# Processing Methods Tested

a. standard processing *(baseline case)*

b. fixed aerosol model pair *(control case)*

c. 5x5 averaging of Lt - Lr(765) and Lt - Lr(865)

- *assumes aerosol type and concentration vary on scales greater than 5km (20km for GAC)*
- *possibility of spreading sub-pixel clouds (high $\tau_a$) into otherwise uncontaminated pixels*

d. use models from case c, but leave Lt as measured

- *smooth aerosol type, but leave concentration unchanged*
- *requires two passes through atmospheric correction*

e. 5x5 "epsilon" averaging

- *similar to case d, but can be done in 1 pass*

# Epsilon Averaging

define NIR aerosol radiance at pixel i for wavelength $\lambda$ 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:

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

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 $L_a(865,x)$:

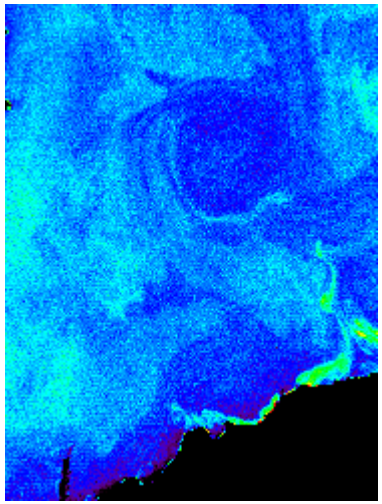
$$L_a'(765,x) = \varepsilon_x\ L_a(865,x)$$

and reconstruct the TOA radiance at 765nm:

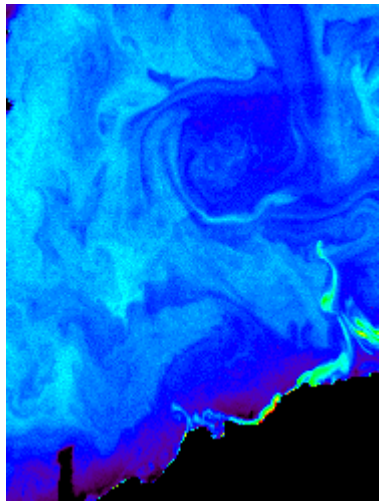
$$L_t(765,x) = [L_a'(765,x)\ t_{O2} + Lr]\ t_{O3} + tL_f$$

# SeaWiFS nLw(443), Comparison of Smoothing Methods

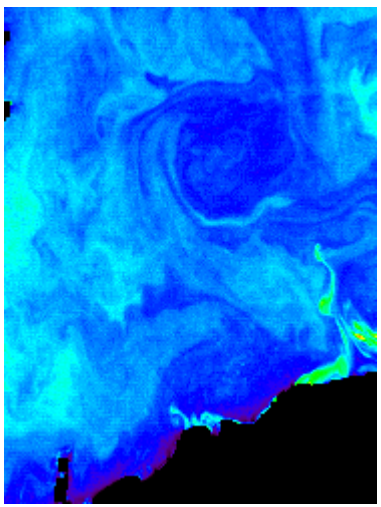
a. Standard Processing



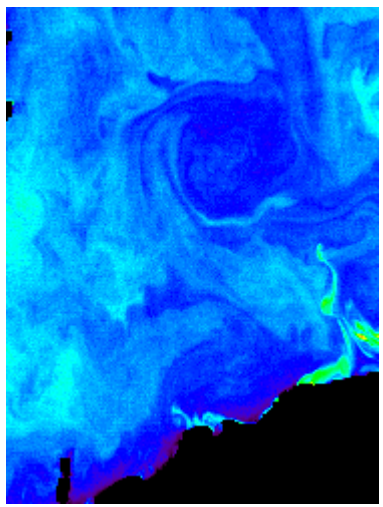
b. Fixed Model (c50, t99)



