Evaluation of IDPS Cloud Mask for Ocean Color EDR

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IDPS OCC EDR Cloud Related Flags

- Inherited from VIIRS-CM-IP, all in quality flag 5 (QF5_VIIRSOCCEDR)

  (1) Cloud confidence indicator (bit 0~1)
  - Confidently cloudy (11)
  - Probably cloudy (10)
  - Probably clear (01)
  - Confidently clear (00)

  (2) Adjacent pixel is not confidently clear (bit 2)

  (3) Thin cirrus cloud detected (bit 3)

  (4) Cloud shadow detected (bit 4)

  (5) Non-cloud obstruction, thick aerosol (bit 5)
- May consider: QF7_VIIRSOCCEDR, inherited from VIIRS Bright Pixel IP: Bright Target Flag (bit 5)
- IDPS VIIRS OCC EDR only masks all pixels as “confidently cloud”, and leaves the options of masking other flags to users. The pixels contaminated by cloud stray-light will likely be flagged as bright targets due to their higher-than-normal TOA reflectance.

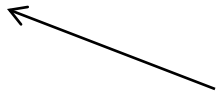
NOAA-MSL12/NASA-L2GEN Cloud Mask (CM)

- Based on Rayleigh-corrected reflectance at the NIR band M7 (862 nm)
- Results from NOAA-MSL12 CM agrees with NASA-L2GEN CM (~95%)
- Straylight flag can be used in NASA-L2GEN.
- Straylight flag and cloud flag is mutually exclusive (i.e., straylight flag only applies to non-cloudy pixels)

Example of the VCM and Ocean Color Product

Cloud

Glint



Standard Cloud uses a threshold of the 862 channel.

April 20, 2012 --

VCM – Flag

0 – Confidently clear

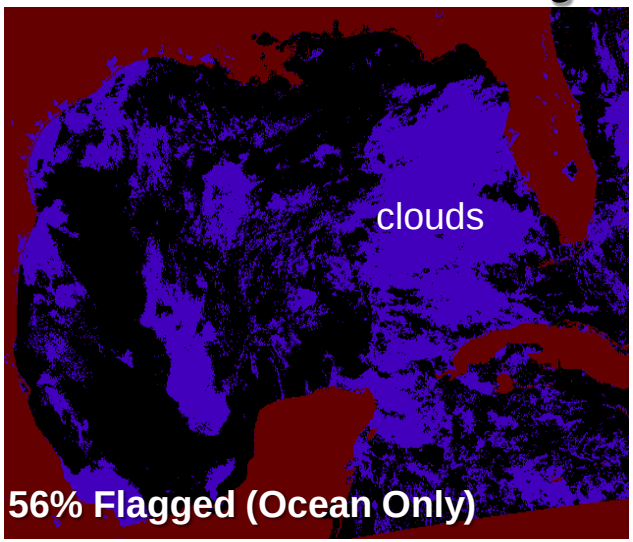
1- Probably clear

2- Probably cloudy

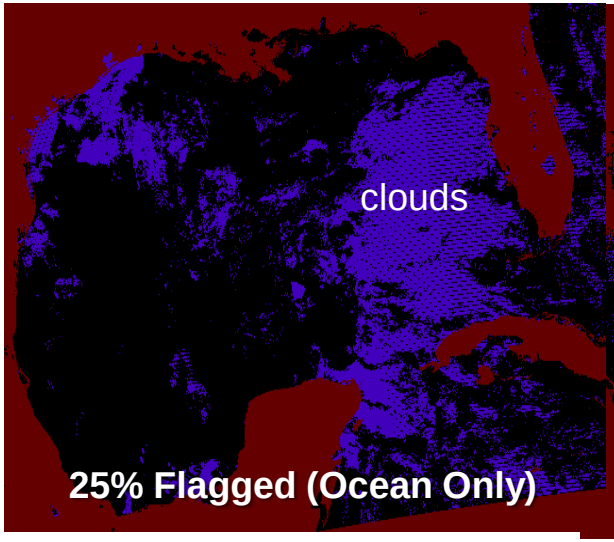
3 – Confidently cloudy

Cloud Flag Comparisons – NRL vs. IDPS EDR's (Continued)
Gulf of Mexico – April 20, 2012

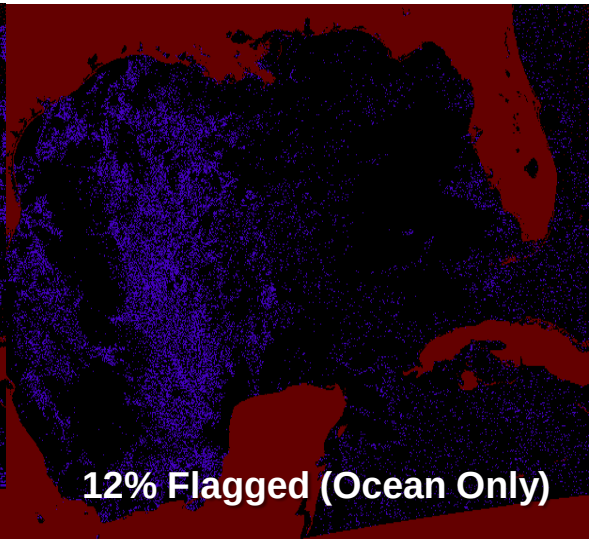
862 Threshold Cloud Flag



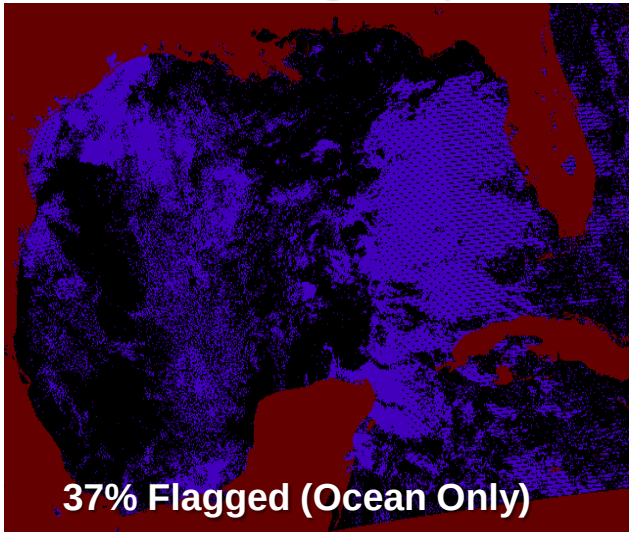
IDPS Cloud Flag3 (Cloudy)



