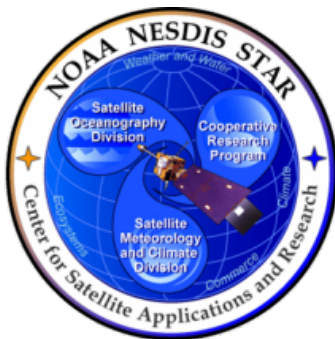


Evaluation of IDPS VIIRS Cloud Mask for Ocean Color EDR

Menghua Wang
VIIRS Ocean Color Team



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)

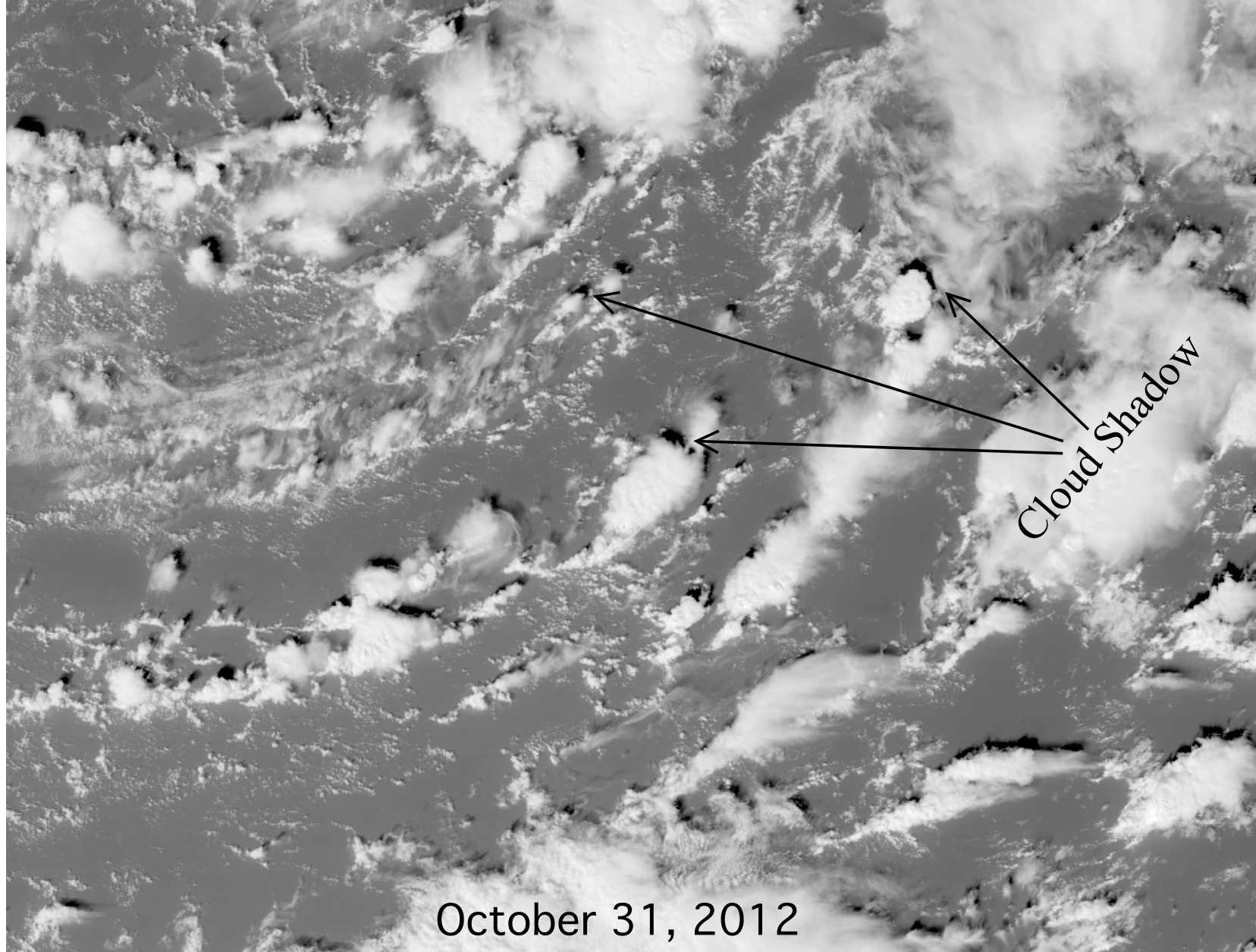
- May consider: QF7_VIIRSOCCEDR, inherited from VIIRS Bright Pixel IP: Bright Target Flag (bit 5)
- IDPS VIIRS OCC EDR only masks all pixels as “confidently cloud”, and leaves the options of masking other flags to users. The pixels contaminated by cloud straylight will likely be flagged as bright targets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