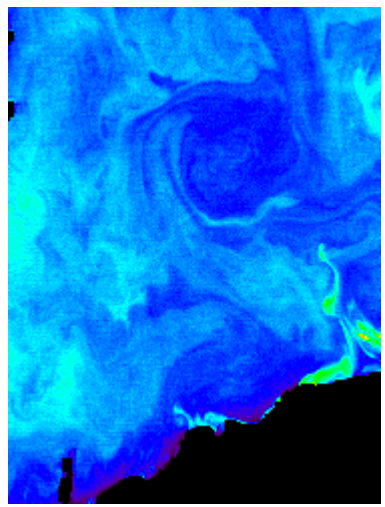
c. NIR 5x5 Averaging



d. Fixed Models from case c

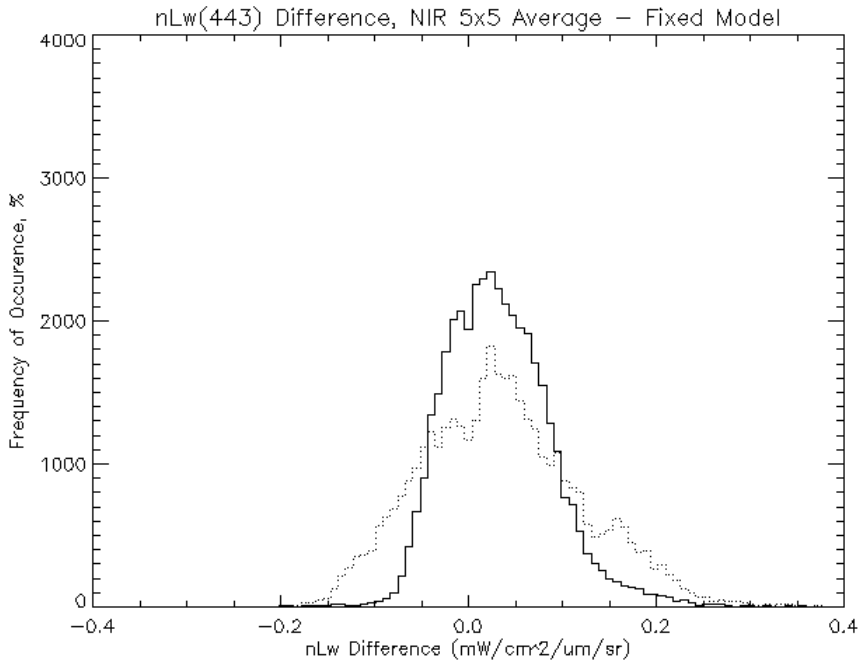


e. Epsilon 5x5 Averaging

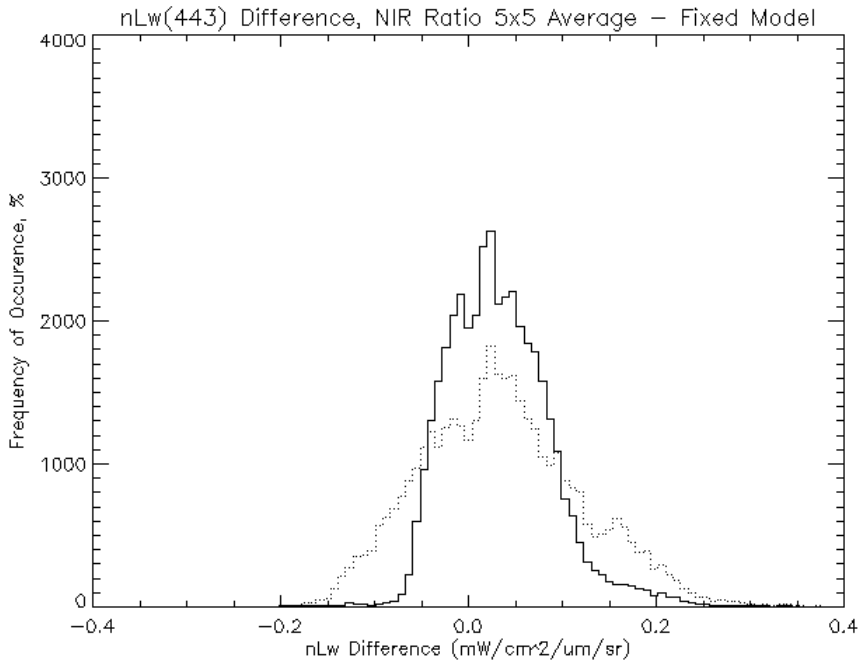


# nLw(443) Difference Distribution
# TOA Smoothing (c) versus Epsilon Smoothing (d)
# Relative to Fixed Model Case (b)

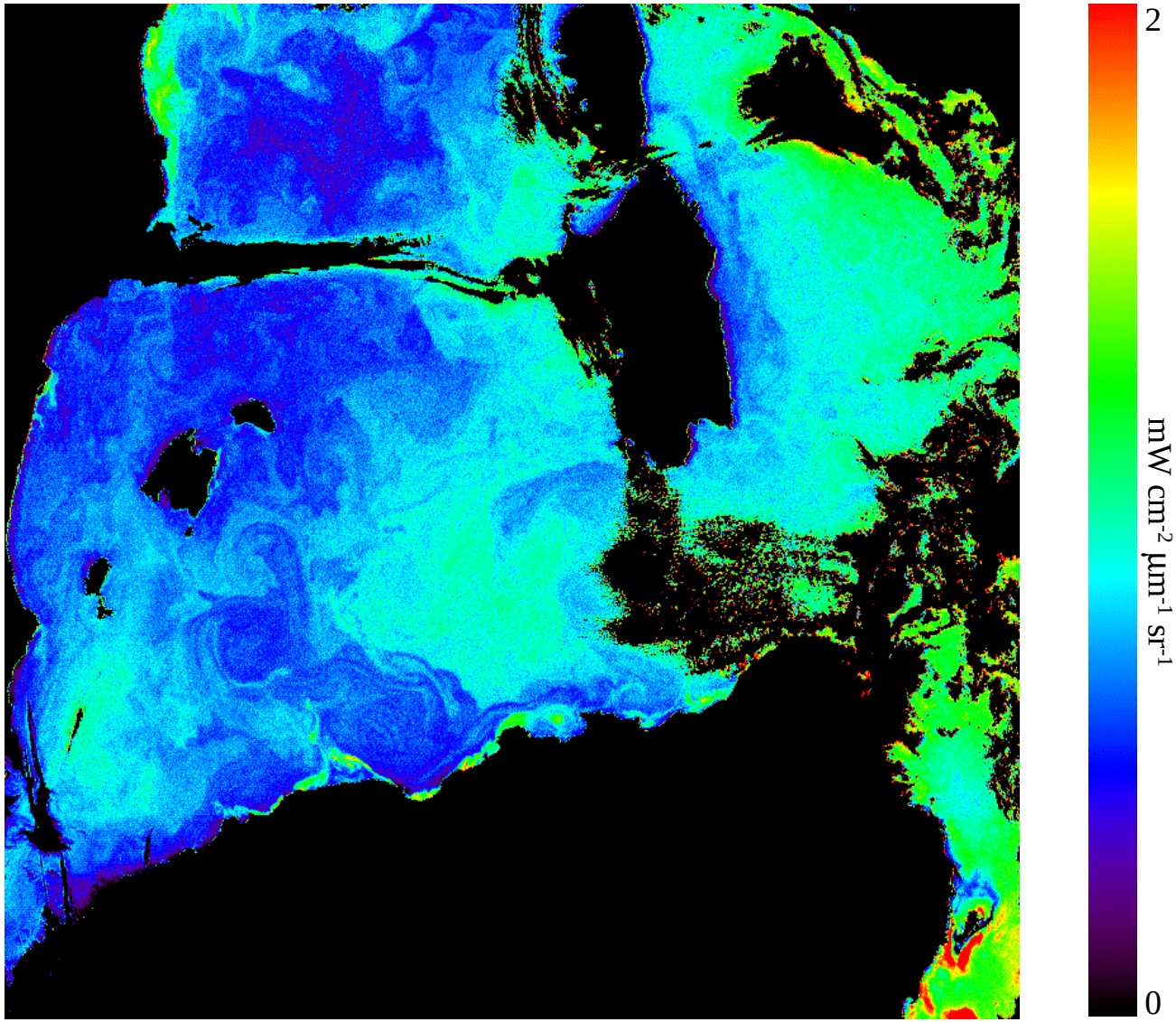
5x5 Averaging of Lt(765) and Lt(865)



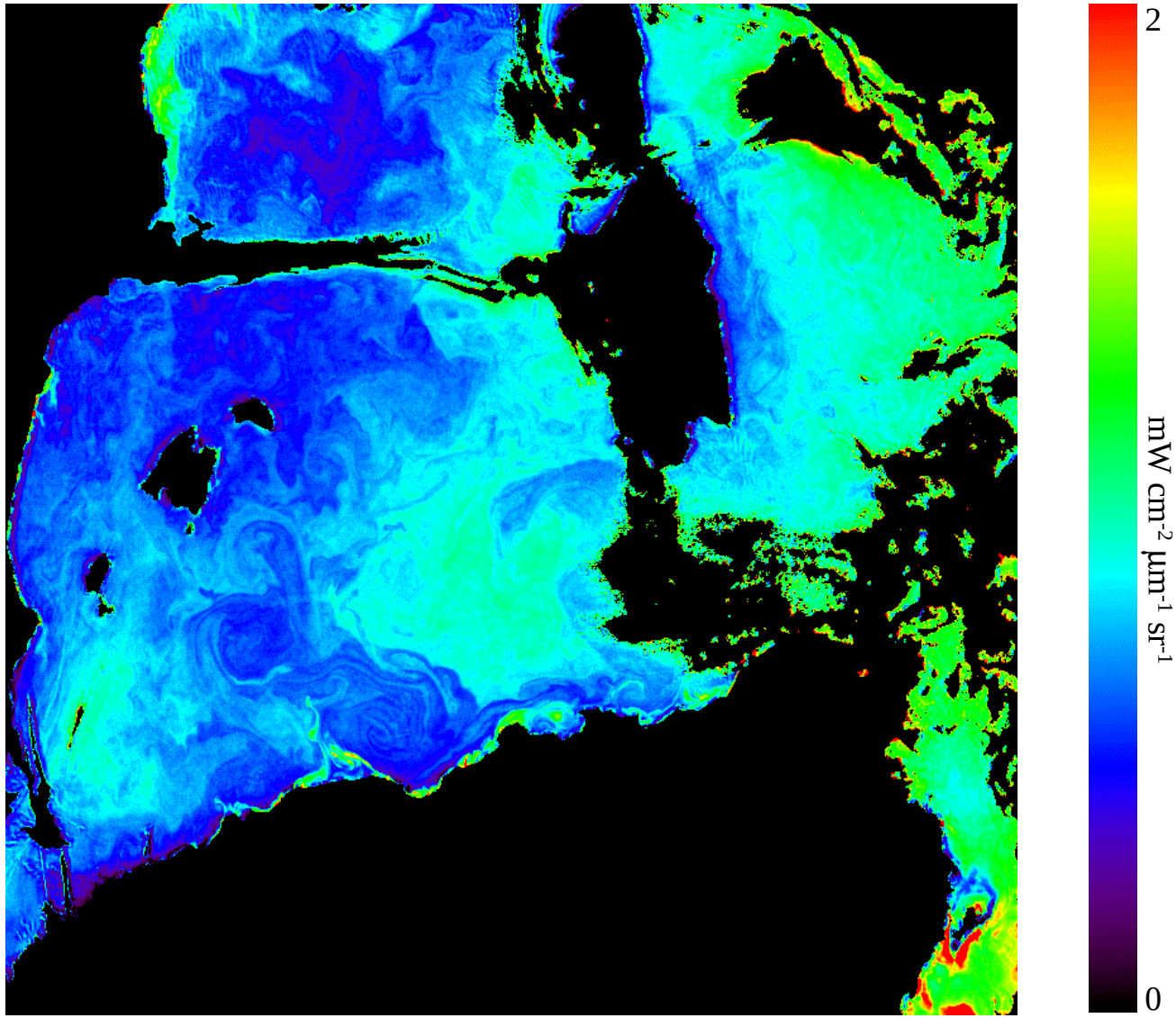

5x5 Averaging of Epsilon(765,865)



