The state of the western North Pacific in the second half of 2004

Toshiyuki Sakurai
Office of Marine Prediction, Climate and Marine Department
Japan Meteorological Agency
1-3-4 Otemachi, Chiyoda-ku,
Tokyo, Japan. 100-8122
E-mail: tsakurai@met.kishou.go.jp

Mr. Toshiyuki Sakurai is a scientific officer of the Office of Marine Prediction at the Japan Meteorological Agency (JMA). He is working as a member of a group in charge of oceanic information in the western North Pacific. Using a new "Ocean Comprehensive Analysis System" (in operation since January 2001), this group produces surface and subsurface temperature, salinity and current maps with 0.25× 0.25 resolution in waters adjacent to Japan. Monthly averaged fields obtained from the system are included in the "Monthly Ocean Report" published by JMA. Mr. Sakurai is now involved in developing a new daily analysis system for sea surface temperature in the global ocean, using in situ *observations and data from several satellites with infrared and microwave sensors.*

Sea surface temperature

Figure 1 shows monthly mean sea surface temperature (SST) anomalies in the western North Pacific from July to December 2004, computed with respect to JMA's 1971-2000 climatology. Monthly SSTs are calculated from JMA's MGDSST (Merged satellite and *in-situ* data Global Daily SST), which is based on AVHRR/NOAA data, microwave sensor (AMSR-E/AQUA) data, and *in situ* observations. Time series of 10-day mean SST anomalies are presented in Figure 2 for the 9 regions (indicated in the bottom panel).

SSTs were generally above normal in the seas adjacent to Japan, except for September (Figs. 1 and 2). Positive SST anomalies exceeding +2ºC prevailed in the Japan Sea from October through December, and south of the Kuril Islands in August. Those anomalies were most significant over the past 9 years in Region 1 in November, and in Region 2 in August.

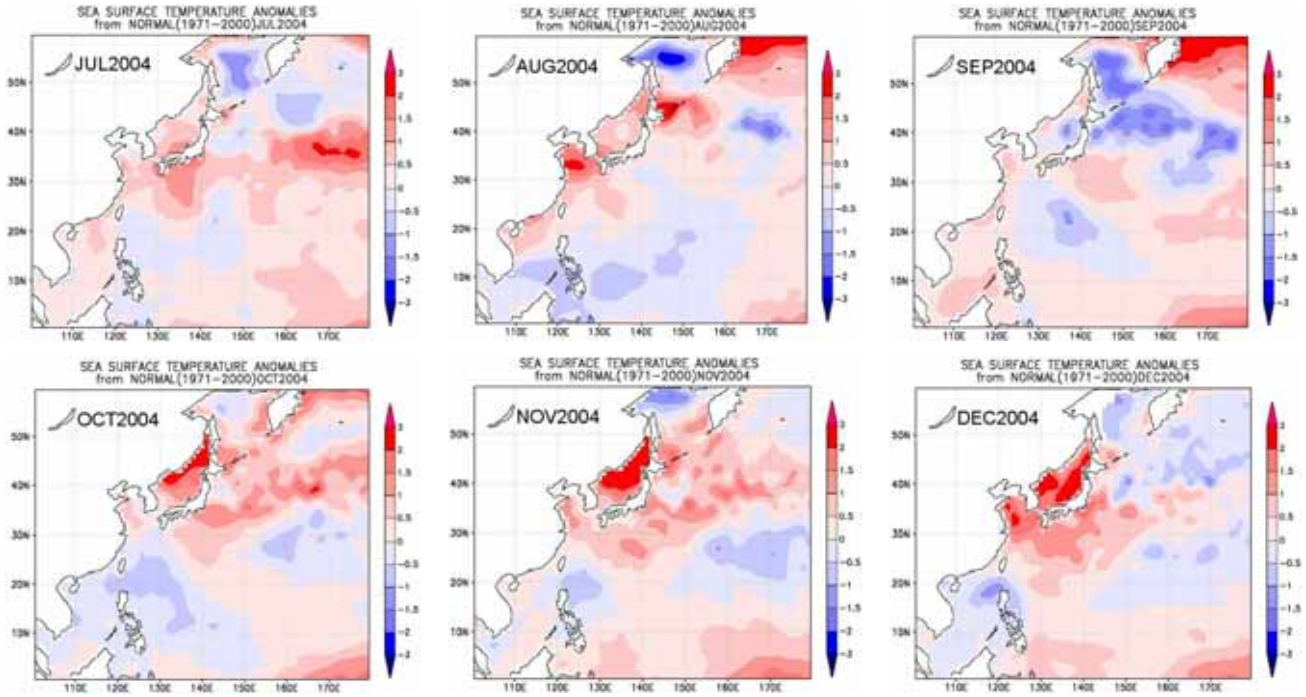

Fig. 1 Monthly mean sea surface temperature anomalies (ºC) from July to December 2004. Anomalies are deviations from JMA's 1971-2000 climatology.

Negative SST anomalies had persisted in the seas east of Honshu Island since 2003; however, those changed to be near normal or slightly positive in the second half of 2004 (Region 4 of Fig. 2). In September, SSTs were generally below normal, except for southeast of Japan, and negative SST anomalies exceeding –1ºC were found in the Sea of Okhotsk, along 40ºN, and around 22ºN, 138ºE. Although positive SST anomalies dominated around the Philippines from 1998 to early 2004, negative SST anomalies were often observed after May 2004.

