Epsilon Averaging

define NIR aerosol radiance at pixel i for wavelength λ as:

$$L_a(\lambda,i) = [\ (L_t - tL_f)/t_{O3} - L_r\ ]/t_{O2}$$

given a scan/pixel window centered on pixel x, containing a total of n unmasked pixels, compute mean $L_a(\lambda)$ at x as:

$$\langle L_a(\lambda,x)\rangle = 1/n\ \ \Sigma\ L_a(\lambda,i),\ \ i=1,n \text{ for } \lambda=765 \text{ and } 865nm$$

compute mean epsilon at x as:

$$\varepsilon_x = \langle L_a(765,x)\rangle\ /\ \langle L_a(865,x)\rangle$$

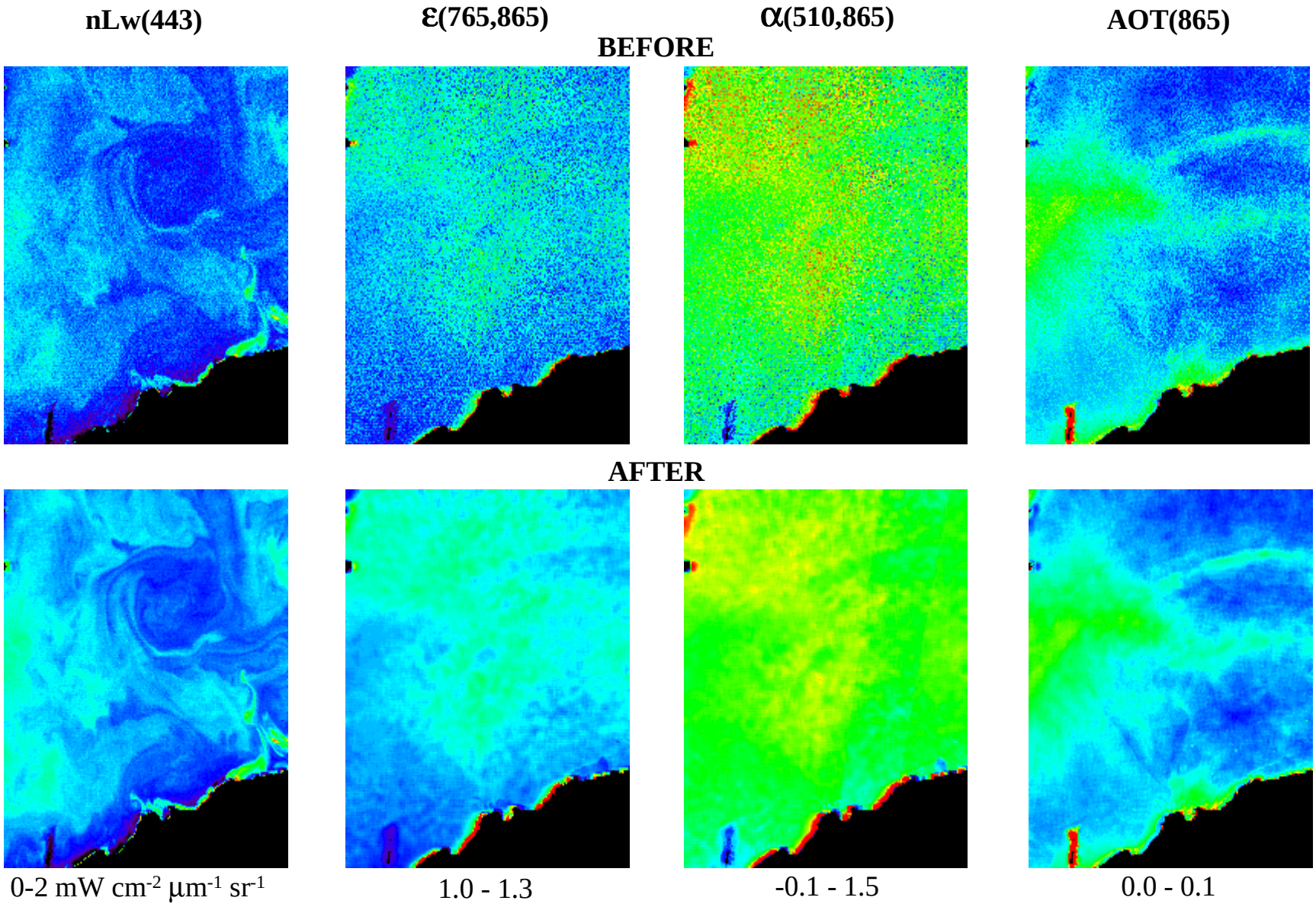
now compute a new $L_a(765,x)$ which would yield the mean epsilon when combined with the original $L_a(865,x)$:

$$L_a'(765,x) = \varepsilon_x\ L_a(865,x)$$

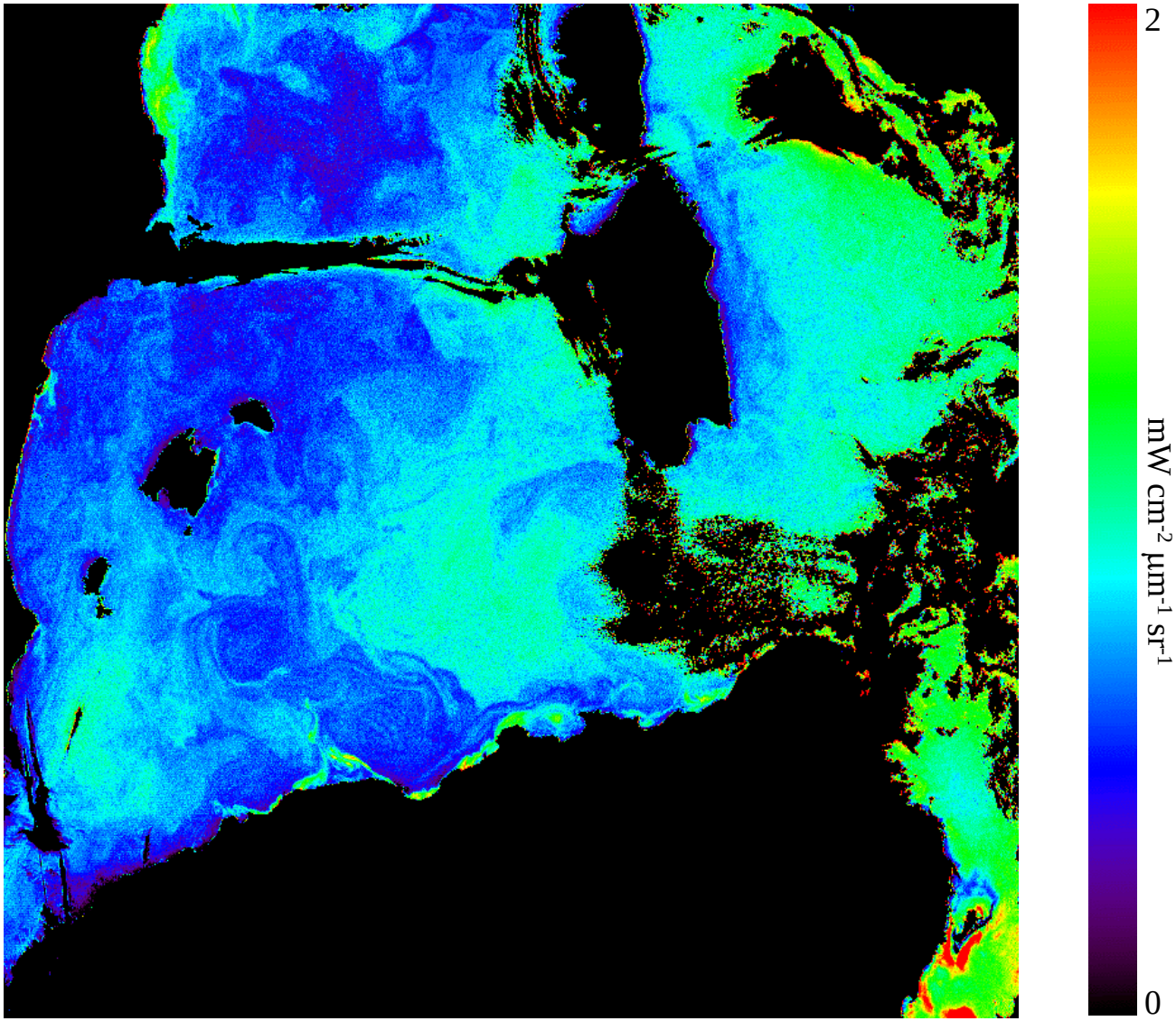
and reconstruct the TOA radiance at 765nm:

$$L_t(765,x) = [L_a'(765,x)\ t_{O2} + Lr]\ t_{O3} + tL_f$$

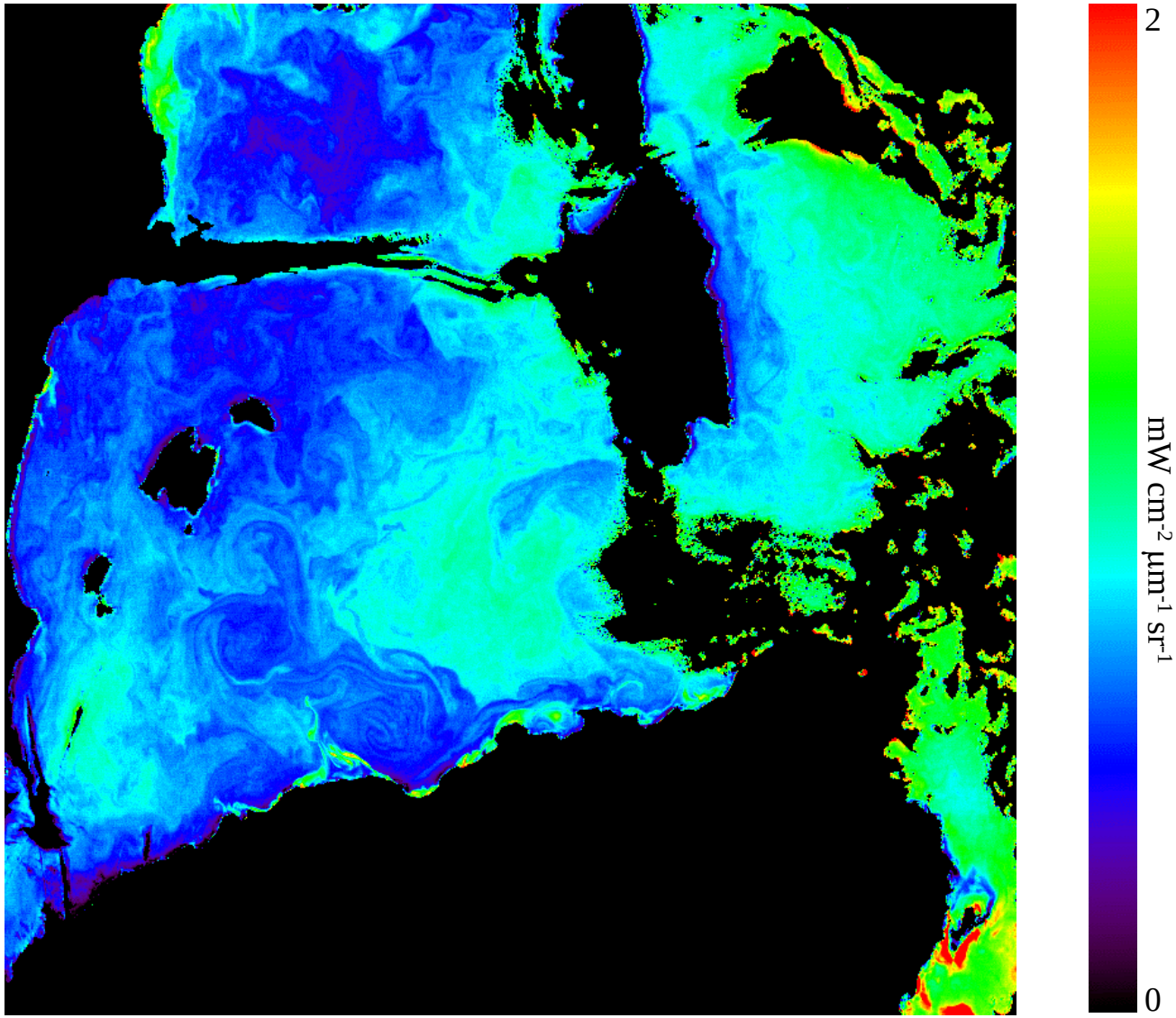
SeaWiFS Epsilon Averaging Results



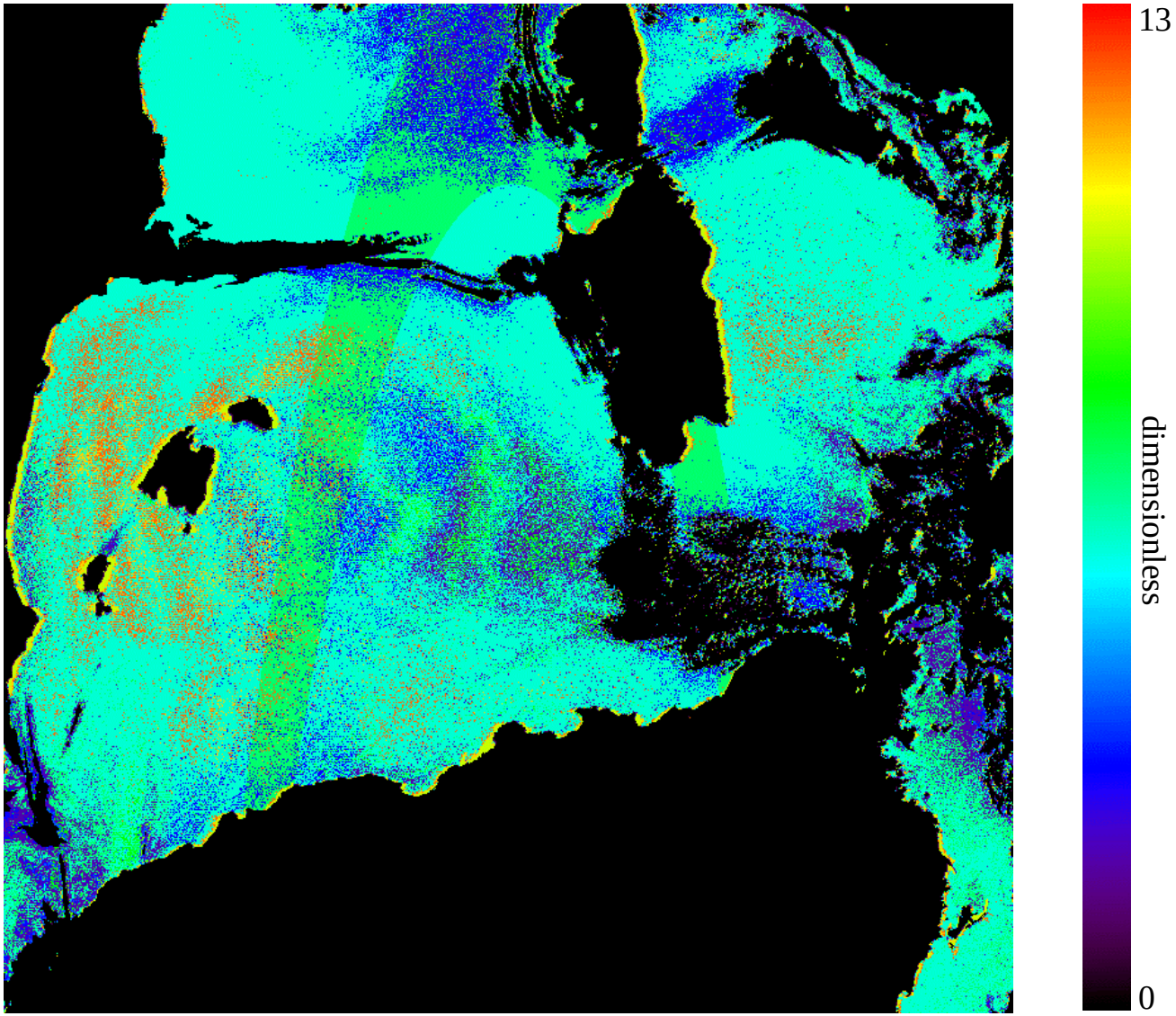
nLw(443), Standard Processing



