

Discussing Sea Surface Temperature Climatology

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Figure of merit: 0.5 K

-- Buoy accuracy

-- RMS of global analyses v. buoy

- What is climatology?
- How long a period is needed to establish it?

- What resolution is needed for SST analysis?
- Does it vary in space?

- Beyond the first moment, what are the statistics of the 2nd, 3rd, and 4th moments of SST?
- What do they tell us?

- Information Theory Intro + Illustration

- n.b.: This consideration is driven by interest in climatology for use in near real time daily SST analysis

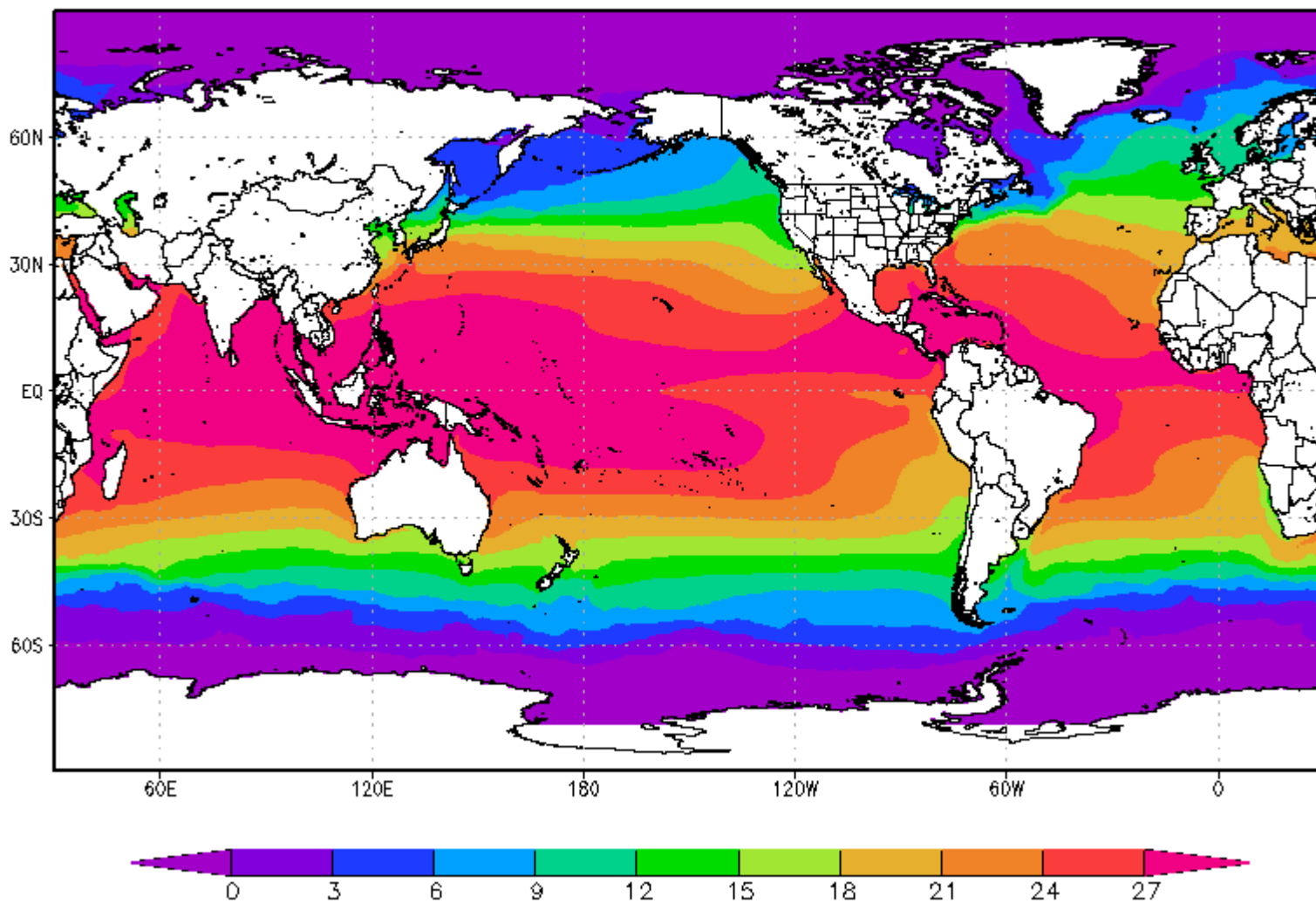
Climate is what you expect, weather is what you get.
R. A. Heinlein *Notebook of Lazarus Long*

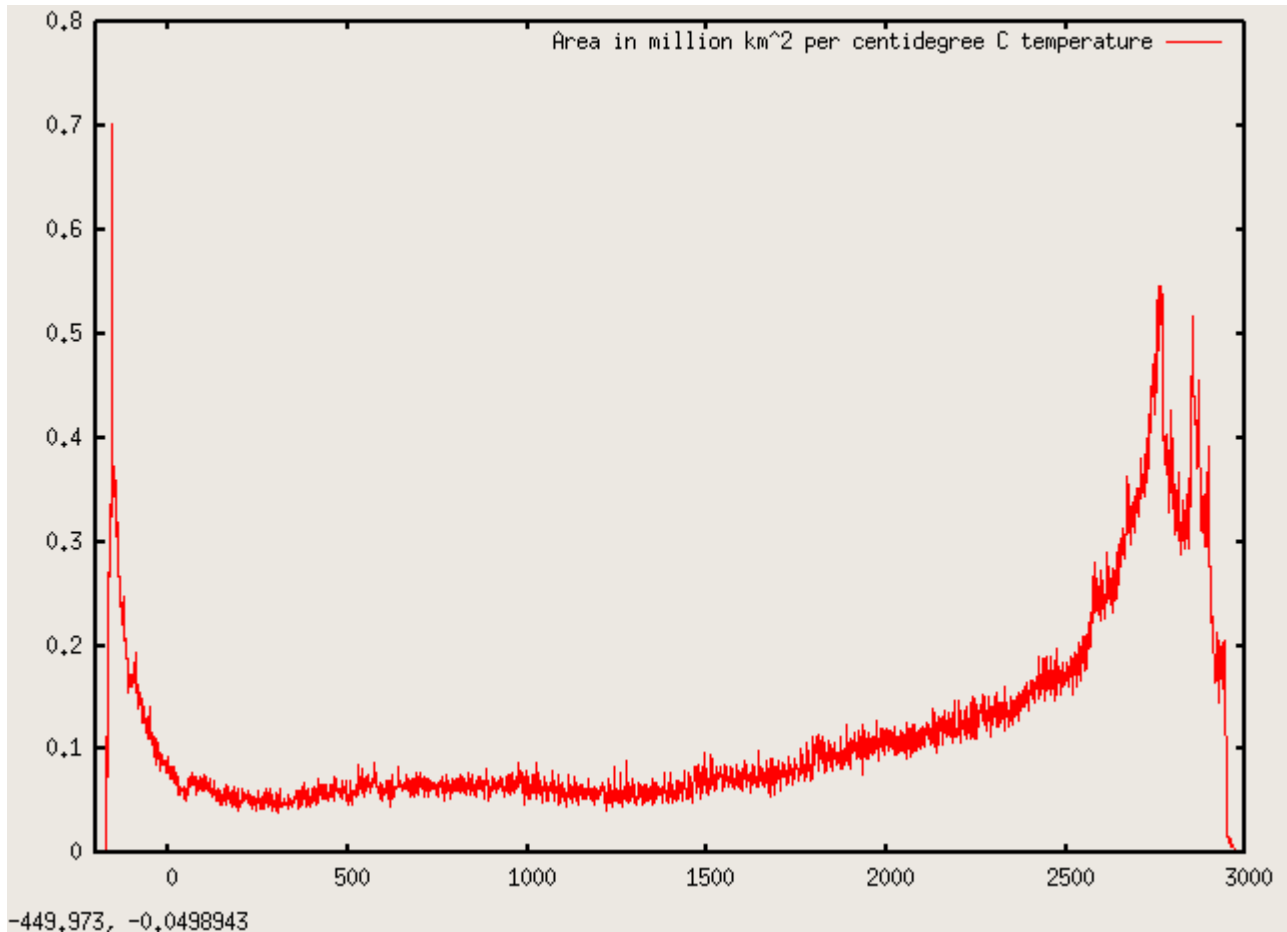
But what is a reasonable expectation?

30 year WMO Standard (from where, exactly?)
Continuum approach

Can we 'expect' a trend? (!?)

