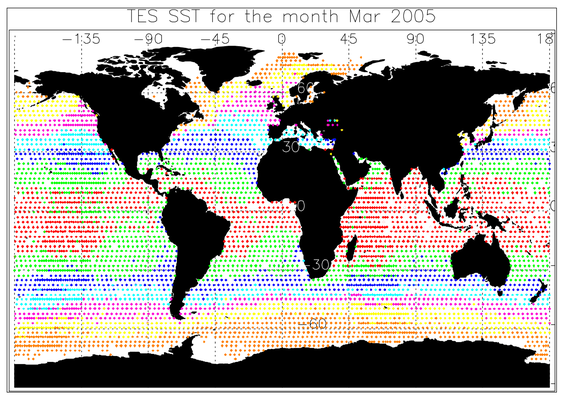
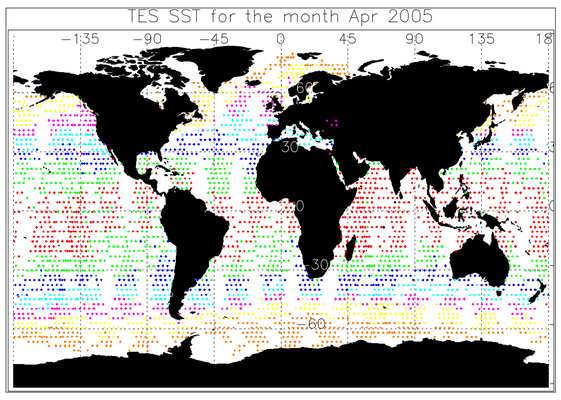
TES SST Measurements through Two Years of Operations (cont.'d)

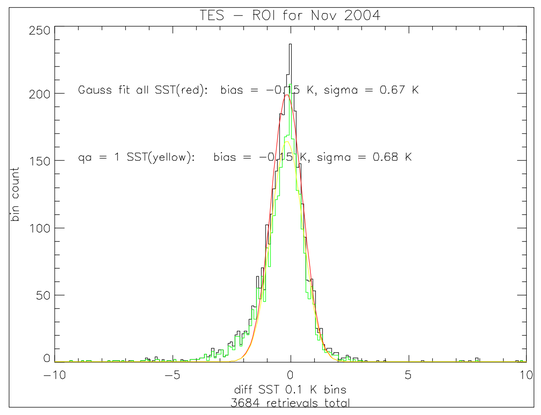
TES has been producing data for a little over two years. Although TES nominally performs a global survey every other day, there have been some gaps in data. A major gap was in the spring of 2005 after the instrument went into safe mode. A response team determined that the event was most likely caused by a high energy cosmic ray and the instrument was put back into normal operations. Other gaps have been caused by focal plane de-icing and an optical bench warm-up. The optical bench warm-up successfully increased signal significantly, particularly important for methane and other trace gases with smaller signal.

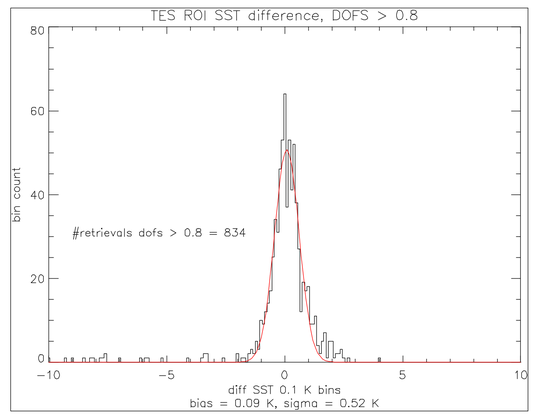
The SST time series represented here by monthly plots contains over 140,000 SST measurements made over this time frame.