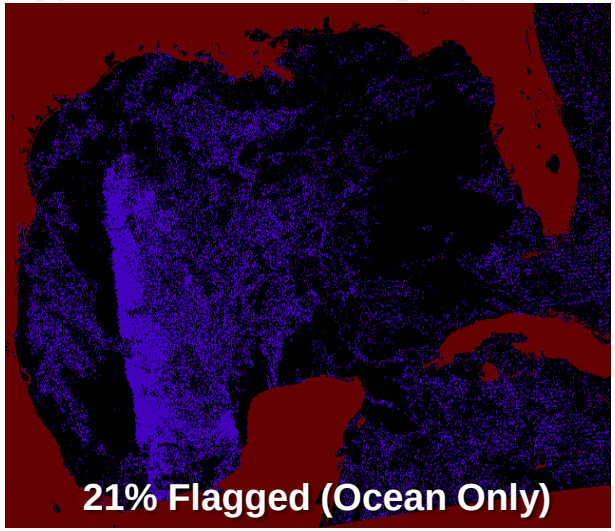
IDPS Cloud Flag2 (Prob Cloudy)



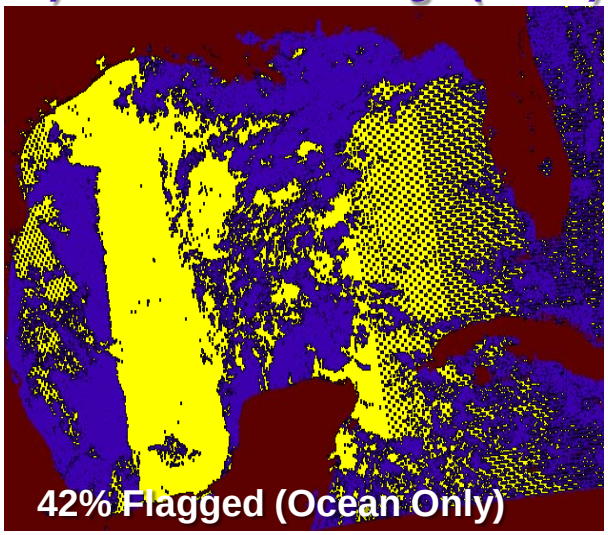
IDPS Cloud Flag2&3 (Prob/Cloudy)



IDPS Cloud Flag1 (ProbClear)



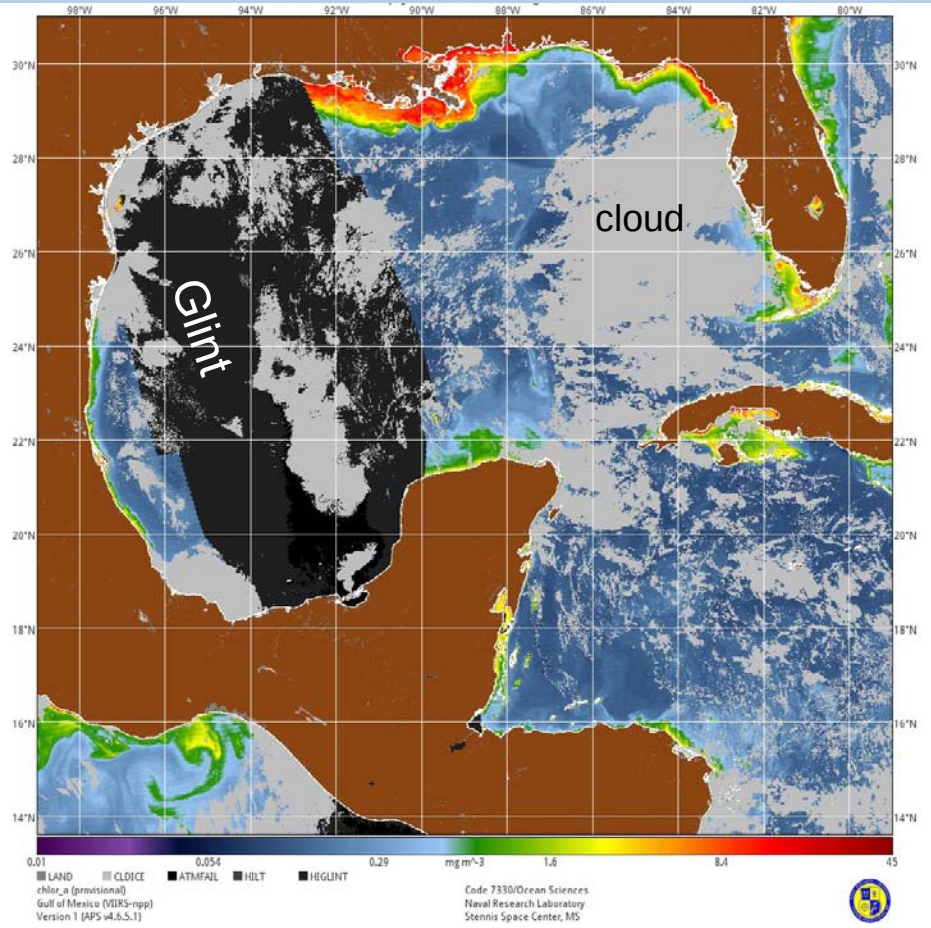
IDPS Cloud Flag0 (Clear)