Average Temperature (K)

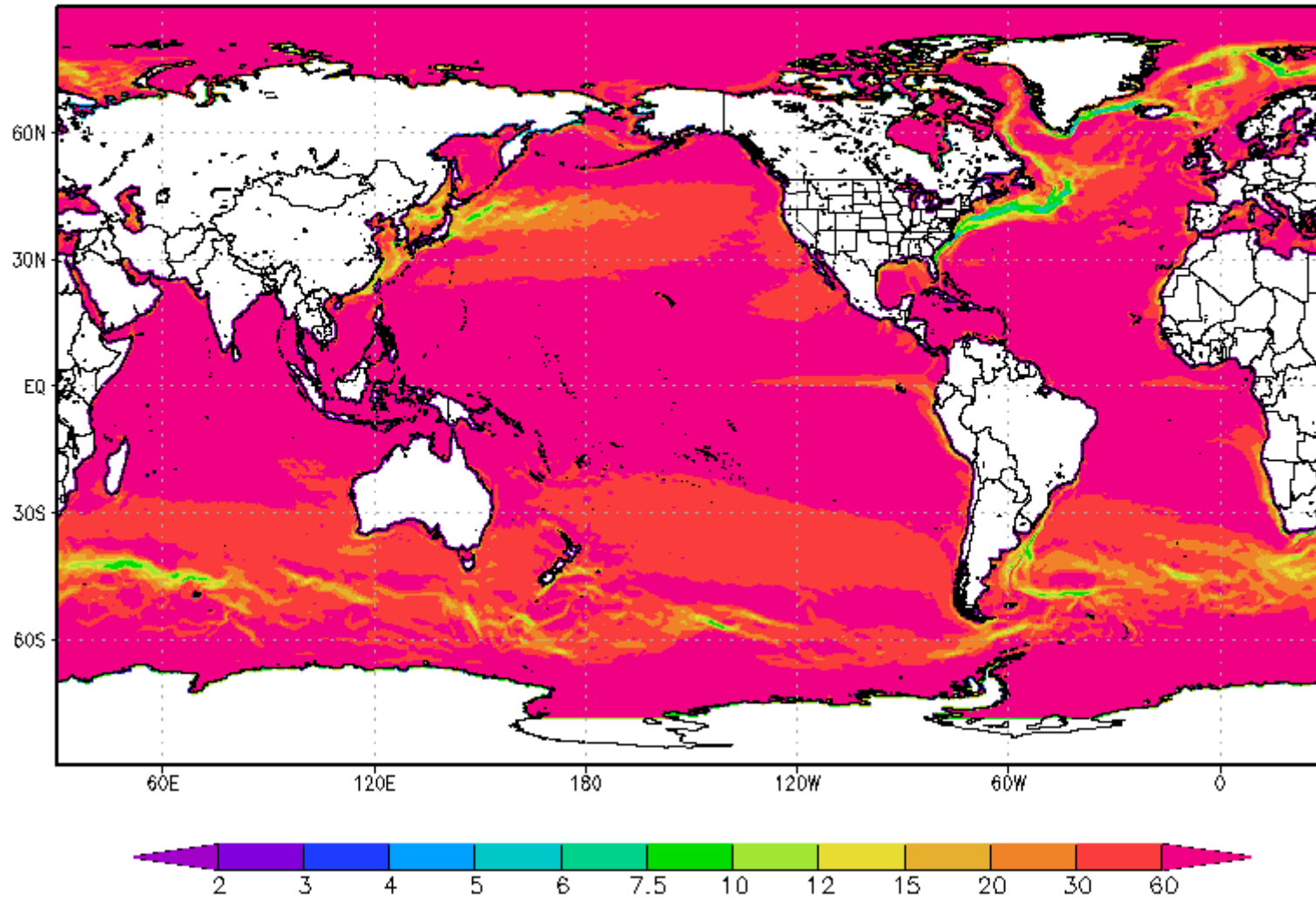




Mean through time, selected points

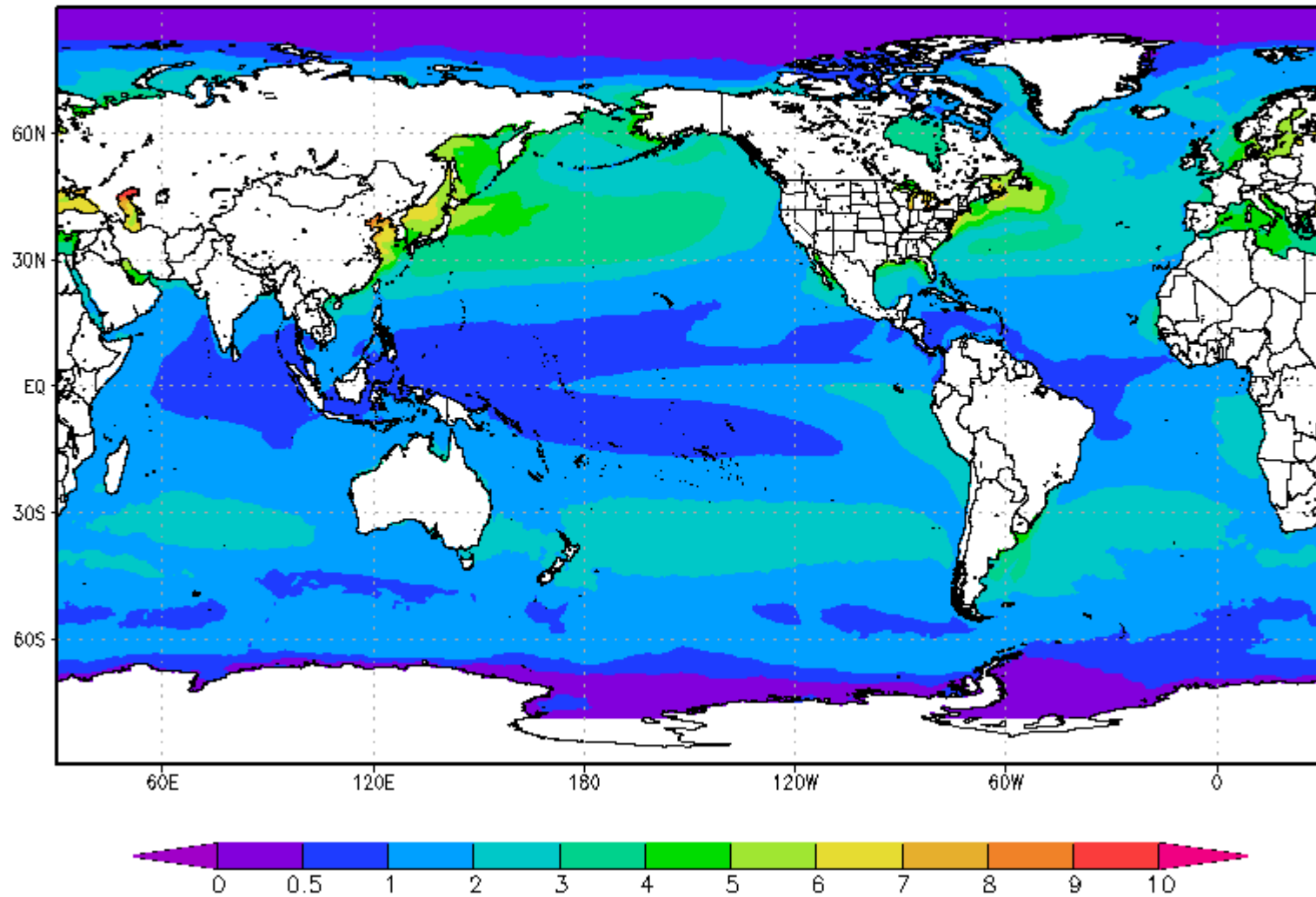
Resolution Requirements (vs. 30 year mean field!)

