

## Aquarius Version 2.0/Version 3.0 Comparisons

In order to get some sense of gross changes in the Aquarius salinity data between versions 2.0 and 3.0, I arbitrarily chose the year, 2012, and plotted some global maps from the level-3 bin files for that year.

I also plotted difference maps to show how the changes varied regionally from version to version. The figures included are:

Figure 1: mean salinity differences of V2.0 SSS vs. V3.0 SSS
Figure 2: mean salinity differences of V2.0 SSS vs. V3.0 SSS bias_adj
Figure 3: mean salinity differences of V3.0 SSS vs. V3.0 SSS bias_adj
Figure 4: standard deviation differences of V2.0 SSS vs. V3.0 SSS
Figure 5: standard deviation differences of V2.0 SSS vs. V3.0 SSS bias_adj
Figure 6: standard deviation differences of V3.0 SSS vs. V3.0 SSS bias_adj
Figure 7: differences in number of observations per bin of V2.0 vs. V3.0
Figure 8: differences in number of orbits per bin of V2.0 vs. V3.0
Figure 9: 3 histograms of salinity: V2.0 SSS, V3.0 SSS, and V3.0 SSS bias_adj

I used the h5dump program from The HDF Group

(<http://www.hdfgroup.org/HDF5/doc/RM/Tools.html#Tools-Dump>) to read just three of the datasets that are stored in the level-3 files, namely BinList, SSS, and SSS\_bias\_adj.

```
h5dump -A Q20120012012366.L3b_YR_SCI_V3.0.main
.
.
GROUP "Level-3 Binned Data" {
.
.
DATASET "BinList" {
  DATATYPE H5T_COMPOUND {
    H5T_STD_U32LE "bin_num"; ← bin number (yields geographical location)
    H5T_STD_I16LE "nobs"; ← number of observations per bin
    H5T_STD_I16LE "nscenes"; ← number of orbits per bin
    H5T_IEEE_F32LE "weights"; ← divides sum and sum_sq to yield mean and standard deviation
    H5T_STD_U64LE "flags_set";
  }
  DATASPACE SIMPLE { ( 26620 ) / ( H5S_UNLIMITED ) }
}
.
.
DATASET "SSS" {
  DATATYPE H5T_COMPOUND {
    H5T_IEEE_F32LE "SSS_sum"; ← divide by "weights" to get mean salinity
    H5T_IEEE_F32LE "SSS_sum_sq"; ← divide by "weights" and subtract square of mean to get variance of salinity
  }
  DATASPACE SIMPLE { ( 26620 ) / ( H5S_UNLIMITED ) }
}
DATASET "SSS_bias_adj" {
  DATATYPE H5T_COMPOUND {
    H5T_IEEE_F32LE "SSS_bias_adj_sum"; ← divide by "weights" to get mean salinity
    H5T_IEEE_F32LE "SSS_bias_adj_sum_sq"; ← divide by "weights" and subtract square of mean to get variance of salinity
  }
  DATASPACE SIMPLE { ( 26620 ) / ( H5S_UNLIMITED ) }
}
.
.
.
```

(The SSS\_bias\_adj dataset is not present in Version 2.0.)

For each bin number in the file, I computed the geographical corner coordinates using a slight variation of the logic presented in Appendix A of [NASA Technical Memorandum 104566, Volume 32, Level-3 SeaWiFS Data Products: Spatial and Temporal Binning Algorithms](http://oceancolor.gsfc.nasa.gov/SeaWiFS/TECH_REPORTS/PreLPDF/PreLVol32.pdf) ([http://oceancolor.gsfc.nasa.gov/SeaWiFS/TECH\\_REPORTS/PreLPDF/PreLVol32.pdf](http://oceancolor.gsfc.nasa.gov/SeaWiFS/TECH_REPORTS/PreLPDF/PreLVol32.pdf)). With these corner coordinates I could draw each bin as a little rectangle on the maps I made – using a color look-up table to represent different data values with different colors.

I made three separate comparisons each for the mean salinity and its standard deviation at each level-3 bin.

- V2.0 SSS *versus* V3.0 SSS
- V2.0 SSS *versus* V3.0 SSS\_bias\_adj
- V3.0 SSS *versus* V3.0 SSS\_bias\_adj

I also compared the number of observations per bin and number of orbits per bin between V2.0 and V3.0.

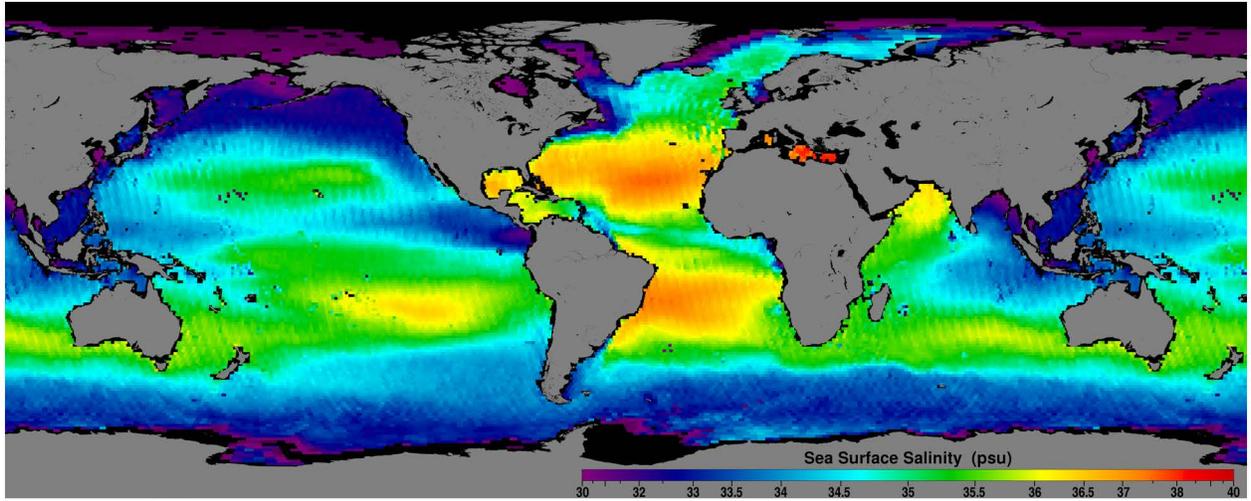
Finally, I gathered all of the level-3 2012 salinity means from V2.0 SSS, V3.0 SSS, and V3.0 SSS\_bias\_adj into classes that are 0.1 psu wide and plotted three histograms showing how many of the global measurements fell into each of the classes. I also constructed such histograms for each of the 7-day level-3 bin files (V3.0 only) and assembled them into an animated GIF.

All of these graphics are available at the following location.

