

Possibilities for OC-CCI v4.0

This is a short list of some possible improvements to include in v4.0. Currently only contains input from the engineering teams at PML & BC, plus comments from PML's scientific-engineer-crossover ninja.

IDEPIX improvements (MODIS)

Time needed:

- Development: ???
- Runtime: 1 week

In v3.0 we had to give up on using idepix for MODIS due to lots of bad pixels coming in. A big part of it was straylight, but also low light conditions and other factors - this can be gleaned from the QC emails at the time. BC has stated an intention to improve on this for v4.0. The alternative is sticking with the (very heavy-handed) NASA flagging.

IDEPIX for VIIRS

Time needed:

- Development: ???
- Runtime: 1 week?

Doesn't exist yet. Might be part of the VIIRS CCN? Marco says he thinks it on the list.

OLCI incorporation

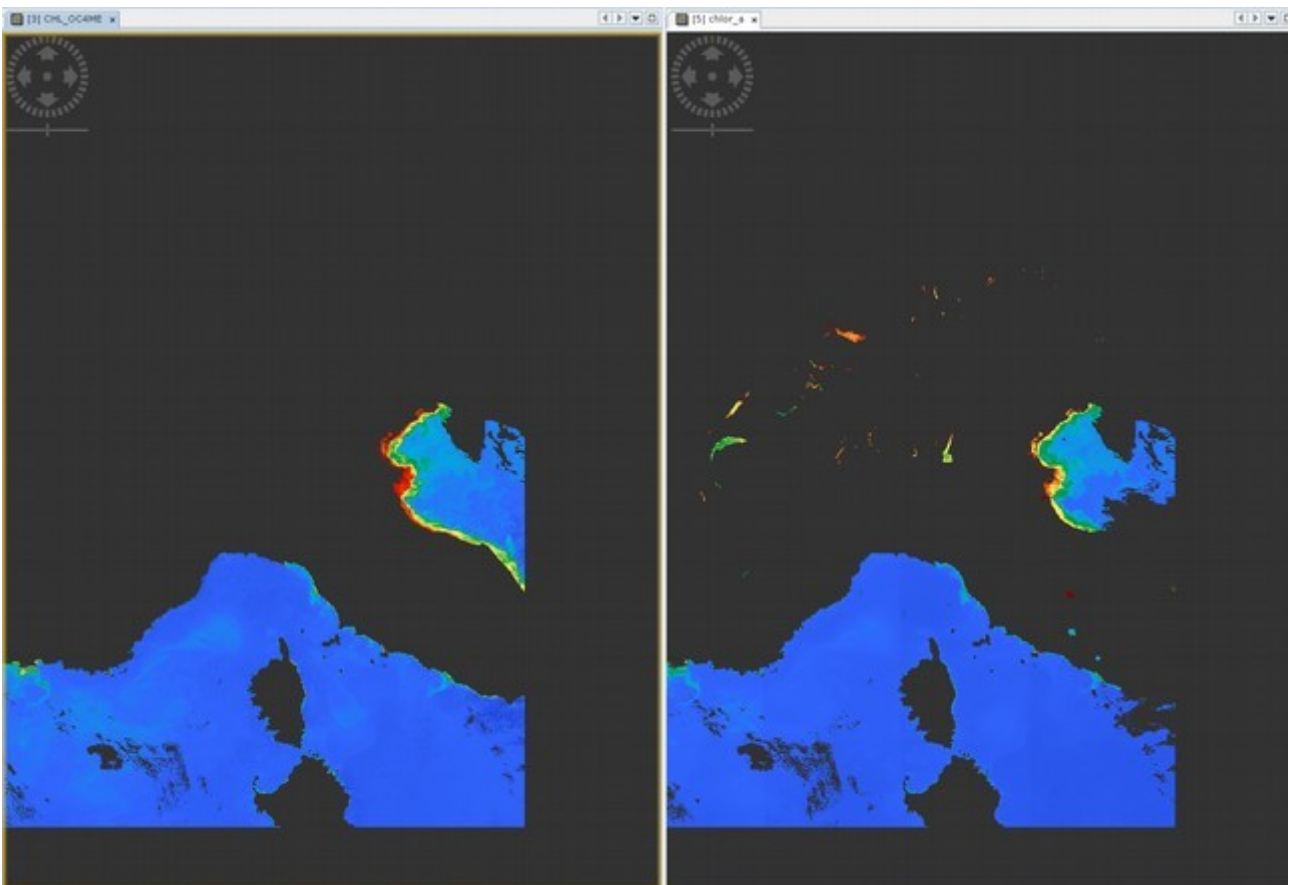
Time needed:

- Development: ??? (large parts done)
- Runtime: 2 months?? (l2gen, ~50 machines; polymer would be faster)

It now looks moderately likely that there will be some initial data available (max ~6-8 months) within the timeframe of v4.0. This will likely be poor quality for the initial months, maybe improving towards the end.

Several processors may be available: POLYMER (beta?), l2gen (hackable/untuned prototype), ESA/EUMETSAT L2 (pre-release), c2rcc (being tuned). These are not yet ready, either in terms of processing time or output quality/correctness.