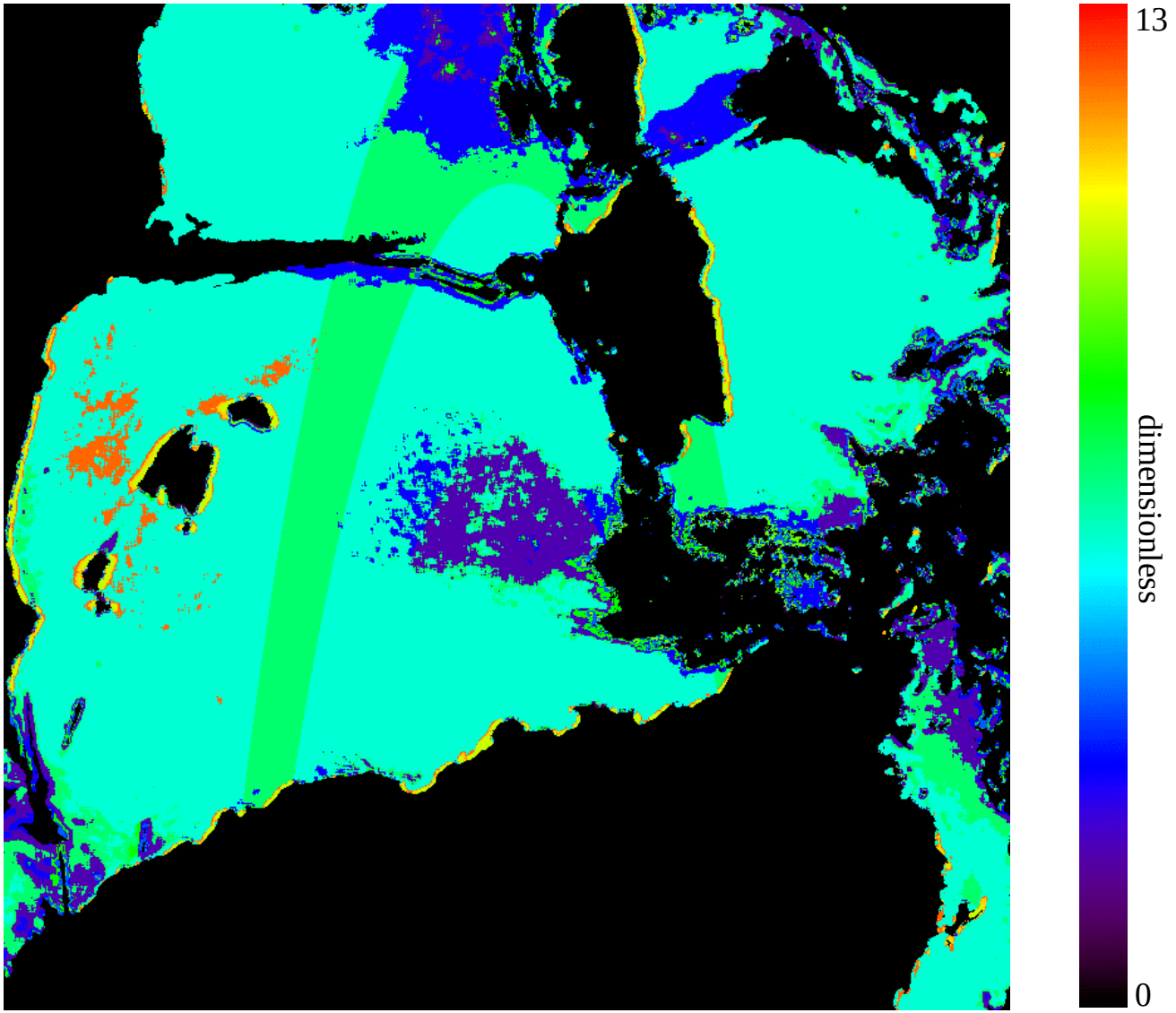
nLw(443), Epsilon 5x5 Averaging



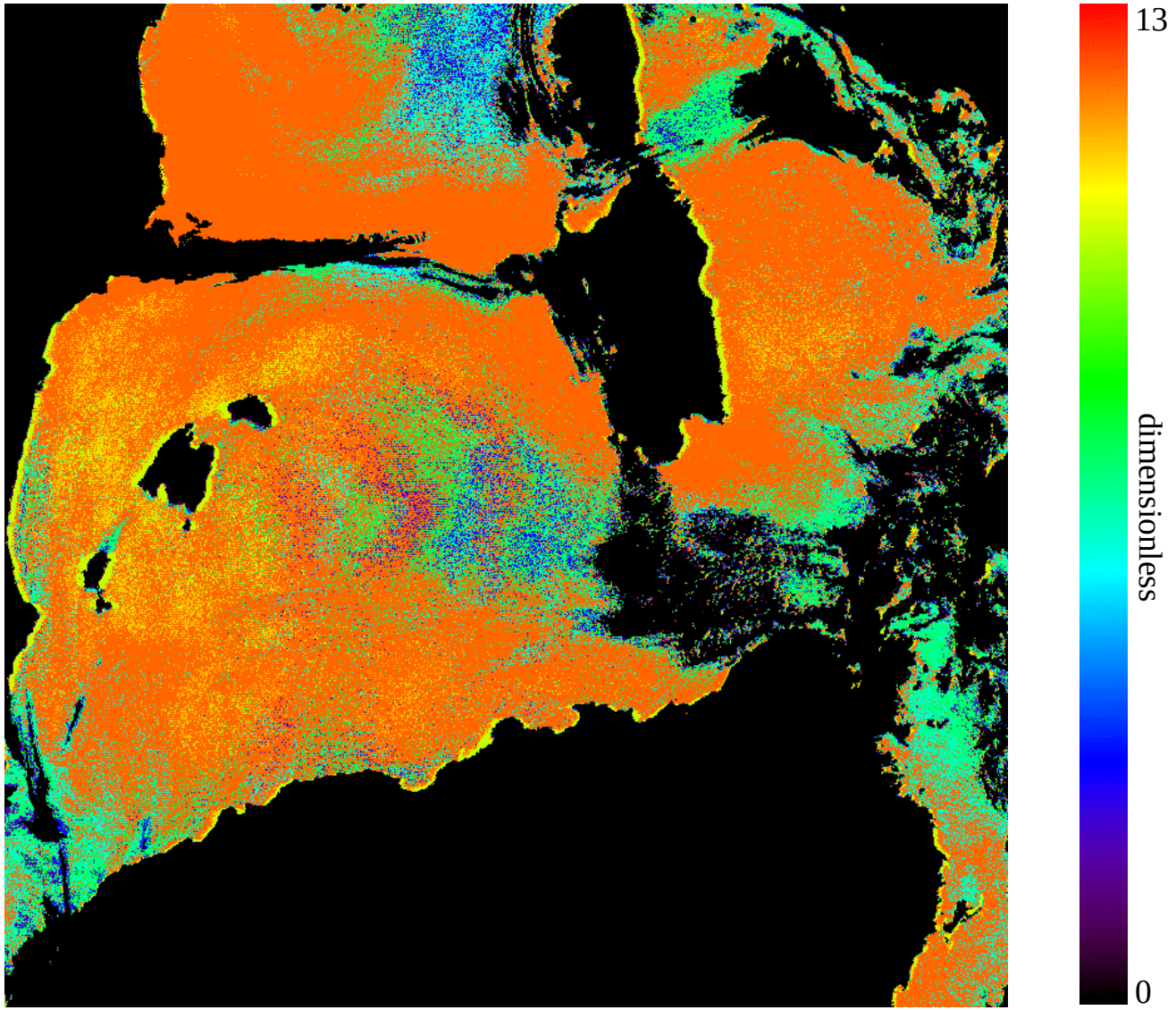
Lower Bounding Model, Standard Processing



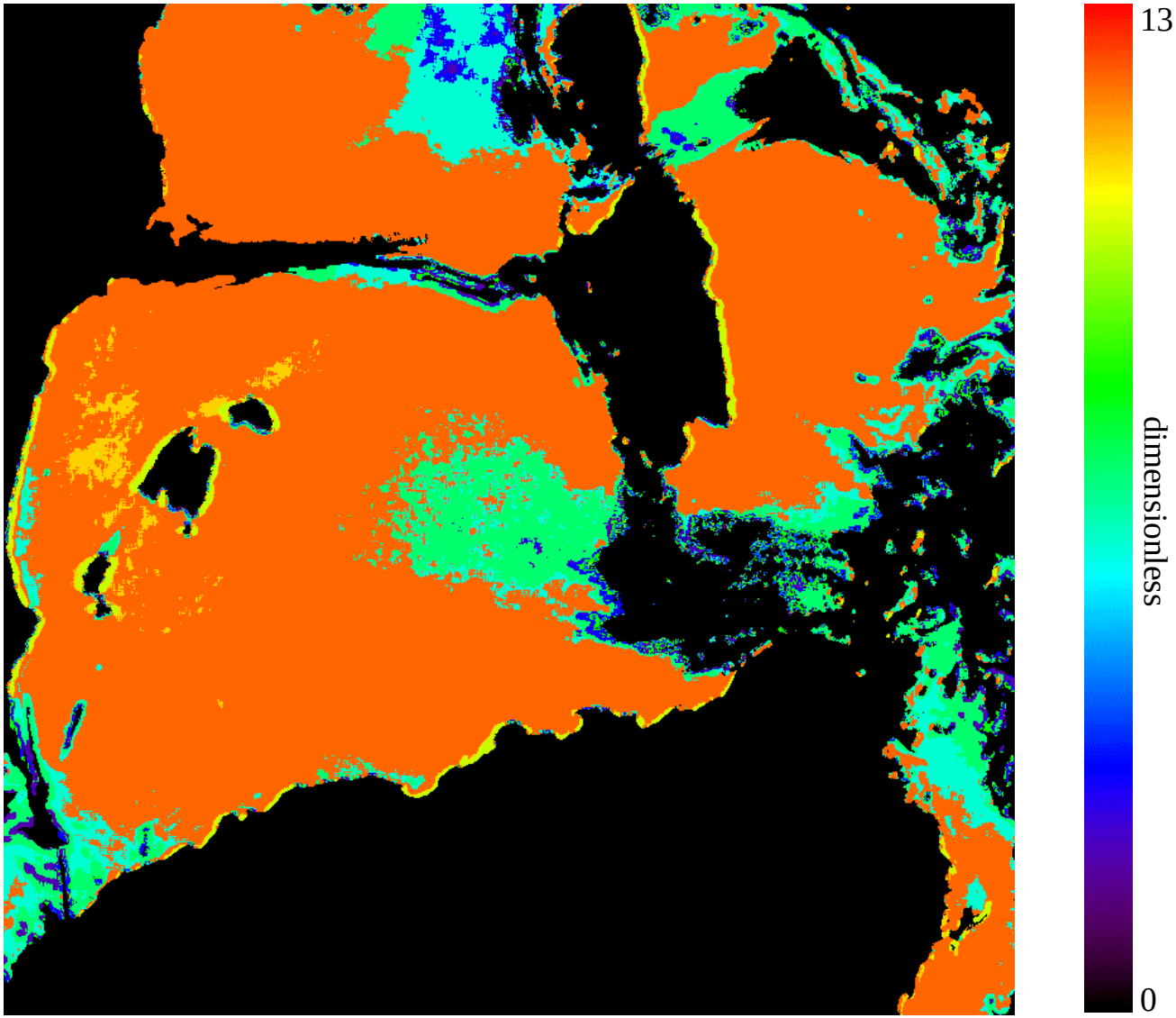
Lower Bounding Model, Epsilon 5x5 Averaging