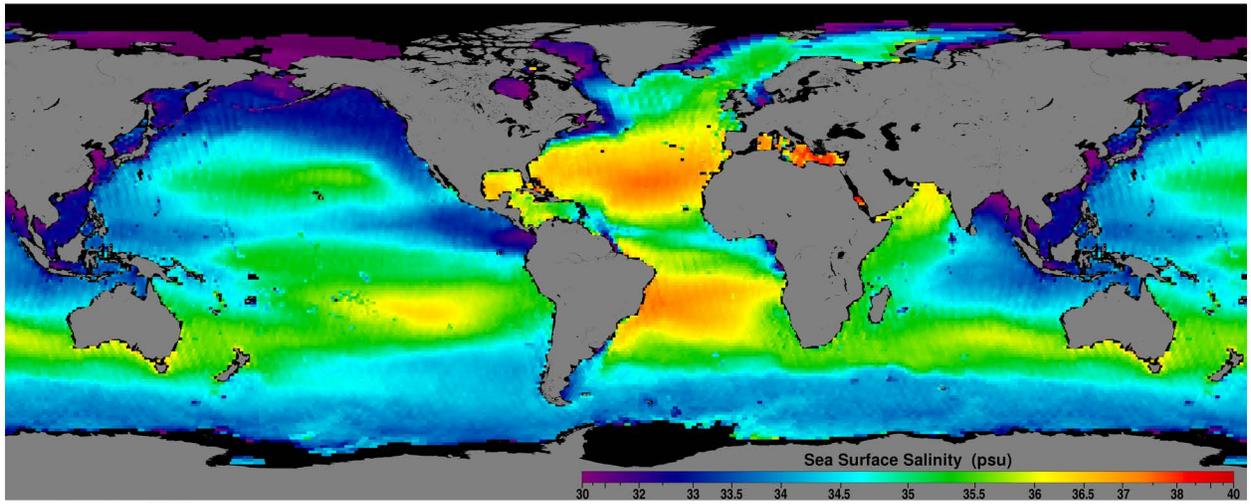
[ftp://samoa.gsfc.nasa.gov/pub/norman/Aquarius/V3.0\\_V2.0\\_comparison/](ftp://samoa.gsfc.nasa.gov/pub/norman/Aquarius/V3.0_V2.0_comparison/)

P1.2012_V3.0_SSS_mean-2012_V2.0_SSS_mean.png	V2.0 SSS vs. V3.0 SSS	mean salinity differences
P2.2012_V3.0_SSS_bias_adj_mean-2012_V2.0_SSS_mean.png	V2.0 SSS vs. V3.0 SSS_bias_adj	mean salinity differences
P3.2012_V3.0_SSS_bias_adj_mean-2012_V3.0_SSS_mean.png	V3.0 SSS vs. V3.0 SSS_bias_adj	mean salinity differences
P4.2012_V3.0_SSS_stdev-2012_V2.0_SSS_stdev.png	V2.0 SSS vs. V3.0 SSS	standard deviation differences
P5.2012_V3.0_SSS_bias_adj_stdev-2012_V2.0_SSS_stdev.png	V2.0 SSS vs. V3.0 SSS_bias_adj	standard deviation differences
P6.2012_V3.0_SSS_bias_adj_stdev-2012_V3.0_SSS_stdev.png	V3.0 SSS vs. V3.0 SSS_bias_adj	standard deviation differences
P7.2012_V3.0_nobs-2012_V2.0_nobs.png	V2.0 vs. V3.0	differences in number of observations per bin
P8.2012_V3.0_nscenes-2012_V2.0_nscenes.png	V2.0 vs. V3.0	differences in number of orbits per bin
P9.Q20120012012366.L3b_YR_SCI_V2.0_V3.0.hist.png	3 histograms of salinity:	V2.0 SSS, V3.0 SSS, and V3.0 SSS_bias_adj
Aquarius_7D_salinity_histograms.anim.gif	A time series of 7-day salinity histograms	(V3.0 SSS and SSS_bias_adj)
Aquarius_V2_V3_comparisons.pdf	This document	