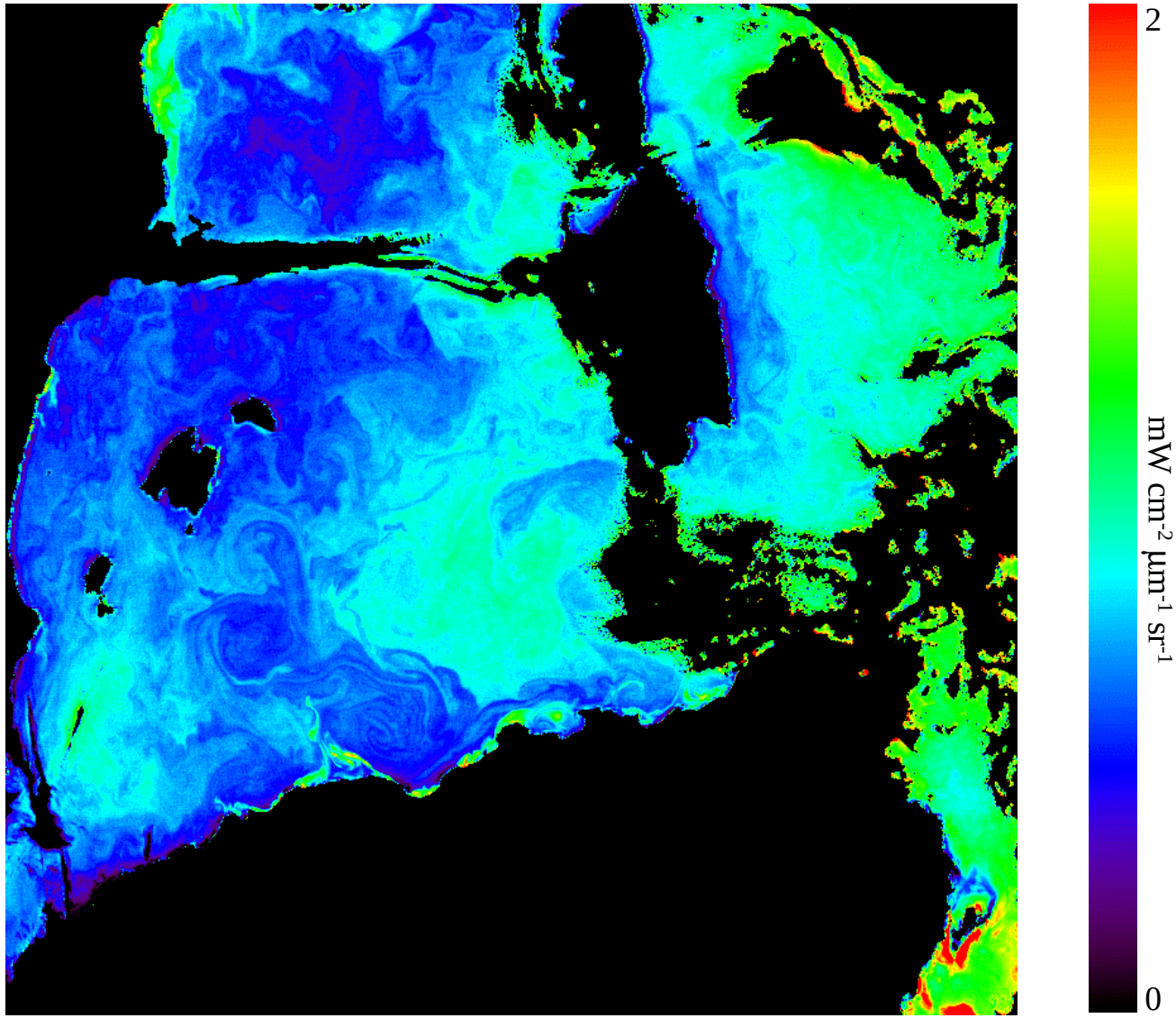
# nLw(443), Standard Processing



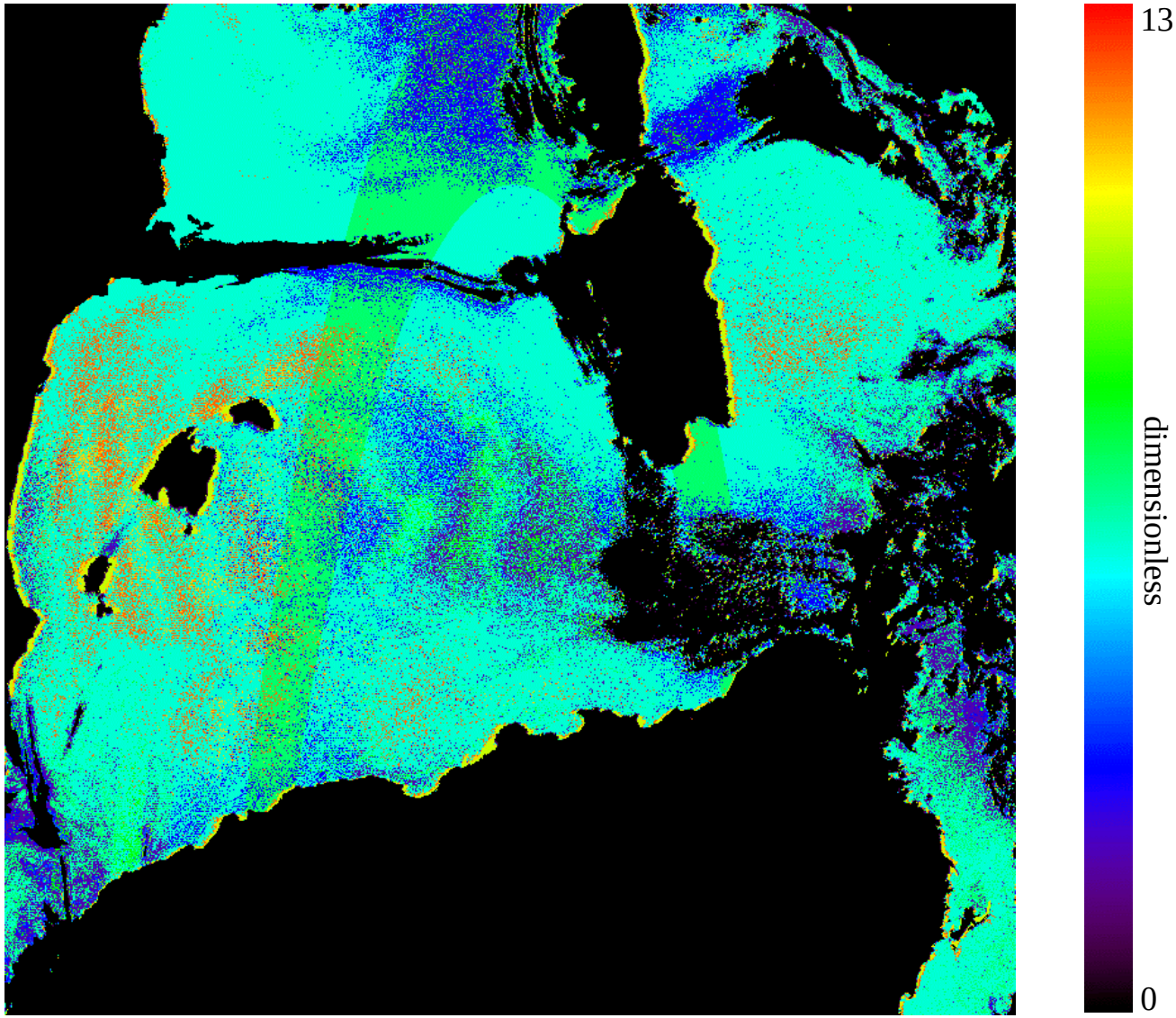
# nLw(443), NIR 5x5 Averaging



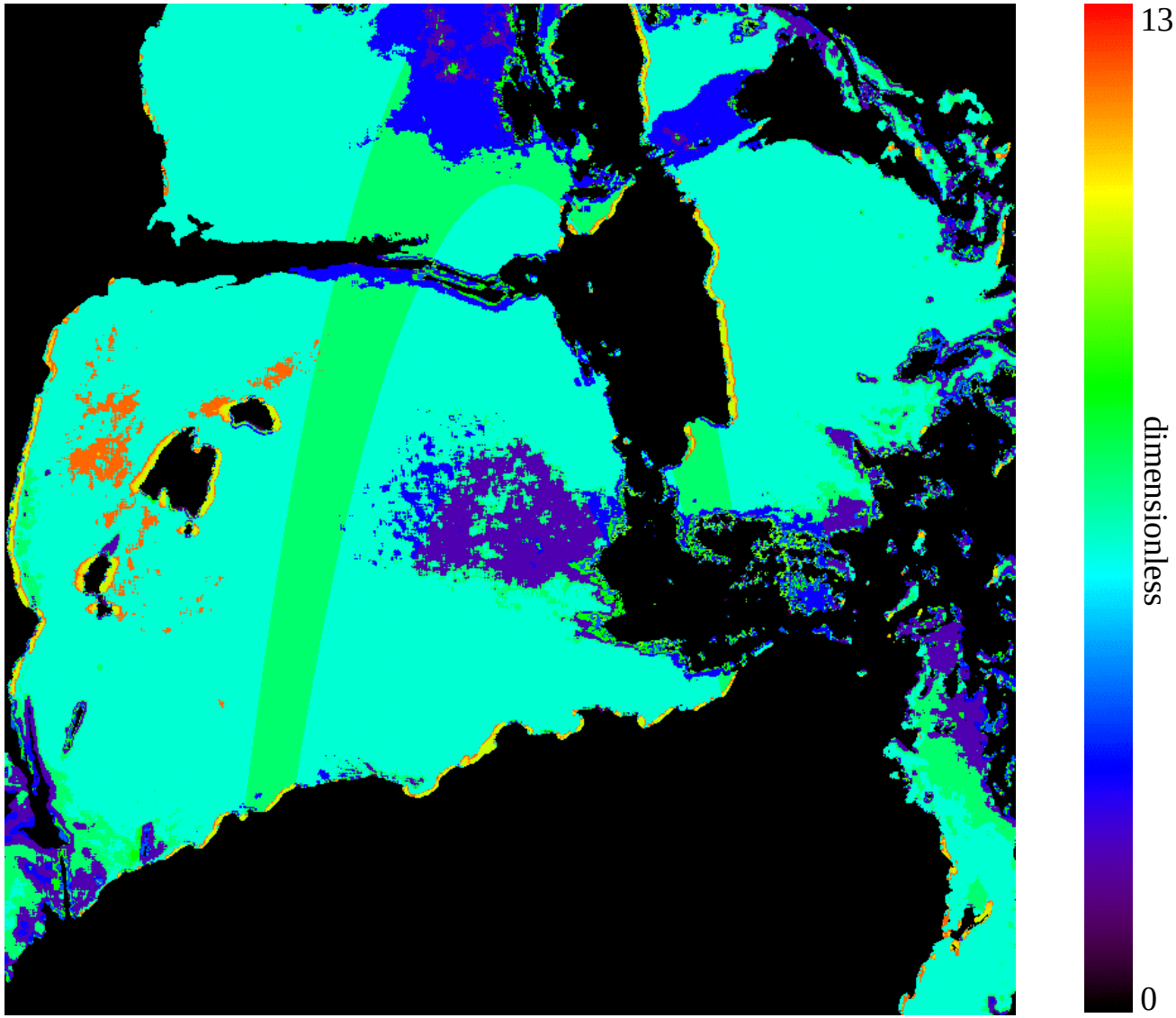
