The GCOS SST/SI Intercomparison Framework for Global SST Analysis

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BACKGROUND

Global and near-global sea surface temperature (SST) analysis products are created using a wide range of statistical reconstructions and interpolations that are applied to data sets from a variety of input platforms. These data sets are subjected to quality control processes, bias corrections, and input from sea ice data as well as *a priori* assumptions. The result of these different analysis routines is a collection of products that can say subtly or significantly different things about the changing climate. Indeed, because these analyses contribute to our understanding of the global climate, it is essential that we understand the origin and nature of their differences.

Thus, as part of the Global Climate Observing System (GCOS) SST and Sea Ice (SI) Working Group, the NOAA National Oceanographic Data Center has undertaken a project to record and evaluate differences among SST/SI analyses, identify the sources of those differences, and recommend actions and criteria to ensure the quality and consistency of the SST/SI analyses.

METHODS

The initial set of SST analyses selected for this framework (see Figure 1 at right) consists primarily of products created by members of the GCOS working group. Some of these are daily analyses; some extend back as far as the satellite SST record (end of 1981), whereas others use *in situ* data to reconstruct the SST record for the past two centuries.

The selected SST analyses vary in temporal and spatial resolution and coverage, so were processed to adhere to one standard format at two resolutions. This format is a "data cube" of weekly, one degree gridded SST or monthly, five degree gridded SST between 1981 and 2007.

Figure 1: GCOS Intercomparison SST Products

Data Set Name	Resolution	Date Range
AVHRR Pathfinder V5, Quality Flags 4-7	Weekly One Degree, Monthly Five Degree	Jan 1985 – Dec 2007
AVHRR Pathfinder V5, Quality Flag 7		
Operational AVHRR	Weekly One Degree	Dec 1981 – July 2007
Hadley Centre SST	Weekly One Degree, Monthly Five Degree	Dec 1981 – Nov 2005
NOAA Optimum Interpolation Version 2	Weekly One Degree, Monthly Five Degree	Jan 1985 – Dec 2007
NOAA Daily ¼-degree Optimum Interpolation	Weekly One Degree, Monthly Five Degree	Dec 1981 – Oct 2007
Hadley Centre Sea Ice and SST (HadISST)	Monthly Five Degree	Jan 1981 – Nov 2007
NOAA Extended Reconstruction	Monthly Five Degree	Jan 1981 – Oct 2007
Kaplan Reconstructed	Monthly Five Degree	Jan 1981 – Oct 2007

STANDARD DIAGNOSTICS

To quantitatively compare analyses, a framework of standard diagnostics was created. Global fields of standard deviation (Fig 2), time-averaged differences (Fig 5), RMS differences, time-latitude sections of anomalies (Figs 4 and 7), and time series of global and hemispheric anomalies (Figs 3 and 6) are included in this framework.

These diagnostics have been organized into two phases. The first evaluates each data set both with respect to its own climatology and with respect to a common climatology (Pathfinder V5, Quality Flag 7). The second phase evaluates each data set with respect to every other data set.

Active online tables allow application of each test to any combination of SST analyses.

