

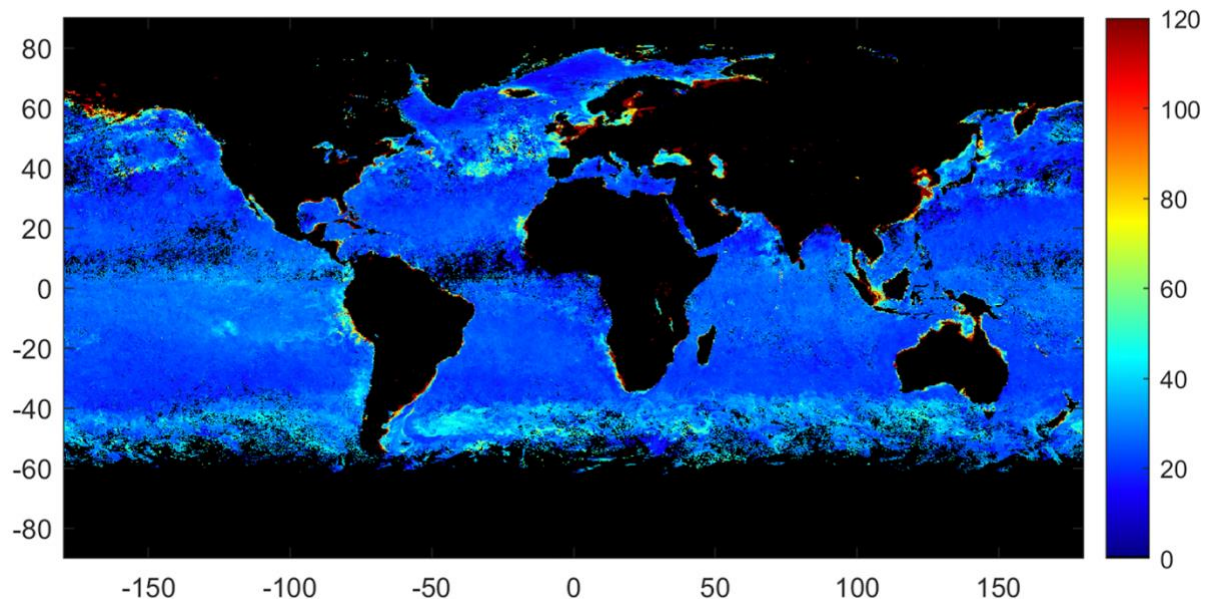
# Phytoplankton Carbon Concentration (carbon\_phyto)

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## 1 – Product Summary

This algorithm returns the concentration of the phytoplankton carbon (*carbon\_phyto*) in  $\text{mg m}^{-3}$ , calculated using an empirical relationship derived from field data between analytical measurements of *carbon\_phyto* and particulate backscattering coefficient (Graff et al. 2015). Implementation of the algorithm is contingent on the availability of particulate backscattering coefficient at 470 nm, that is currently derived using Generalized Inherent Optical Property (GIOP, Werdell et al., 2013) model output *bbp\_443\_giop* and *bbp\_s\_giop*.



Phytoplankton carbon distribution ( $\text{mg m}^{-3}$ ), MODIS A, April 2020.

Algorithm Point of Contact: Jason Graff and Toby Westberry, OSU

## 2 – Algorithm Description

**Input:**

*bbp\_s\_giop*  
*bbp\_443\_giop*

**Output:**

*carbon\_phyto*  
Phytoplankton Carbon (mg m<sup>-3</sup>)

**General Algorithm:**

The algorithm is a linear relationship between *bbp\_470* and *carbon\_phyto* where:

$$carbon\_phyto = a1(bbp\_470) + b1$$

**Where:**

a1 = 12,128

b1 = 0.59

Backscattering is calculated using the [Inherent Optical Properties](#) products (currently GIOP), where *bbp\_470* is derived from *bbp\_443\_XXX* assuming the power function of the backscattering spectral shape, using *bbp\_s\_XXX* as a slope coefficient, where XXX = {IOP MODEL}

$$bbp\_470 = bbp\_443\_xxx \left( \frac{470}{443} \right)^{bbp\_s\_xxx}$$

### 3 – Implementation

**Product Short Name:**

*carbon\_phyto*

**Level-2 Product Suite:**

None (available through SeaDAS command-line processing)

**Level-3 Product Suite:**

*carbon\_phyto* (test product)

**Calling in L2GEN:**

*l2prod* = *carbon\_phyto*

*iop\_opt* (int) (default=7) = IOP model for use in downstream products

1. None (products requiring a or bb will fail)
2. Carder
3. GSM
4. QAA
5. PML
6. NIWA
7. LAS

## 8. GIOP

To override using a variable bbp slope, specify: `bbp_s_{IOP MODEL}`  
e.g. `bbp_s_giop = -1`

## 4 – Assessment

Not available currently. TBD, product will be validated using SeaBASS phyto\_carbon data, using standard procedures for validation of the ocean data products.

## 5 – References

Graff, J.R., Westberry, T.K., Milligan, A.J., Brown, M.B., Dall’Olmo, G., Dongen-Vogels, V.v., Reifel, K.M., & Behrenfeld, M.J. (2015). Analytical phytoplankton carbon measurements spanning diverse ecosystems. *Deep Sea Research Part I: Oceanographic Research Papers*, 102, 16-25

Werdell, P.J., Franz, B.A., Bailey, S.W., Feldman, G.C., Boss, E., Brando, V.E., Dowell, M., Hirata, T., Lavender, S.J., & Lee, Z. (2013). Generalized ocean color inversion model for retrieving marine inherent optical properties. *Applied Optics*, 52, 2019-2037

## 6 - Data Access

TBD