We could potentially incorporate these data in a limited test-set form, but we cannot bias correct it with the current methods (insufficient data). It cannot be in the main v4.0.



OLCI level 2 (Italy), EUMETCAST L2 (left) vs preliminary l2gen output (right). [credit: Nick Selmes @ PML]

Choice of bandset

Time needed:

- Development & testing: 2 weeks?
- Runtime: already included in processing estimates

This is independent of the debiasing reference sensor, surprisingly. It precedes debiasing.

The methodology used in OC-CCI is basically to convert the inputs to IOPs, use these IOPs as parameters into a spectral model and read out values at any selected wavelength. Currently we use SeaWiFS centre wavelengths, which are mostly supported by nearby bands in the native sensors (MERIS, MODIS, VIIRS).

We suggest that we try shifting to OLCI bands, which are nearly identical to MERIS ones:

MODIS	OLCI	MERIS	SeaWiFS	VIIRS
	400			
412.5	412.5	412.5	412	412
443	442.5	442.5	443	445
469				
488	490	490	490	488
faked in all OC-CCI	510	510	510	faked in v3.0
531				
551				
555	560	560	555	555
	620	620		
645				
667	665	665	670	672
	673.75			
678	681.25	681.25		
	708.75	708.75		
				746
748	753.75	753.75		
	761.25	760.625		
	764.375		765	
	767.5			
	778.75	778.75		
858.5	865	865	865	865
869.5				
	885	885		
905	900	900		
936				
940	940			
	1020			

Table of center wavelengths per sensor (bandwidths vary, but are normally around 10-20nm). Green = current OC-CCI bands. Red = faked in v3.0 or earlier. Yellow = v4.0 fake, if we used OLCI/MERIS band (probably incomplete).

We should make a few tests, decide on the bandset and whether we should create (and/or release) bands them when they don't exist / don't have nearby support on the native sensor. We currently do this at 510nm for MODIS (distant support at 531nm+/-5nm) and VIIRS (no support).

Choice of reference sensor for debiasing

Time needed:

- Development & testing: 3 weeks?
- Runtime: already included in processing estimates

This is independent of the bandset chosen, surprisingly. This stage necessarily occurs after bandshifting as we need the bands to be identical to make comparisons. The only consideration on bandsets is that “unsupported” bands (meaning those where the native sensor doesn't have a nearby waveband) may be less true to the real world than supported ones.

The current methodology produces daily bias maps that give a per-pixel correction for that day, in the event that both sensors in a pair had a pixel present to compare. The inputs are heavily averaged to smooth them and to increase the likelihood of a pairing - the initial inputs are weekly composites, averaged into a 5 year climatology, then each day is temporally-averaged over a 60 day window and spatially-interpolated by up to 11 pixels.

For v3.0, we used SeaWiFS as the reference and corrected VIIRS against MODIS-debiased-to-SeaWiFS-levels. For v4.0, we could retain SeaWiFS as the reference or choose a different sensor.

Mike's personal evaluation of the sensors:

1. SeaWiFS (GAC+LAC):

- Longest history, well trusted. Overlaps MERIS & MODIS. Ok pixel availability.
- Requires bridging to reach VIIRS (over debiased-MODIS) as in v3.0.
- Requires bridging to reach OLCI, either over debiased-MODIS (very dubious) or over debiased-MODIS-debiased-VIIRS (ugly double-hop).

2. MODIS:

- Decent quality and best overlap (touches everything). Ok-high pixel availability depending on flagging.
- Sensor degradation in later years makes it dubious to use in direct overlap with VIIRS or OLCI. However, we already do this for VIIRS in 2012/13 (hopefully pre-degradation, but no choice anyway).
- OLCI could be done directly, but is in the high degradation period. Better to make a single hop over debiased-VIIRS on the assumption that the 2012/13 degradation is less?

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- 3. MERIS:
 - Overlap same as SeaWiFS. High pixel availability with POLYMER+IDEPIX.
 - The duff eastern camera worries me a lot; it will skew the debiasing in an unpredictable way depending on which pixels are present in the various daily bias maps. Heavy averaging will spread this around, but will overall raise levels.
 - Requires bridging to reach VIIRS (over debiased-MODIS)
 - Requires bridging to reach OLCI, either over debiased-MODIS (very dubious) or over debiased-MODIS-debiased-VIIRS (ugly double-hop).
- 4. VIIRS & OLCI: insufficient overlap with other sensors. Insufficient data. No good.

Crazy stuff

- Bring in MODIS-Terra? NASA seem a lot happier with it than previously, e.g:
http://oceancolor.gsfc.nasa.gov/ANALYSIS/global/tr2014.0m_ar2014.0m/anomaly.html
 - Acquiring and L1c processing the data may be hard in the timeframe; could be months!

Minor stuff

- Start including insitu after 2012 in uncertainty table generation and IW RR? Currently we ignore everything after that date
- Fix IDEPIX generation crashes for a few hundred SeaWiFS passes (causes a few trivially small holes)
- Improvements to cloud/high-aerosol masking? Currently we have a couple of “magic” filters from Tom & François that clean up a few bits. We can just make these a permanent feature or could work on improving them.
 - Improvements would need time and testing; not so minor then!