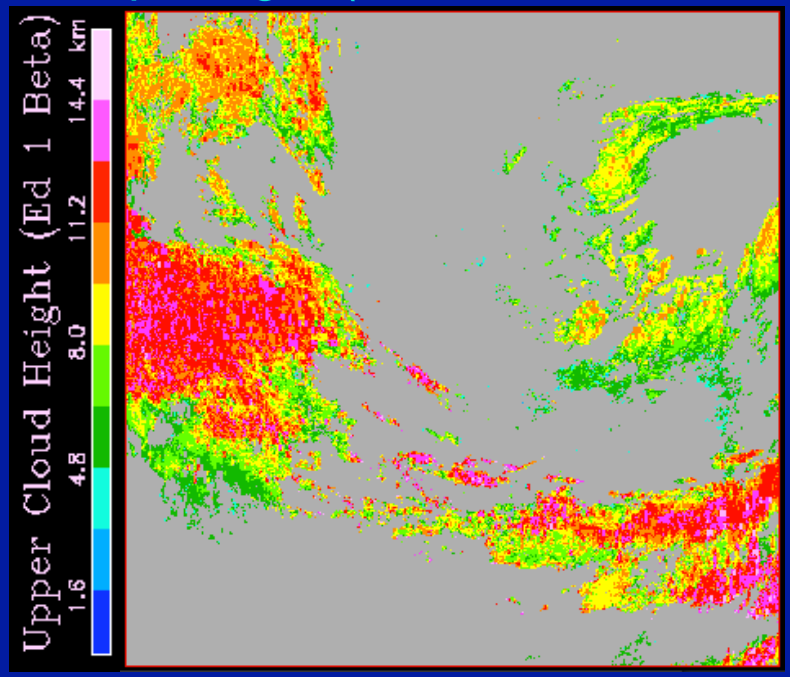
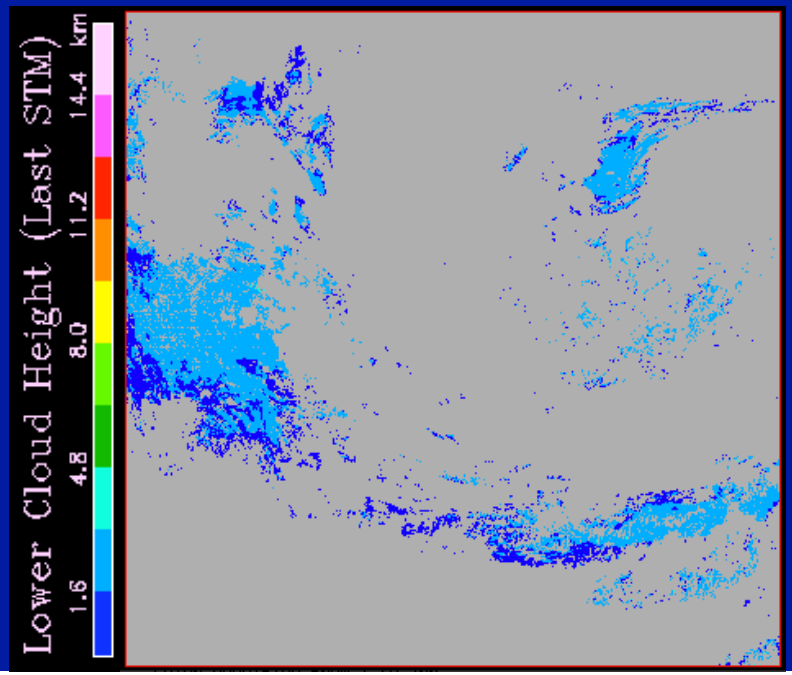