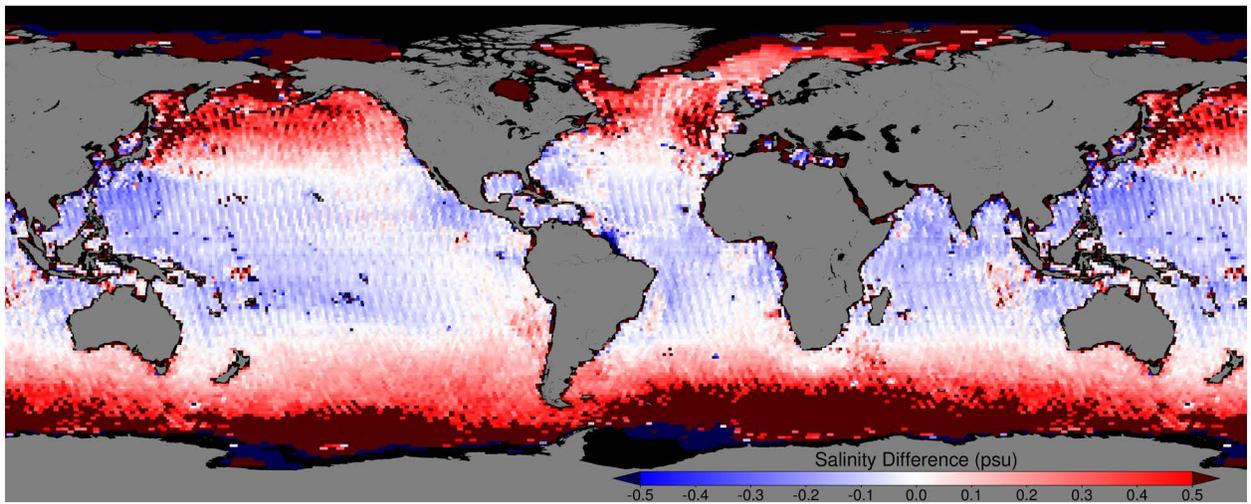
FIGURE 1



2012 V2.0 SSS

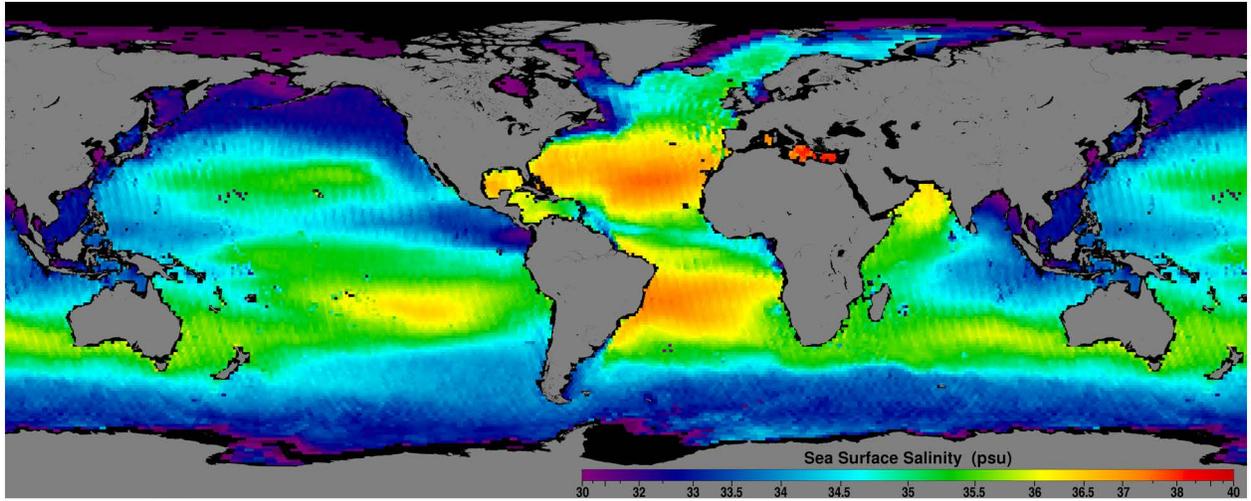


2012 V3.0 SSS

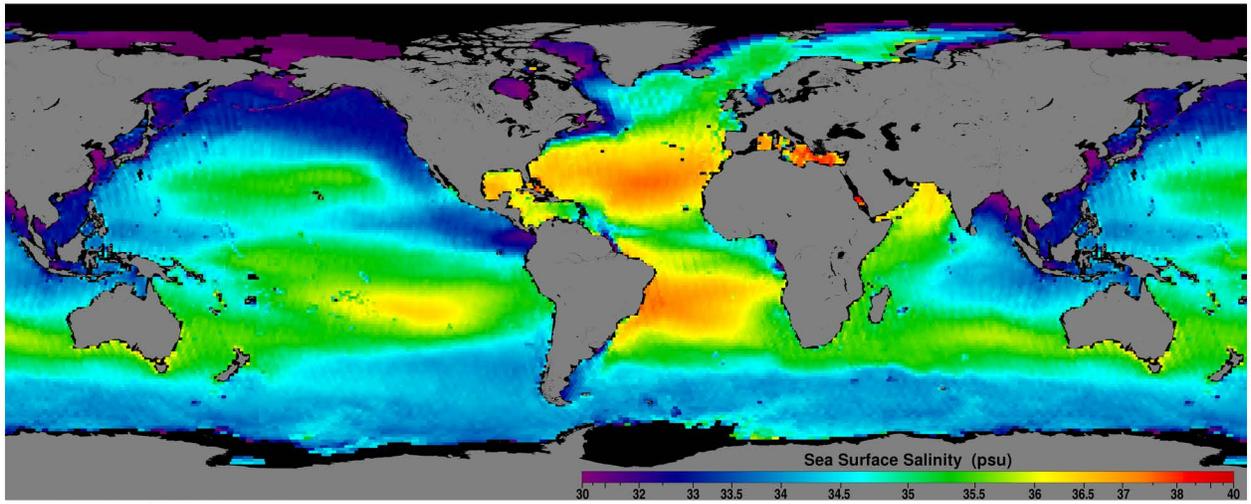


2012 V3.0 SSS minus 2012 V2.0 SSS

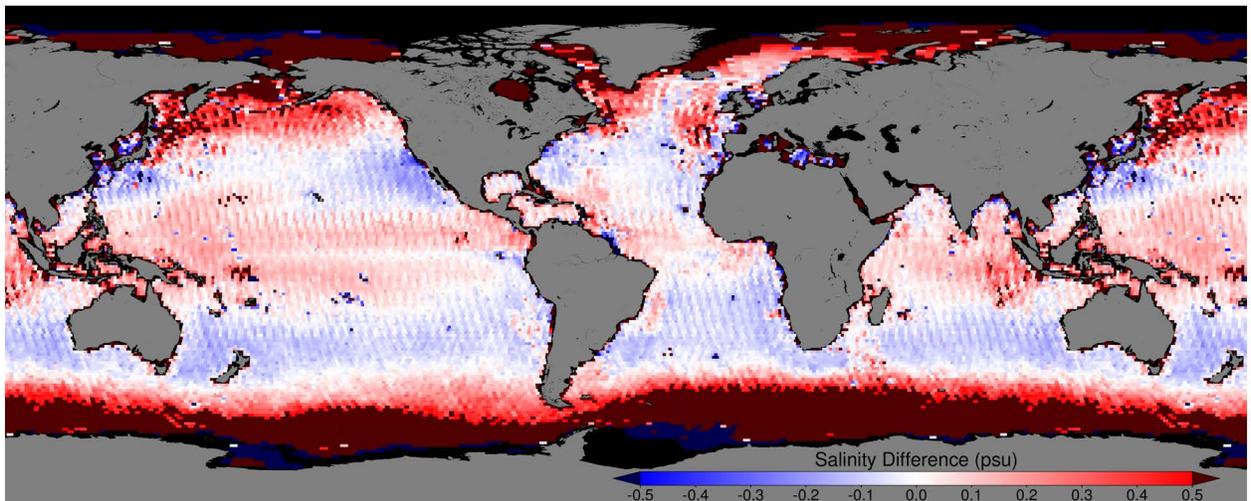
FIGURE 2



2012 V2.0 SSS