arcminutes (latitude) per 0.5 K

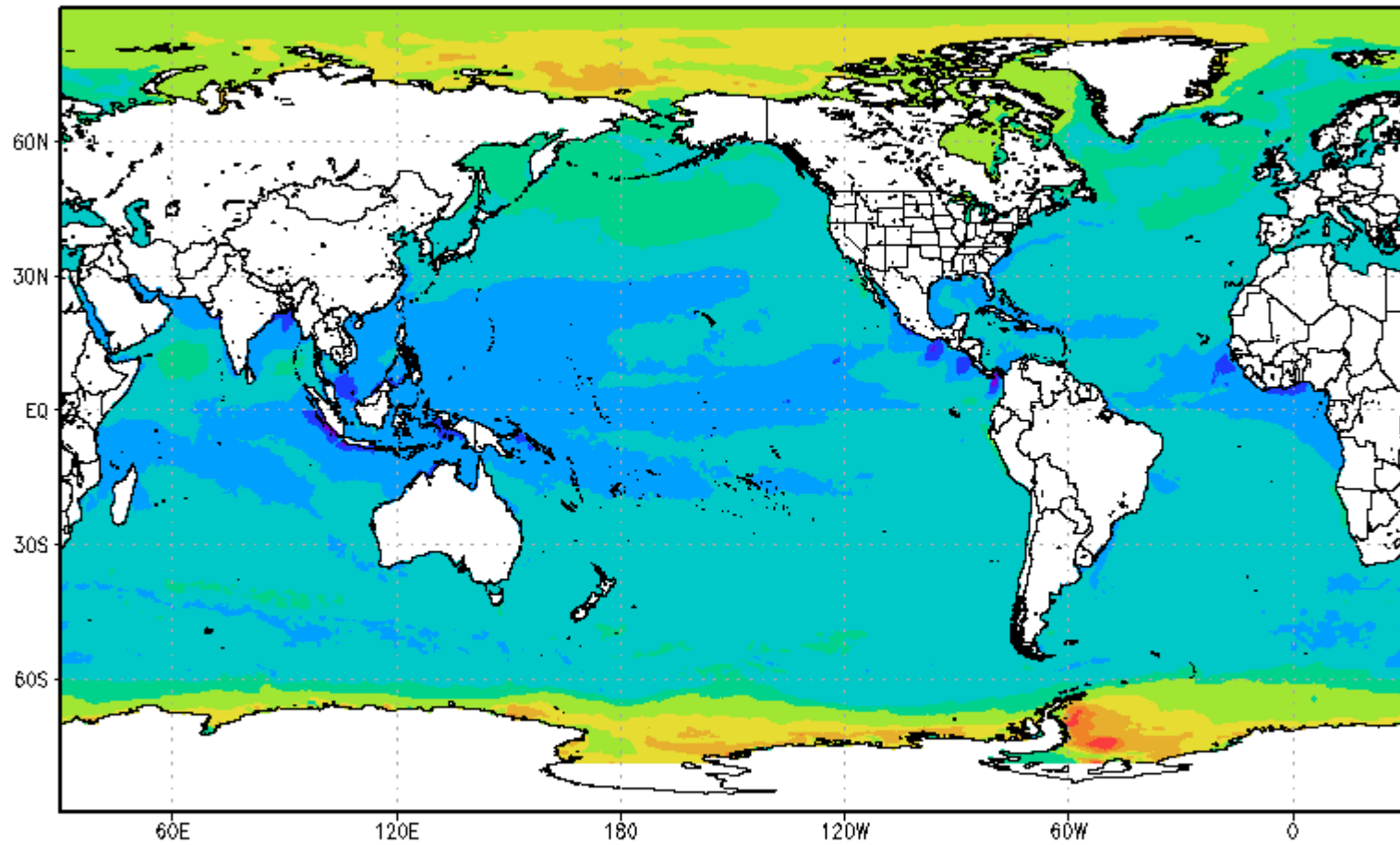


Higher Order Statistics – With Seasons

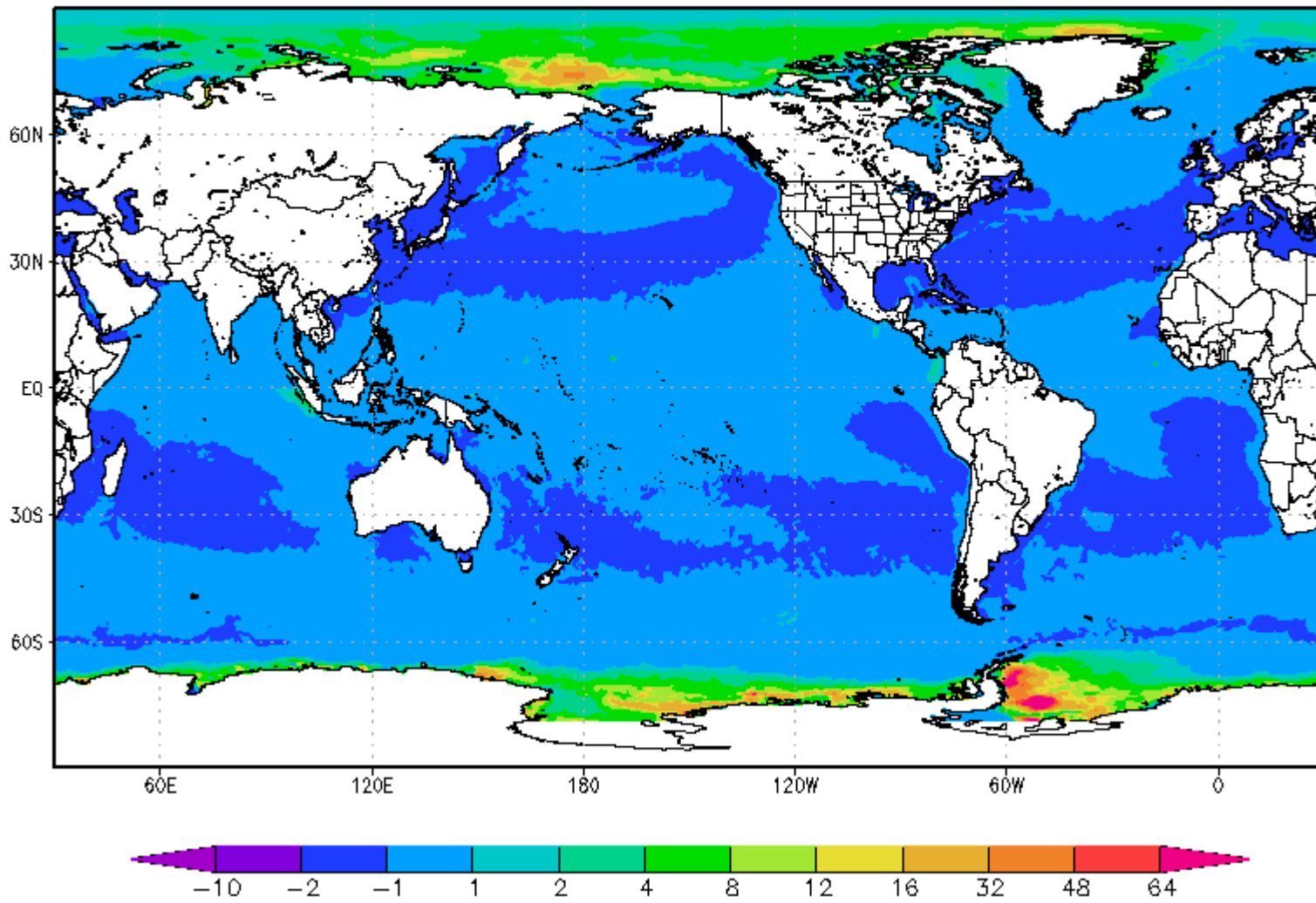
Sqrt(Variance) (K)