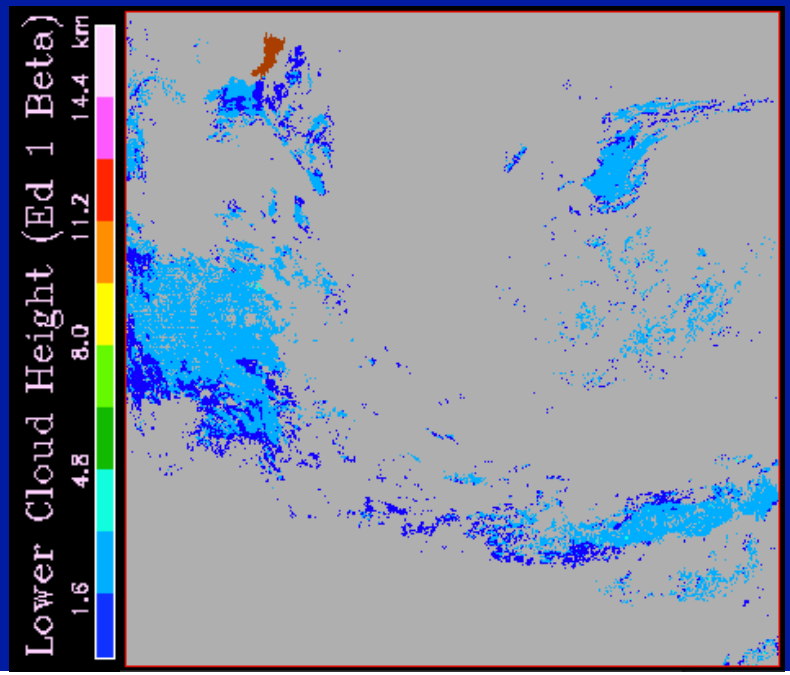
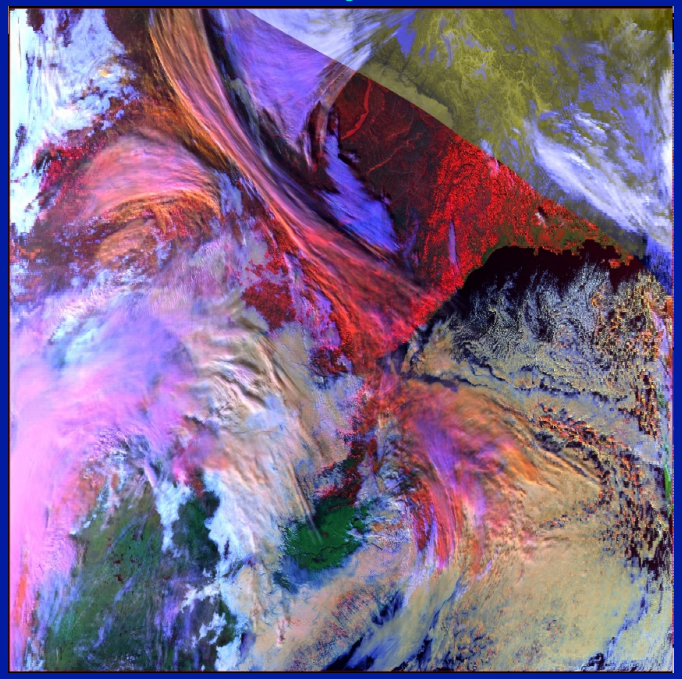