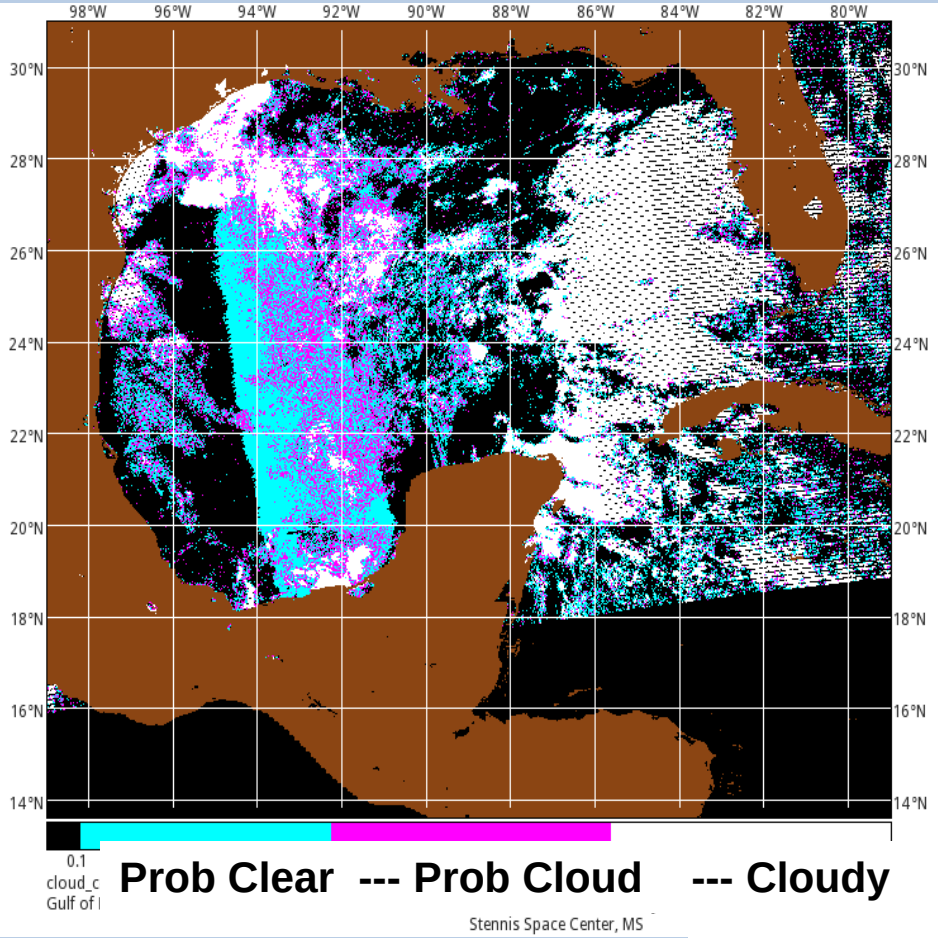


Cloud Flag Comparisons – nL2gen vs. IDPS EDR's

Gulf of Mexico – April 20, 2012

NRL Chlorophyll w/ Cloud,Glint,AtmFail,HiLt flags IDPS w Cloud Flags (0 Clear, 1 ProbClear, 2 ProbCloud, 3 Cloud)

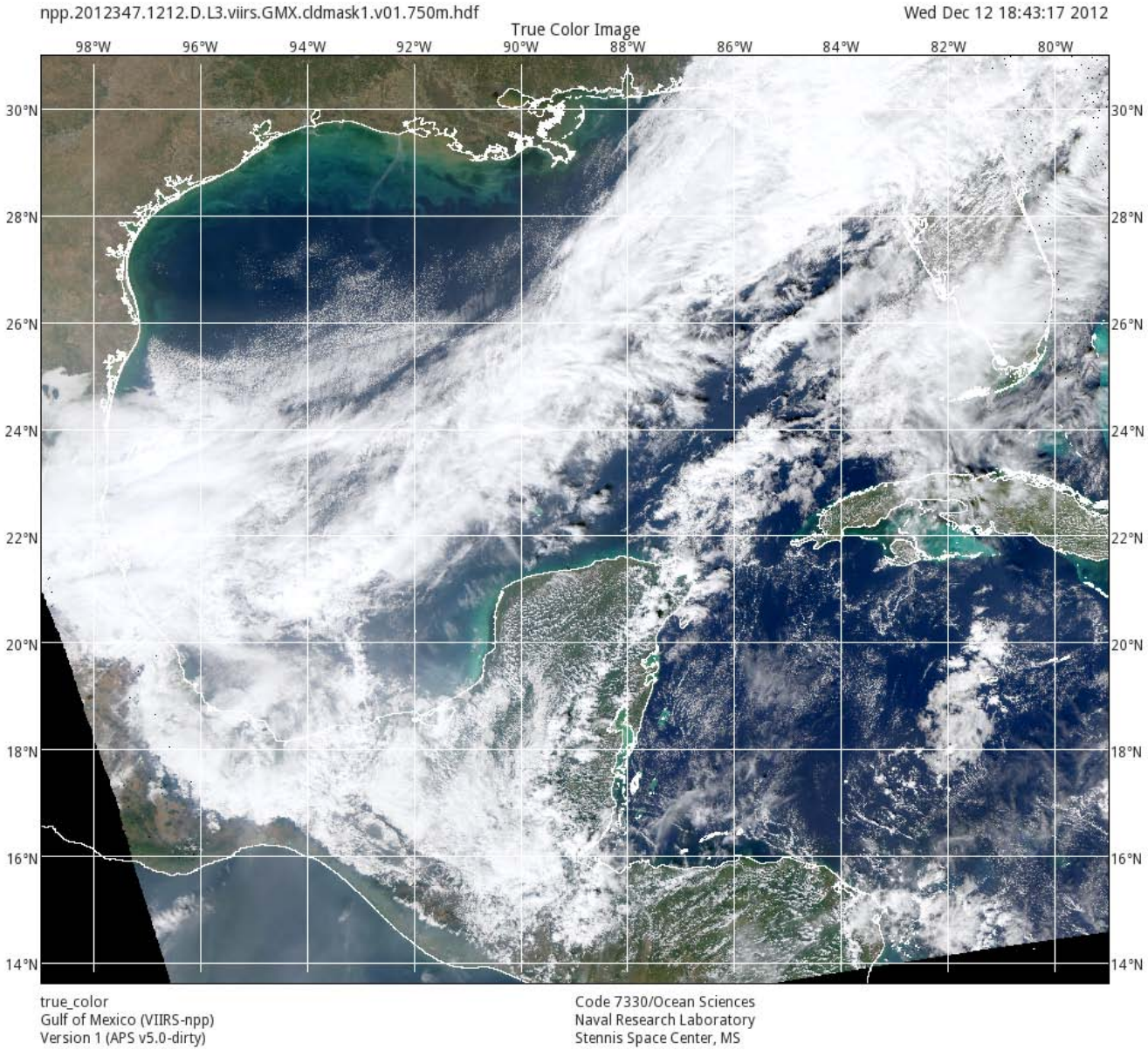




Initially IDPS (ProbCloudy & Cloudy) and nL2gen Cloud Flags agree very well!