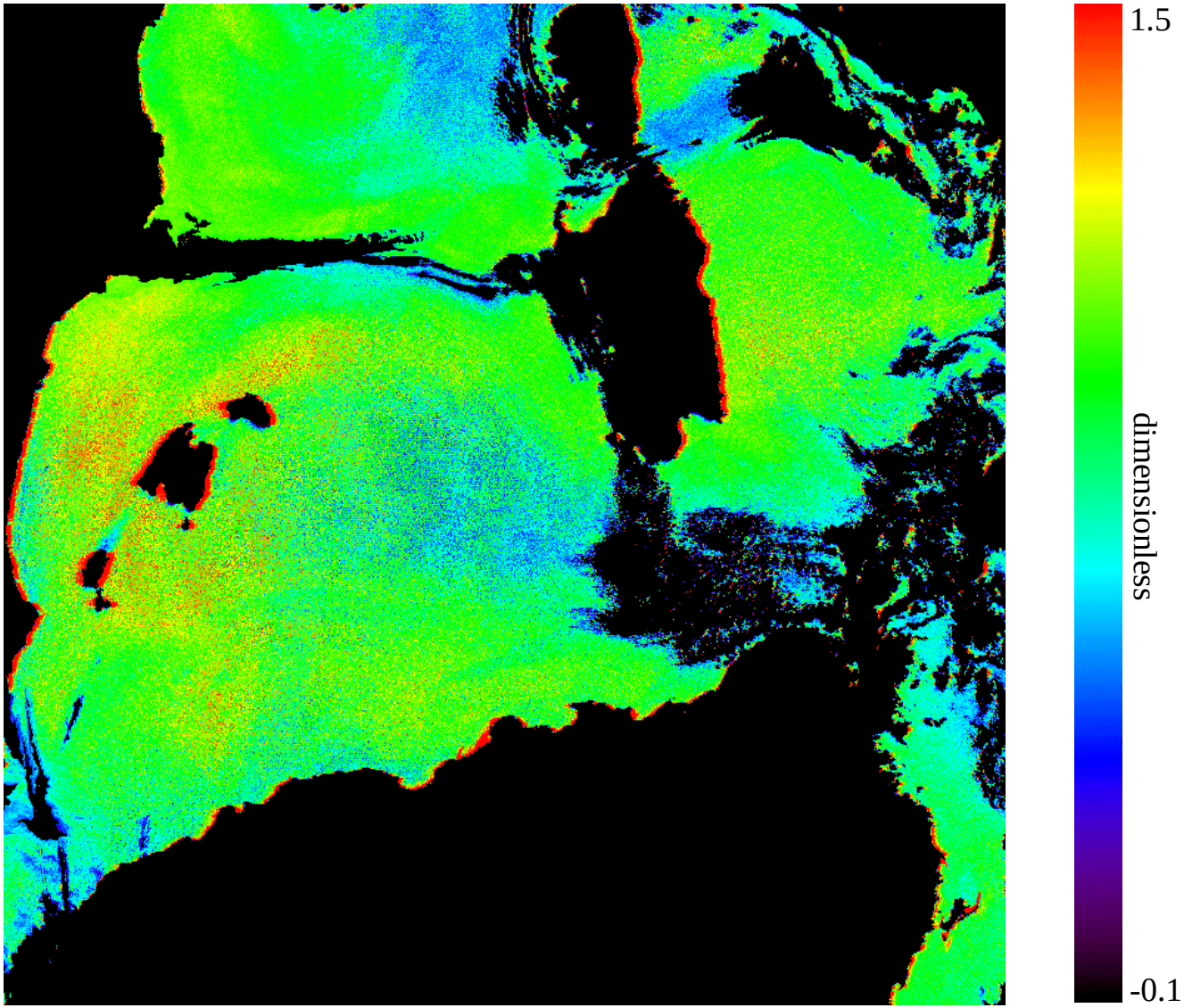
Upper Bounding Model, Standard Processing



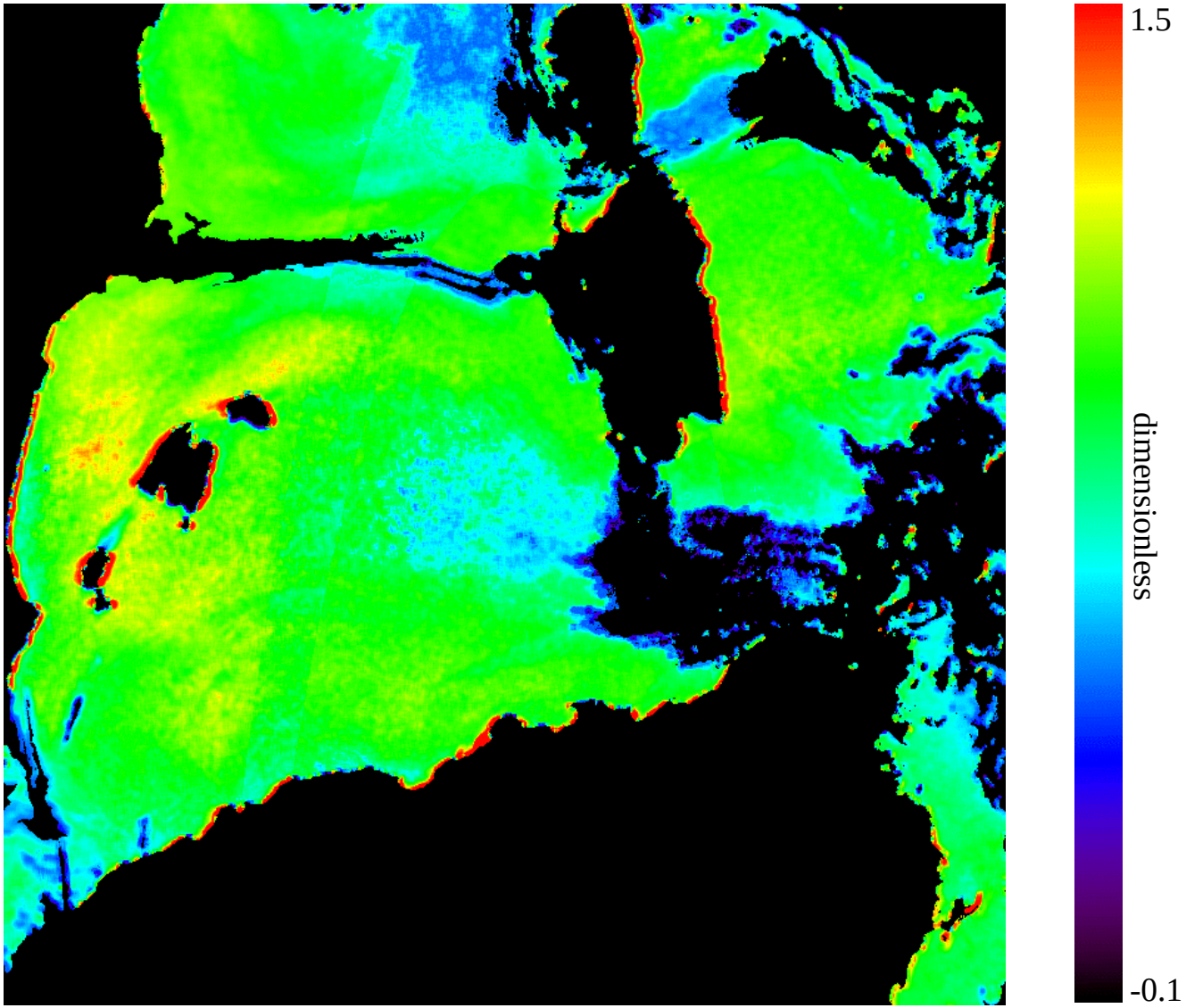
Upper Bounding Model, Epsilon 5x5 Averaging