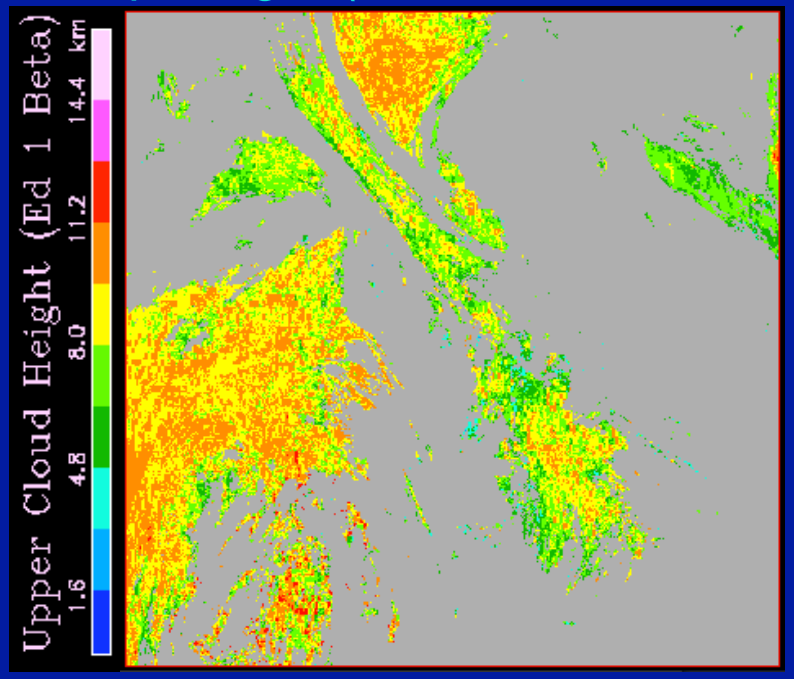


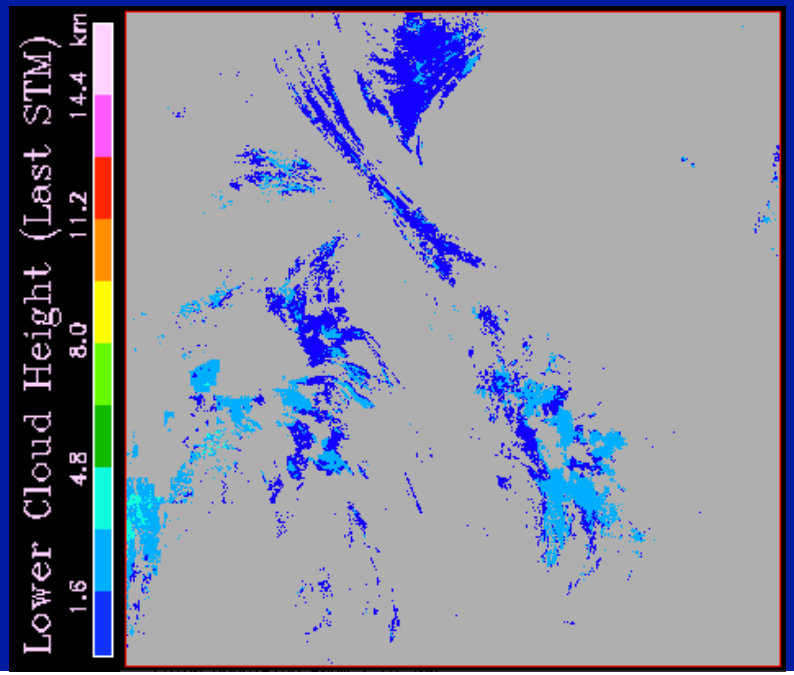


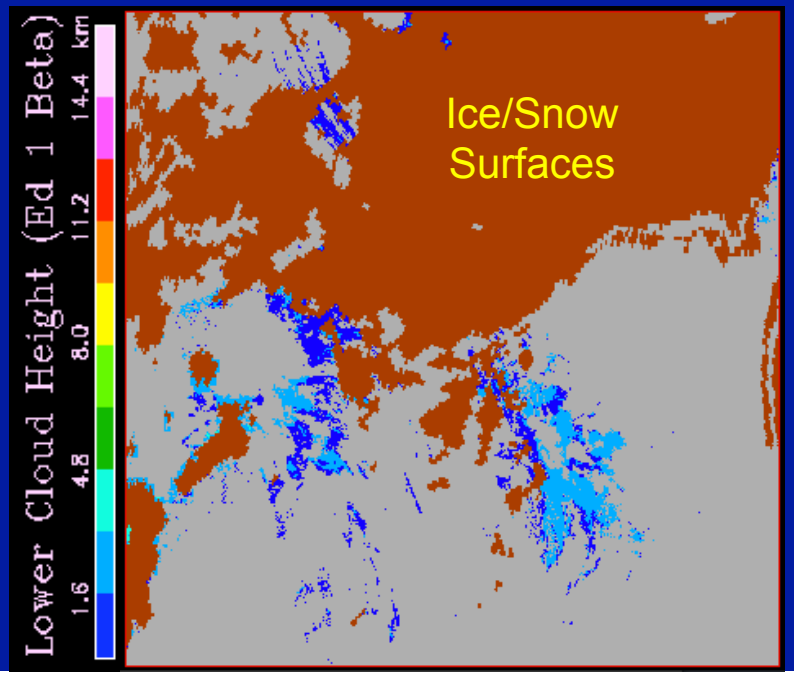


CERES VIIRS Multi-layered Lower Cloud Top Height (2012/11/10, 03:40Z)