NOAA-MSL12 Cloud Mask (CM)

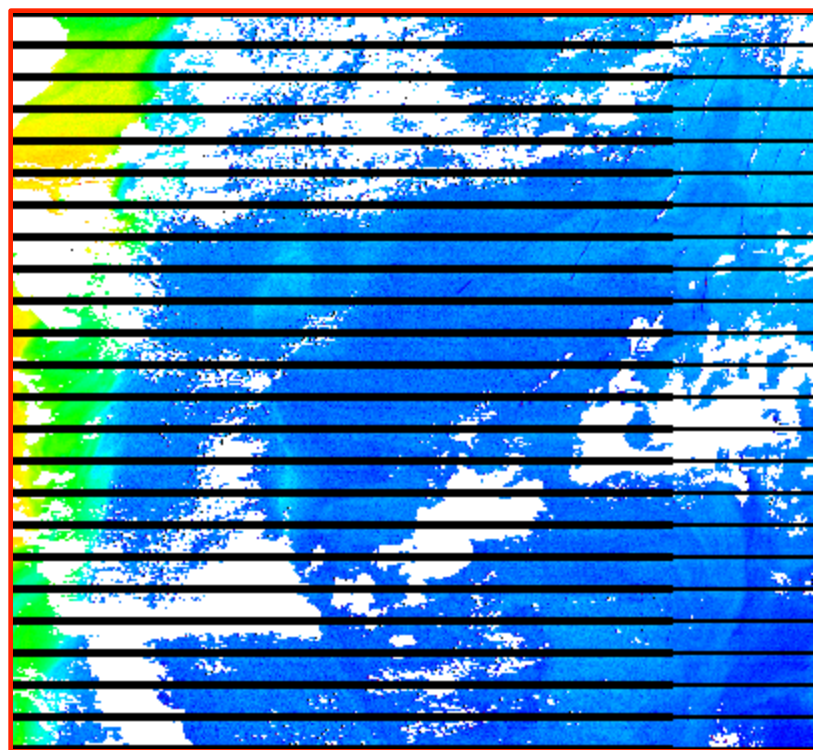
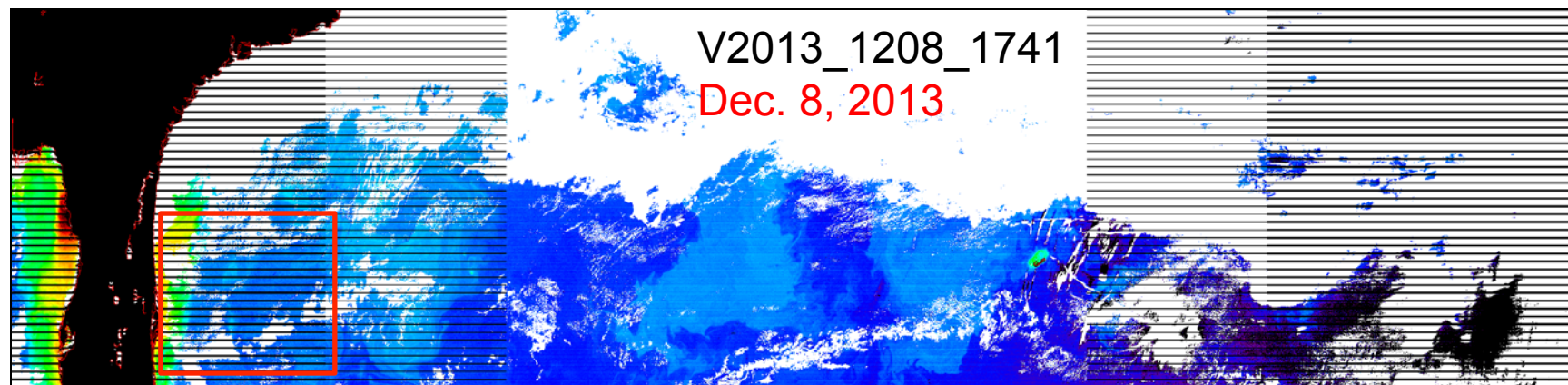
- Heritage CM for the ocean color data processing is based on Rayleigh-corrected reflectance at the VIIRS NIR band M7 (862 nm).
- Results from NOAA-MSL12 CM agrees with NASA-L2GEN CM (~95%).
- *Jiang and Wang* (2013) developed a new method for straylight flag for VIIRS ocean color data processing.
- Straylight flag and cloud flag is mutually exclusive (i.e., straylight flag only applies to non-cloudy pixels).