2012 V3.0 SSS\_bias\_adj



2012 V3.0 SSS\_bias\_adj minus 2012 V2.0 SSS

FIGURE 3

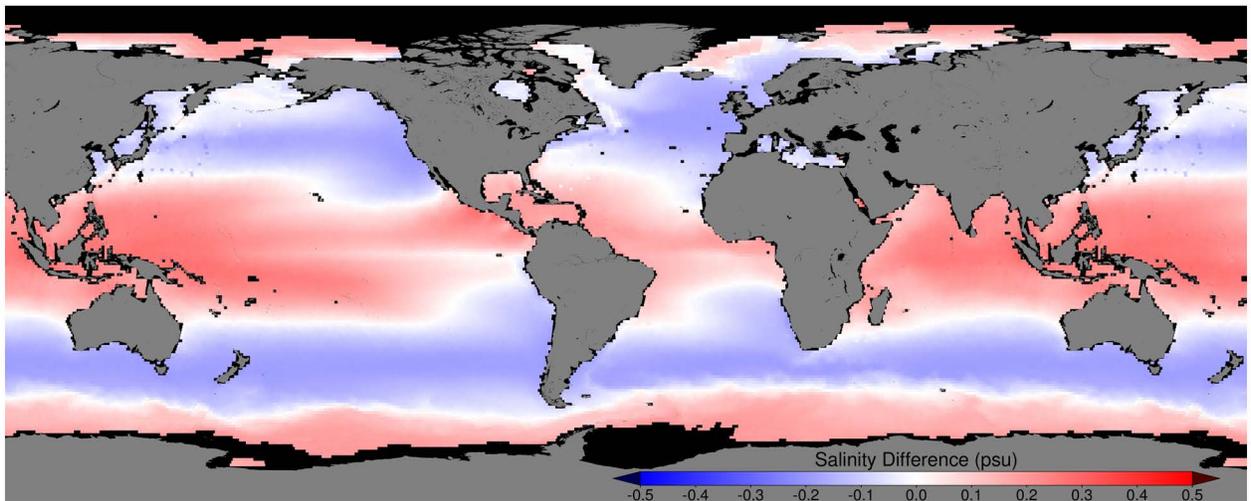
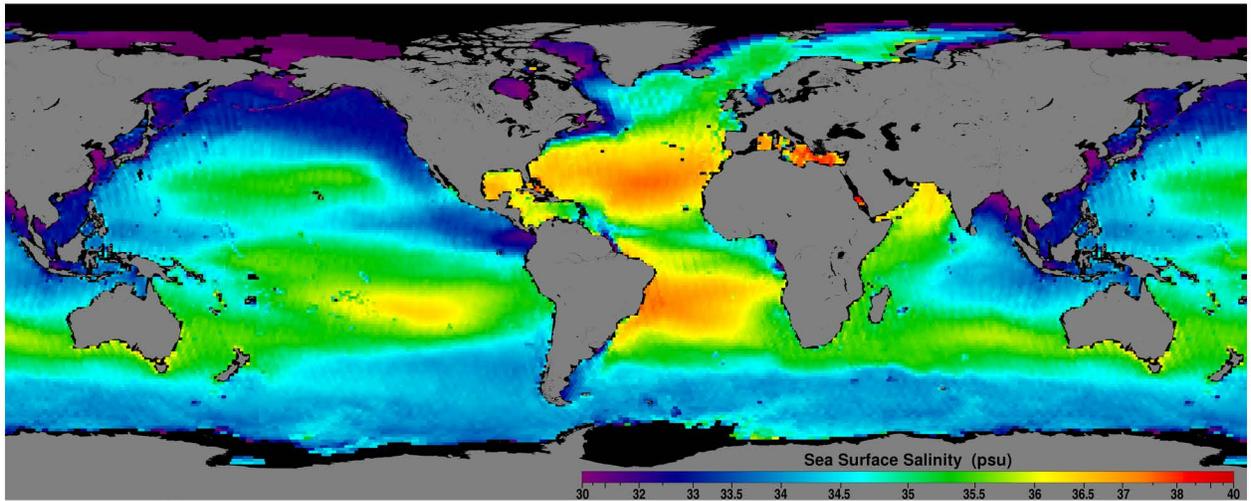
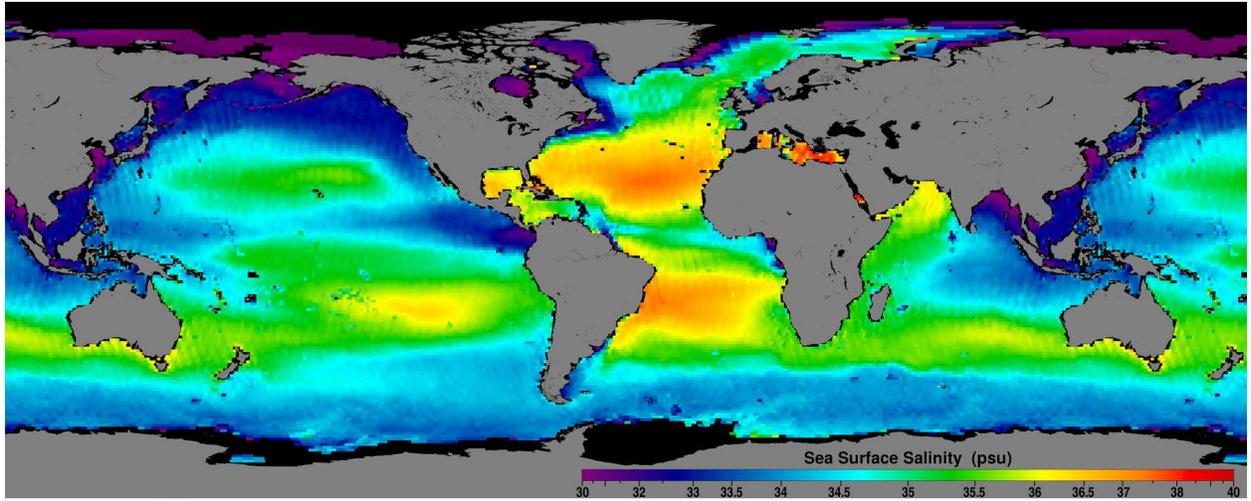
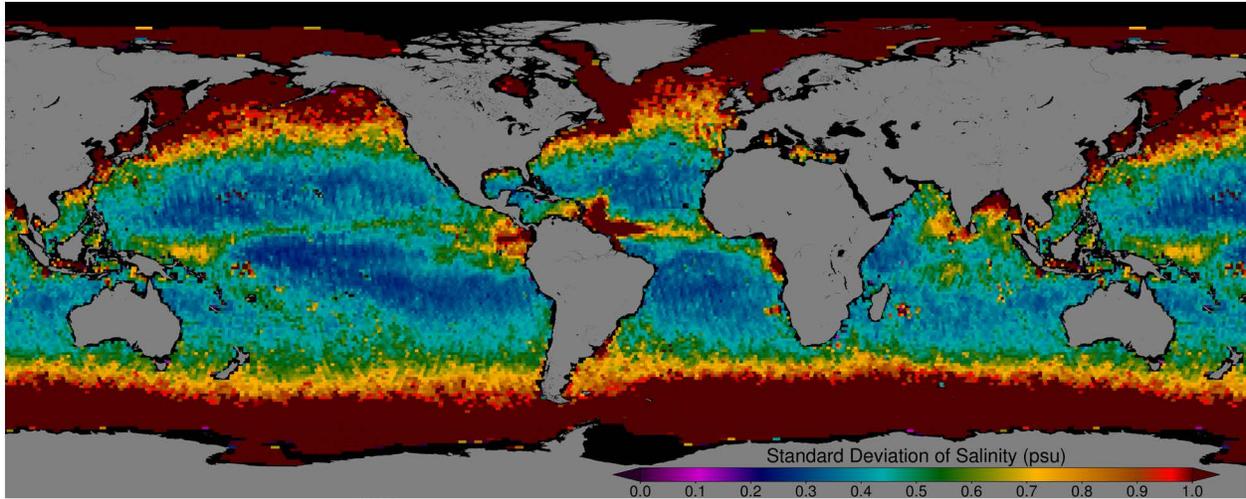
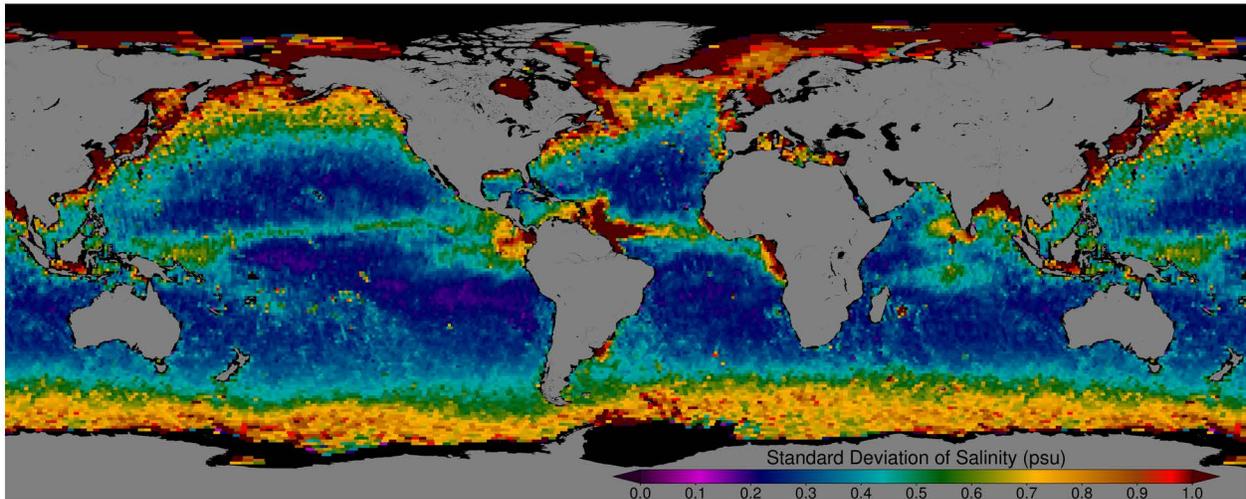