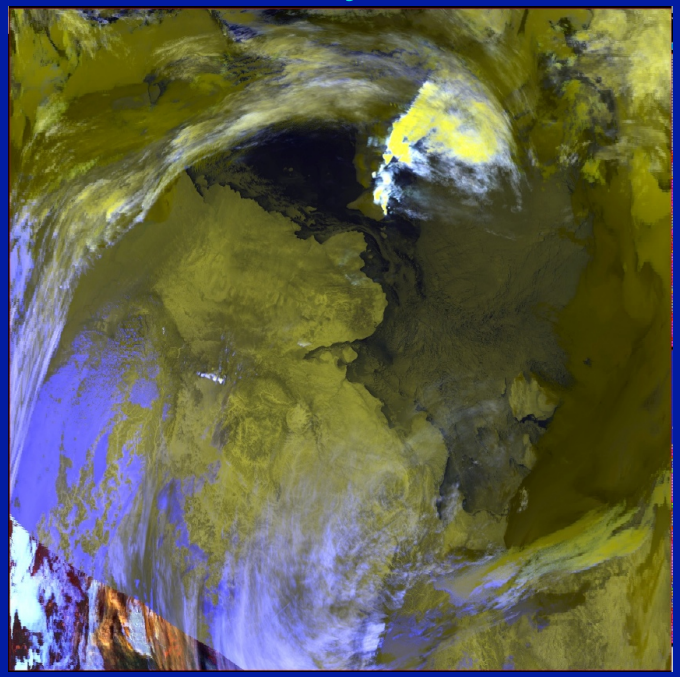


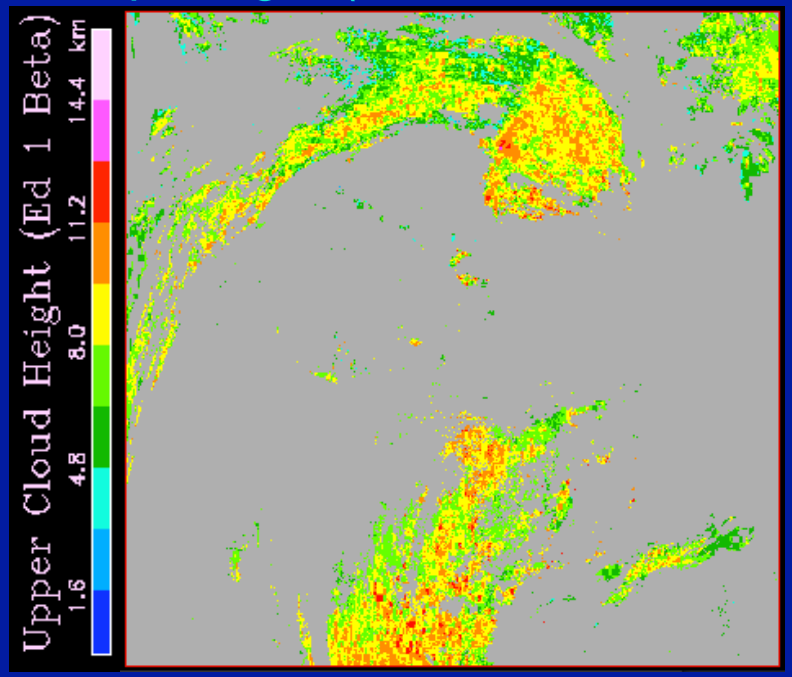


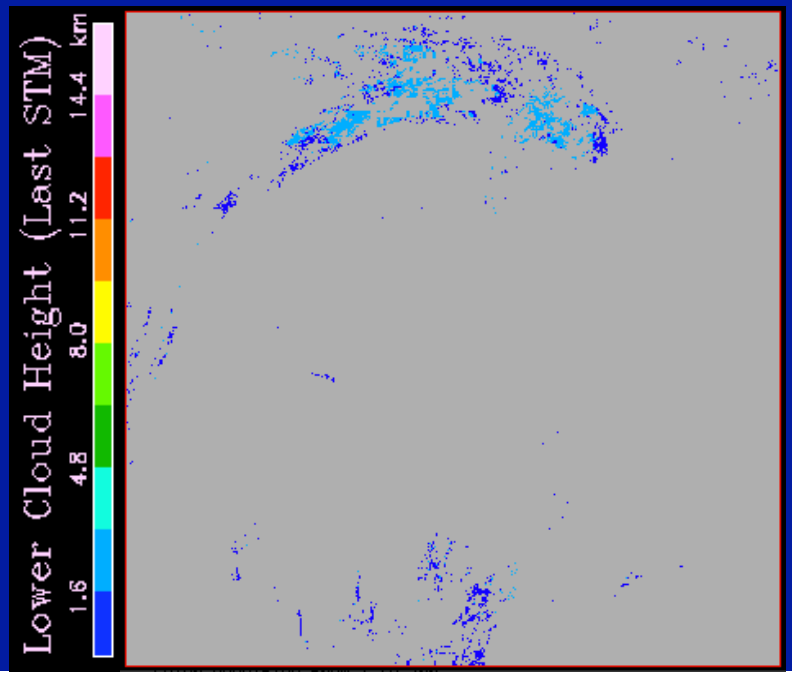