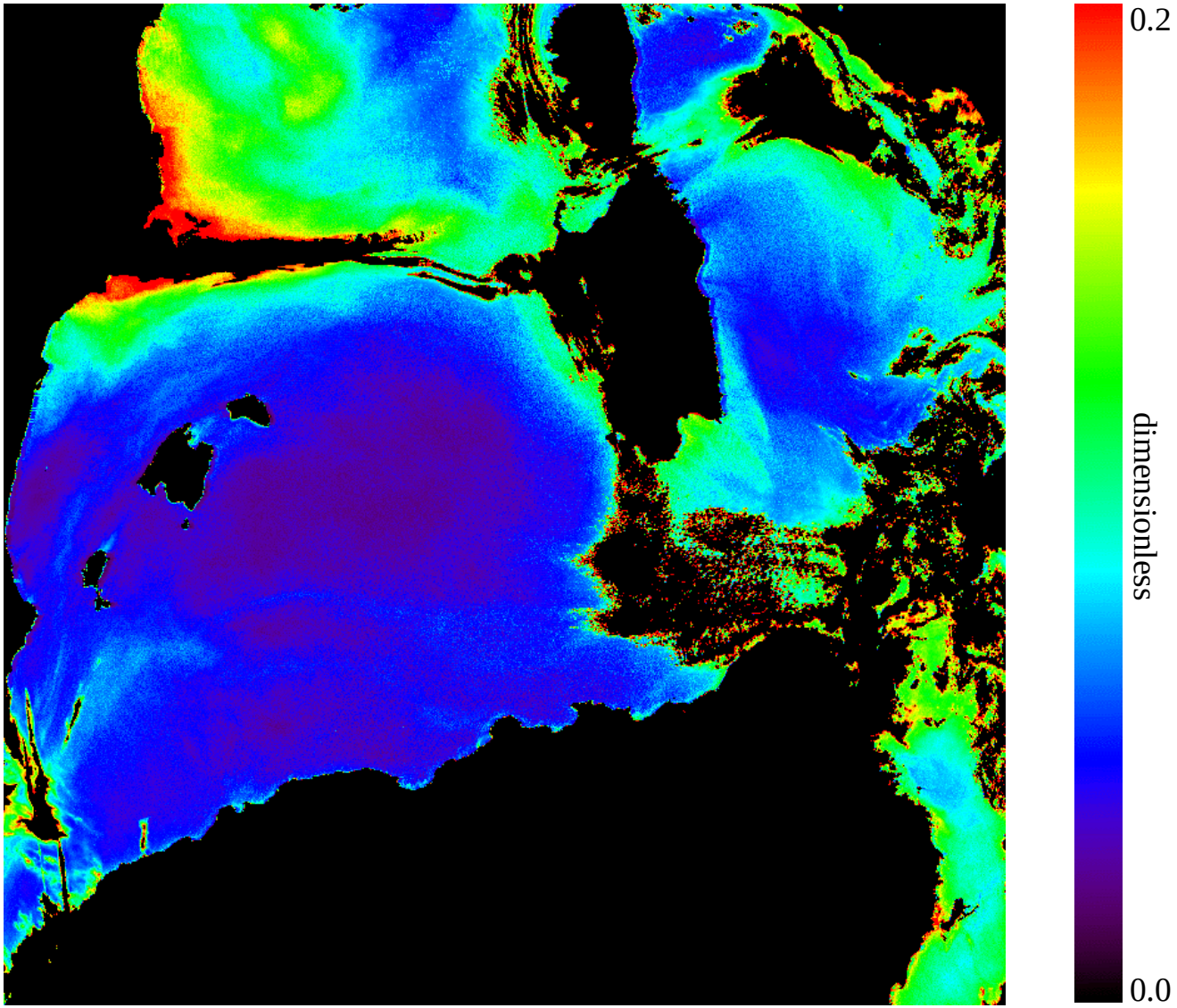
Ångstrom(510,865), Standard Processing



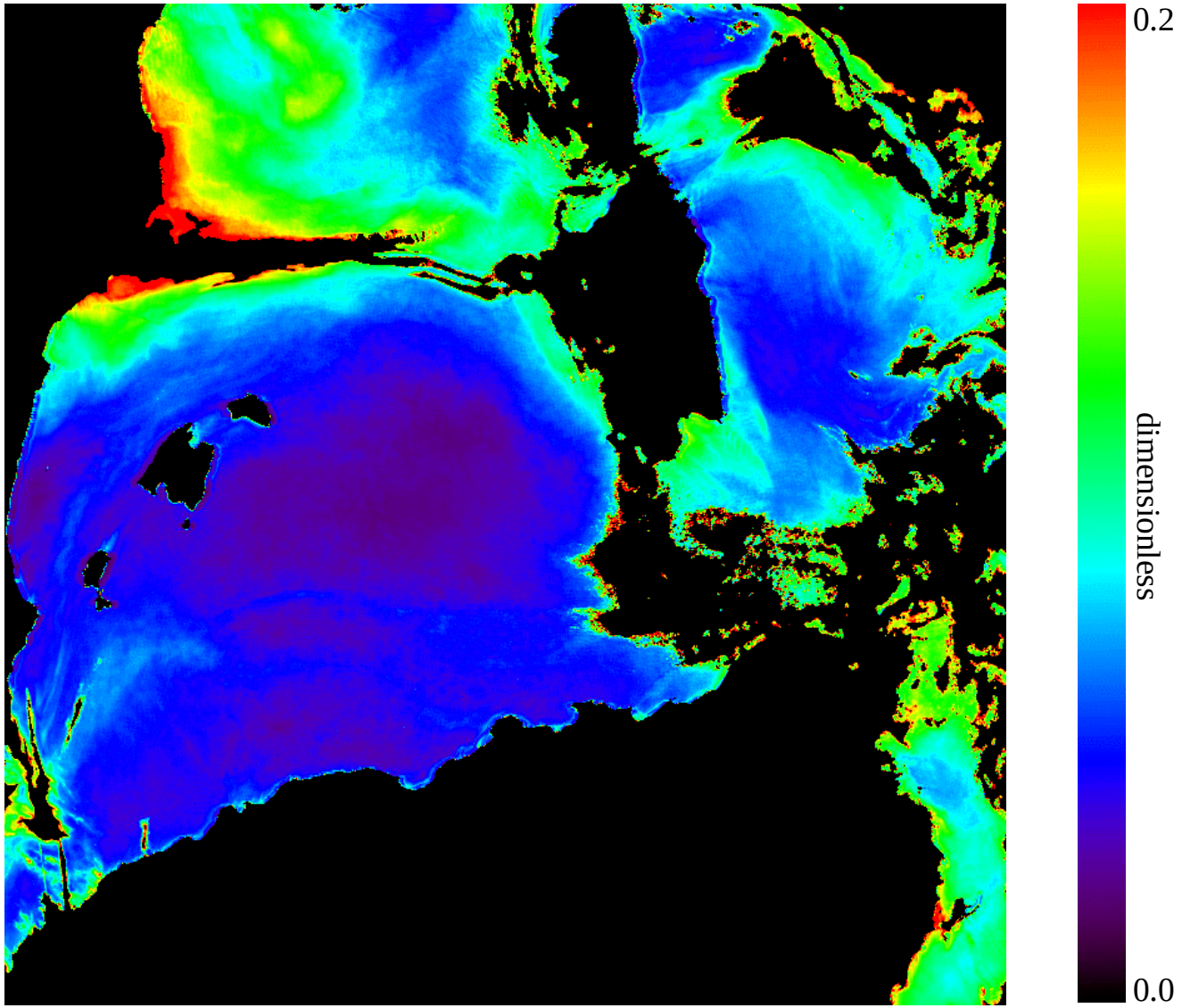
Ångstrom(510,865), Epsilon 5x5 Averaging