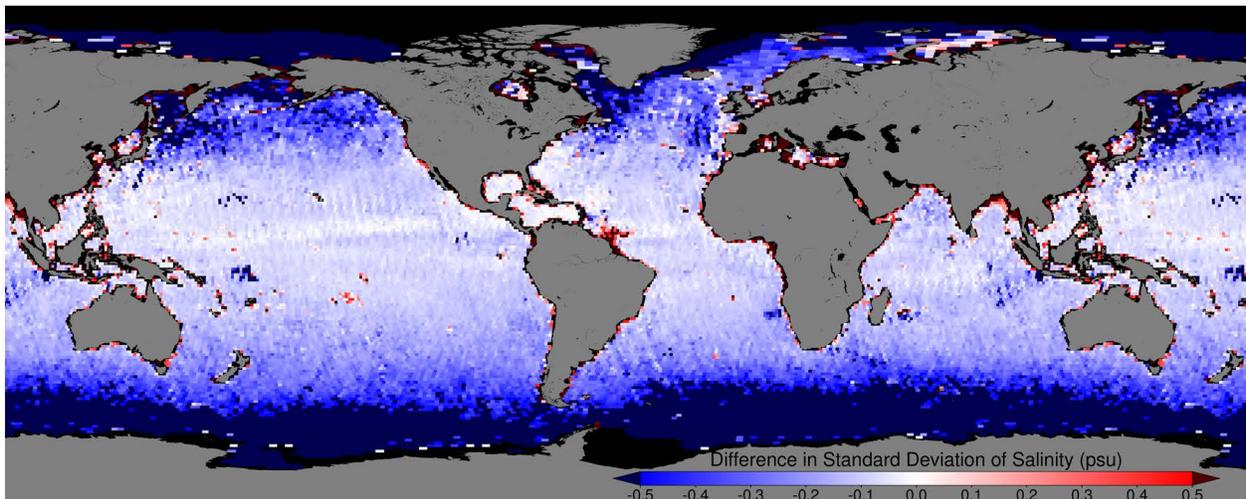
FIGURE 4



2012 V2.0 standard deviation of SSS

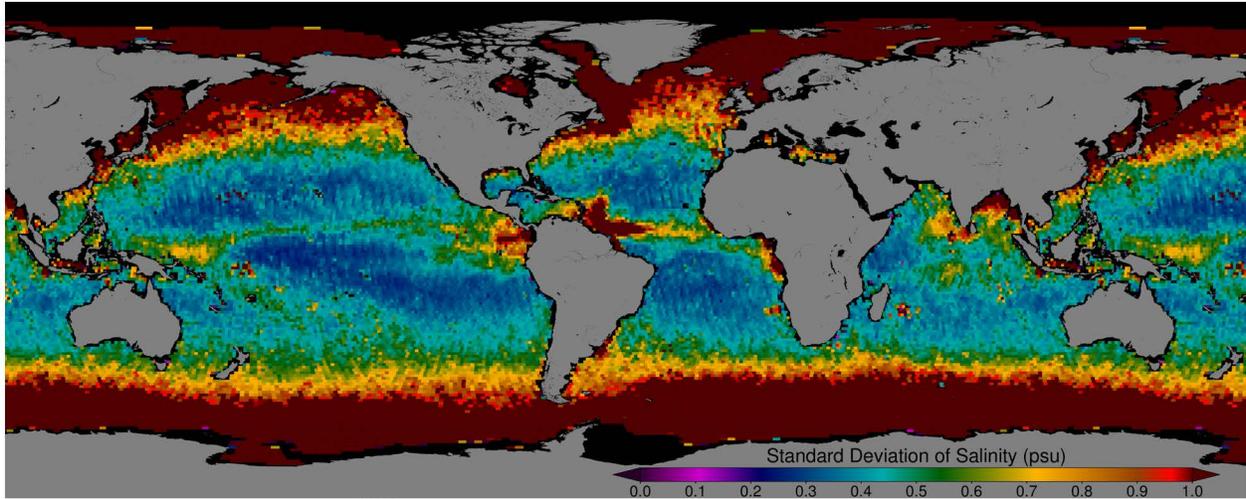


2012 V3.0 standard deviation of SSS

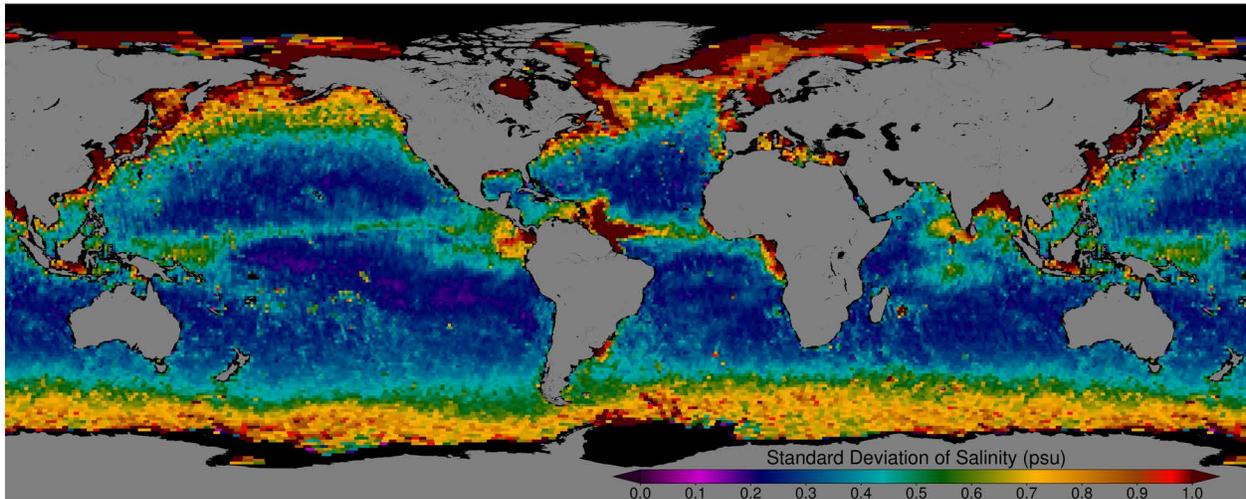


2012 V3.0 standard deviation of SSS minus 2012 V2.0 standard deviation of SSS

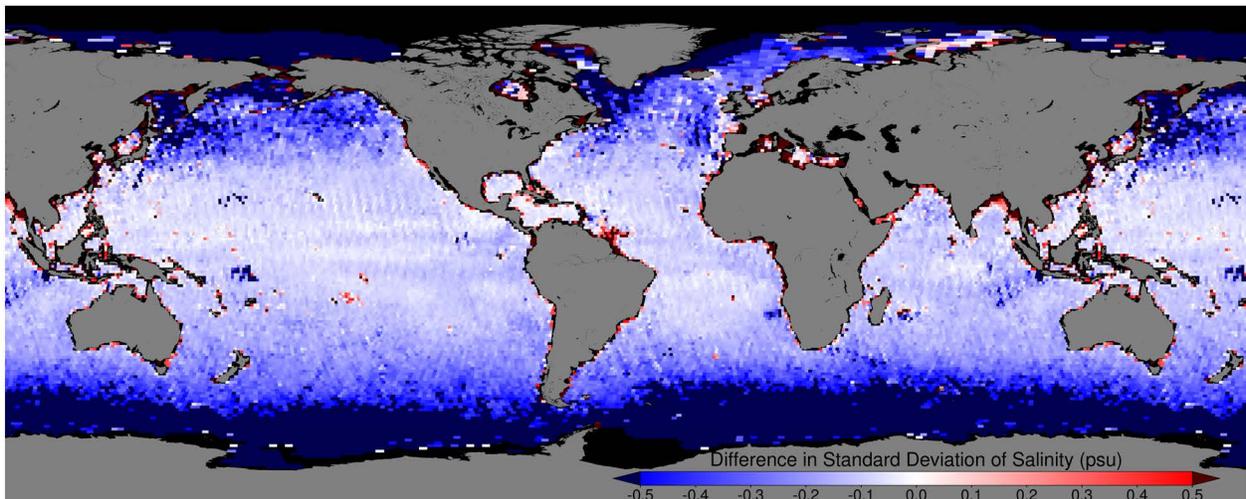
FIGURE 5