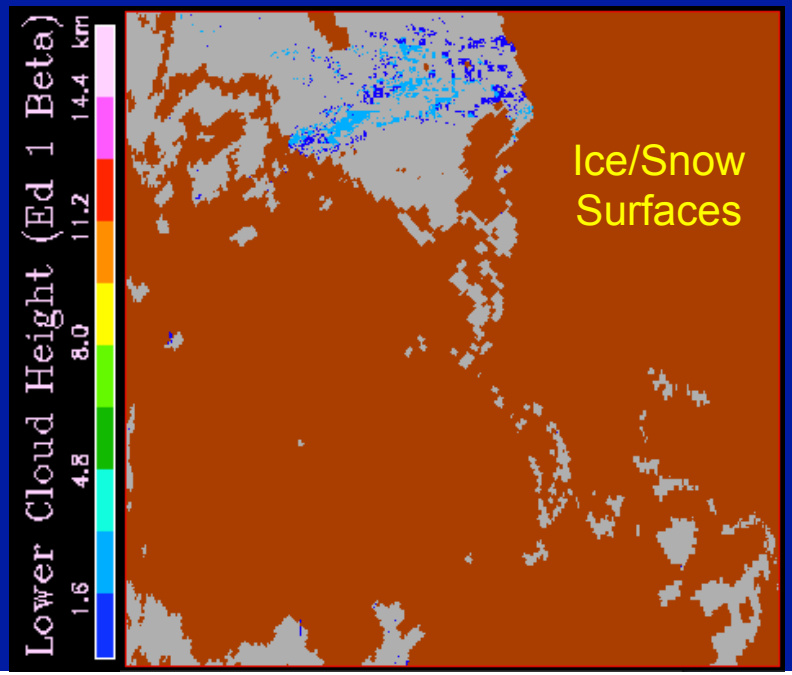


CERES VIIRS Multi-layered Lower Cloud Top Height (2012/11/10, 03:45Z)