The two histograms below, are for Nov 04 and are representative of the two-scan averaged global surveys done in the initial operation of TES. These SST differences are between Reynolds Optimally Interpolated SST rather than AMSR-E, although the statistics are very similar. The plot above shows a small negative bias, similar but slightly smaller than the single scan retrievals. The 1 sigma width of the gaussian fit is also slightly smaller, in part due to two competing effects – greater signal after optical bench warm-up per scan and going to single nadir scans in the global surveys. The green histogram is based on selecting SSTs from retrievals with an 'overall good quality' flag set. The yellow gaussian is the best fit to that data. The second plot is based on selecting SSTs with degrees of freedom of signal greater than 0.8 (max is 1.0) rather than selecting for small effective cloud optical depths. In this case it can be seen that the negative outliers have almost completely been removed, resulting in a slight positive bias. The 1 sigma width is also smaller at ~0.5 K. Further work on the relative merits of selecting high quality SSTs based on effective optical depth or DOFS will be done.



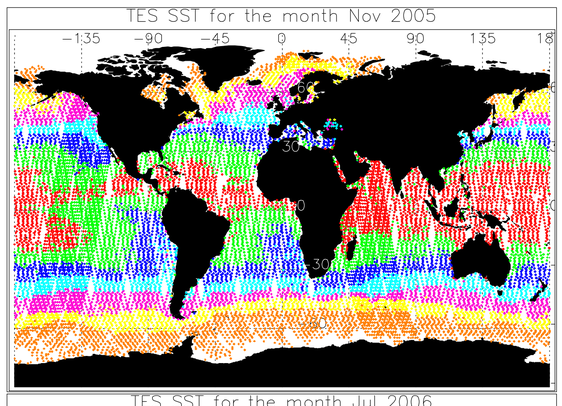


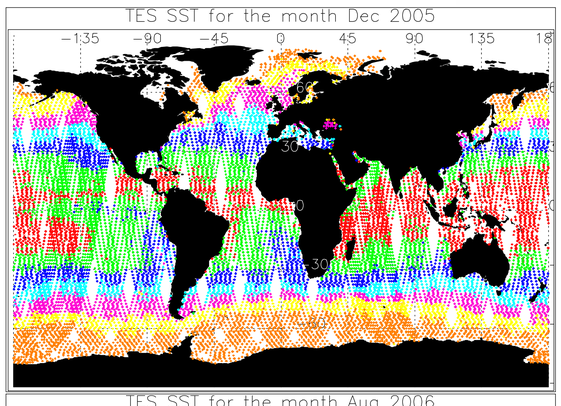


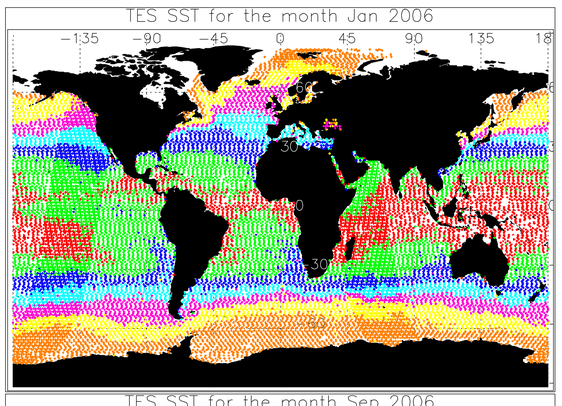


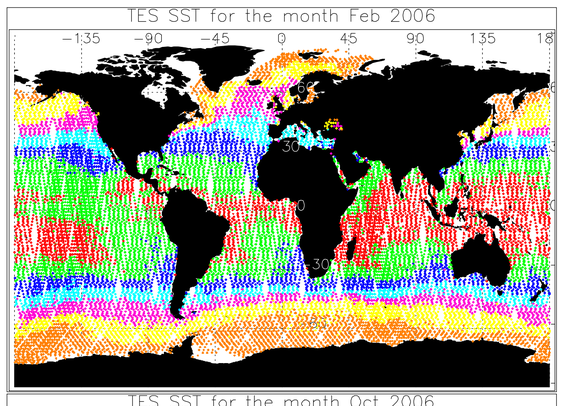
Above: global surveys with nominally 1152 two-nadir scans per retrieval,
Below: global surveys with 3456/3152 single nadir scans per retrieval