2012 V2.0 standard deviation of SSS

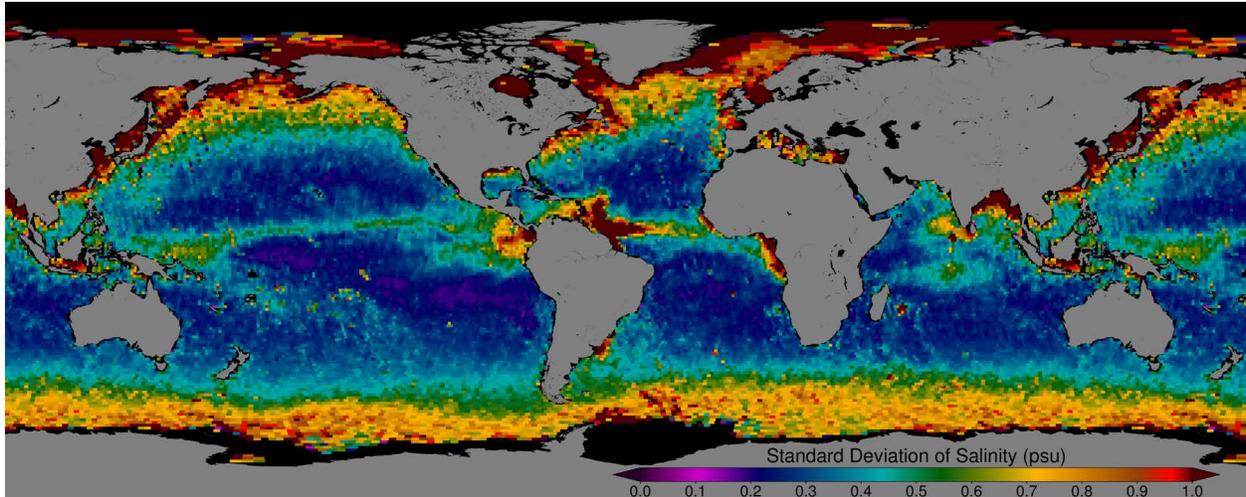


2012 V3.0 standard deviation of SSS\_bias\_adj

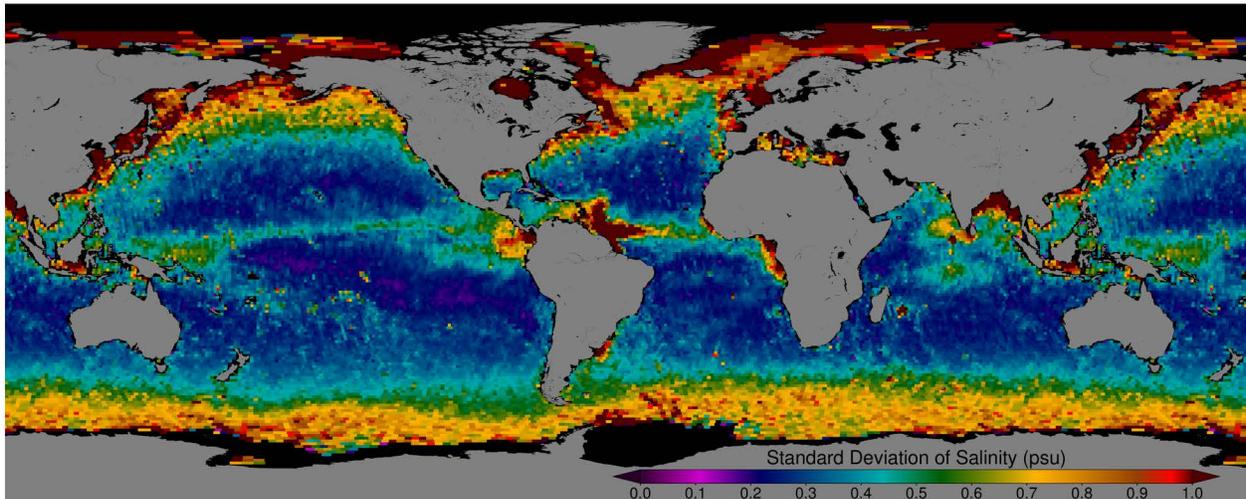


2012 V3.0 standard deviation of SSS\_bias\_adj minus 2012 V2.0 standard deviation of SSS

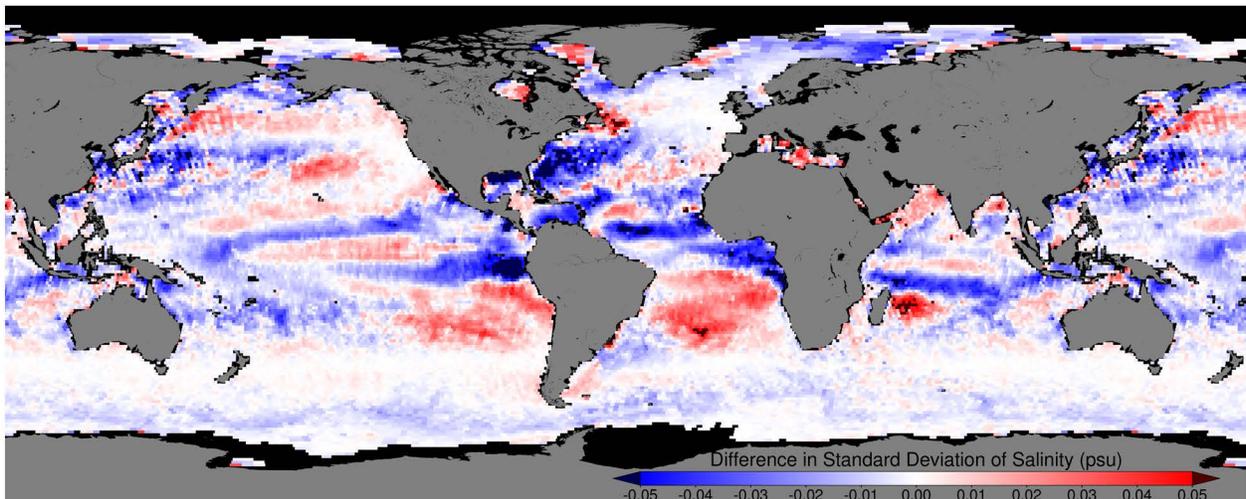
FIGURE 6



2012 V3.0 standard deviation of SSS