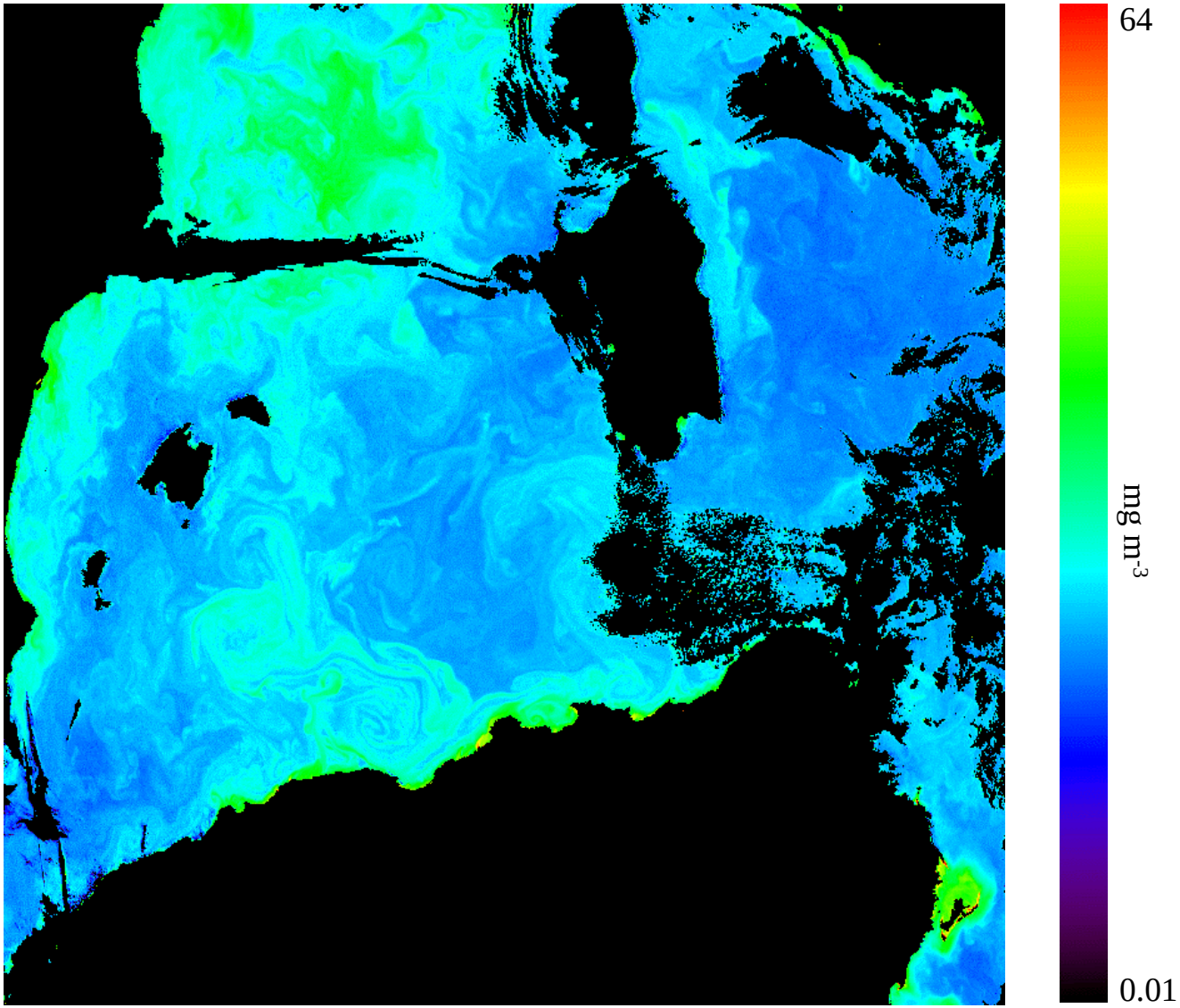
$\tau_a(865)$, Standard Processing



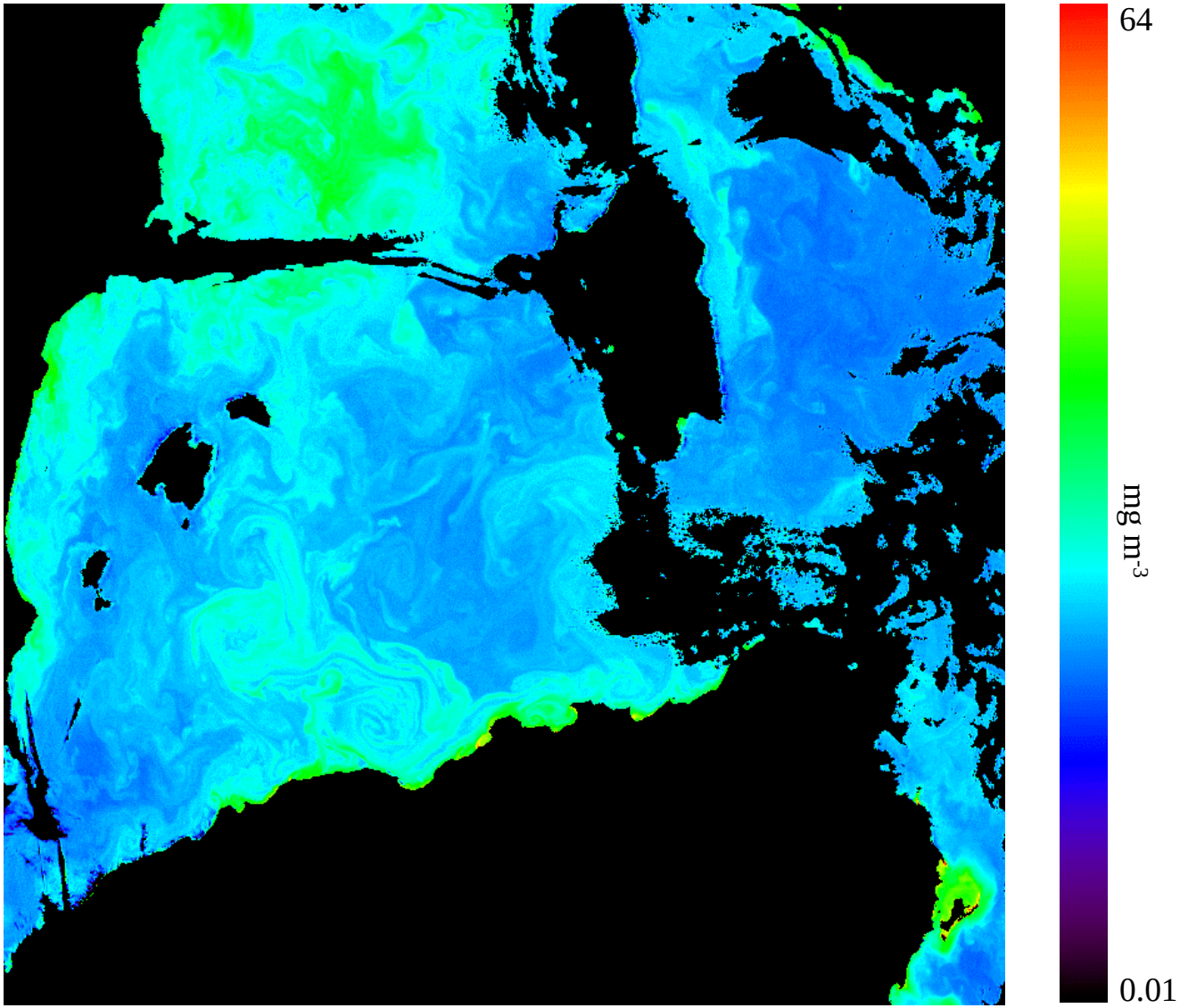
τ_a(865), Epsilon 5x5 Averaging



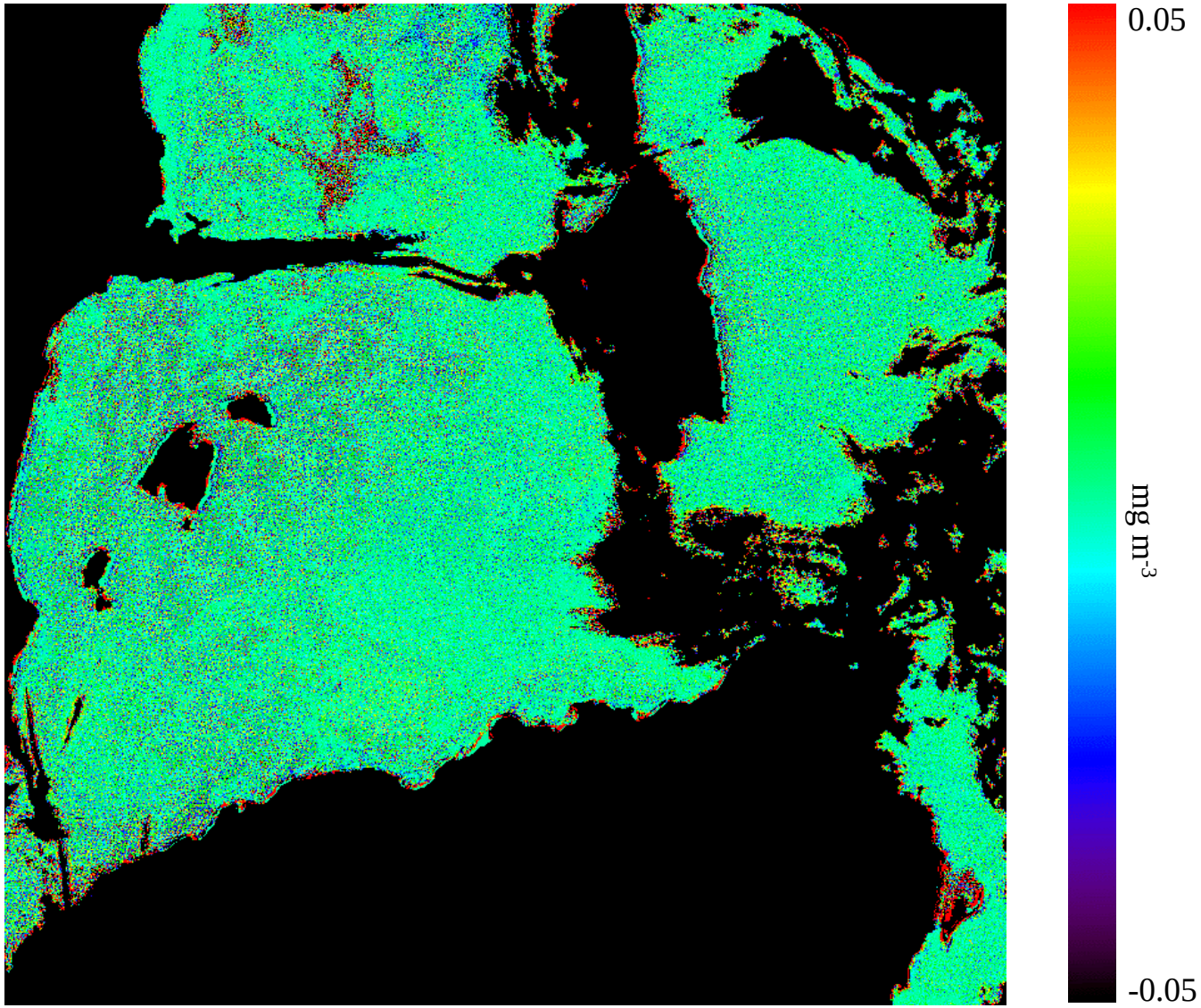
Chlorophyll, Standard Processing



Chlorophyll, Epsilon 5x5 Averaging

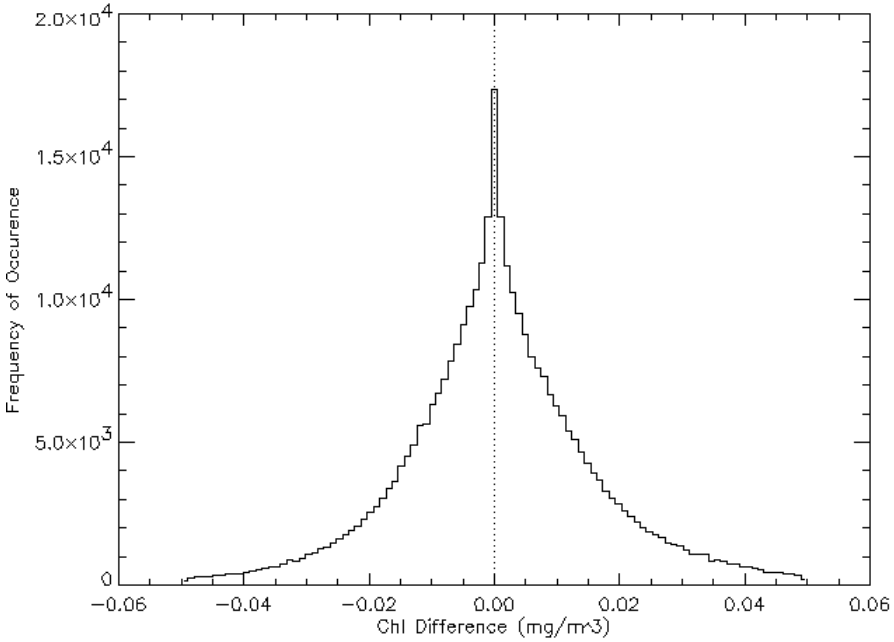