Jiang, L. and M. Wang (2013), "Identification of pixels with stray light and cloud shadow contaminations in the satellite ocean color data processing," *Appl. Opt.*, **52**, 6757–6770.

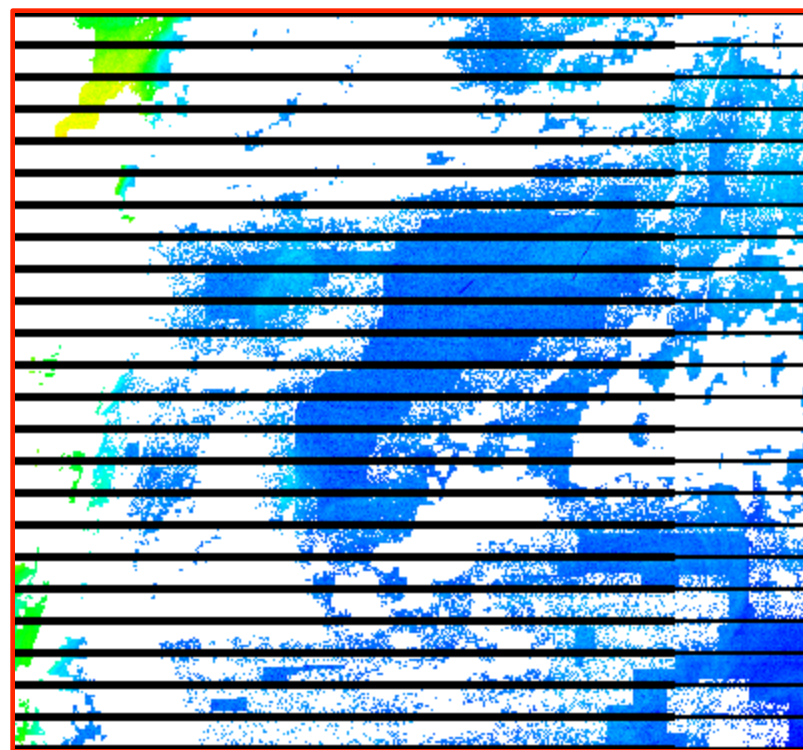
Rayleigh-Corrected TOA Radiance at 410 nm