Skew

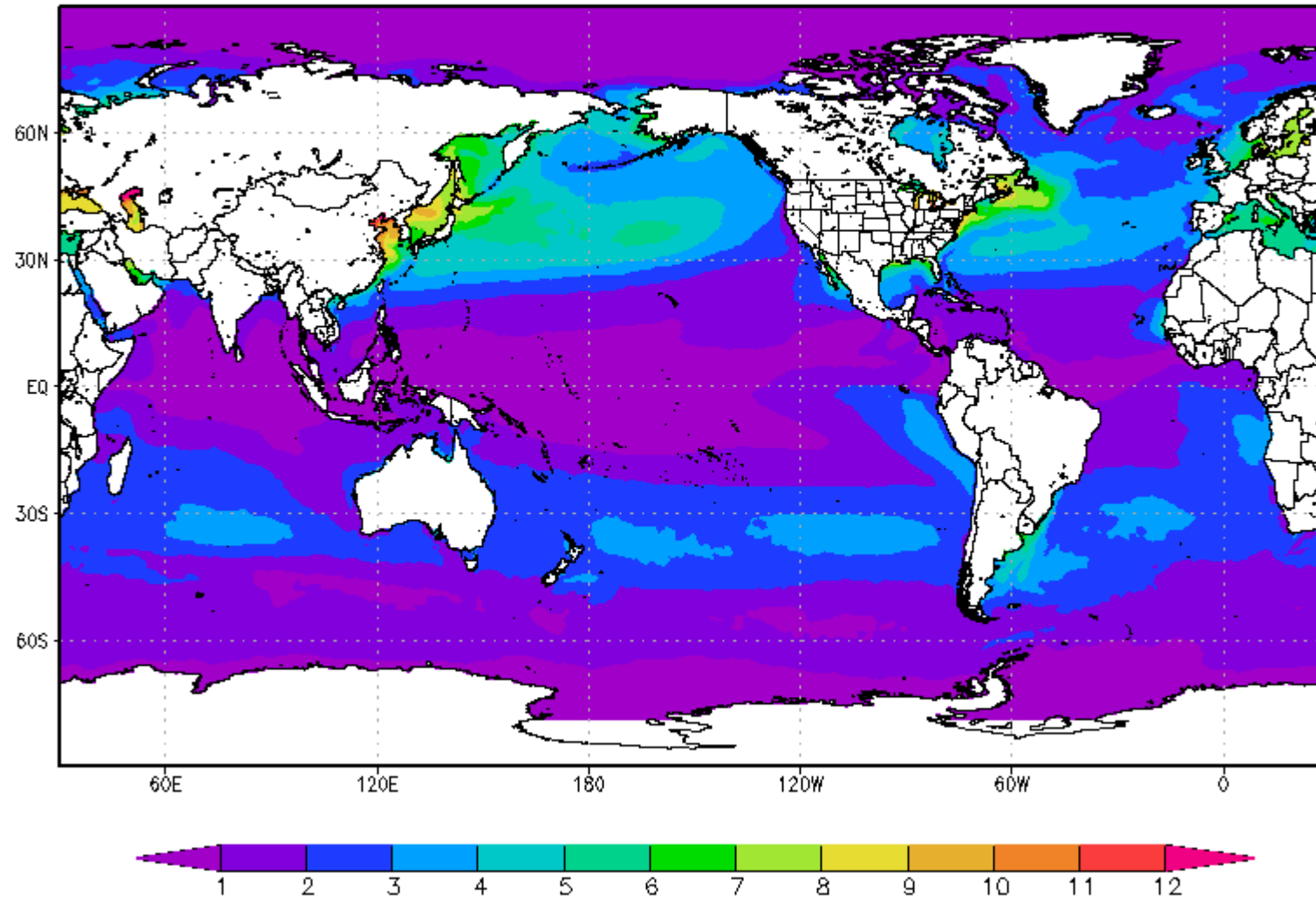


Kurtosis

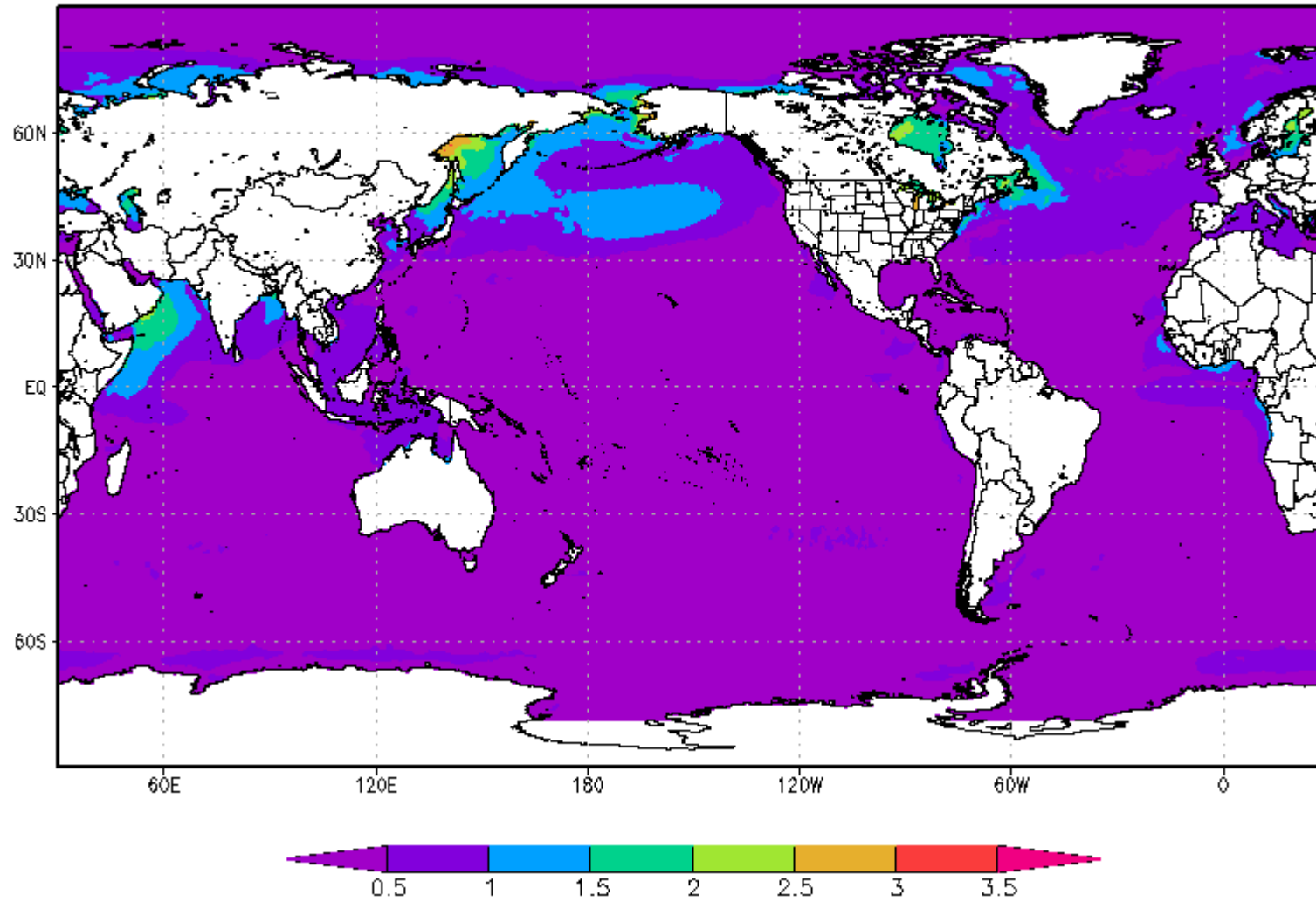


Seasonal Cycle

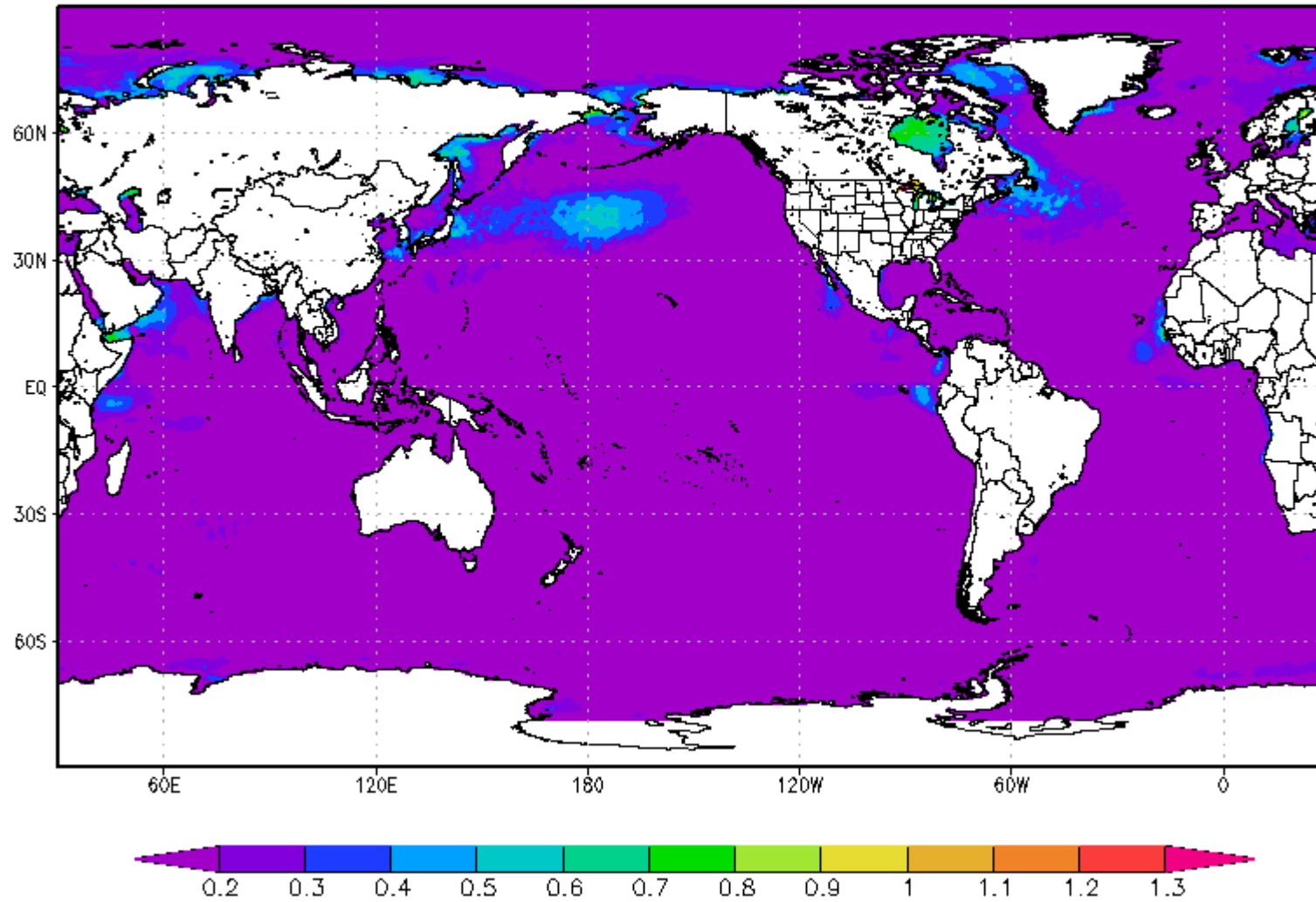