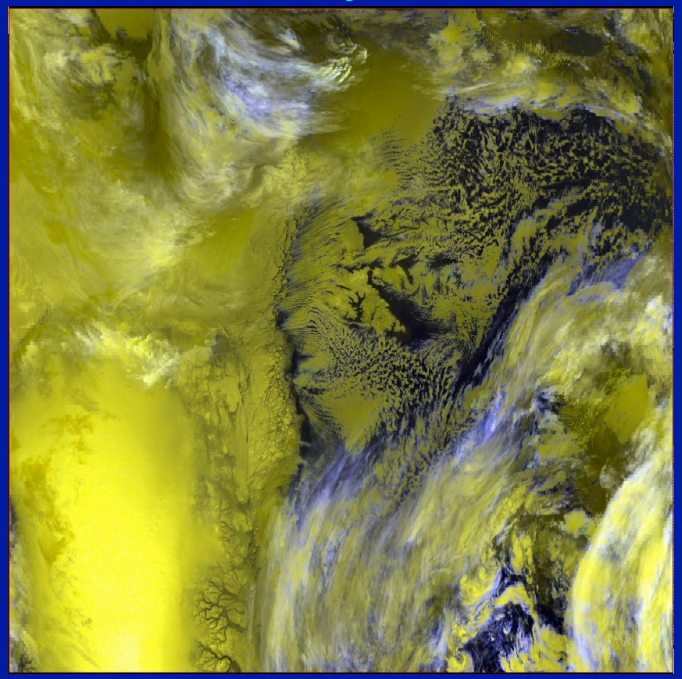


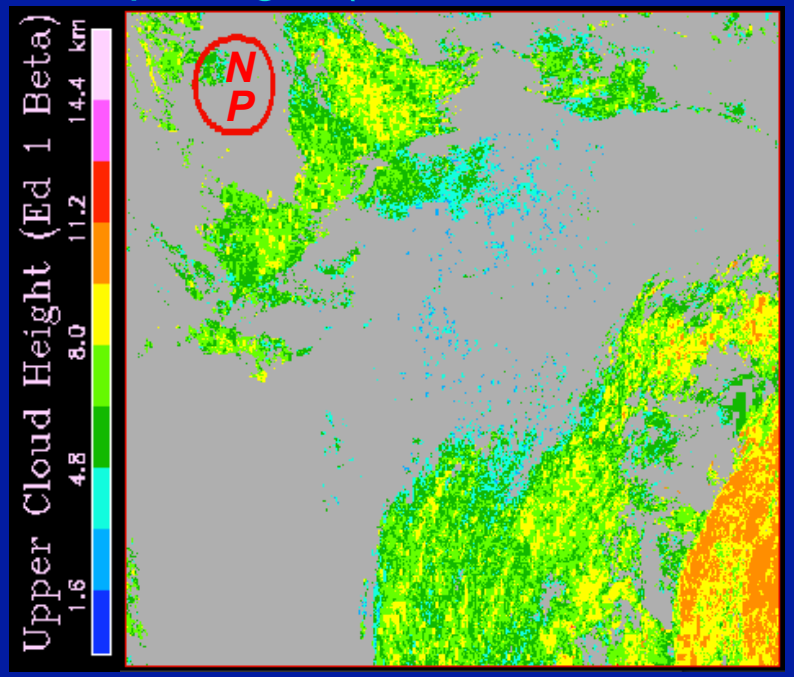


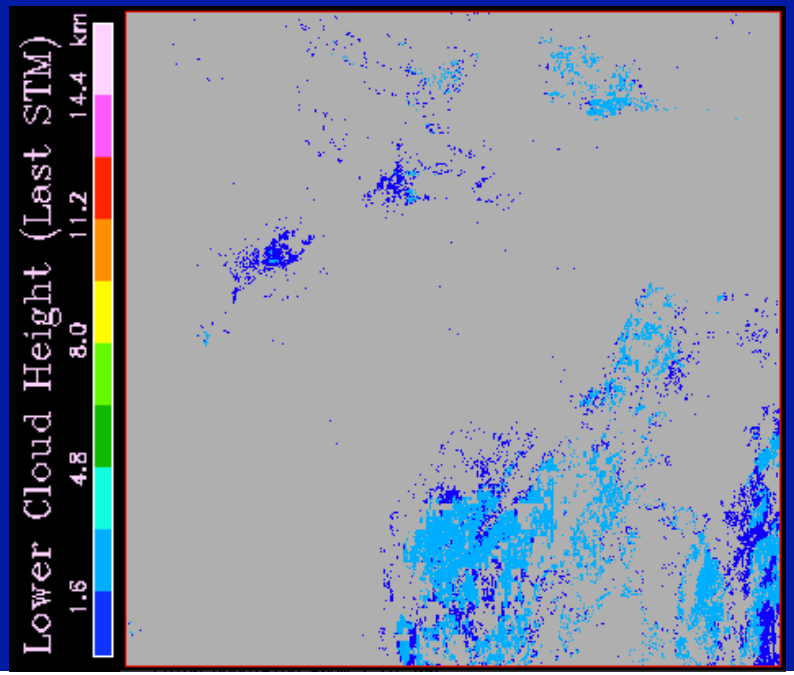