Example of NOAA-MSL12 Cloud & Straylight Flags



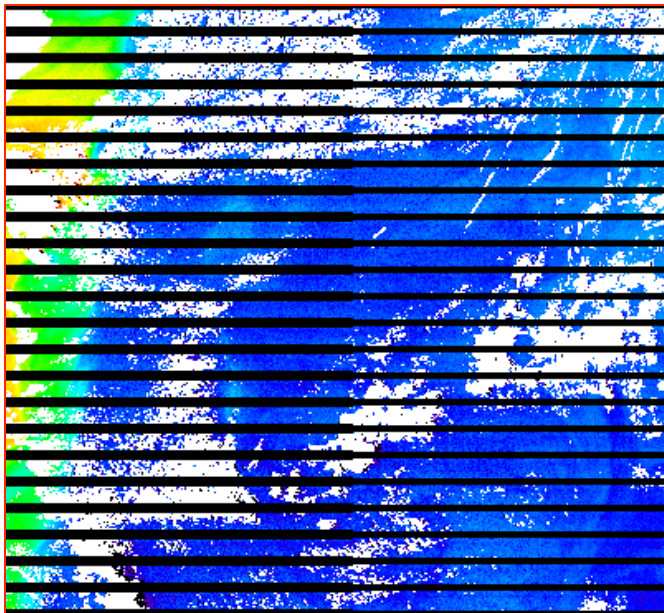
Cloud flags



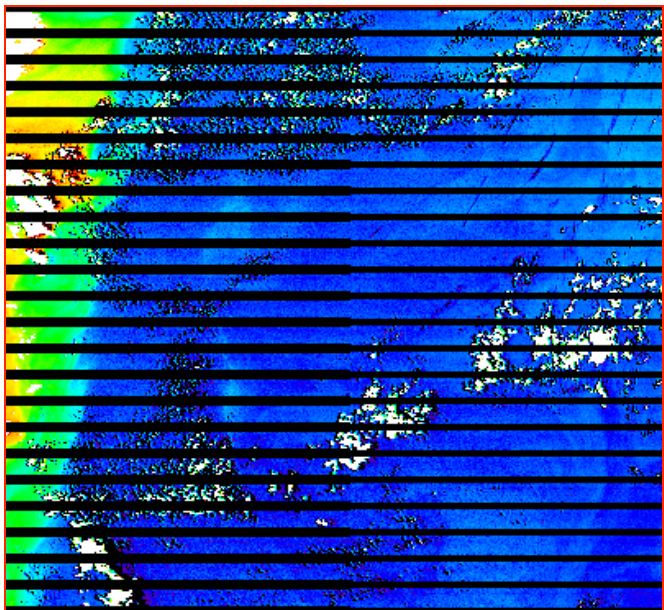
Cloud & Stray-light flags

IDPS Cloud Flags

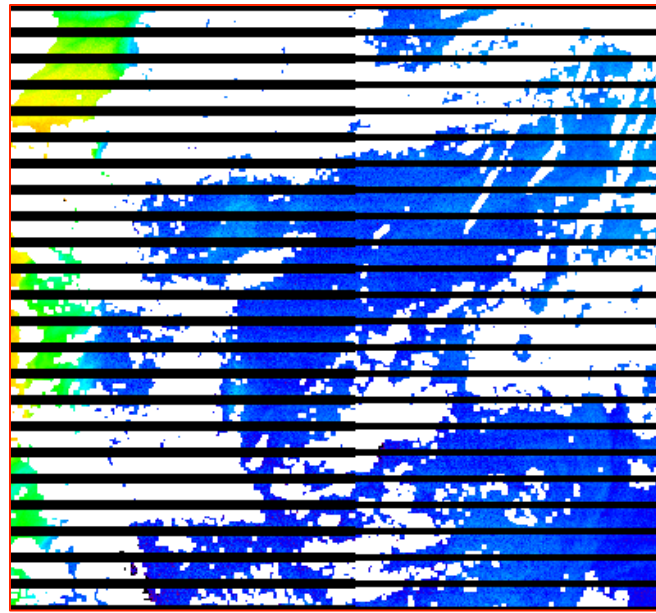
Confidently + Probably Cloudy
+ Probably Clear



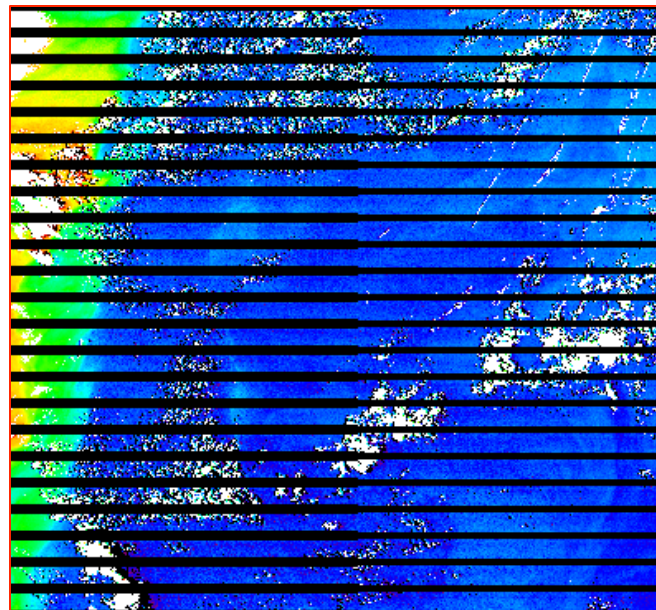
Confidently Cloudy



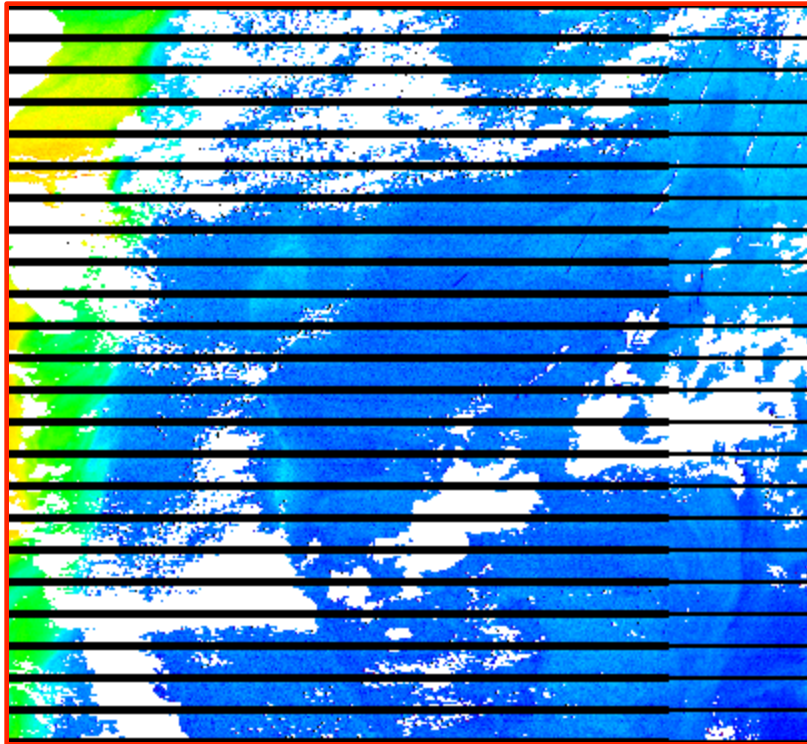
Confidently + Probably Cloudy
+ Probably Clear + Adjacent effects