Harmonic 1 Amplitude



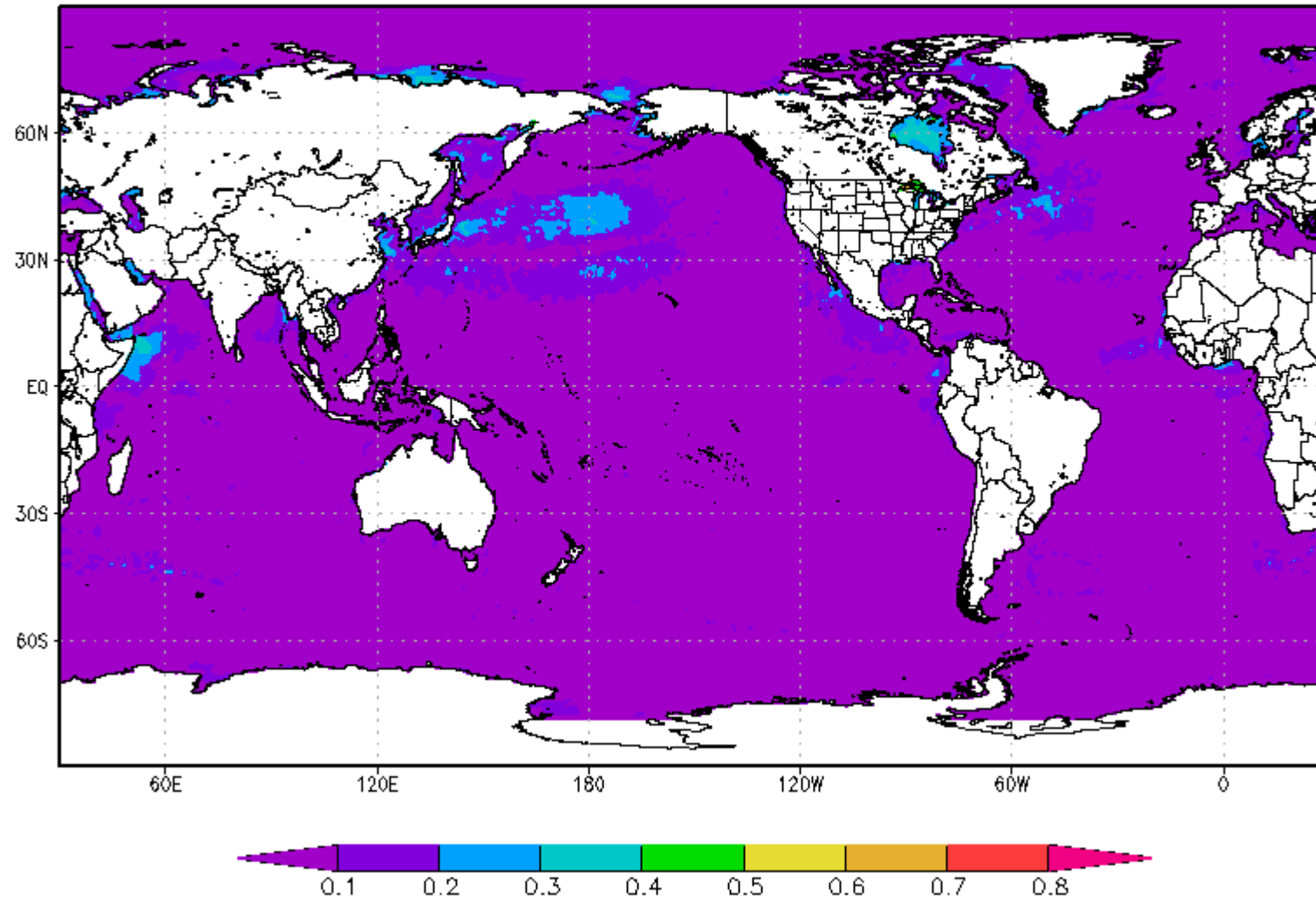
Harmonic 2 Amplitude



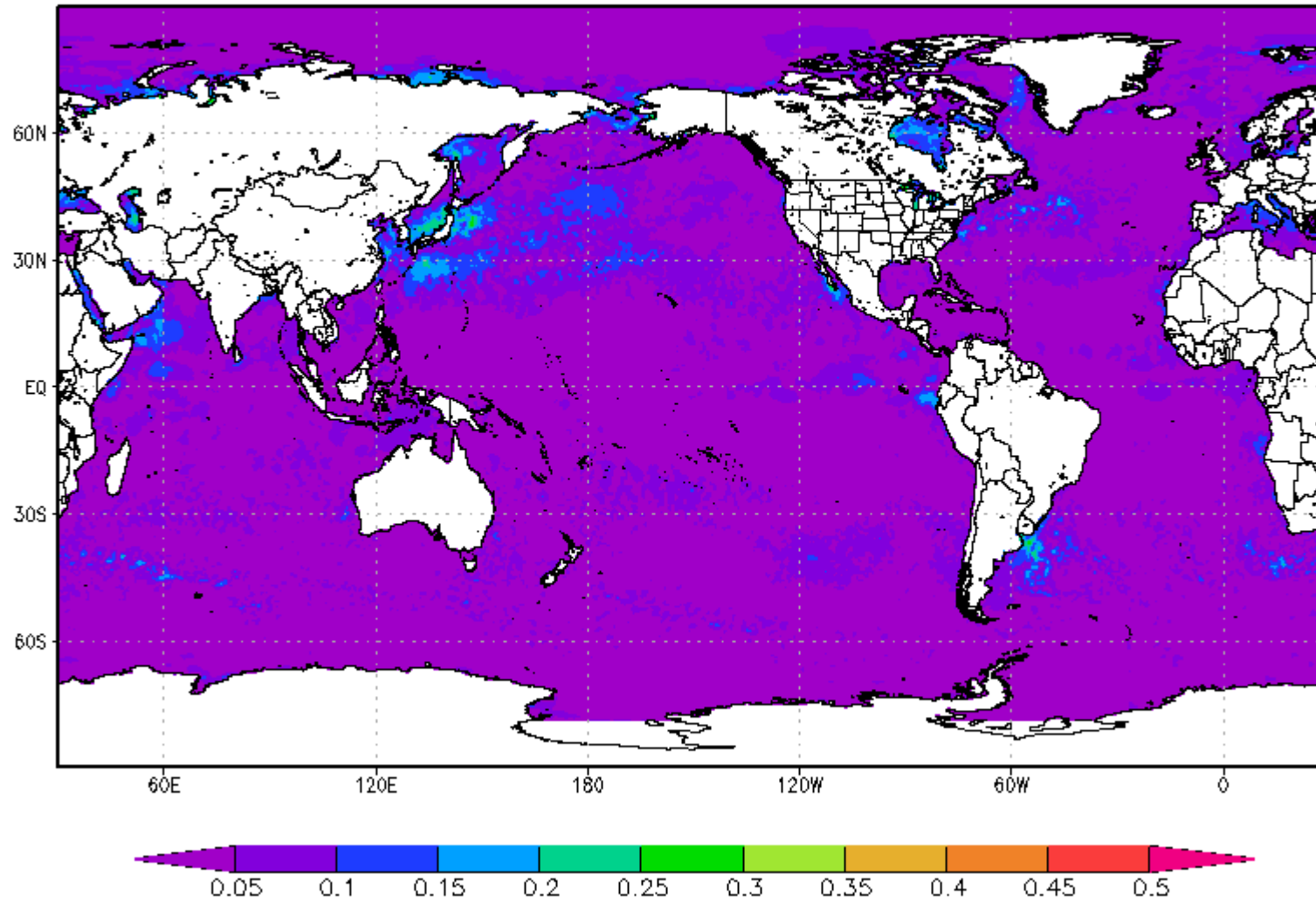
Harmonic 3 Amplitude



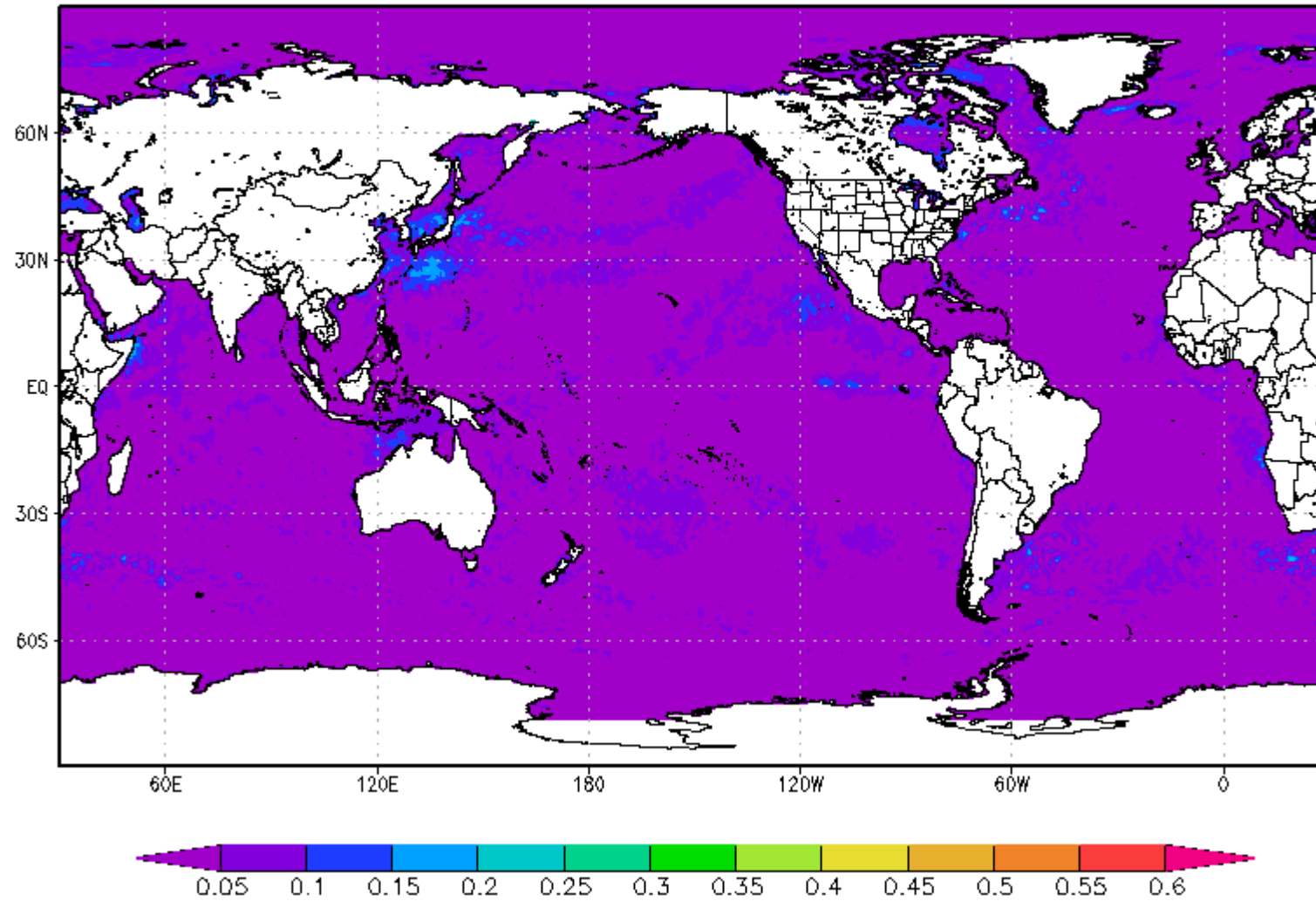