VIIRS –NPP – Gulf of Mexico

Dec 20, 2012



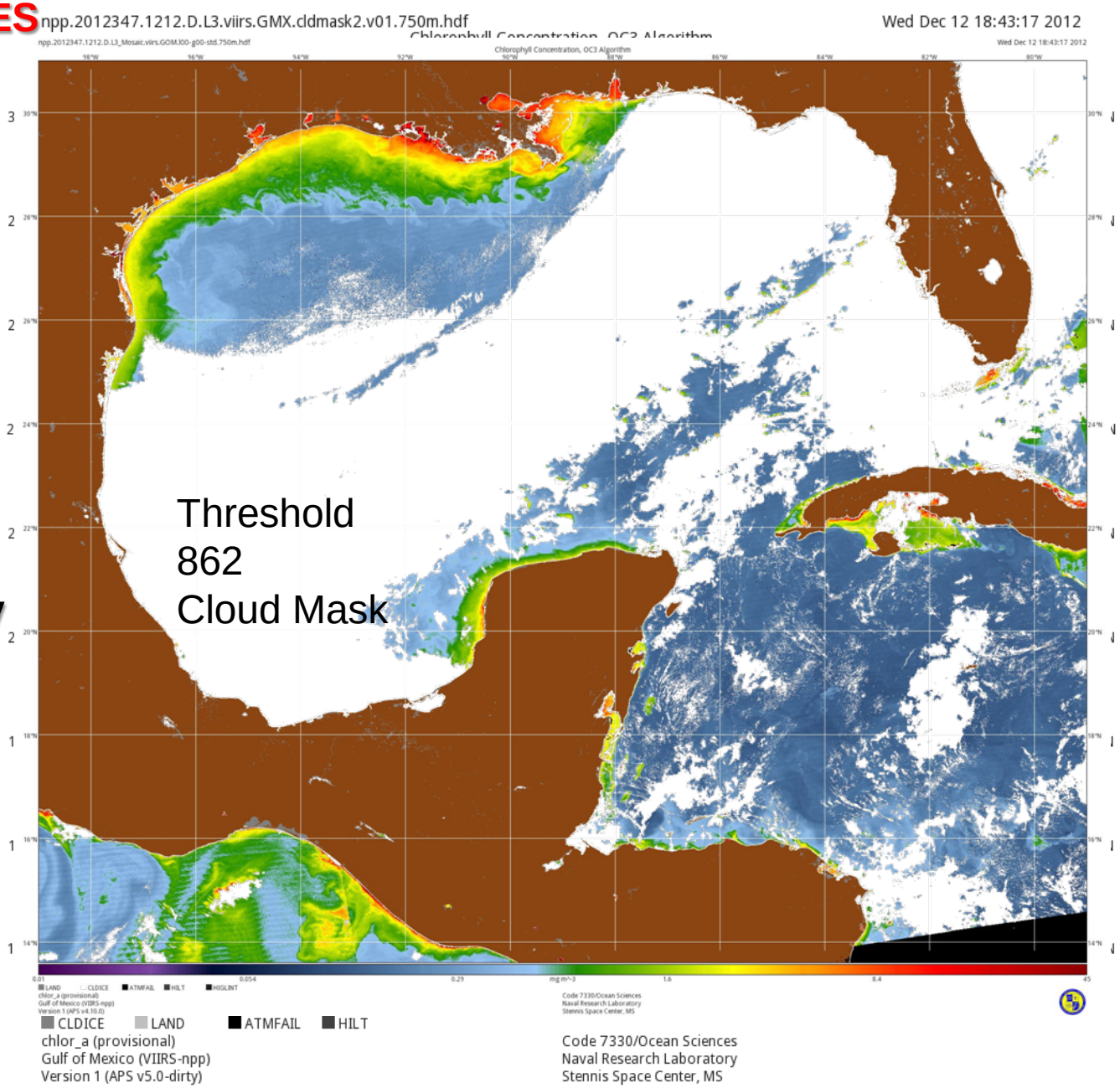
TOGGLE IMAGES

Comparison of Threshold Cloud mask

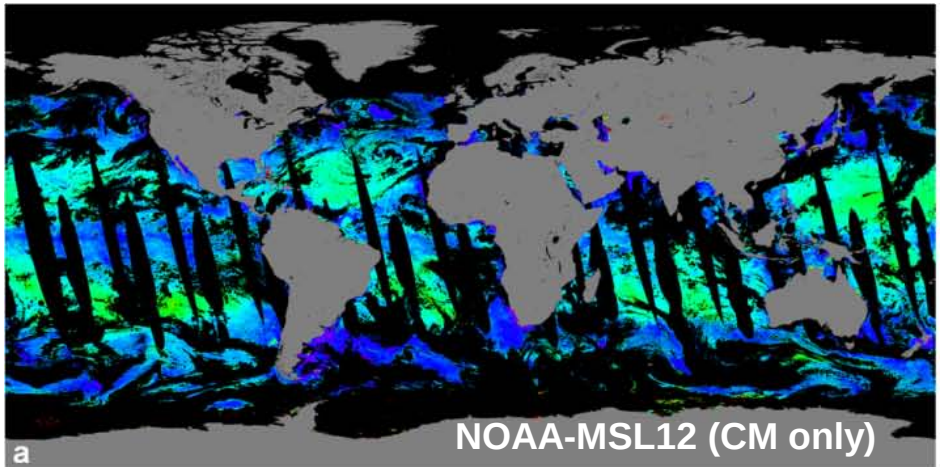
And

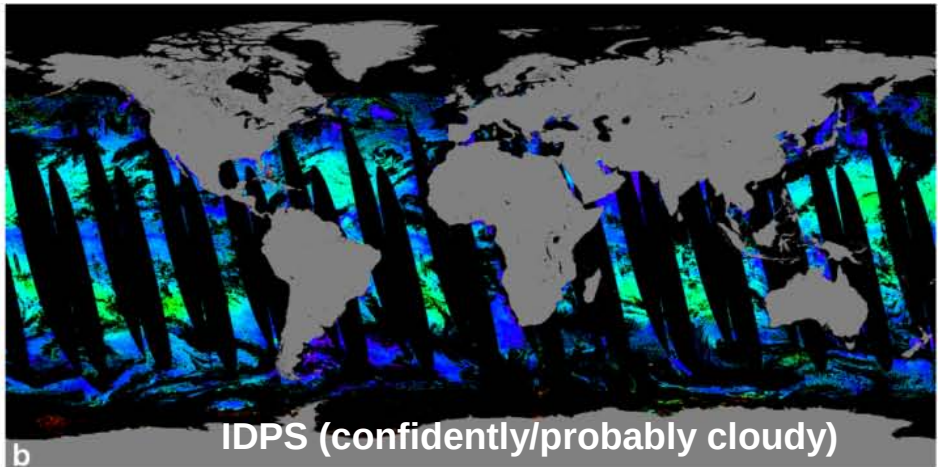
VCM Cloudy and Probably Cloudy

Best .