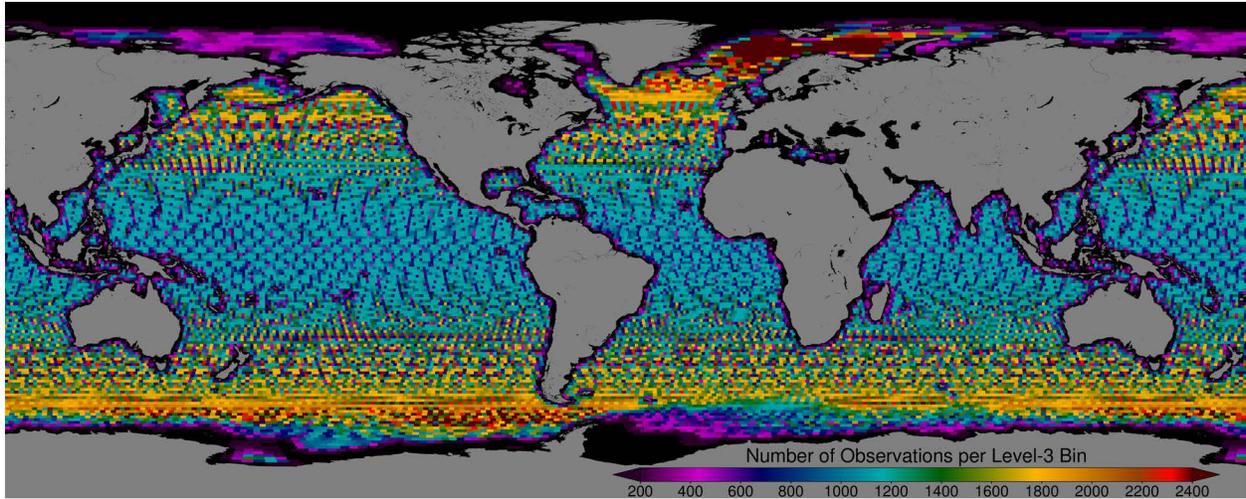
2012 V3.0 standard deviation of SSS\_bias\_adj



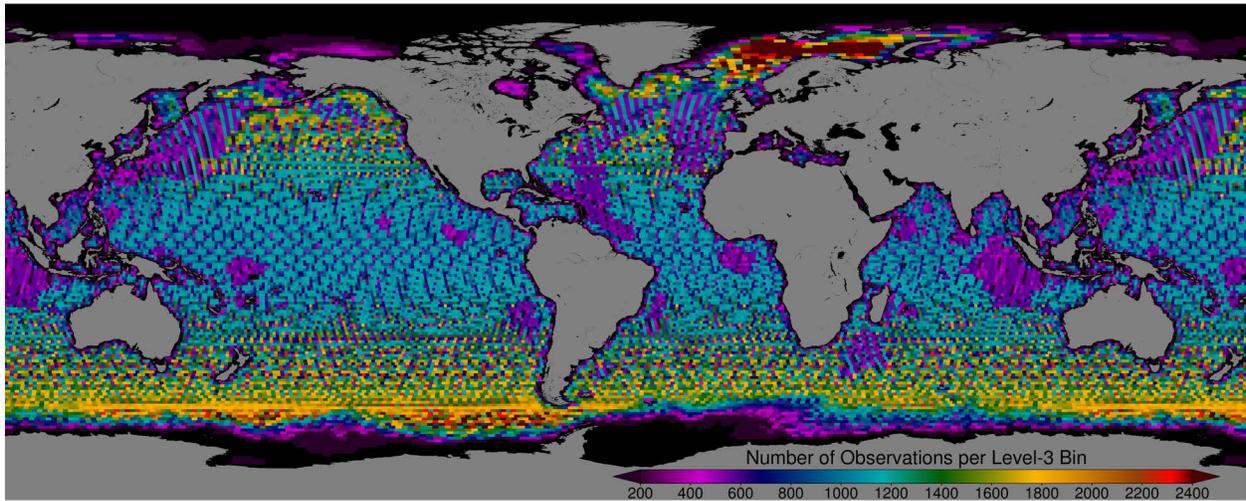
2012 V3.0 standard deviation of SSS\_bias\_adj minus 2012 V3.0 standard deviation of SSS

*N.B. The difference color scale covers a much smaller range compared with the other standard deviation difference plots.*