Harmonic 4 Amplitude



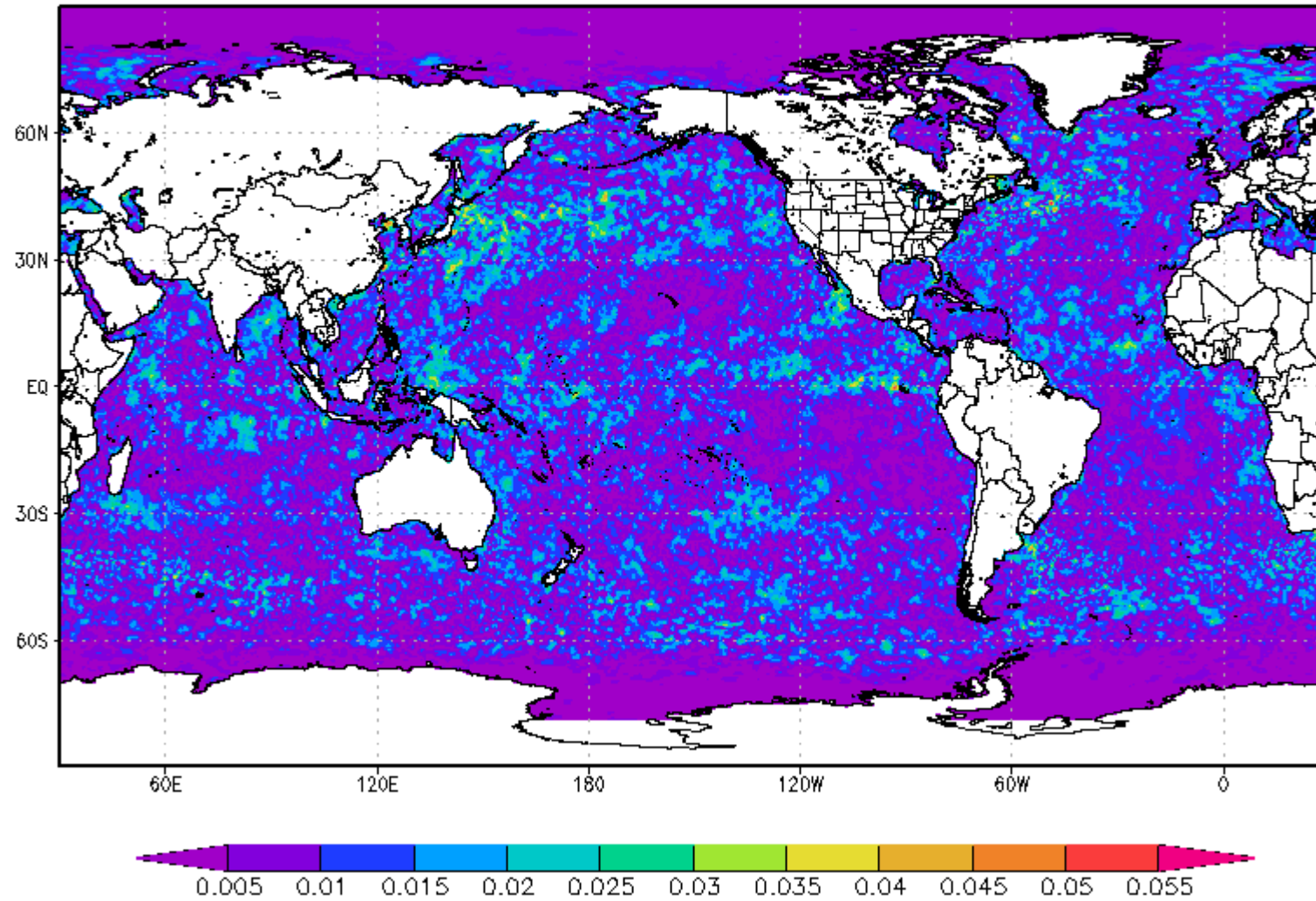
Harmonic 5 Amplitude



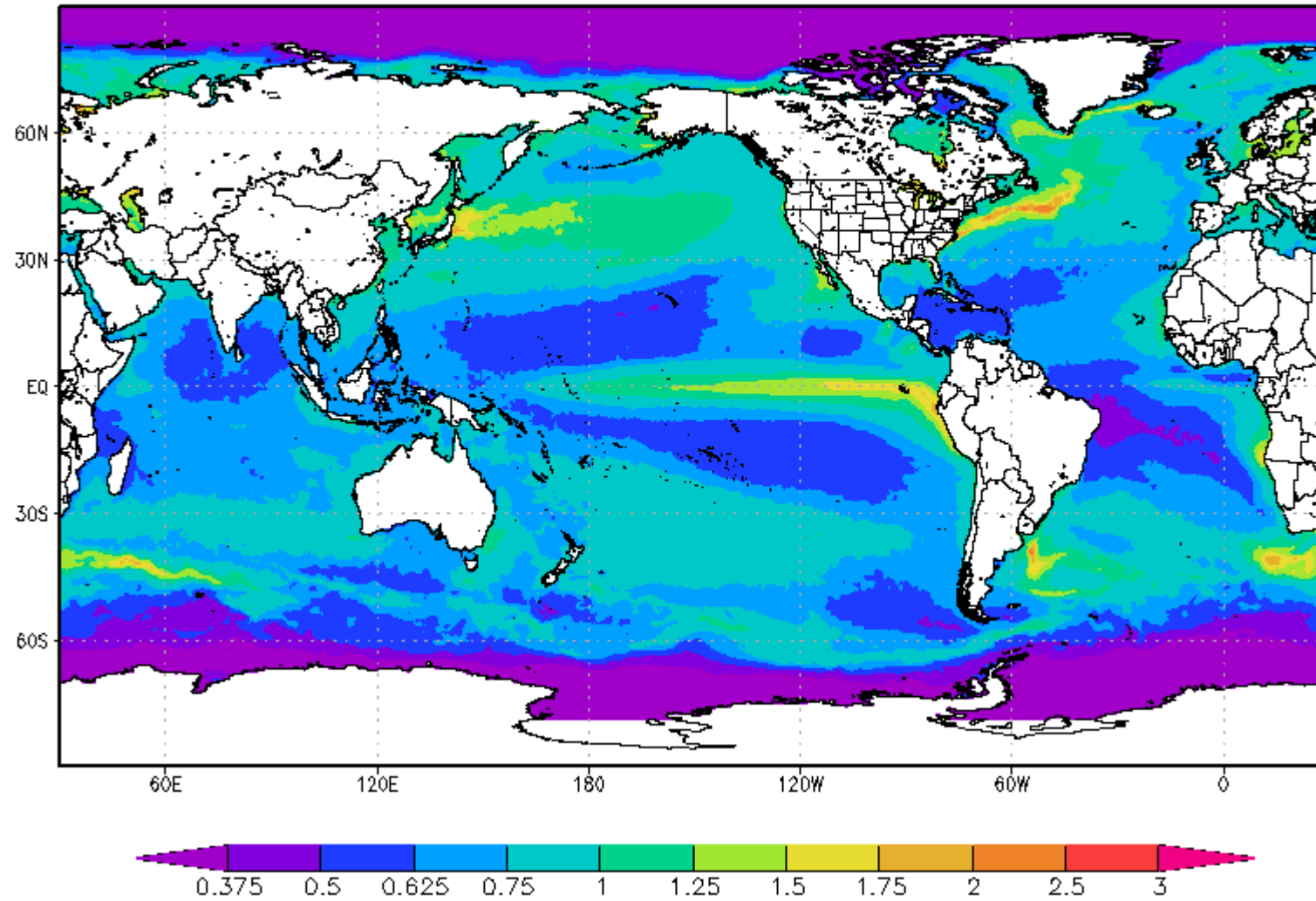
Harmonic 6 Amplitude