Phase One: Absolute and Relative Differences in Anomalies

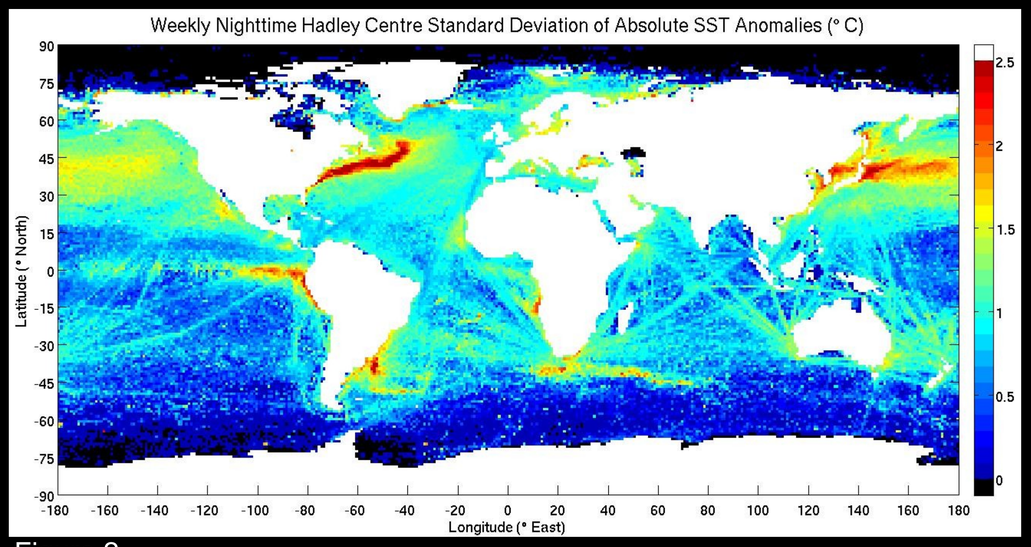

Figure 2

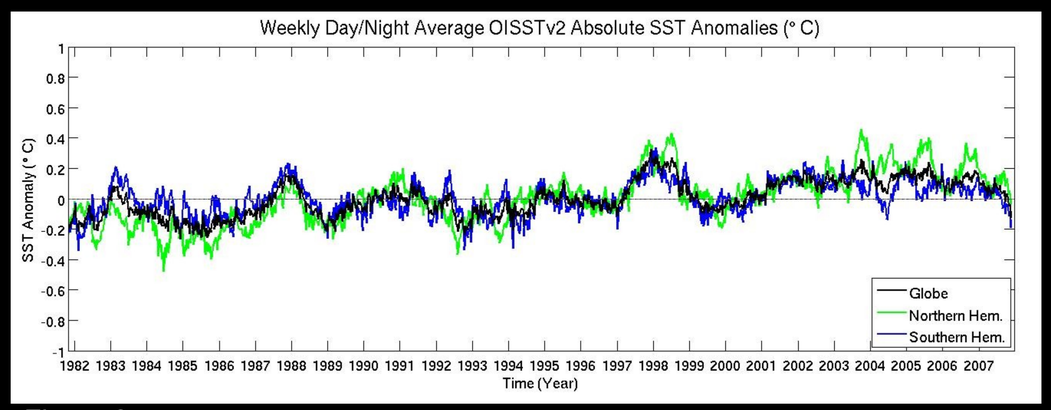

Figure 3

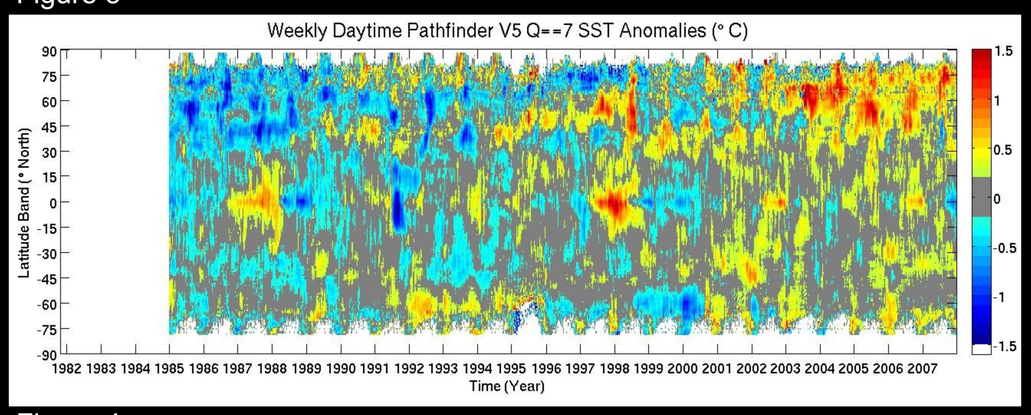

Figure 4

Phase Two: Data Sets Relative to Each Other

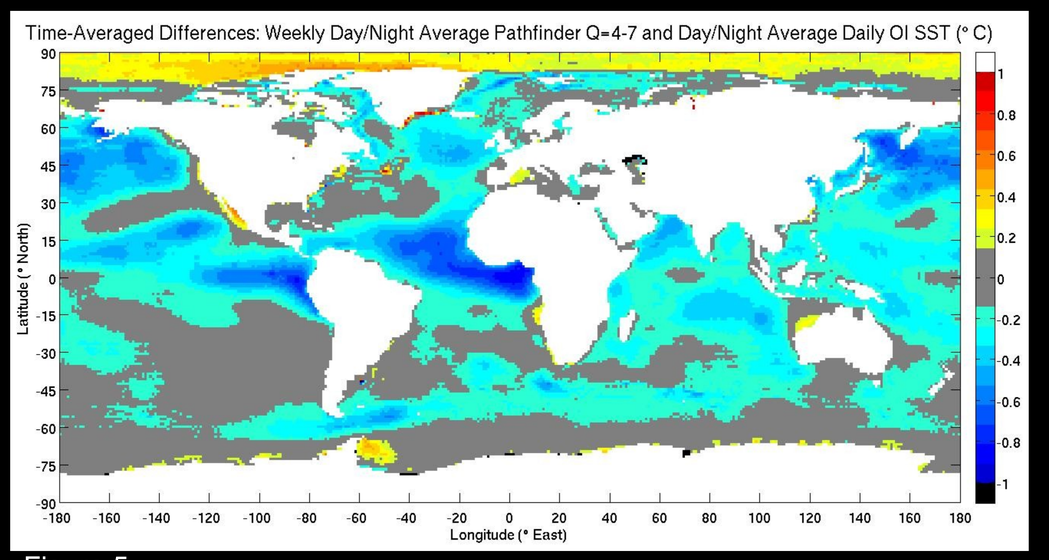

Figure 5

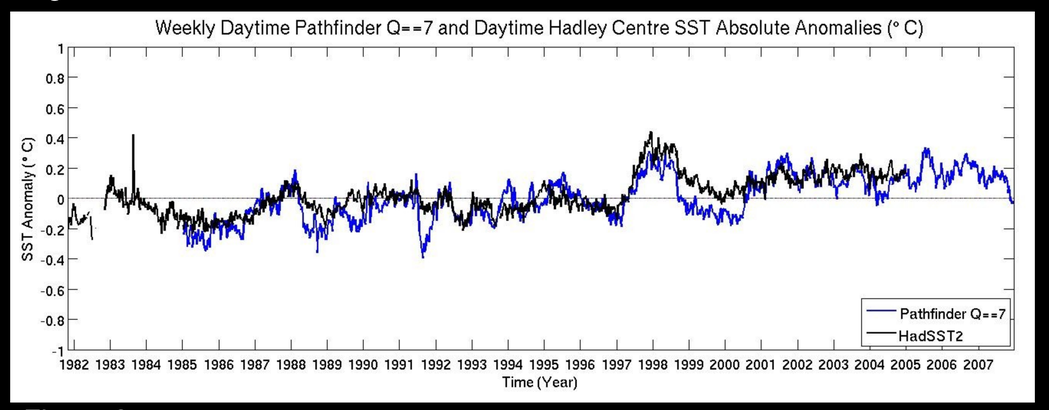

Figure 6

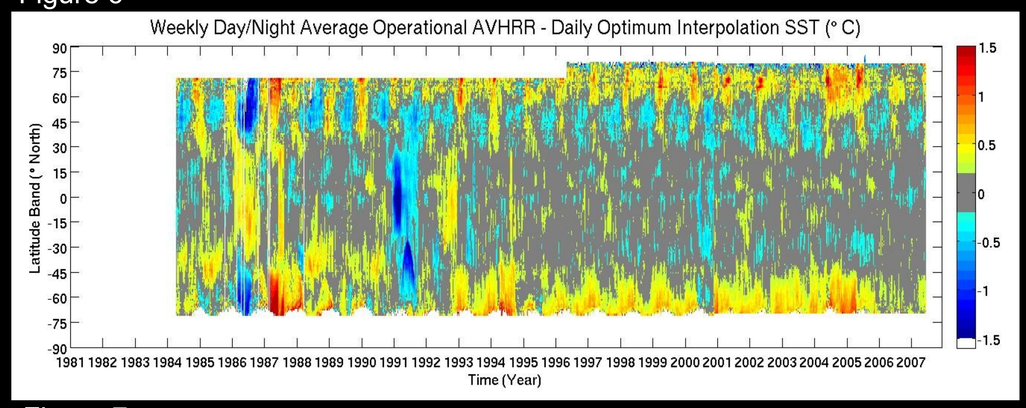

Figure 7

ACCESS

To maximize user compatibility, GCOS data sets are currently available in Matlab and netCDF formats, following the Global Ocean Data Assimilation Experiment (GODAE) High Resolution Sea Surface Temperature (GHRSST) convention. This is a widely accepted standard within the climate community and provides important metadata facilities.

The online interface, an extension of the NODC GHRSST website (***http://ghrsst.nodc.noaa.gov***), makes all GCOS data sets and their various intercomparisons accessible to the general public.

For more information and to access GCOS data, please visit the project website:

http://ghrsst.nodc.noaa.gov/intercomp.html

NEXT STEPS

- Incorporate linear trend, lag1 autocorrelation, spatial correlations, and time series for selected regions to the standard set of diagnostics
- Analyze preliminary results of the intercomparisons in the context of expected climate signals in the global SST patterns
- Adjust intercomparison framework based on these initial results and incorporate more analysis products into it
- Perform intercomparison on each data set's climatology, and explore the use of a composite climatology for the calculation of anomalies
- Evaluate user requirements to ensure the intercomparison framework is meeting the GCOS SST/SI community needs

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