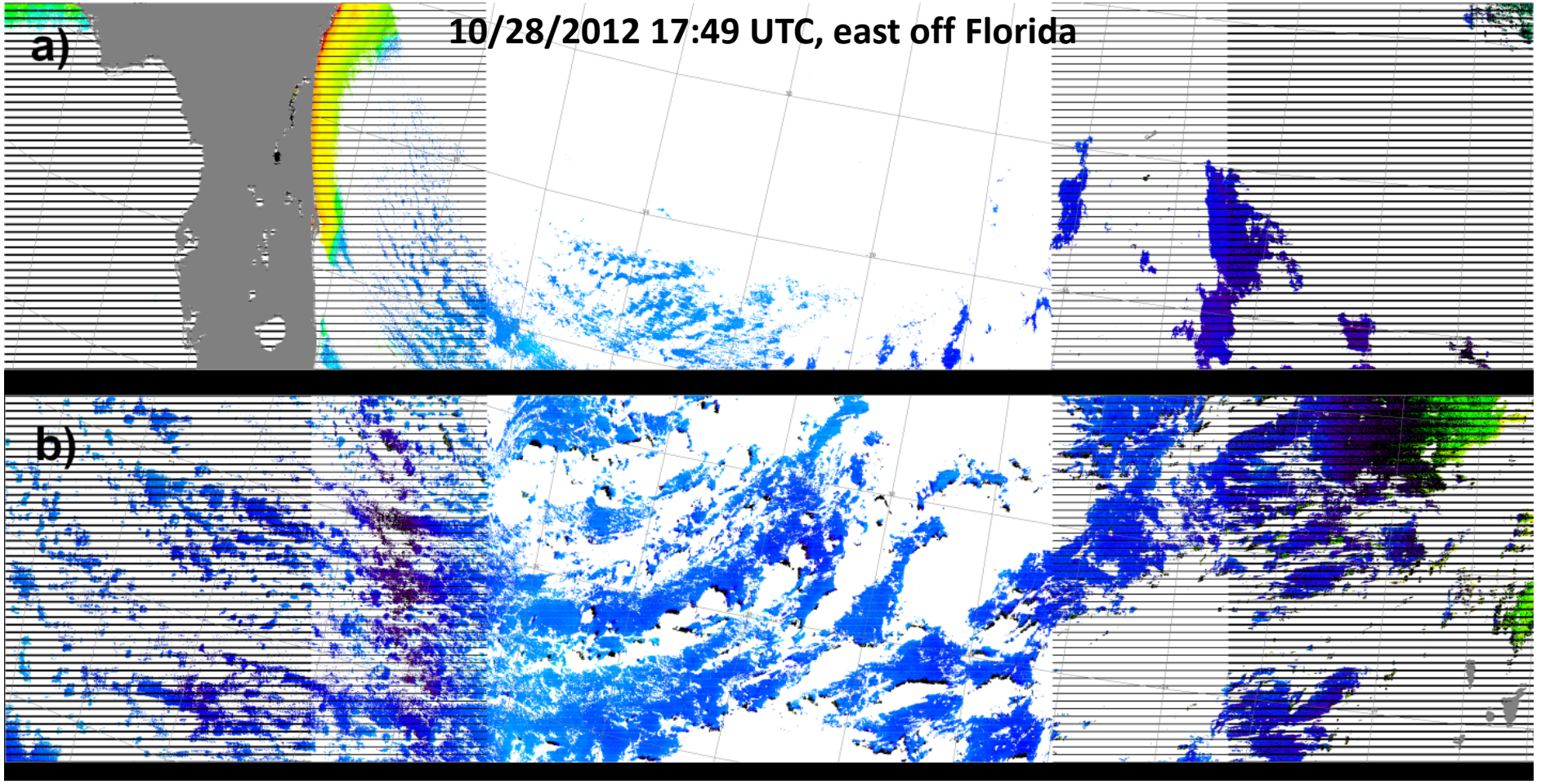


Global Daily Chlorophyll-a 10/31/2012





Quantitative Case Study



NOAA-MSL12 CM vs. IDPS CM (Case 1)

Table 1. MSL12 and IDPS Cloud Mask/Flag Comparisons

IDPS flag used as mask	Either One (MSL12 + IDPS	Both Two (MSL12 & IDPS)	MSL12 only	IDPS only
Confidently Cloudy	1,927,333	1,466,370 (76.1%)	460,937 (23.9%)	26 (0.0%)
Cloudy (+Prob. Cloudy)	1,940,421	1,525,310 (78.6%)	401,997 (20.7%)	13,114 (0.7%)
Cloudy + Cloud Shadow	1,979,923	1,658,155 (83.7%)	269,152 (13.6%)	52,616 (2.7%)
Above +Adjacent to Cloudy	2,007,781	1,717,075 (85.5%)	210,232 (10.5%)	80,474 (4.0%)

Confidently cloudy + Probably cloudy + Cloud shadow + Adjacent pixel not confidently clear

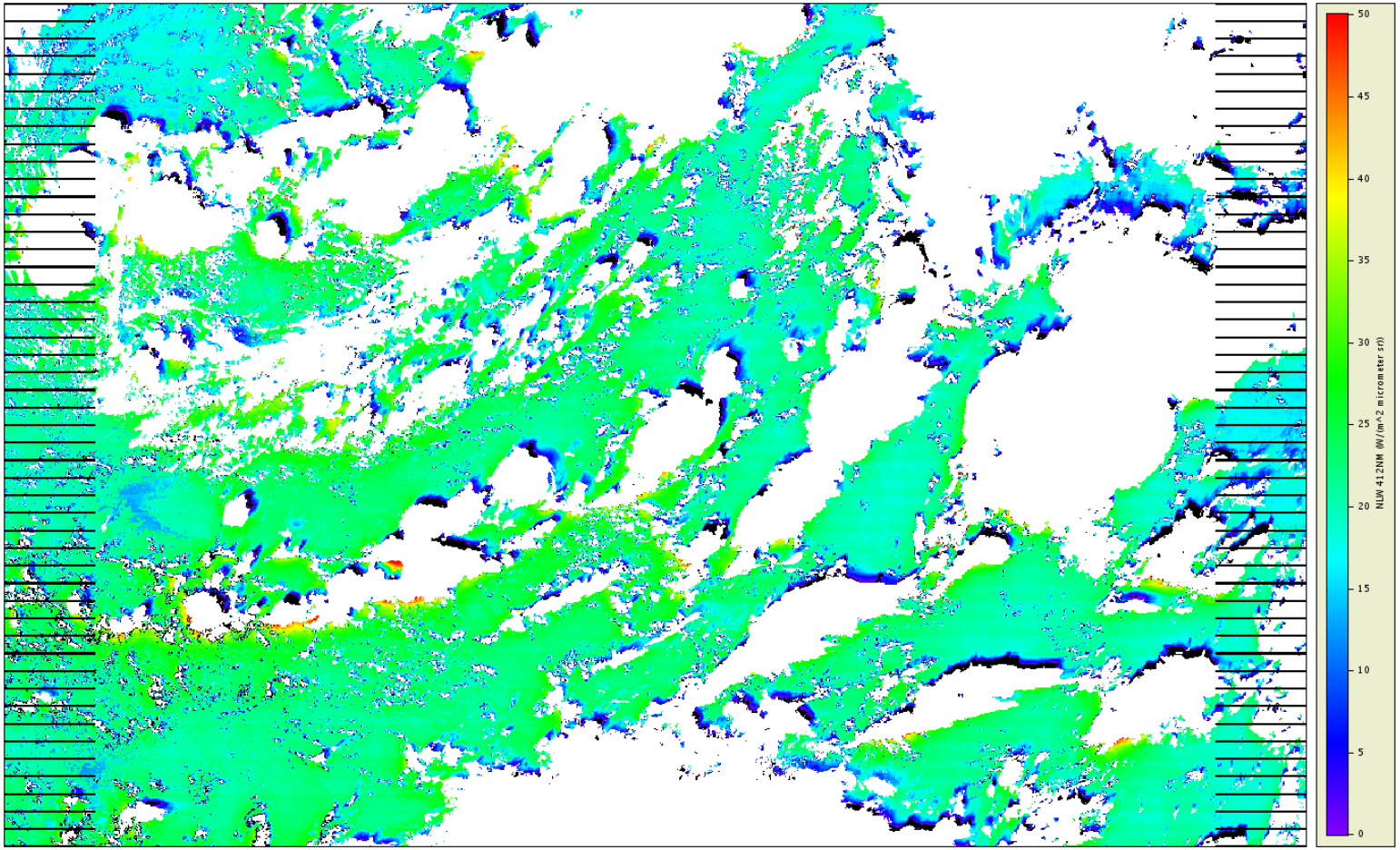
NOAA-MSL12 CM vs. IDPS CM (Case 2)