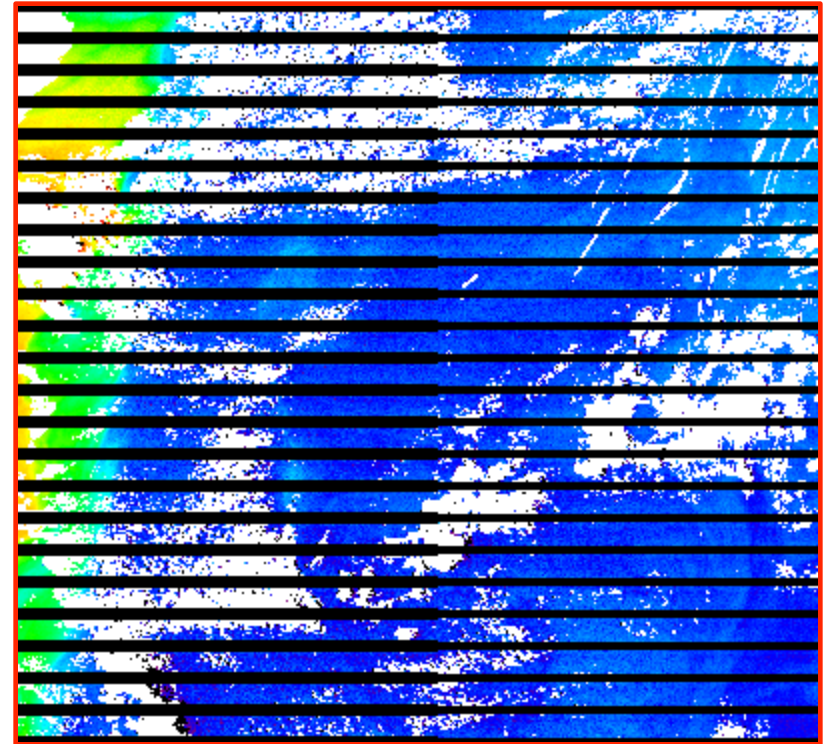
Confidently + Probably Cloudy



NOAA-MSL12 and IDPS Cloud Flags Comparisons (1)