# nLw(443), Epsilon 5x5 Averaging



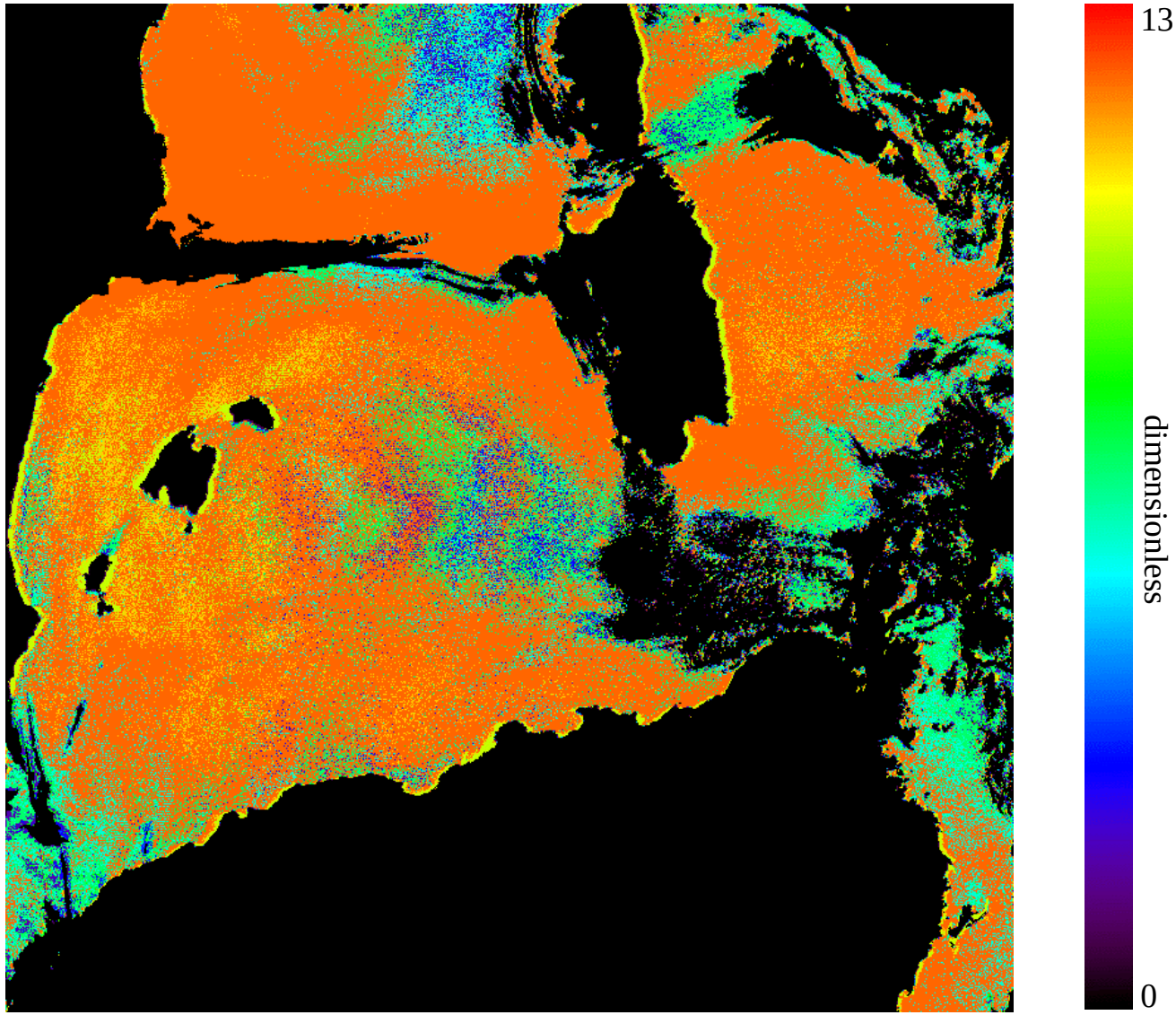
# Lower Bounding Model, Standard Processing



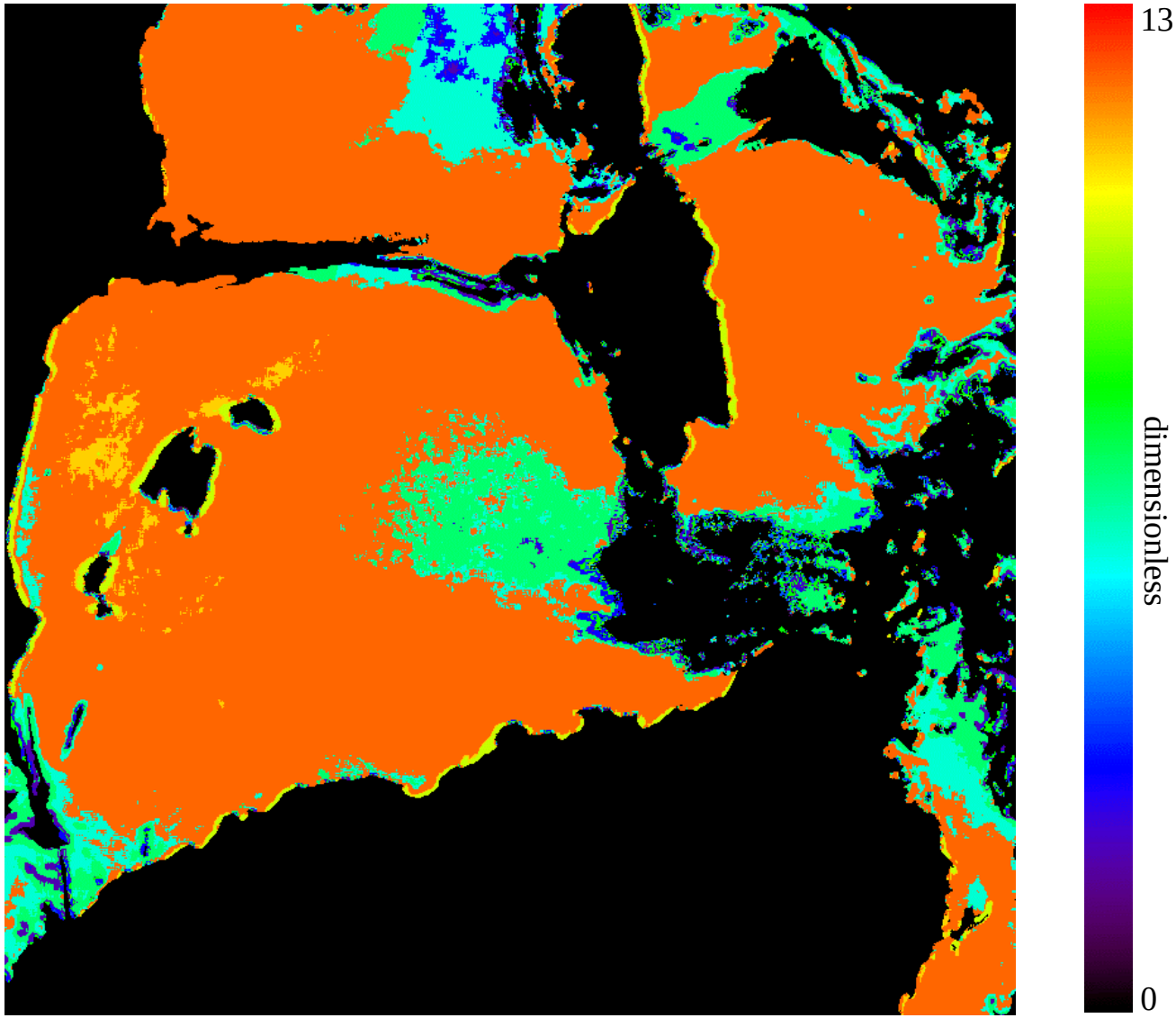
# Lower Bounding Model, Epsilon 5x5 Averaging