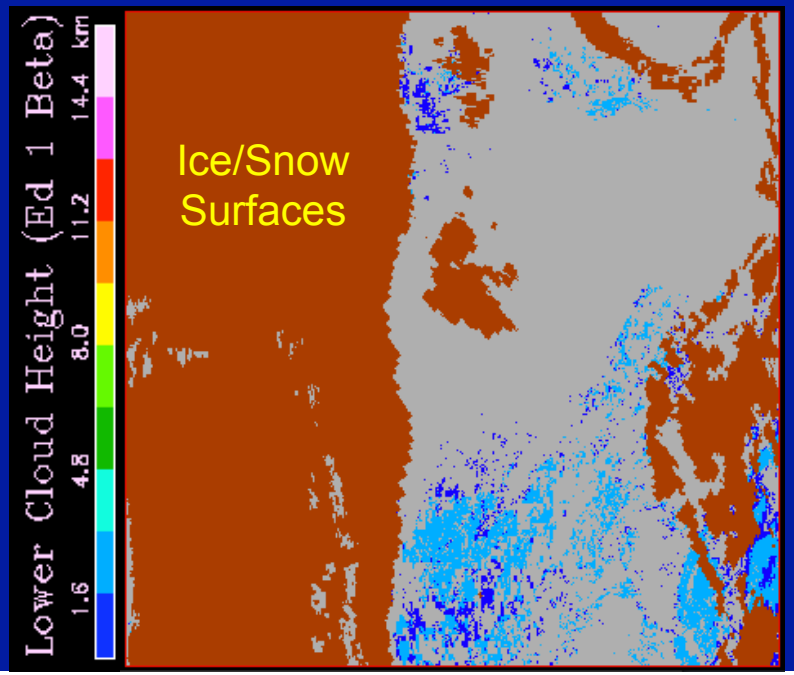


CERES VIIRS Multi-layered Lower Cloud Top Height (2012/11/10, 03:50Z)



