6.2 Sea Surface Temperature Analysis

6.2.1 Merged satellite and in-situ data Global Daily Sea Surface Temperature

High-resolution daily sea surface temperatures (SSTs) in the global ocean on a grid of 0.25° x 0.25° are objectively analyzed for ocean information services and for providing boundary conditions of the atmospheric short-range prediction models and the North Pacific Ocean models (see sections 4.4, 4.5 and 6.5; Kurihara et al., 2006). SSTs obtained from the infrared radiometer of AVHRRs on the NOAA polar orbital meteorological satellites and the microwave radiometer of AMSR-E on the earth observation satellite AQUA are used together with *in-situ* SST observations. While a major portion of the *in-situ* data are obtained through the Global Telecommunication System, still many are obtained from domestic organizations via facsimile, e-mail and postal mail.

Satellite-derived SST anomalies (SSTA) from a daily SST climatology are decomposed into two temporal-scale and three spatial-scale components: long and short timescales with a cutoff period of 53 days, and large, middle and small scales with cutoff wavelengths of 580 km and 143 km. The middle scale is aimed to represent the SST signals caused by eddy-scale phenomena. The small scale is aimed to represent meso-scale signals. The signals varying with a period shorter than 27 days are cut off, because the noise of the data in this range is considerably large. The long timescale signals represent the intra-seasonal variability, and the short timescale signals are influenced by atmospheric condition, such as a tropical cyclone reducing SSTs.

The large-scale and long-timescale SSTAs from AMSR-E and AVHRR are calibrated with *in-situ* SSTAs using Poisson's equation (Reynolds, 1987). The space-time optimum interpolation (OI) is applied to each component. Zero value is adopted as the first guess. The space-time correlation coefficients and the RMS values of the first guess error and the satellites' observation errors were statistically estimated a priori from the satellites' data themselves, using the method of Kuragano and Kamachi (2000). Daily SST is a sum of interpolated SSTAs and the daily climatology (Fig. 6.2.1).

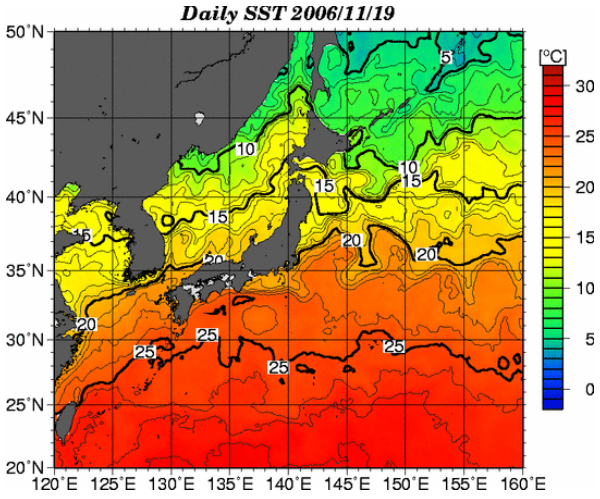

Fig. 6.2.1 An example of analyzed SSTs.

References

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6.2.2 Daily Sea Surface Analysis for Climate Monitoring and Predictions

The Sea Surface Temperature (SST) analysis for climate monitoring at JMA was updated to a new one based on *in-situ* observations in March 2006. Details of the analysis should be referred to Ishii et al. (2005).

The SST analysis has a resolution of 1° latitude and 1° longitude. The east-west grid point starts eastward from 0.5°E to 0.5°W, and the north-south grid point starts northward from 89.5°S to 89.5°N. The analysis uses optimum interpolation method. The deviation of the previous day's analysis from normal is multiplied by 0.95 and is used as a first guess. The analysis is performed daily and uses the marine meteorological data for 7 days, namely between three days before and after the day of interest. The observed data in a day are averaged in 1.5x1.5 degree box before analyzing data by optimum interpolation method to save the processing time of analysis.

The bias corrections for the past SST observation reports were performed by the way of Folland and Parker (1995). The quality control of observed data is performed by checking ship tracks, dates and positions of reports, and then erroneous data are automatically corrected in compiling marine meteorological data in JMA. Moreover, with observed data deviations from climatological values during the period between one month before and after the day of interest, biases of the data having the same ship call signs are estimated, and call signs having large biased data are listed automatically in a blacklist through the daily analysis. The daily analysis is performed with delay of 31 days from real time to allow the data observed in recent two months to be checked. Subsequently for the real time utilization, the analyses of last 30 days are done every day with the fist guesses given by the analyses just before.

The information of sea ice concentration is made use of in estimating SSTs of the Arctic and the Antarctic Ocean.

The daily updated operational SST data are utilized as follows with historical ones.

(i) Monitoring of equatorial Pacific SSTs, El Niño/ La Niña evolutions and global warming over 100 years.

(ii) Input of the operational Ocean Data Assimilation System (ODAS) and historical oceanic analysis (see 6.3).

(iii) Input of the JMA Climate Data Assimilation System (JCDAS) and Japanese 25-year Re-analysis (see 3.11).

(iv) Input of Ensemble Prediction Systems for one-month and seasonal forecasts (see 4.3).

The monthly averaged SST data are made available through JMA's Distributed Data Base (http://ddb.kishou.go.jp) and characteristics of the data are described in JMA (2006) which is available in the Web page of Tokyo Climate Center (http://okdk.kishou.go.jp/MRCS_SV12/index_e.htm).

References

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