Table 2. MSL12 and IDPS Cloud Mask/Flag Comparisons

IDPS flag used as mask	Either One (MSL12 + IDPS	Both Two (MSL12 & IDPS)	MSL12 only	IDPS only
Confidently Cloudy	1,449,910	770,632 (53.1%)	679,051 (46.8%)	227 (0.0%)
Cloudy (+ Prob. Cloudy)	1,491,475	911,023 (61.1%)	538,660 (36.1%)	41,792 (2.8%)
Cloudy + Cloud Shadow	1,649,787	1,149,302 (69.7%)	300,381 (18.2%)	200,104 (12.1%)
Above +Adjacent to Cloudy	1,847,479	1,306,438 (70.7%)	143,245 (7.8%)	397,796 (21.5%)

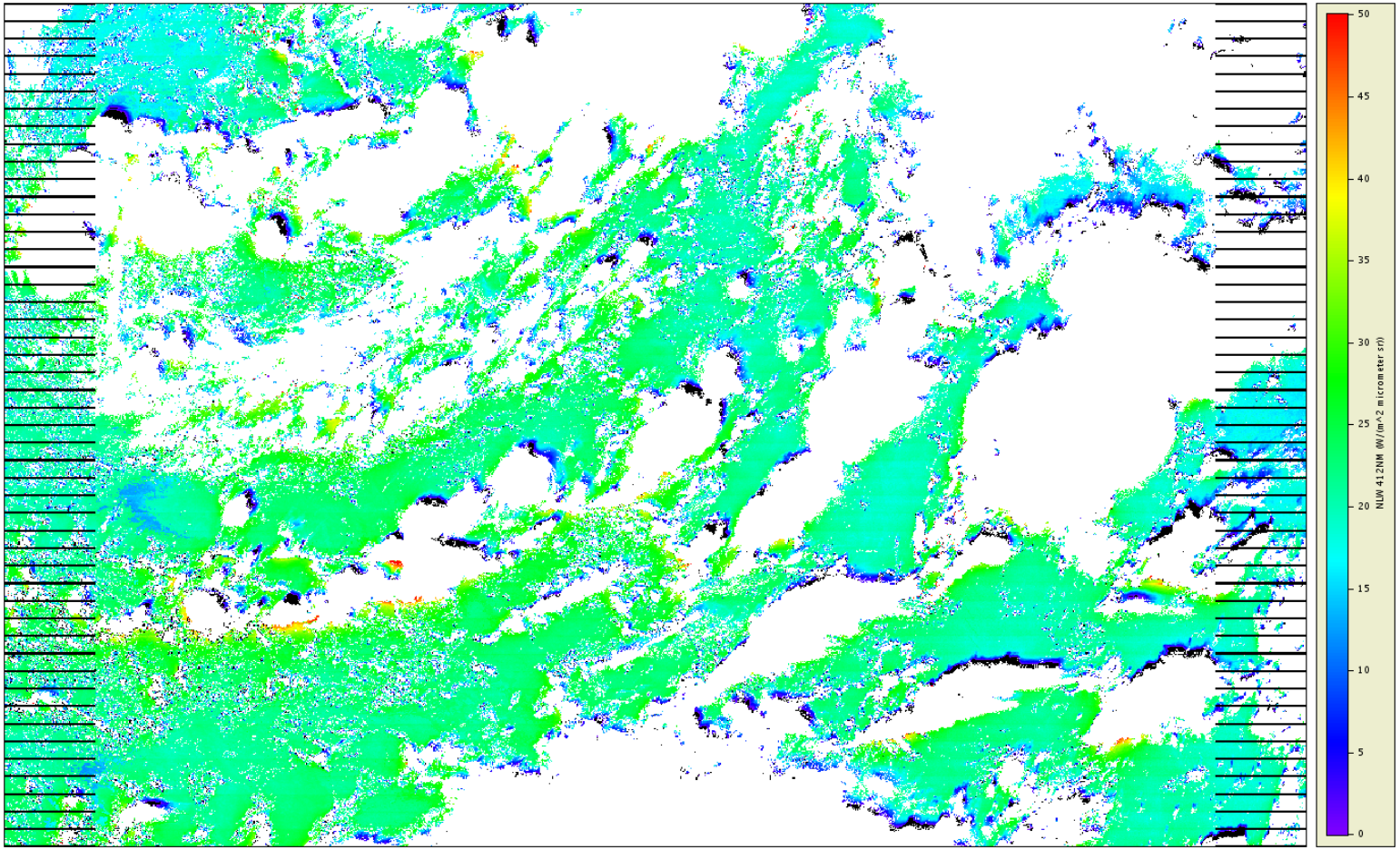
Confidently cloudy + Probably cloudy + Cloud shadow + Adjacent pixel not confidently clear

Confidently Cloudy



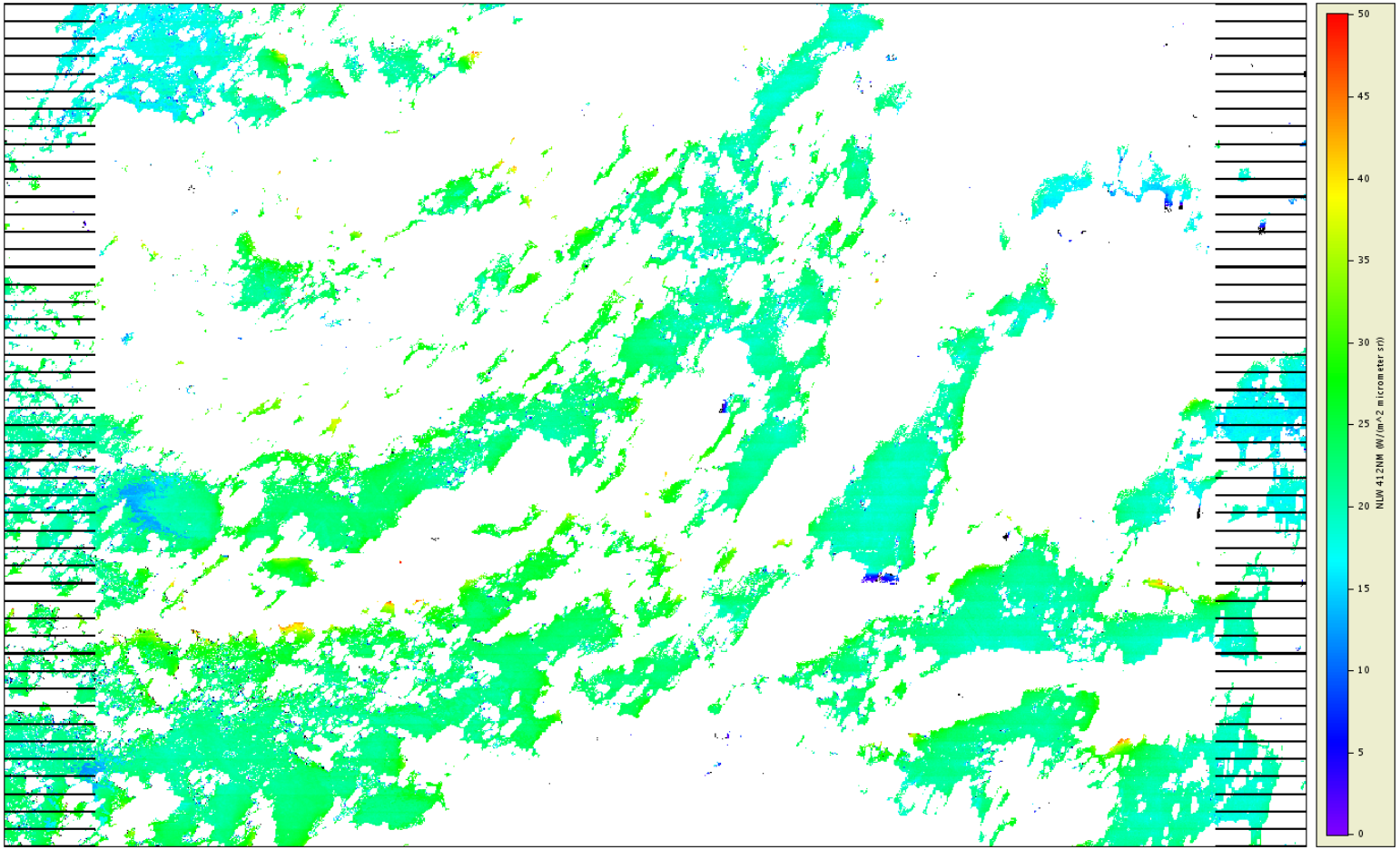
nLw(412)