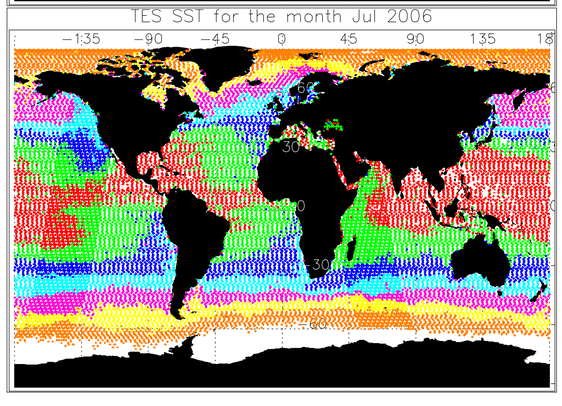
Temperature scale the same for all global SST plots
270 K
-3.15 C
305 K
31.85 C

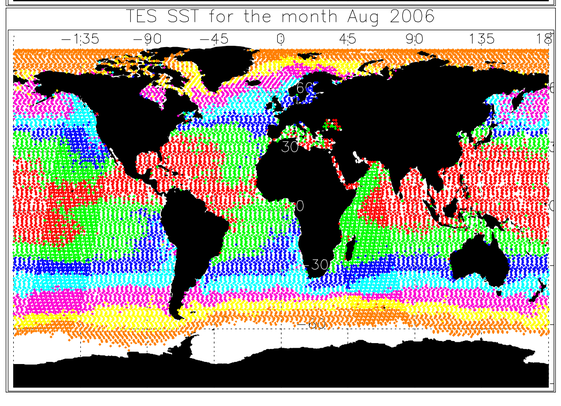


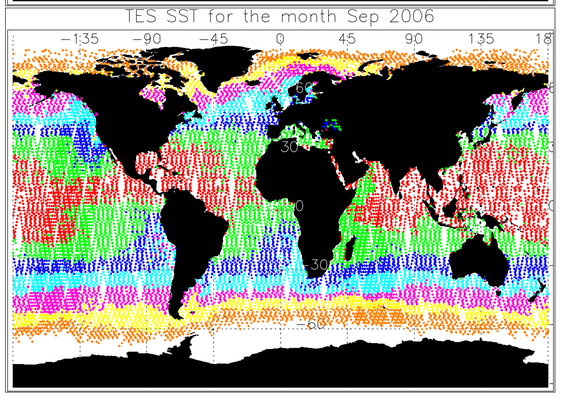


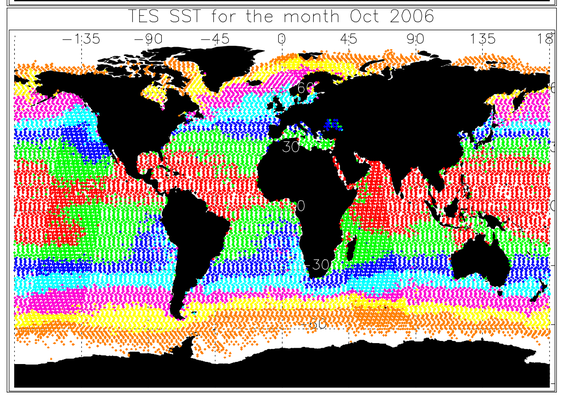


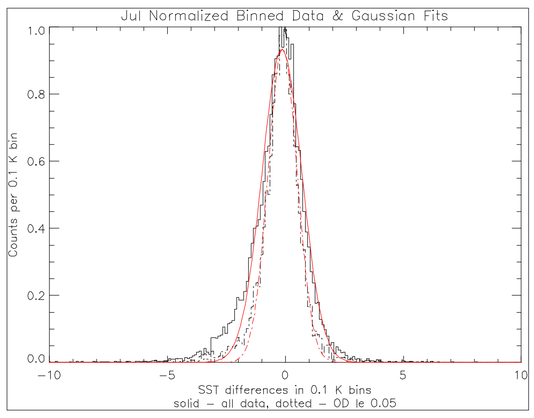


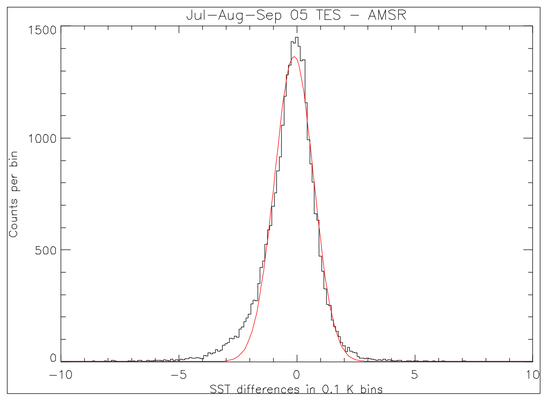


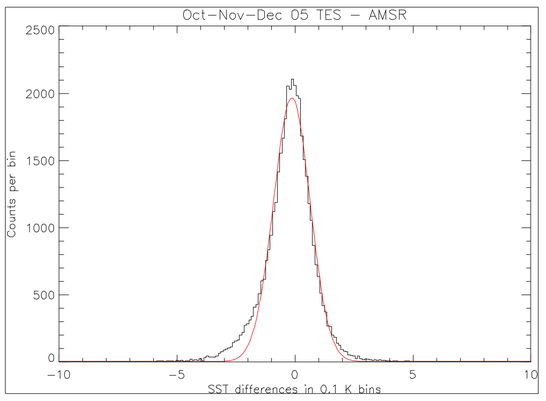


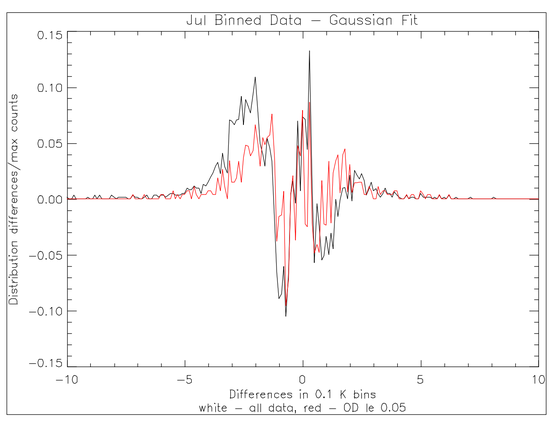












TES and AMSR-E SST difference histograms (above, black) and the gaussian fits to the histograms (red) show the relative variation of TES and AMSR-E SSTs. AMSR-E has an RMS error reported between 0.5 K and 0.6 K. If the TES and AMSR-E errors are both completely random wrt each other then TES RMS error (using average sigma from gaussian fitted distribution) is between 0.53 K and 0.63 K. The July normalized histograms and gaussians to the left and above show how preferentially selecting TES SSTs with low retrieved effective optical depth (less than 0.05 in this case) produces a more nearly normal distribution. The plot to the left shows the normalized differences of the two cases. The low effective optical depth (red) case shows a sharp reduction of the cold outliers between 0 and -5 K wrt all SSTs and the overall distribution is clearly more symmetric although cold outliers still number slightly more than warm outliers. The peaks of the gaussians match well with the peaks of the binned distributions and justify taking the biases of the distributions as being the offset of the gaussians from 0, rather than the average over the entire distribution. In other words we define the bias as the offset of the peaks rather than the average difference which is more affected by outliers.