Chlorophyll Difference, Smoothed - Baseline

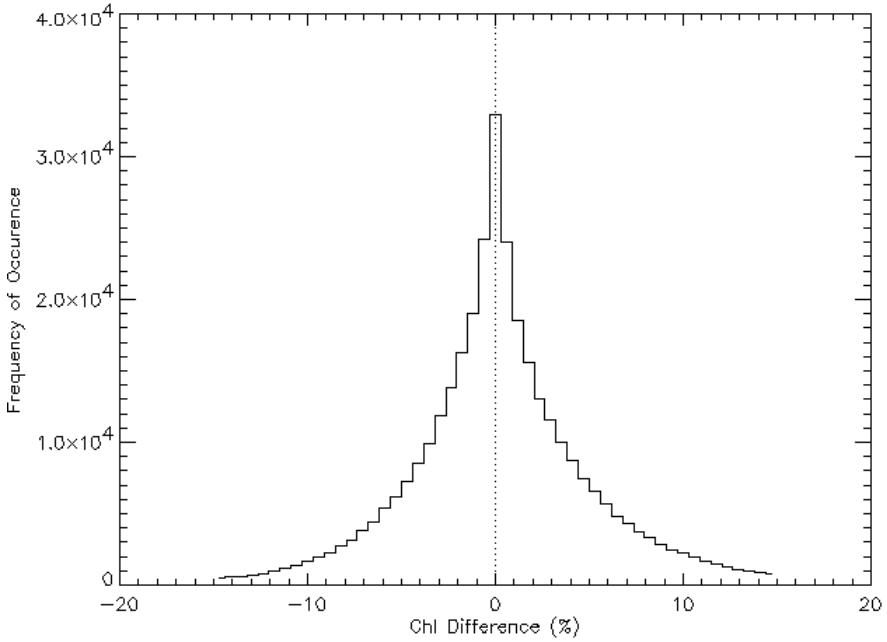


Chlorophyll Difference Distribution
Smoothed - Baseline

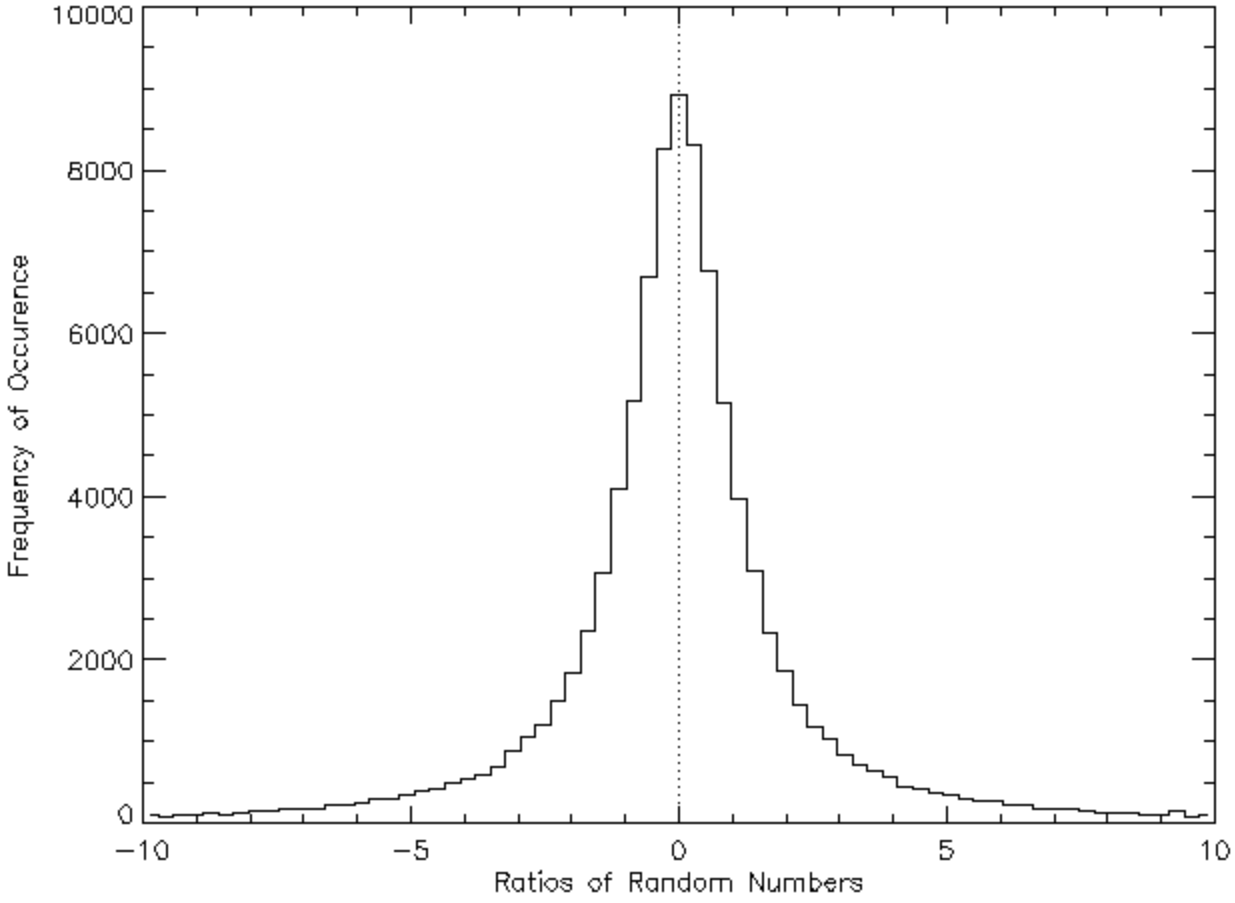
Difference, Chl (Smoothed) - Chl (Baseline)



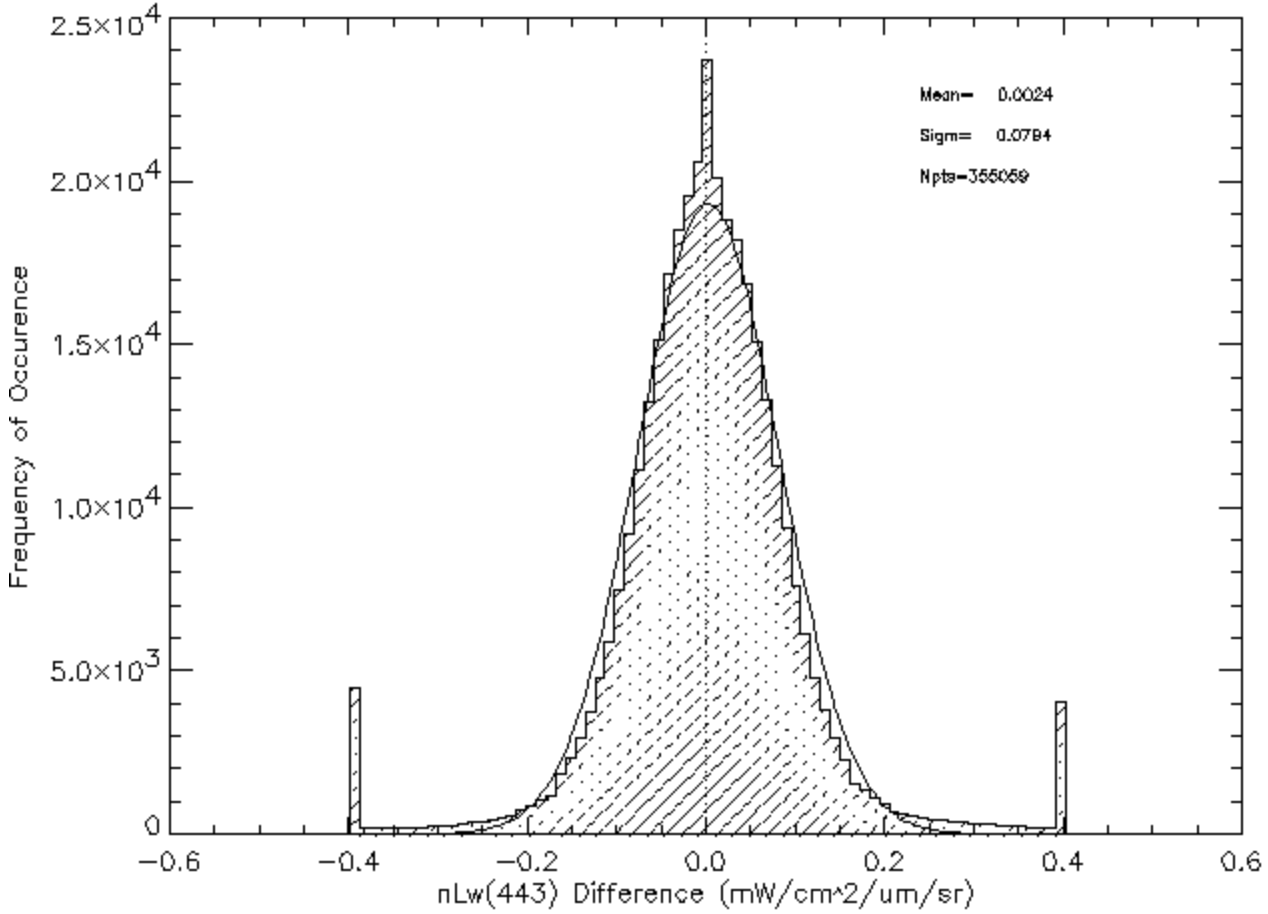
% Difference, Chl (Smoothed) - Chl (Baseline)