Cloudy (Confident + Probable)



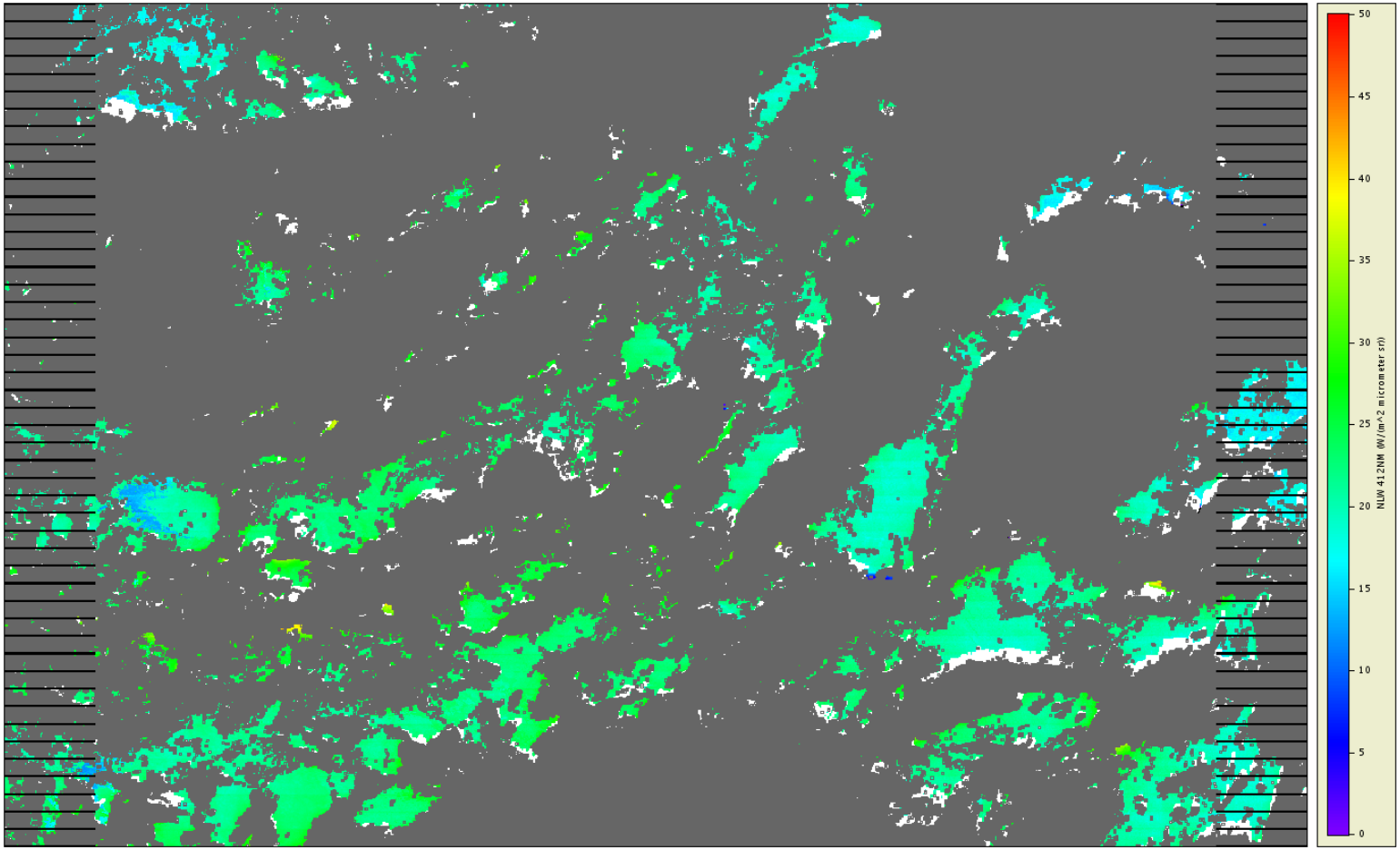
nLw(412)