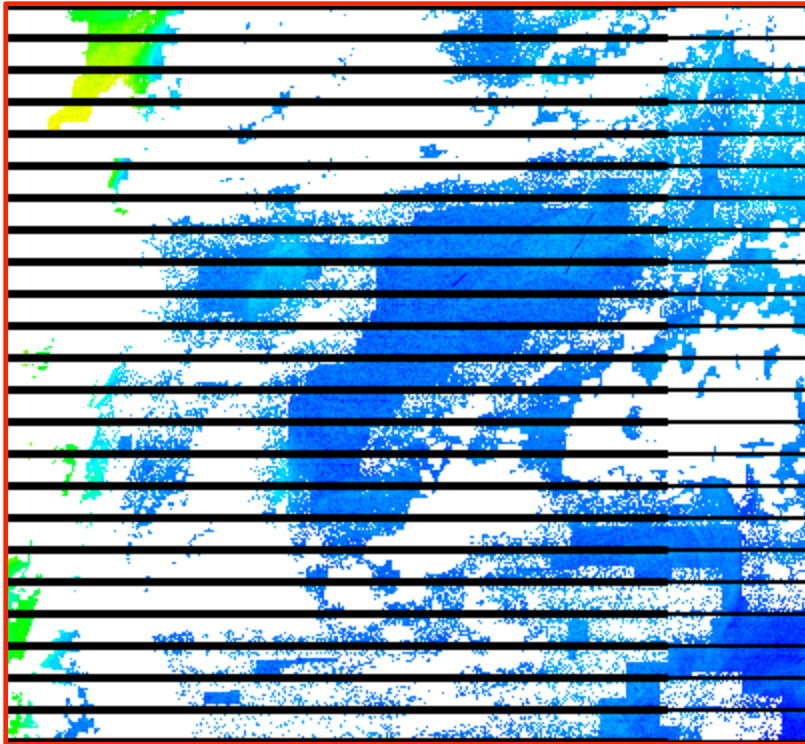


NOAA-MSL12: Cloud Flags

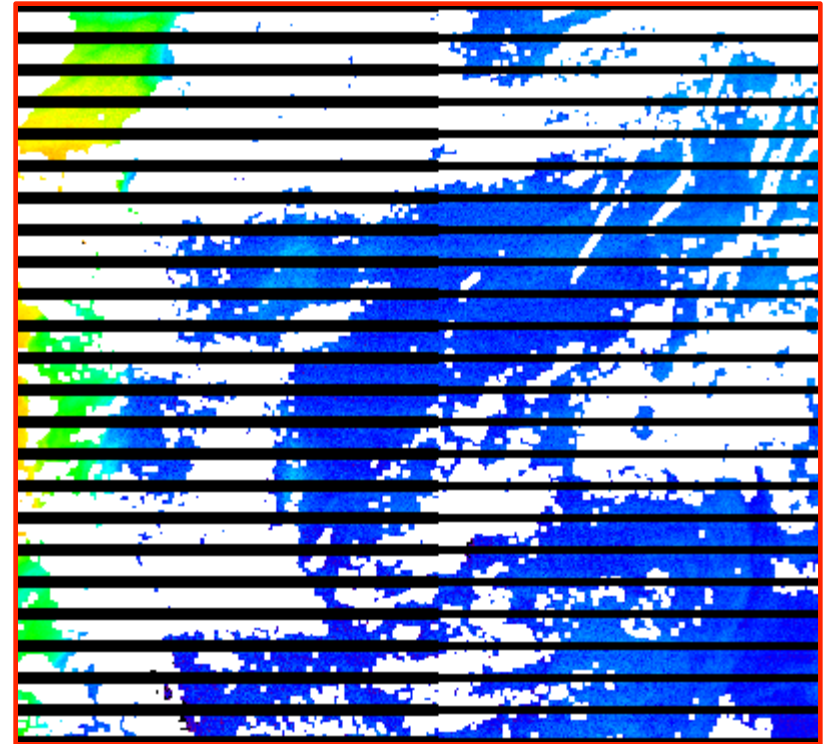


IDPS: Confidently Cloudy + Probably Cloudy
+ Probably Clear Flags

NOAA-MSL12 and IDPS Cloud Flags Comparison (2)



NOAA-MSL12: Cloud & Stray-light flags




IDPS: Confidently cloudy + Probably cloudy
+ probably clear + stray-light

Quantitative Summary

IDPS flags	# pixels (%)	NOAA-MSL12 flags	# pixels (%)
Confidently cloudy	4873 (3.1%)	--	--
Probably cloudy	6284 (4.1%)	--	--
Probably clear	23354 (15.2%)	--	--
Non-confidently clear	34511 (22.4%)	Cloud-Ice	34115 (22.15%)
Stray-light	56899 (36.95%)	Stray-light	38489 (24.99%)

Full Granules CM Comparison (**IDPS** vs. **MSL12**)

IDPS flag used as mask	Either One (MSL12 or IDPS)	Both Two (MSL12 & IDPS)	MSL12 only	IDPS only
Confidently Cloudy	1,276,080	809,395 (63.4%)	381,160 (29.9%)	85,525 (6.7%)
Cloudy (+Prob. Cloudy)	1,293,070	903,342 (69.9%)	287,213 (22.2%)	102,515 (7.9%)
Cloudy + Cloud Shadow	1,367,135	981,816 (71.8%)	208,739 (15.3%)	176,580 (12.9%)
Above + Adjacent Effects	1,638,336	1,090,367 (66.6%)	100,188 (6.1%)	447,781 (27.3%)