Harmonic 36 Amplitude

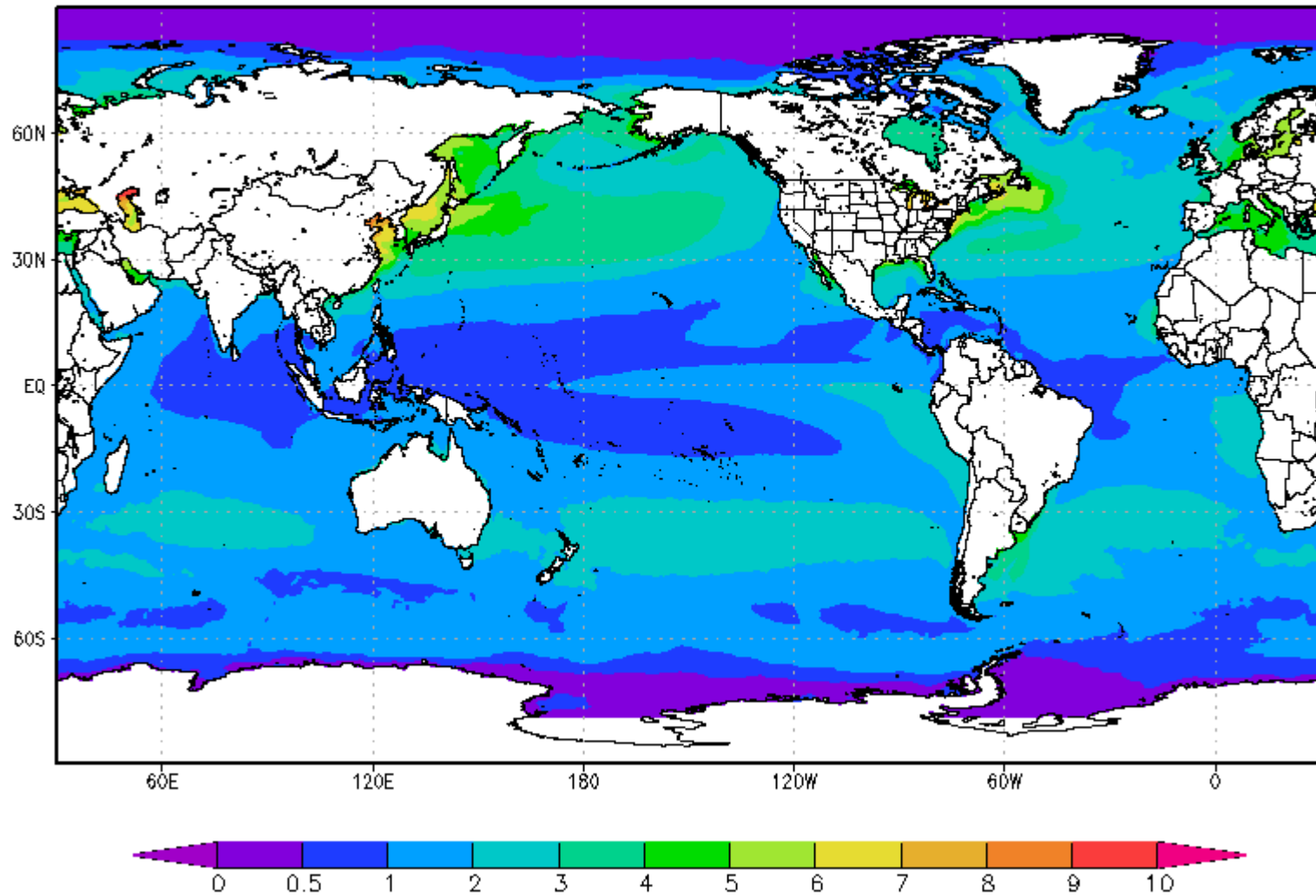


residual stdev

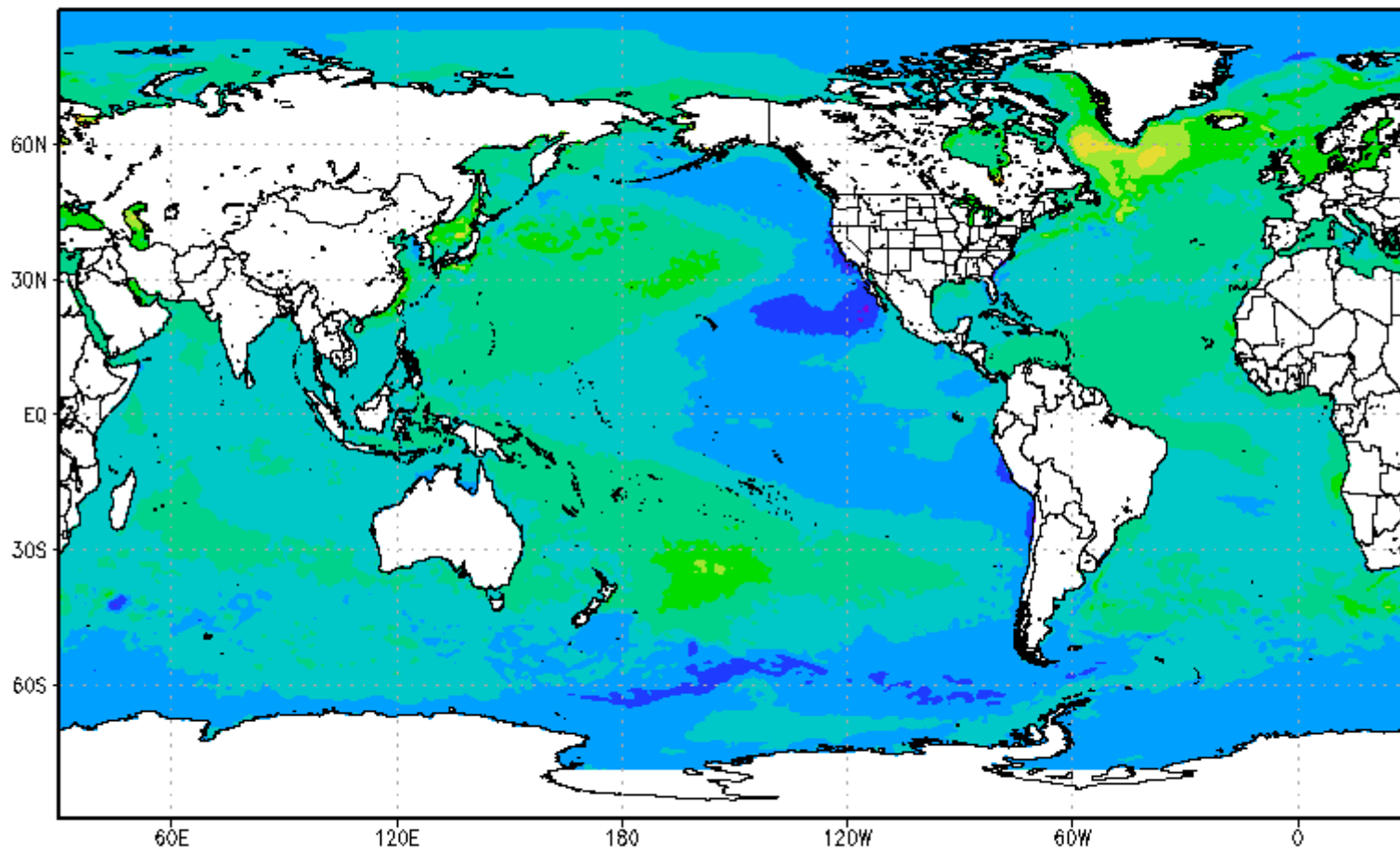


With Seasonal Cycle

Sqrt(Variance) (K)