Cloudy + Cloud Shadow



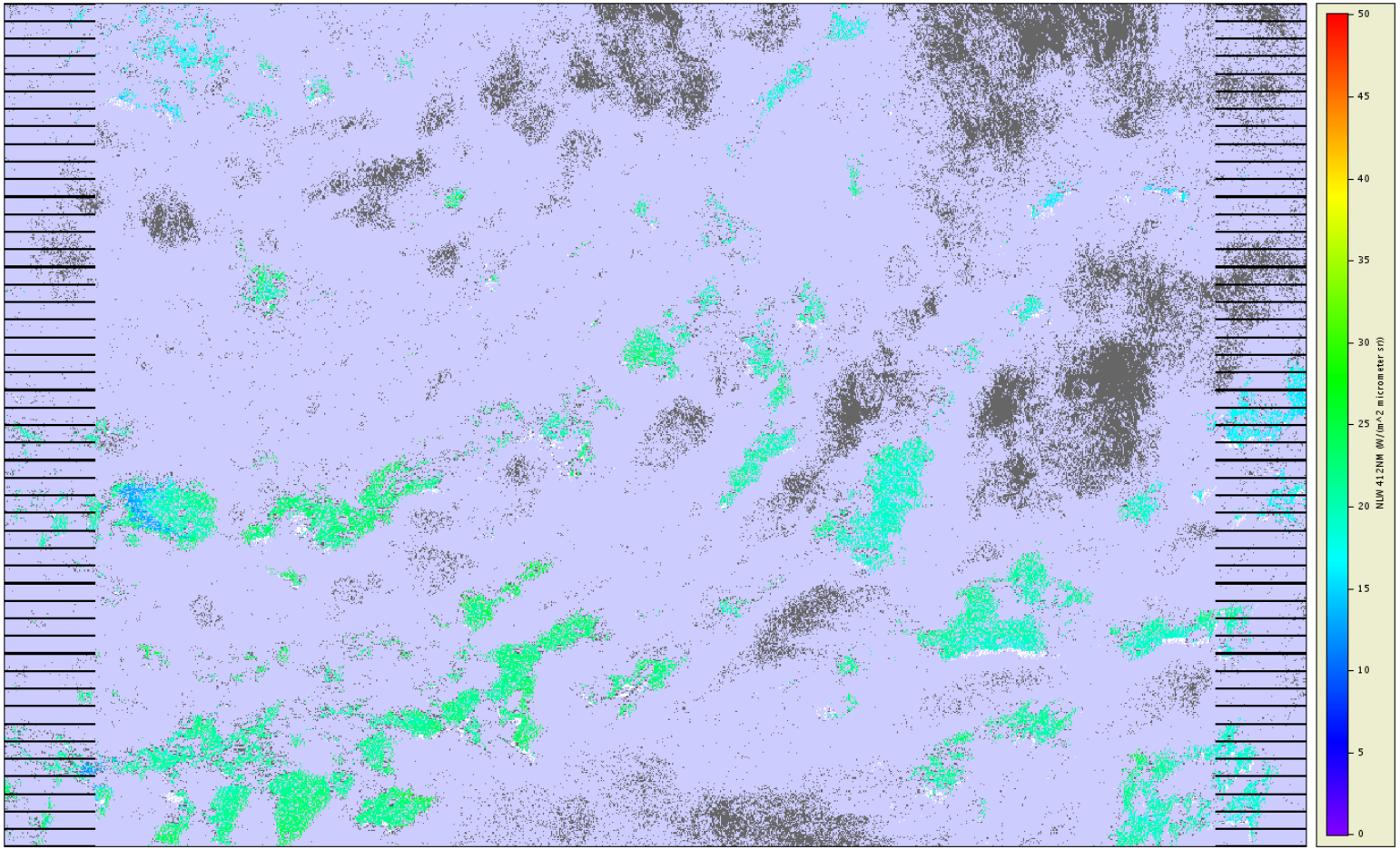
nLw(412)

Cloudy + Shadow + Adjacent pixel not confidently clear



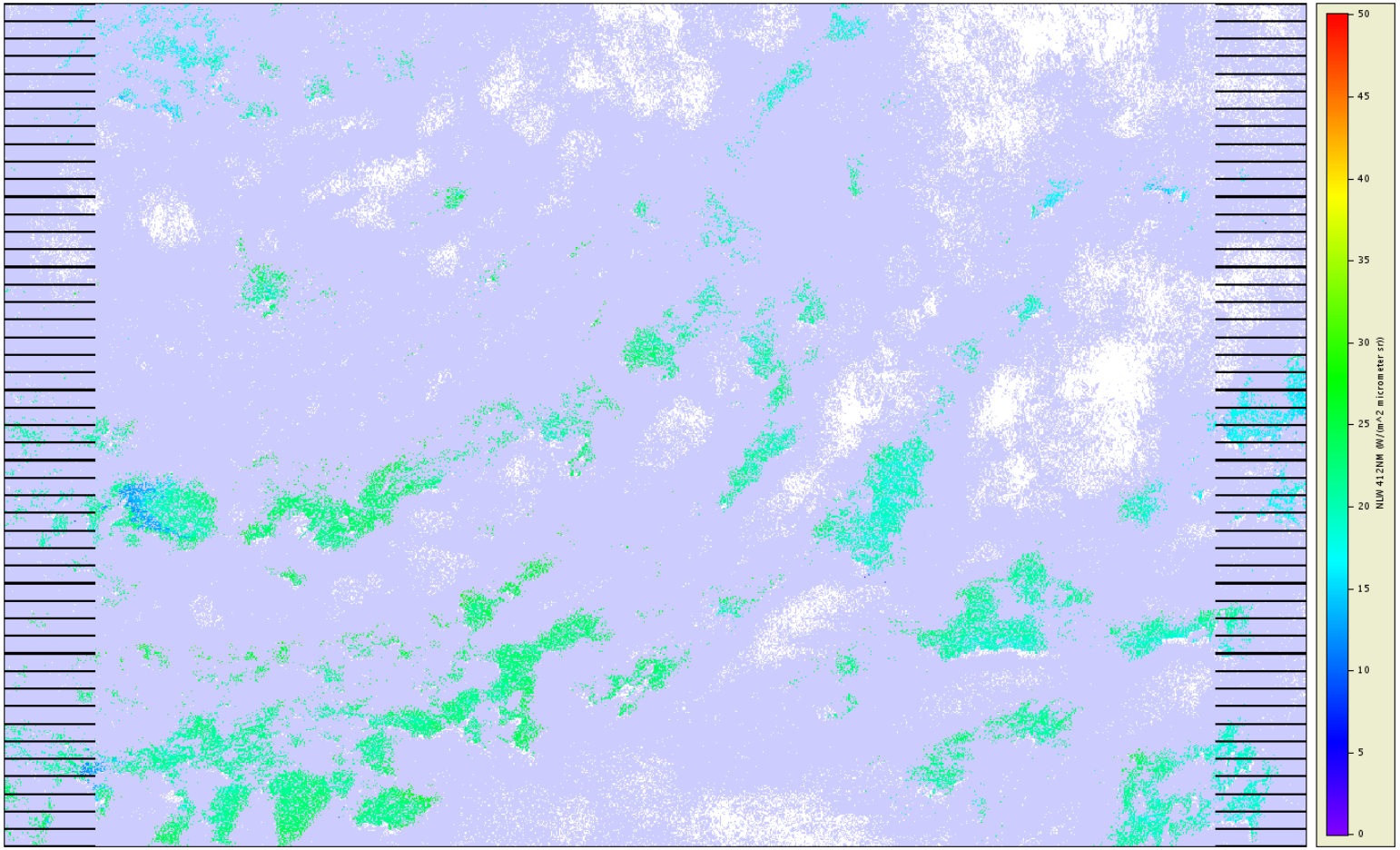
nLw(412)

Cloudy + Shadow + Adjacent + Bright Pixel



nLw(412)

Cloudy + Shadow + Bright Pixel



nLw(412)

Conclusion

- Overall, the quality of CM seems OK for VIIRS OCC EDR data processing.
- Since all data are retrieved in IDPS, except for “confidently cloudy” pixels, users can choose which flag(s) to apply for their purposes.
- However, it is important to understand the performance of each individual flag and when/how to apply it.
- Significant efforts are required to assess the performance of each individual flag and how to properly use it.

Thank You!