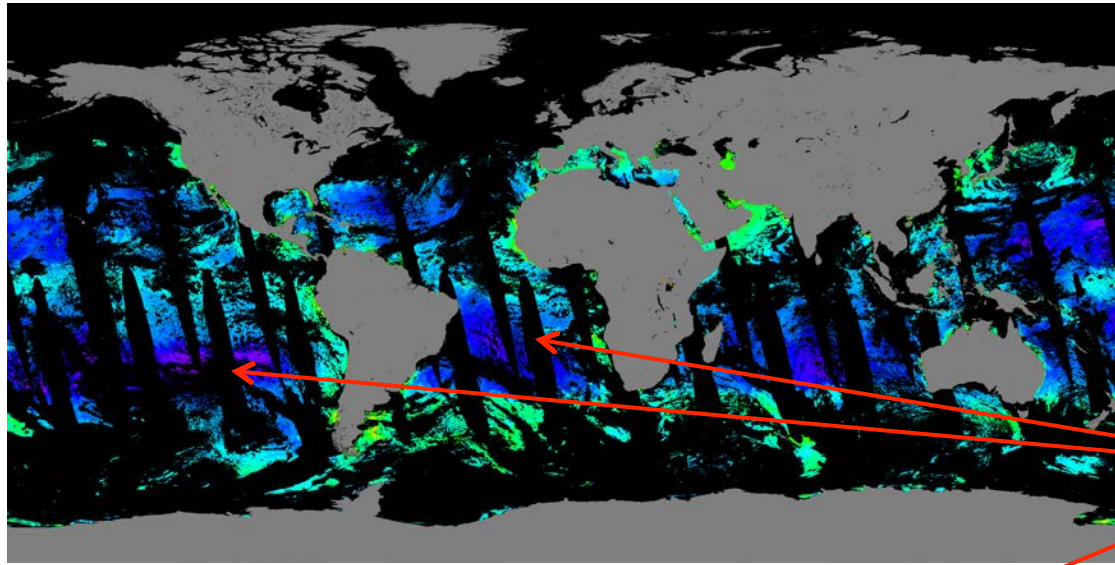
Confidently Cloudy + Probably Cloudy + Cloud Shadow + Adjacent pixel not
confidently clear

Full Granules Comparison (MSL12 CM + NOAA Straylight)

IDPS flag used as mask	Either One (MSL12 or IDPS)	Both Two (MSL12 & IDPS)	MSL12 only	IDPS only
Confidently Cloudy	1,641,422	809,715 (49.3%)	746,502 (45.5%)	85,205 (5.2%)
Cloudy (+Prob. Cloudy)	1,645,428	916,646 (55.7%)	639,571 (38.9%)	89,211 (5.4%)
Cloudy + Cloud Shadow	1,678,708	1,035,905 (61.7%)	520,312 (31.0%)	122,491 (7.3%)
Above +Adjacent Effects	1,760,164	1,334,201 (75.8%)	222,016 (12.6%)	203,947 (11.6%)

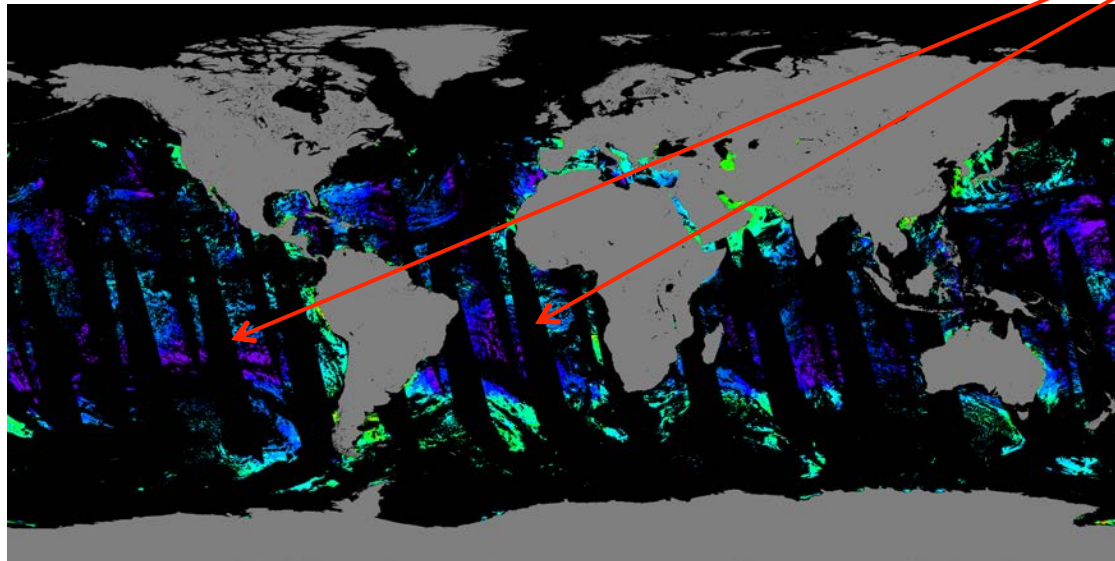
Confidently cloudy + Probably cloudy + Cloud shadow + Adjacent pixel not
confidently clear