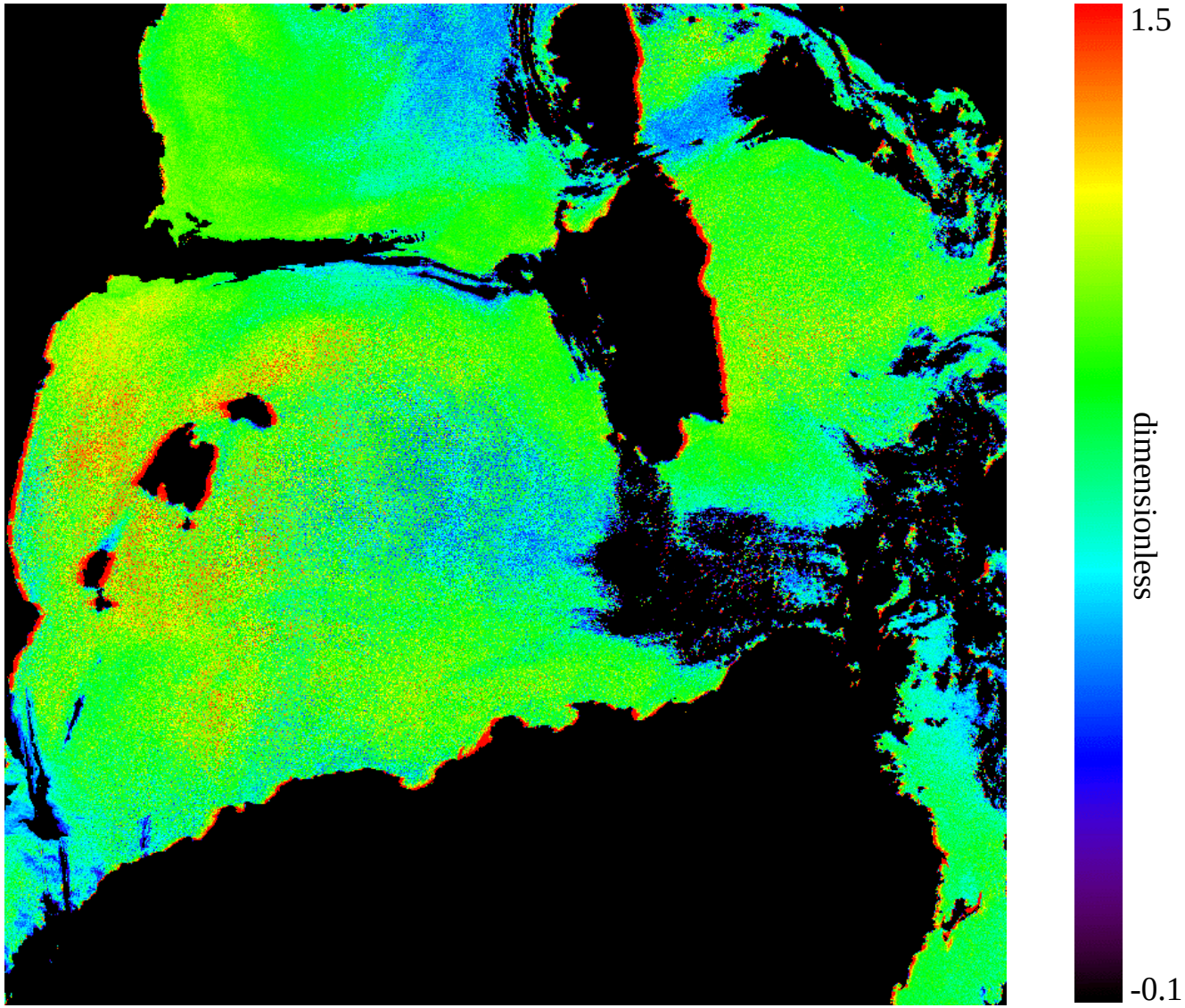
# Upper Bounding Model, Standard Processing



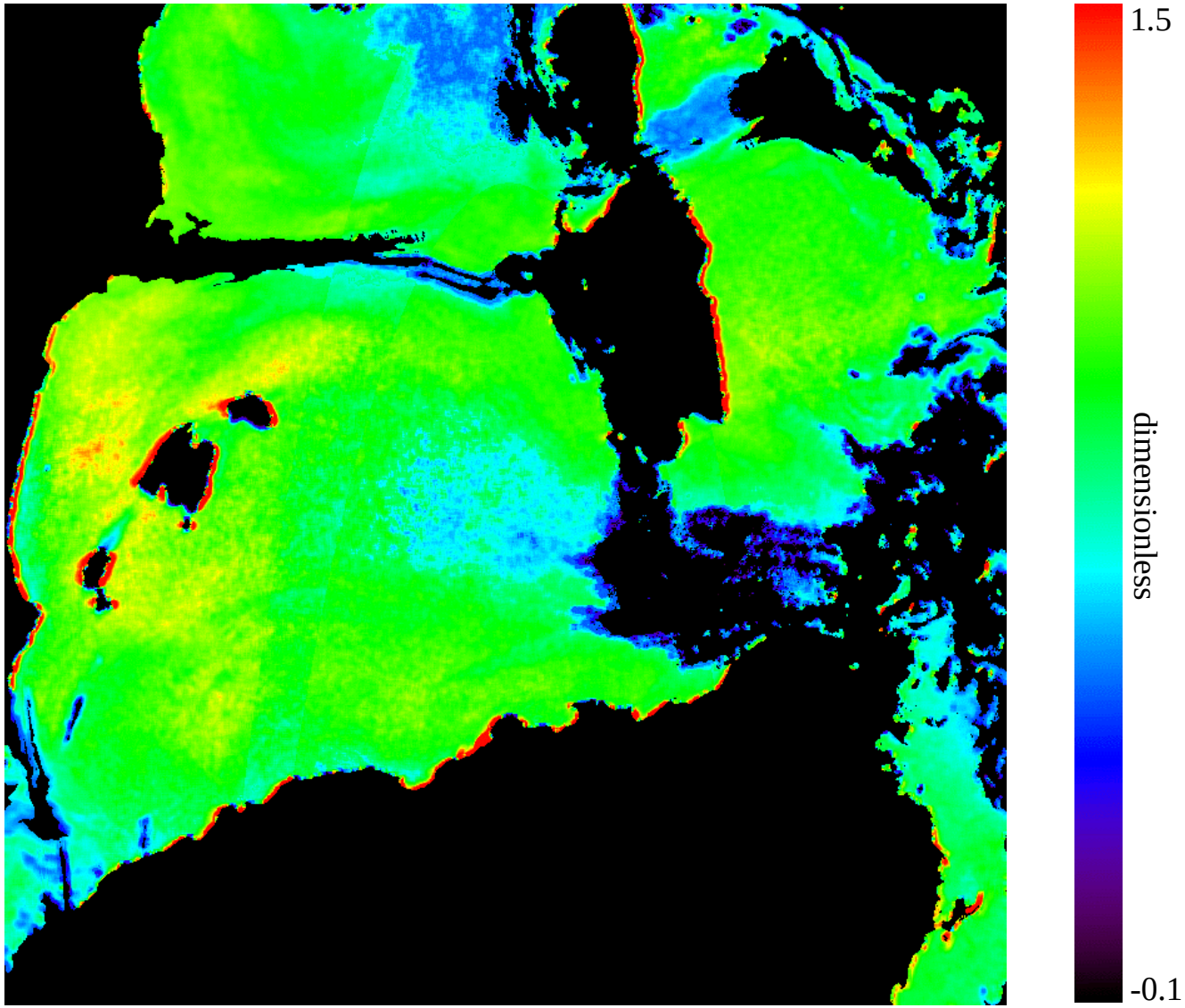
# Upper Bounding Model, Epsilon 5x5 Averaging



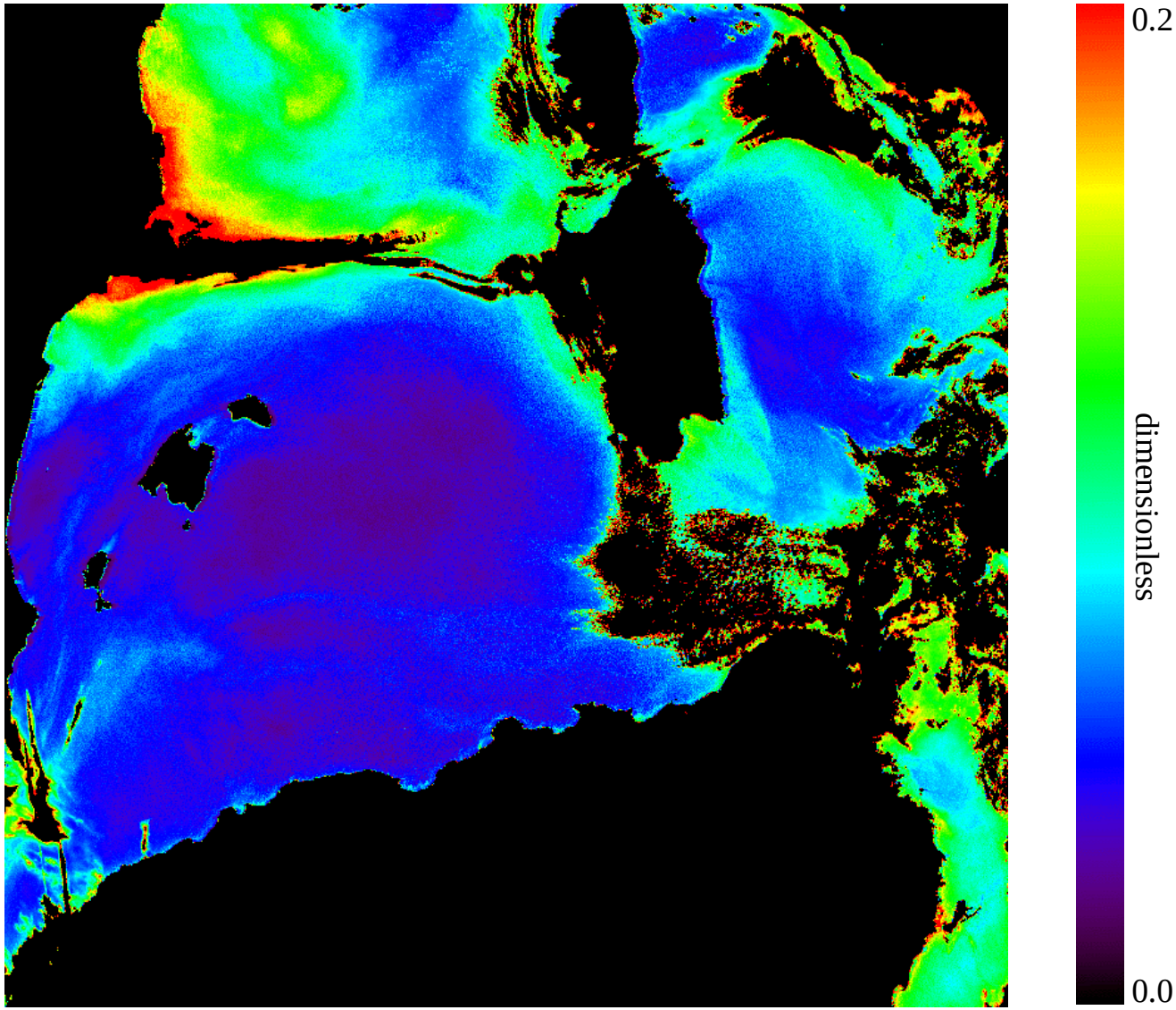
# Angstrom(510,865), Standard Processing