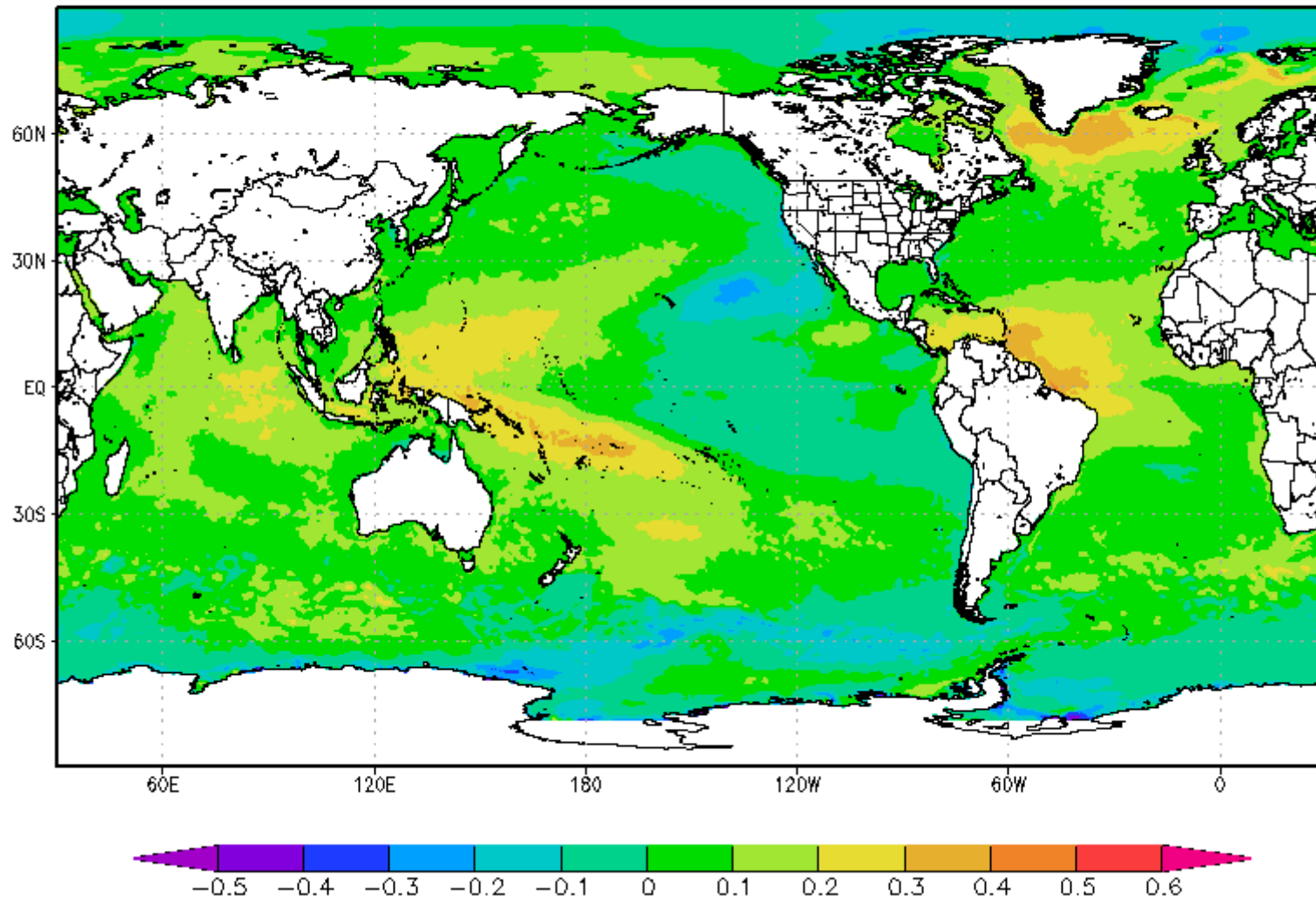


Trend (K/decade)



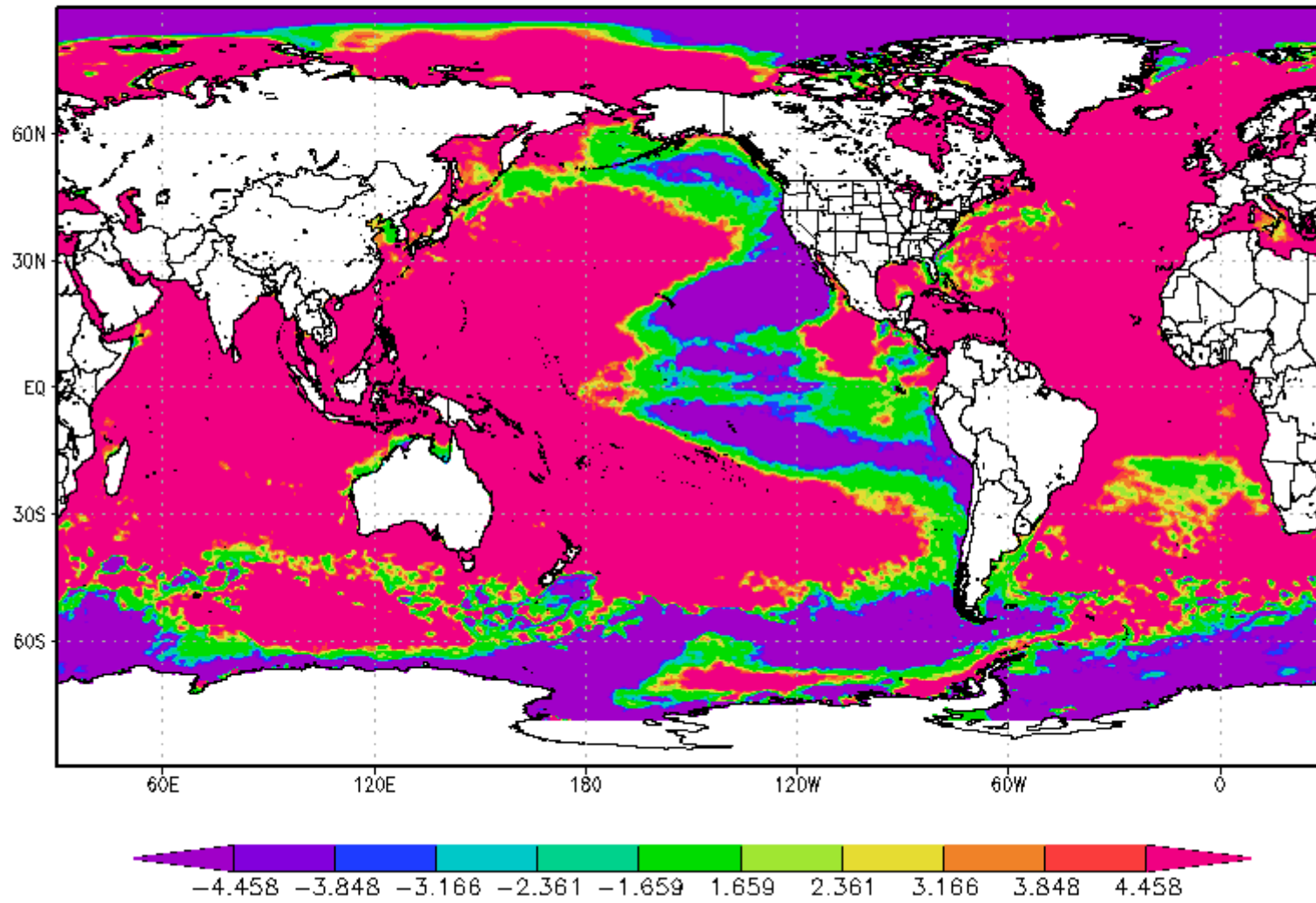
(Computed w. seasonal cycle present!)

Correlation



(ditto)

tstatistic



Shannon Information Theory

$$I = - \sum (p_i * \log(p_i))$$

‘Tell me something I don’t know’

Shannon Information – Original Series
(0.05 K bins)

Shannon Information – After Removal of mean
and seasonal cycle (0.05 K bins)

% Information Explained

% Variance Explained