Distribution of the Ratios of Random Numbers



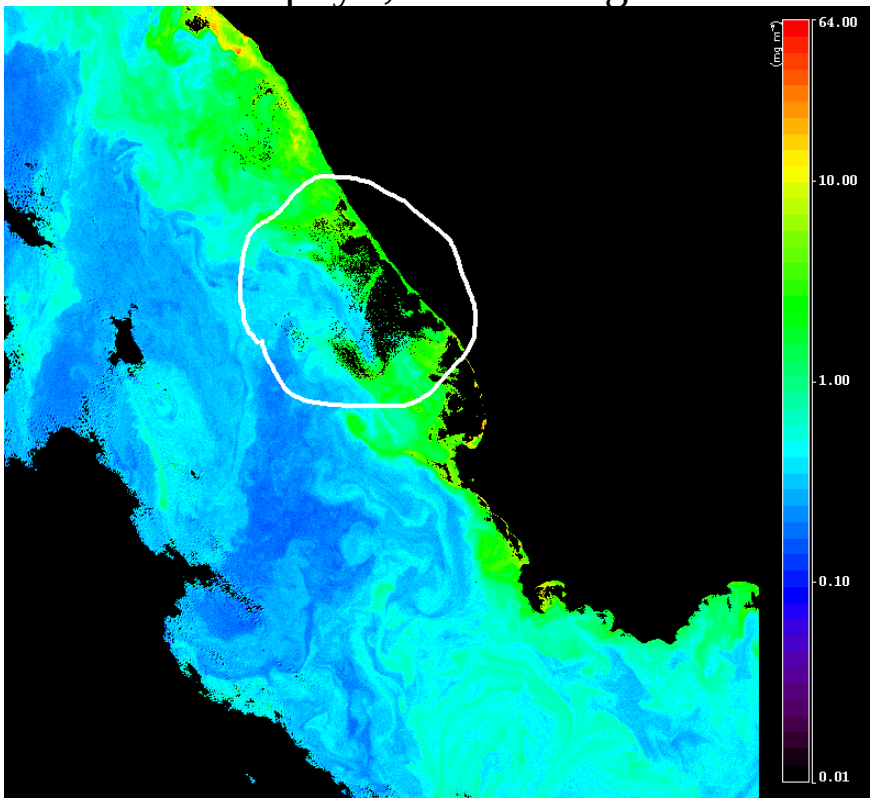
nLw(443) Difference Distribution Smoothed - Baseline



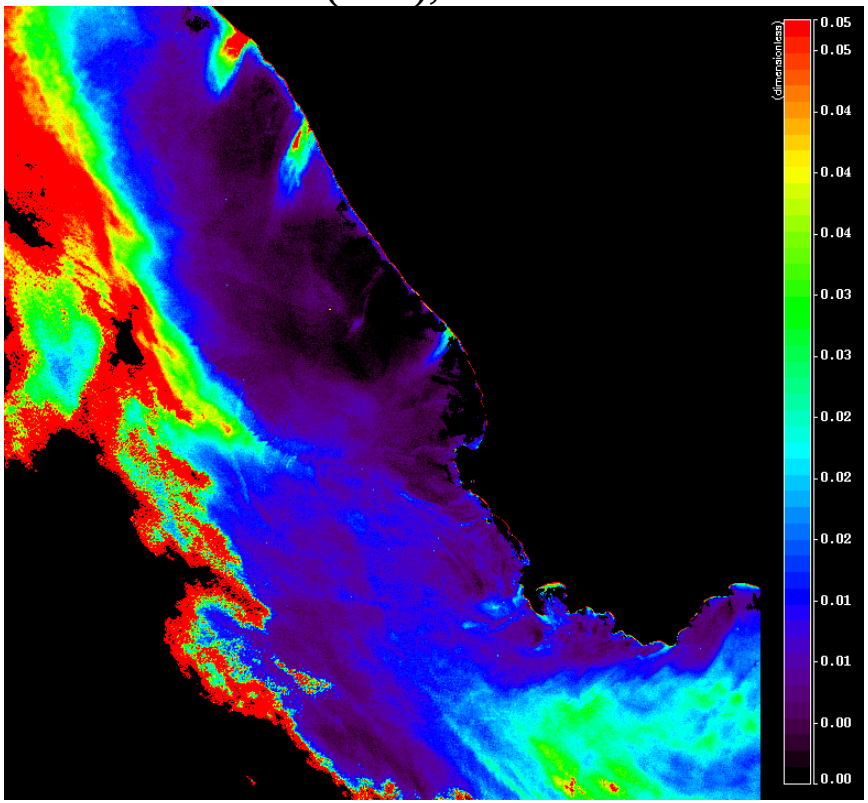
Failure in Low Aerosol Conditions

In extremely low aerosol conditions, the NIR aerosol residual will approach zero or become slightly negative. This can result in failure of the aerosol model selection algorithm. The result is no chlorophyll retrieval in the best of atmospheric conditions.

Chlorophyll, 0.01-64 mg m^{-3}



AOT(865), 0.0 - 0.05



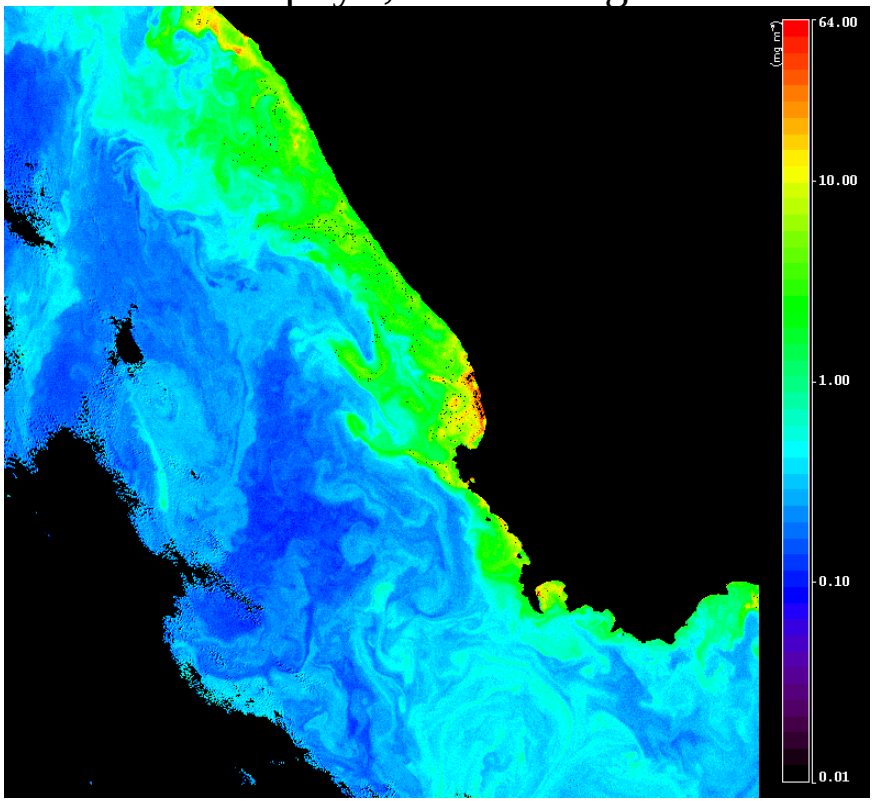
Correction for Low Aerosol Conditions

if $\rho_a(765) < \rho_a\text{min}$ or $\rho_a(865) < \rho_a\text{min}$

$\rho_a(\lambda) = \rho_a(865)$, λ=412-765 i.e.: white aerosol

ε=1.0, model=O99

Chlorophyll, 0.01-64 mg m^{-3}



Ångstrom(510,865), -0.5 - 2