Sun Glint Flag (1)



December 8, 2013 global
Chl-a images

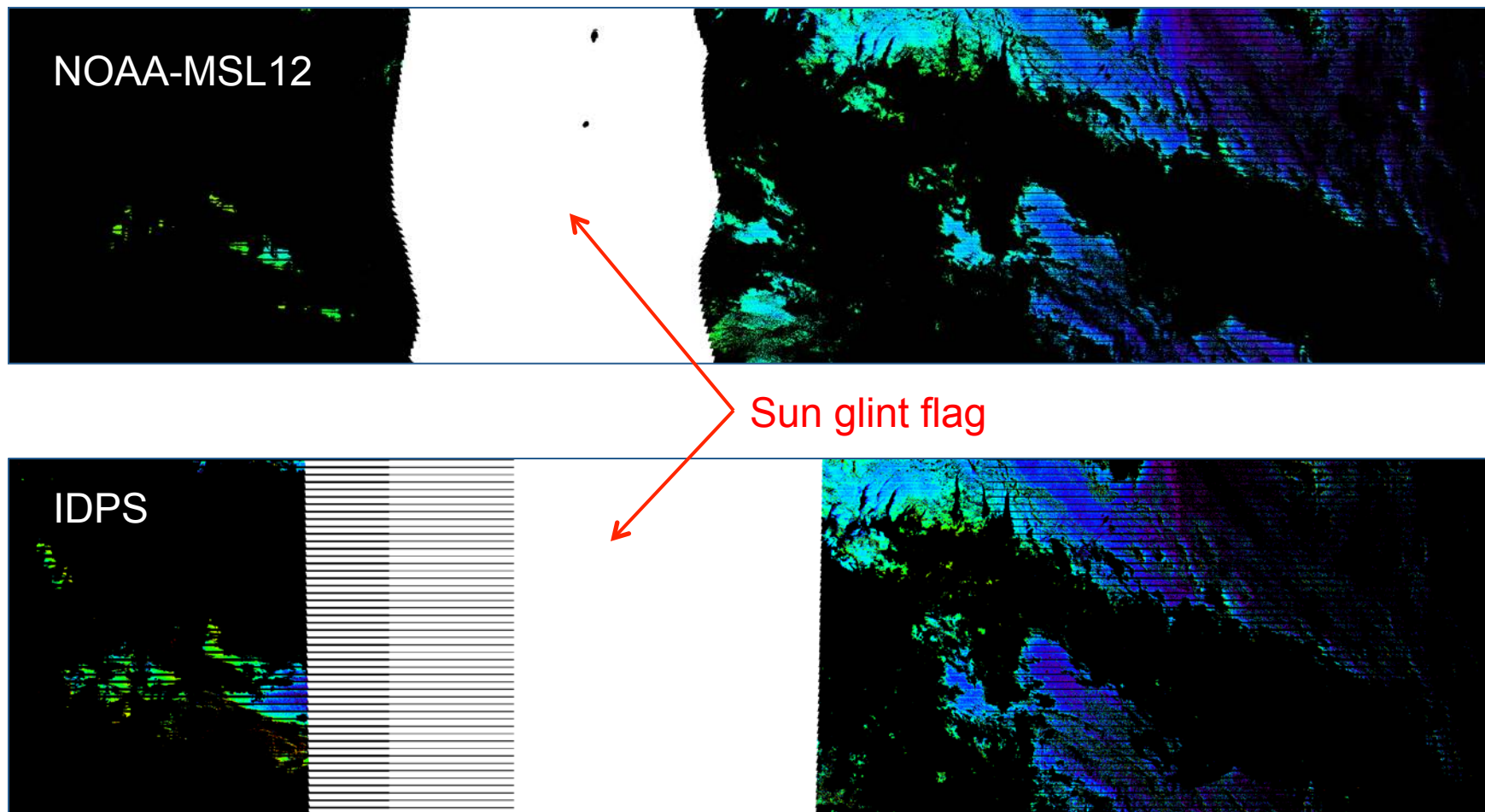
NOAA-MSL12



IDPS

Sun Glint Flag

Sun Glint Flag (2)



V2013_1208_2228 location: [South Pacific Gyre](#)

Conclusion

- Overall, the quality of VCM seems OK for VIIRS OCC EDR data processing.
- However, the VCM sun glint flag masks more area than that from the NOAA-MSL12 high-glint flag. **Thus, more useful data are masked using the VCM sun glint flag.**
- 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!