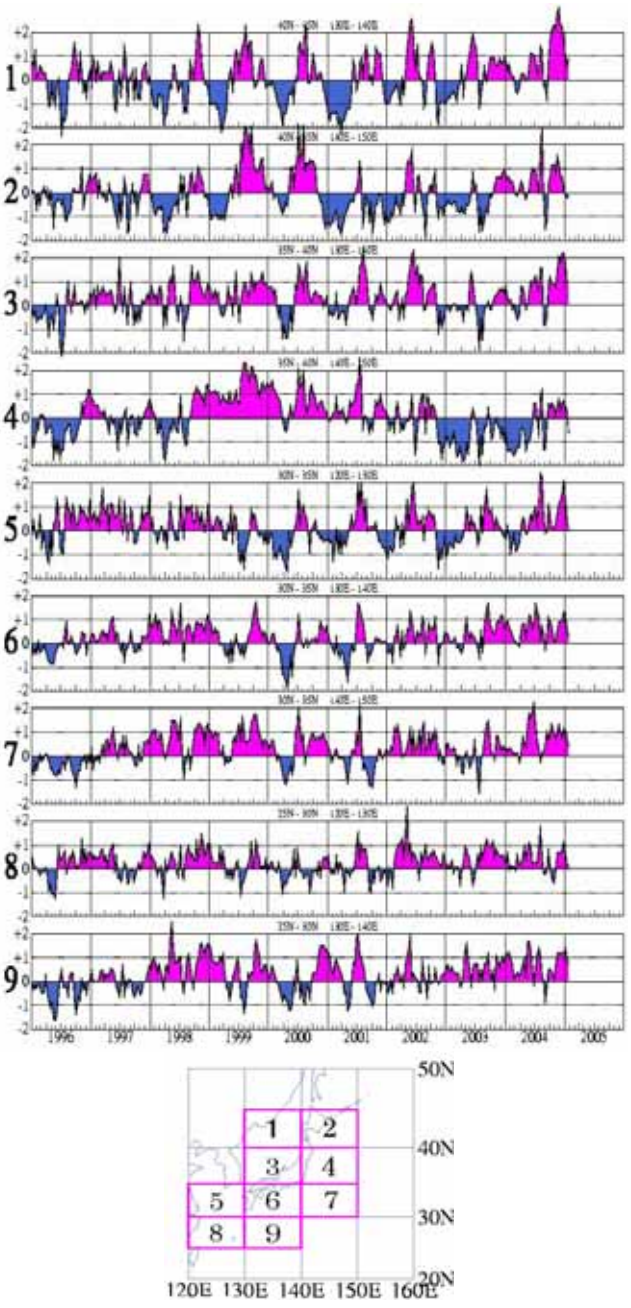

Fig. 2 Time series of the 10-day mean sea surface temperature anomalies (ºC) from JMA's 1971-2000 climatology for the areas shown in the bottom panel.

Kuroshio

The Kuroshio flowed far off the coasts in the seas south of Shikoku Island from mid-April through mid-July (Fig. 3). Its path was gradually moving to the coast of Shikoku and moving southward around 138ºE in July. Then a large-meander path was formed off Tokai in August. This large-meander path has persisted as of December 2004, with its size varying slightly with small perturbations.

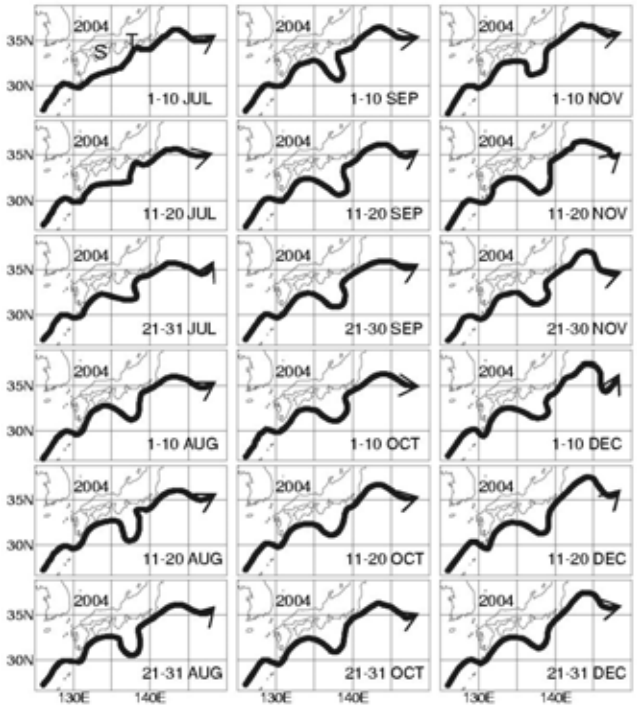

Fig. 3 Location of the Kuroshio axis from July to December 2004. "T" on the top-left map denotes the Tokai area, and "S" denotes the Shikoku area.

Carbon dioxide

JMA has been conducting observations of carbon dioxide (CO_2) in the surface seawater and overlying air in the western North Pacific, on board the R/V *Ryofu Maru* and R/V *Keifu Maru*.

Figure 4 illustrates the distribution of the difference in CO_2 partial pressure (pCO_2) between the surface seawater and overlying air, denoted as ΔpCO_2, observed in the western North Pacific in each season of 2004. The ΔpCO_2 value represents the direction of CO_2 gas exchange across the air-sea interface, indicating the ocean to be a potential source (or sink) for atmospheric CO_2 in the case of a positive (or negative) value of ΔpCO_2.

(*cont. on page 29*)