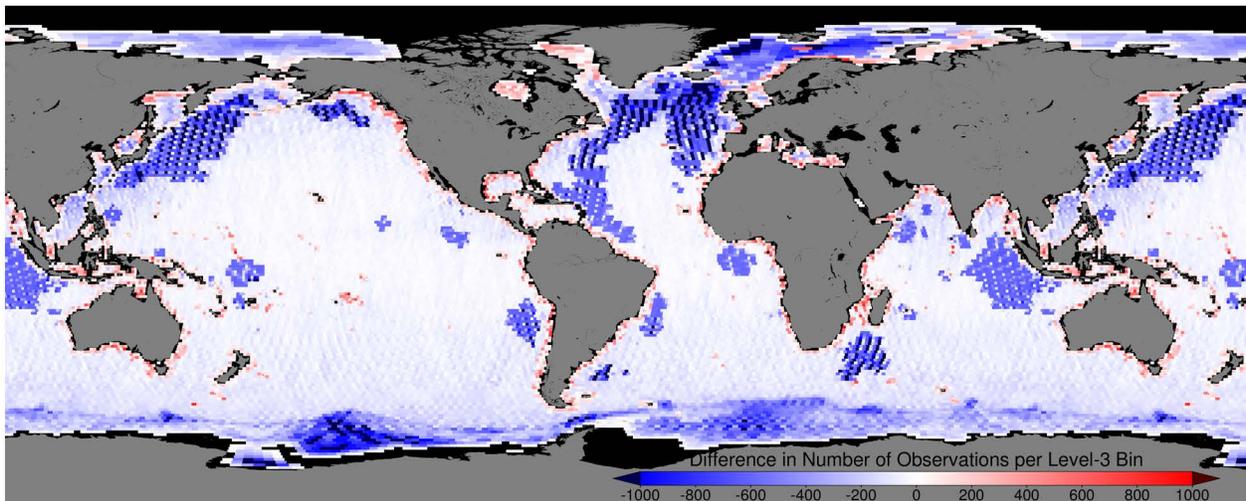
FIGURE 7



2012 V2.0 number of observations per bin

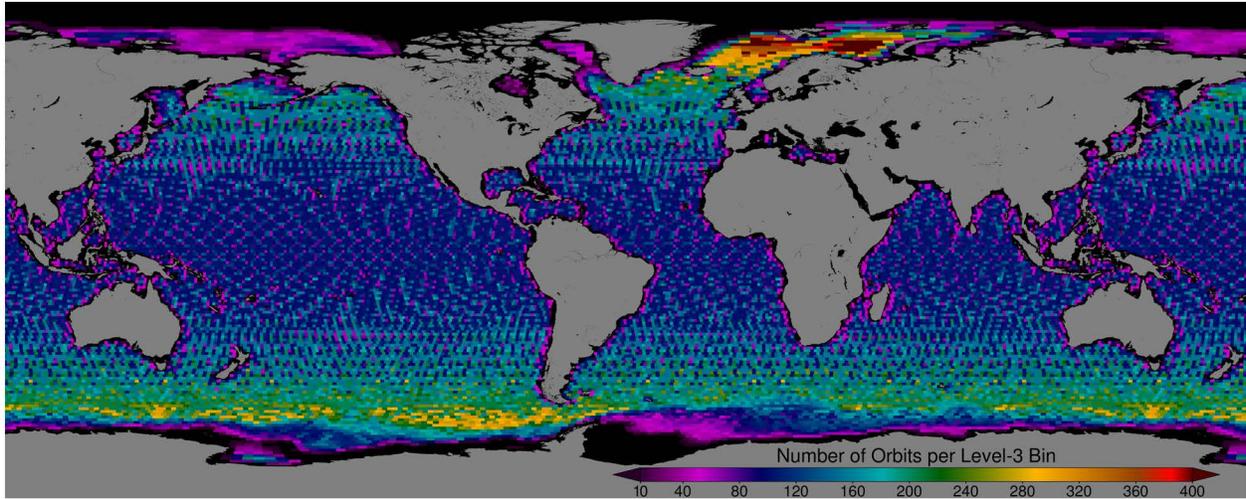


2012 V3.0 number of observations per bin

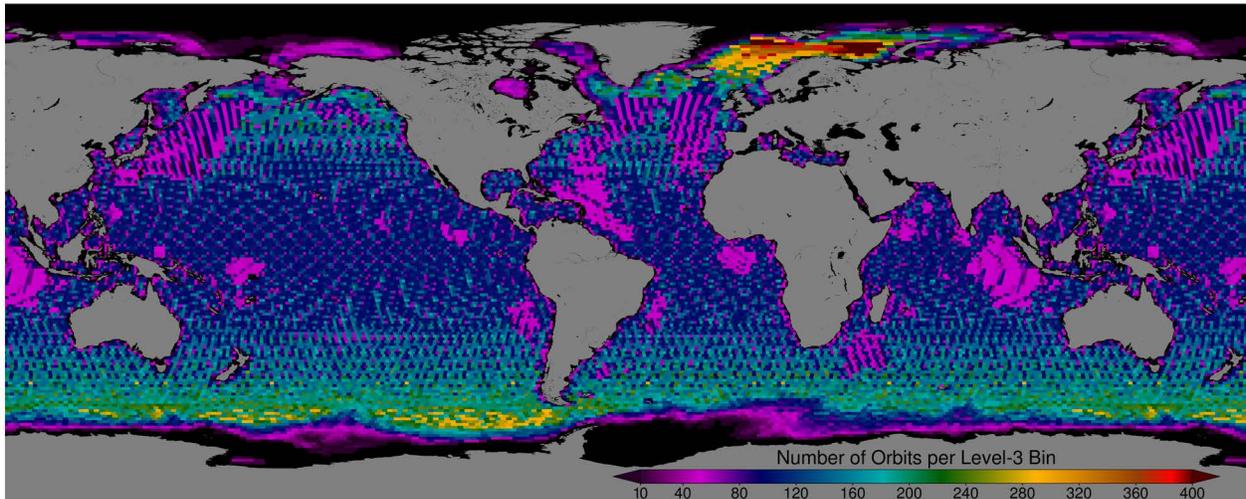


2012 V3.0 number of observations per bin minus 2012 V2.0 number of observations per bin

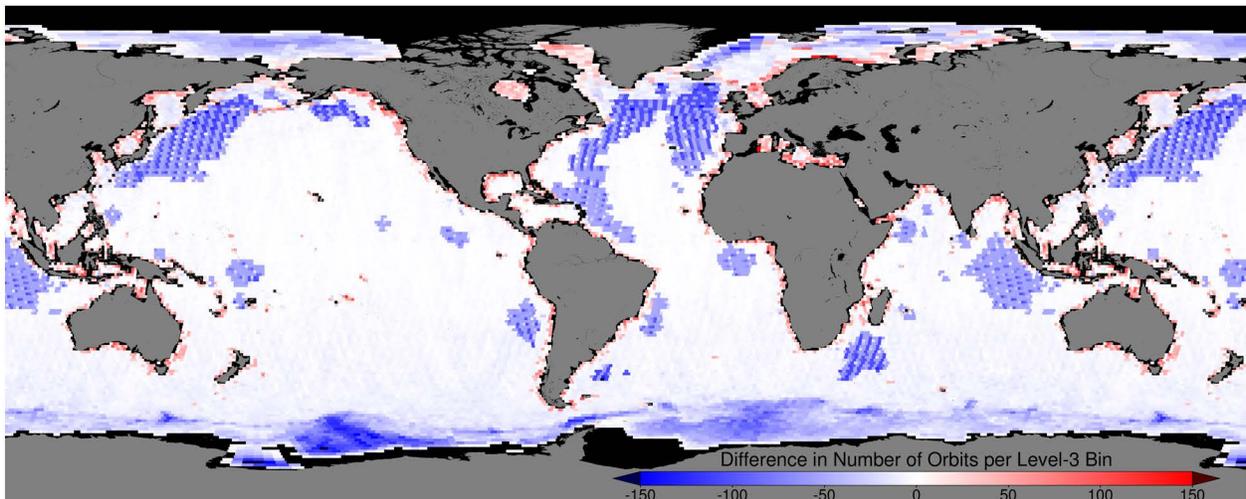
FIGURE 8



2012 V2.0 number of orbits per bin



2012 V3.0 number of orbits per bin



2012 V3.0 number of orbits per bin minus 2012 V2.0 number of orbits per bin

# FIGURE 9

Level-3 Statistics for 1 Jan 2012 through 31 Dec 2012