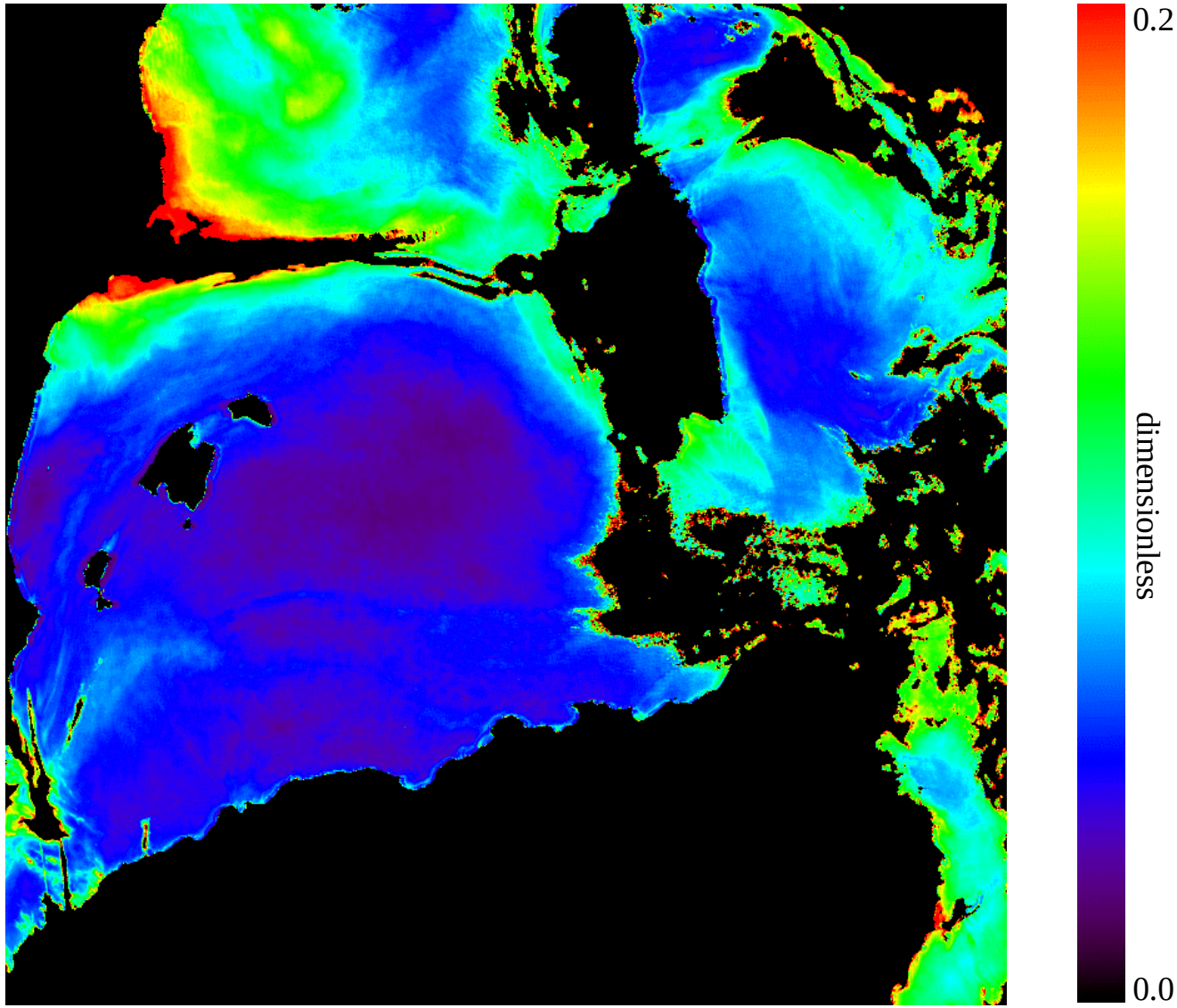
# Angstrom(510,865), Epsilon 5x5 Averaging