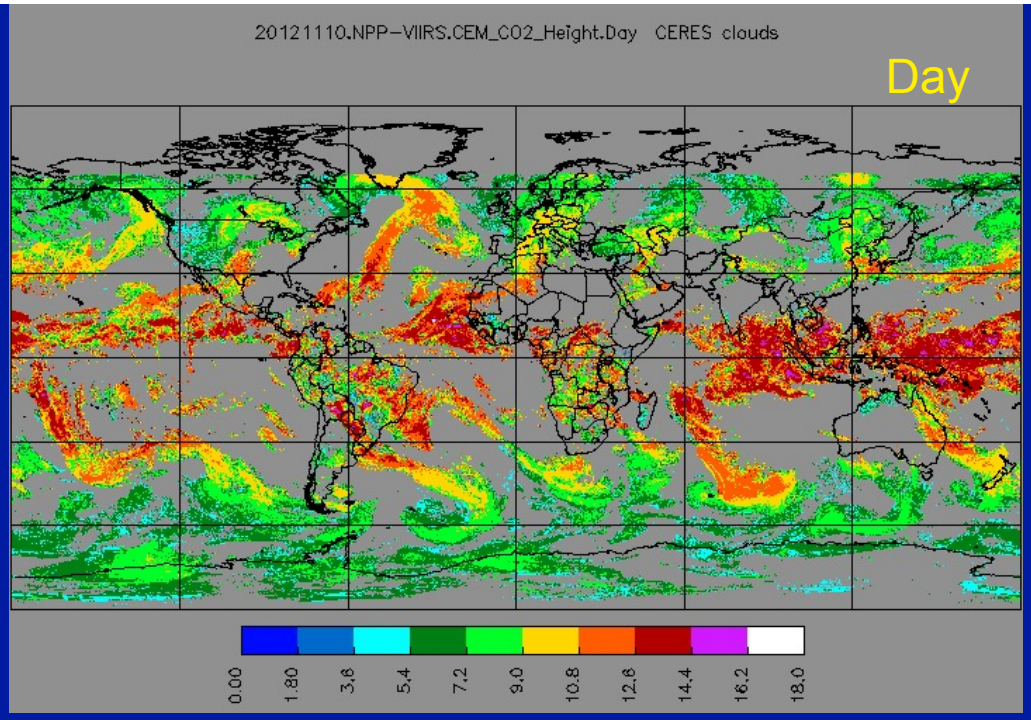


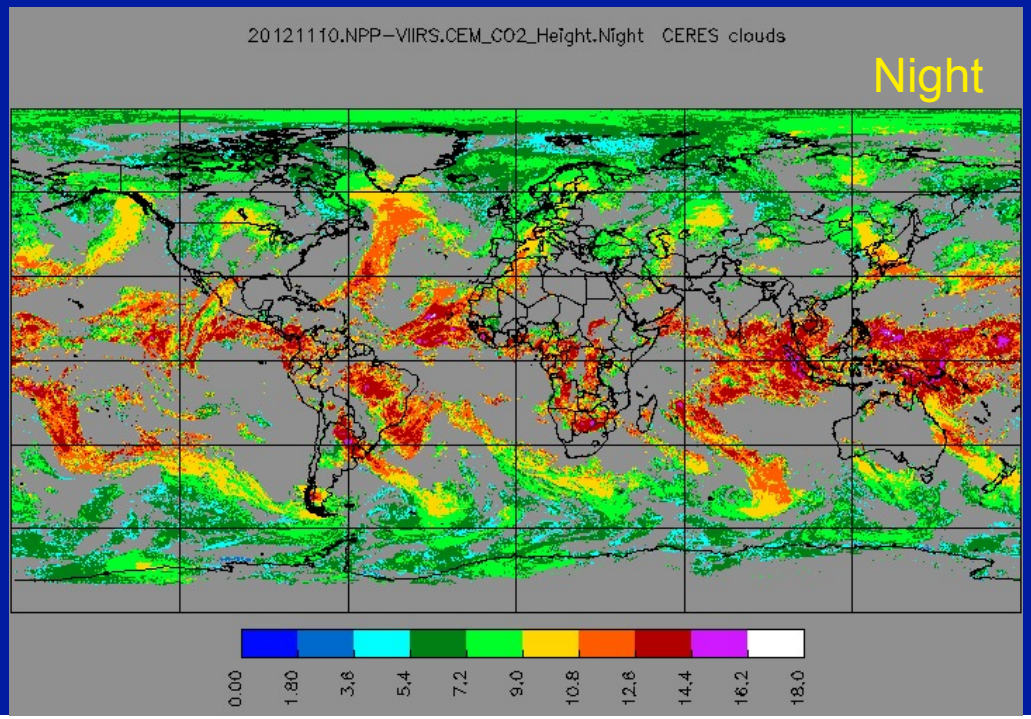




CERES VIIRS Multi-layered Cloud Retrieval Status

- (Last STM) Used CERES MODIS data and demonstrated:
  1) Good VIIRS-like multi-layered simulations and
  2) Good consistencies between VIIRS and MODIS simulations.
- Delivered the Ed-1-β CERES VIIRS multi-layered code, including the pseudo-CO_2 method, for identifying upper cirrus and multi-layered clouds and retrieving their properties.
  - > Reduced our old constraints on tropopause pressure level, which have increased the CERES VIIRS cirrus cloud top heights.
  - > Upgraded cirrus cloud top height retrieval and improved 2-layered cloud retrieval algorithms, which have increased the CERES VIIRS multi-layered cloud fractions.
  - > Eliminated the CERES VIIRS multi-layered cloud retrieval over snow/ice covered surfaces, due to considerable uncertainty in large snow/ice albedos (mostly occurred in high latitude, winter regions).





CERES VIIRS Retrieved Upper Cloud Top Height Edition-1β

(2012 November 10)