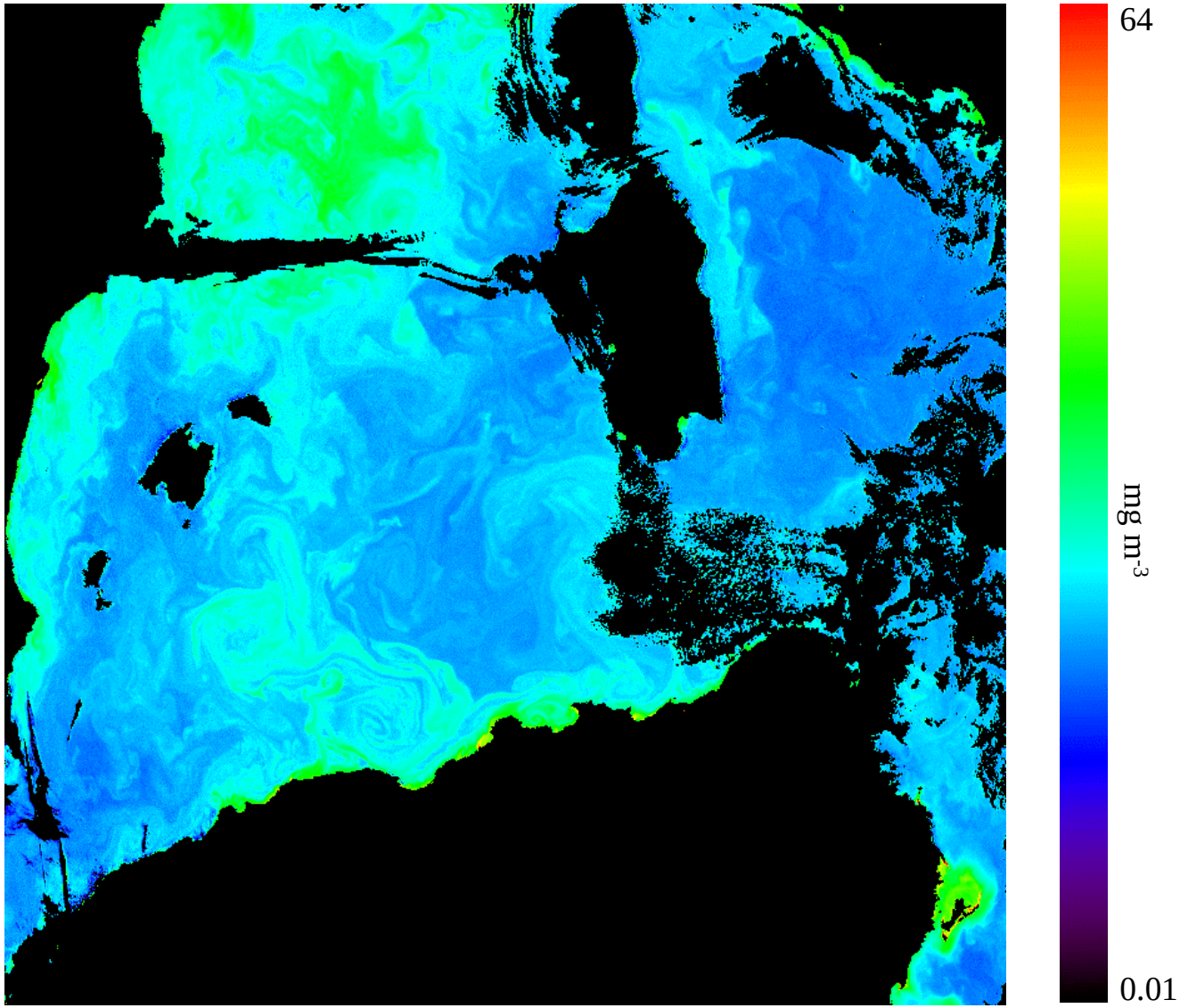
# $\tau_a(865)$, Standard Processing



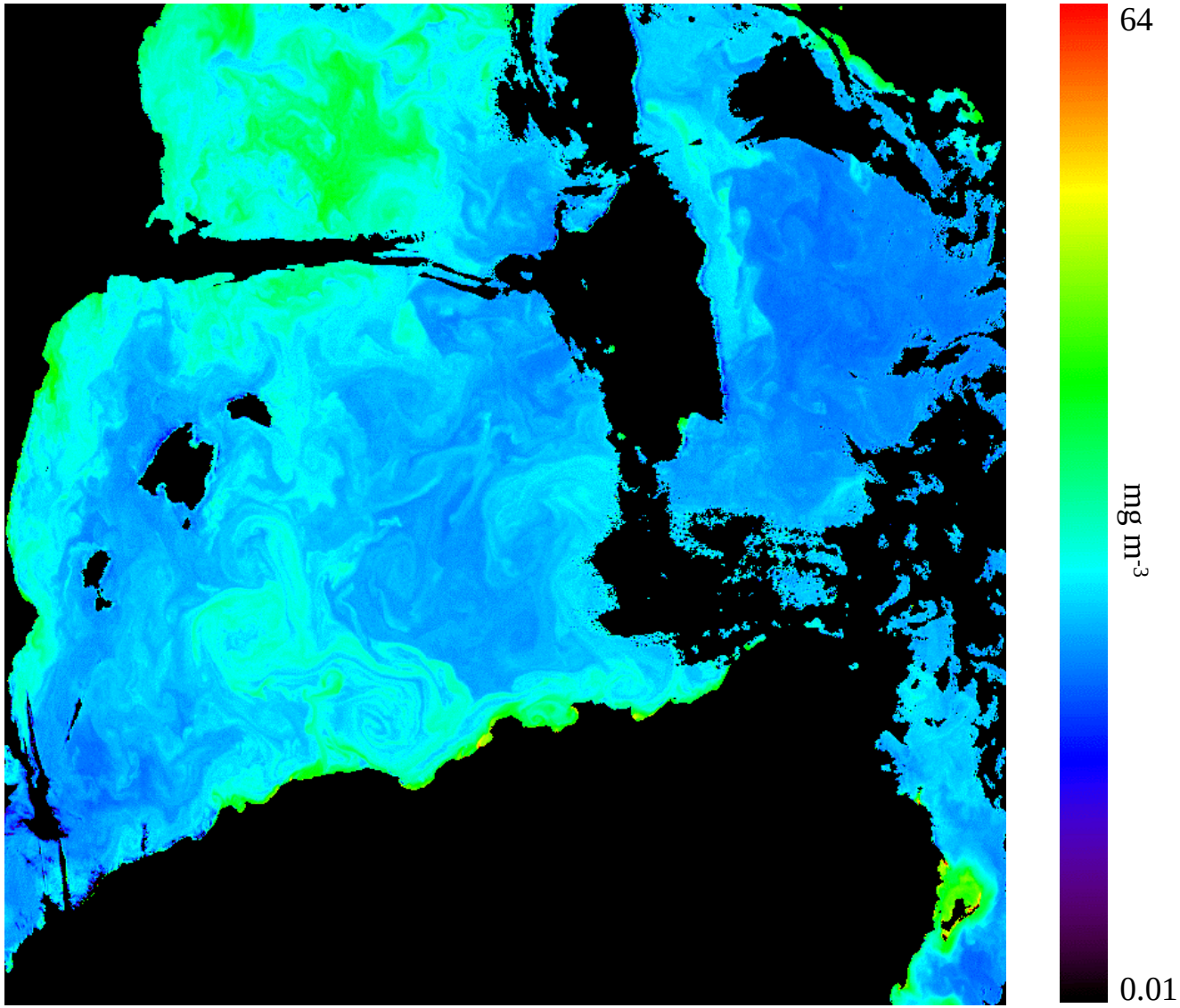
# $\tau_a(865)$, Epsilon 5x5 Averaging



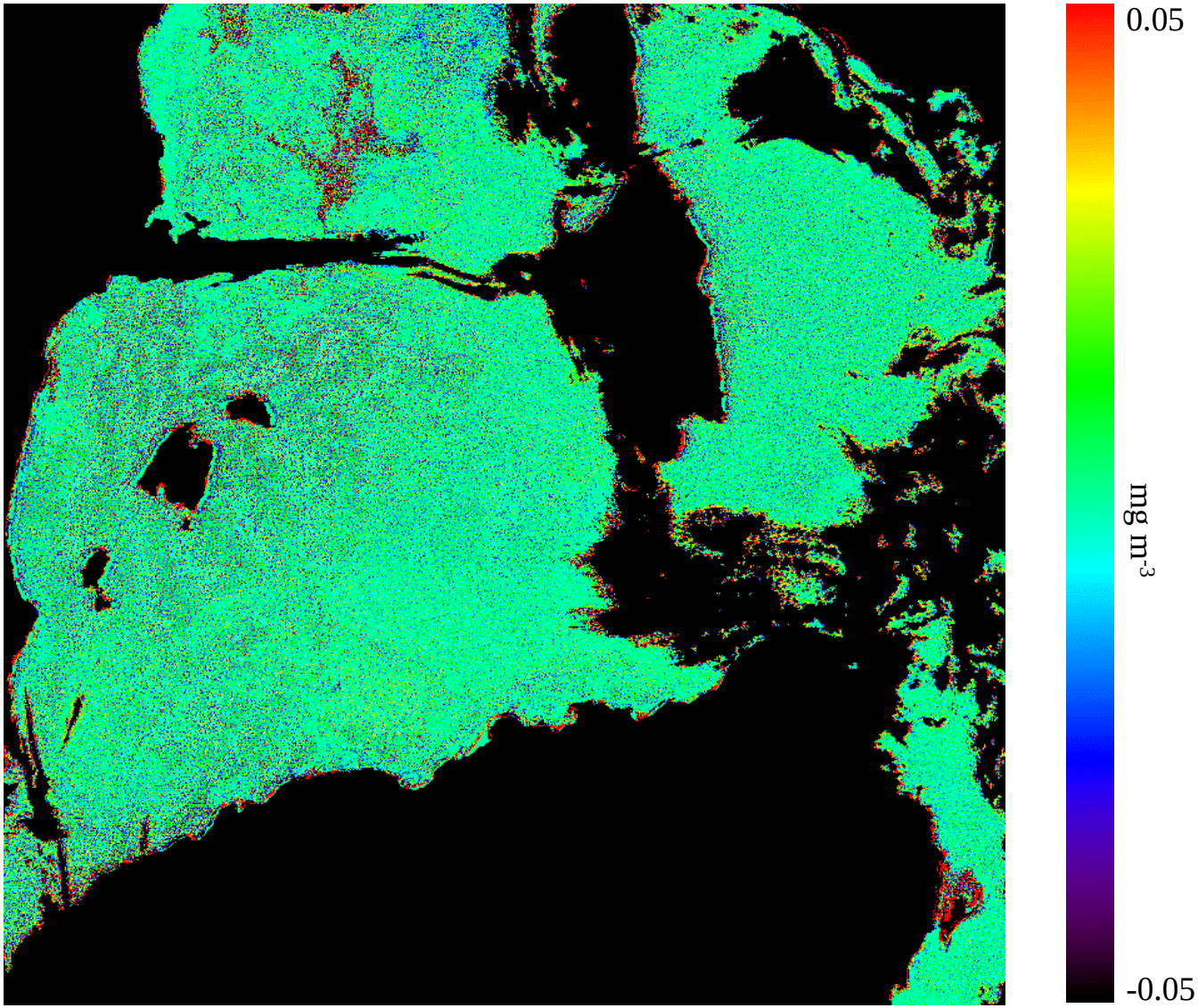
# Chlorophyll, Standard Processing



# Chlorophyll, Epsilon 5x5 Averaging

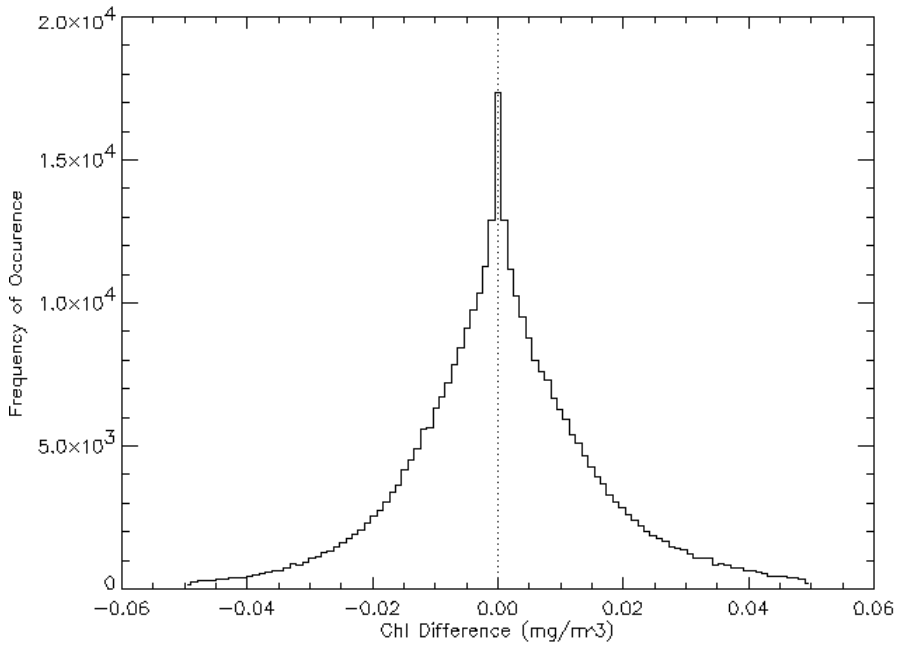


# Chlorophyll Difference, Smoothed - Baseline

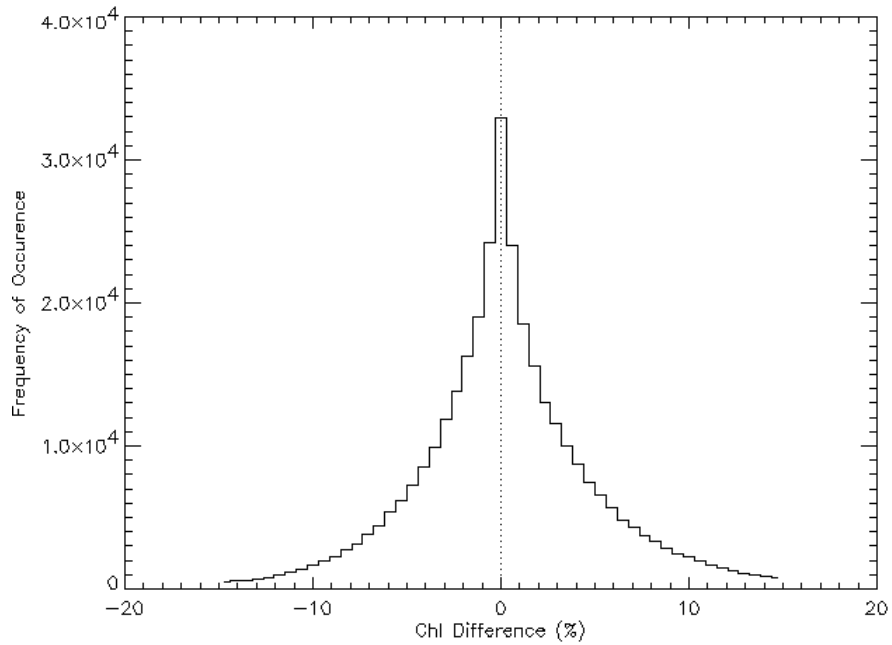


# Chlorophyll Difference Distribution
# Smoothed - Baseline

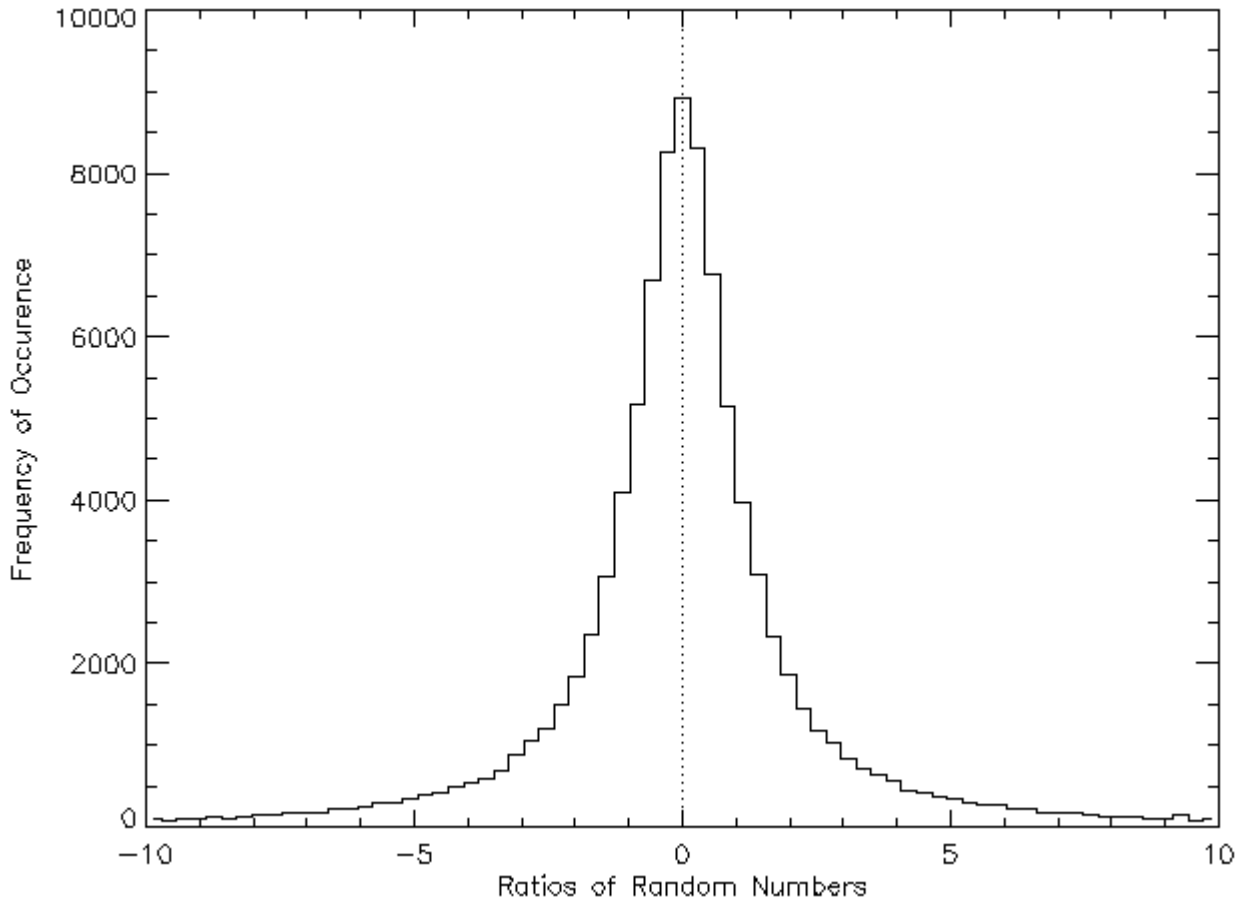
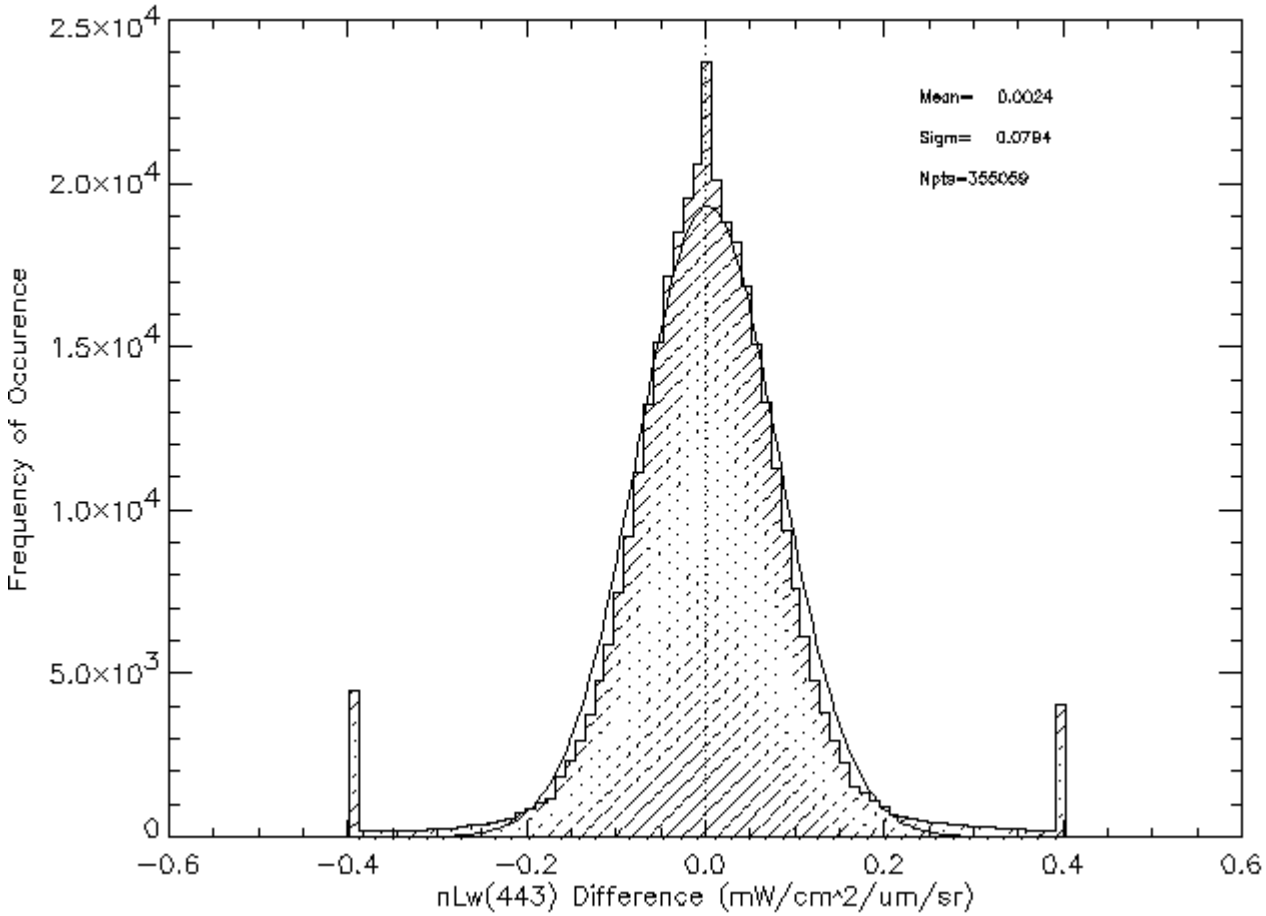
Difference, Chl (Smoothed) - Chl (Baseline)




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



# Distribution of the Ratios of Random Numbers



# nLw(443) Difference Distribution Smoothed - Baseline