The state of the western North Pacific in the second half of 1999

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Mr. Satoshi Sugimoto is Scientific Officer of the Oceanographical Division of the Climate and Marine Department at the Japan Meteorological Agency (JMA). He is working as a member of a group in charge of monitoring and forecasting sea surface temperature and sea surface current in the western North Pacific. Based on in situ *and satellite data, this group provides various oceanographical products. One of the main products is the "Monthly Ocean Report", which is published and distributed by JMA every month. Mr. Sugimoto is now involved in developing a new analysis system for sea surface and subsurface temperature to improve sea surface temperature forecasts in the western North Pacific.*

Sea Surface Temperature

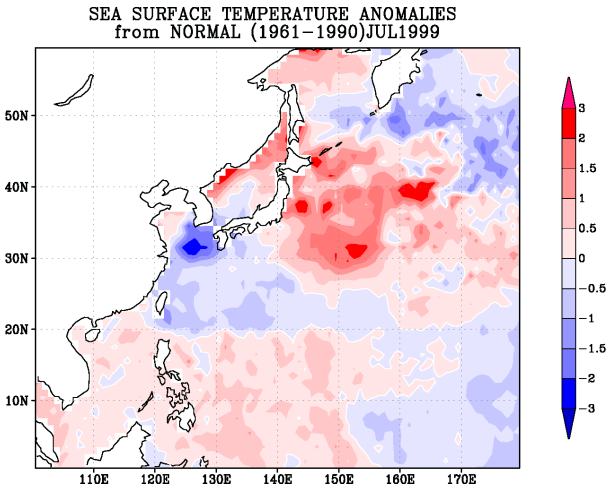
Figure 1 shows monthly mean sea surface temperature (SST) anomalies in the western North Pacific from July to December 1999, computed with respect to JMA's 1961-90 climatology. Satellite-derived SSTs (NOAA/AVHRR) and *in situ* observations are used for the area between 20°N and 50°N from 120°E to 160°E, and only *in situ* observations are used in the other region.

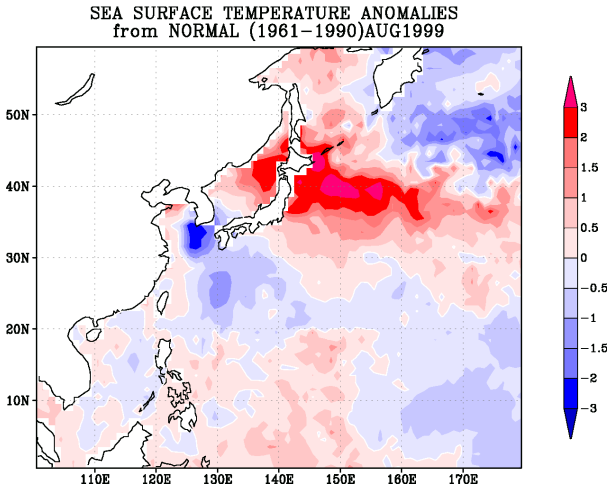
It is noteworthy that positive SST anomalies prevailed zonally between 30°N and 40°N throughout the second half of the year, and those exceeding +3°C were found east of Japan in August (Fig. 1). The large, positive SST anomalies in the northern part of the Japan Sea and east of Japan in August were comparable to those recorded in August 1994, as shown in the time series of the regional ten-day mean SST anomaly for regions 1, 2, and 4 (Fig. 3).

South of 20°N, positive anomalies prevailed around the Philippines and negative anomalies prevailed near the date line throughout the period.

Kuroshio

In Figure 2, a small meander of the Kuroshio became noticeable near 135°E in the last 10 days of September, and the Kuroshio largely meandered south of Japan in November. The southernmost positions of the meander were 32°N, 137°E in the last 10 days of October and 31°N, 139.5°E in the last 10 days of November, gradually shifting eastward. The northward flow of the meander was along 139°E in the first 10-day of November, along 140°E in the second and last 10 days of November, and east of 140°E in December.





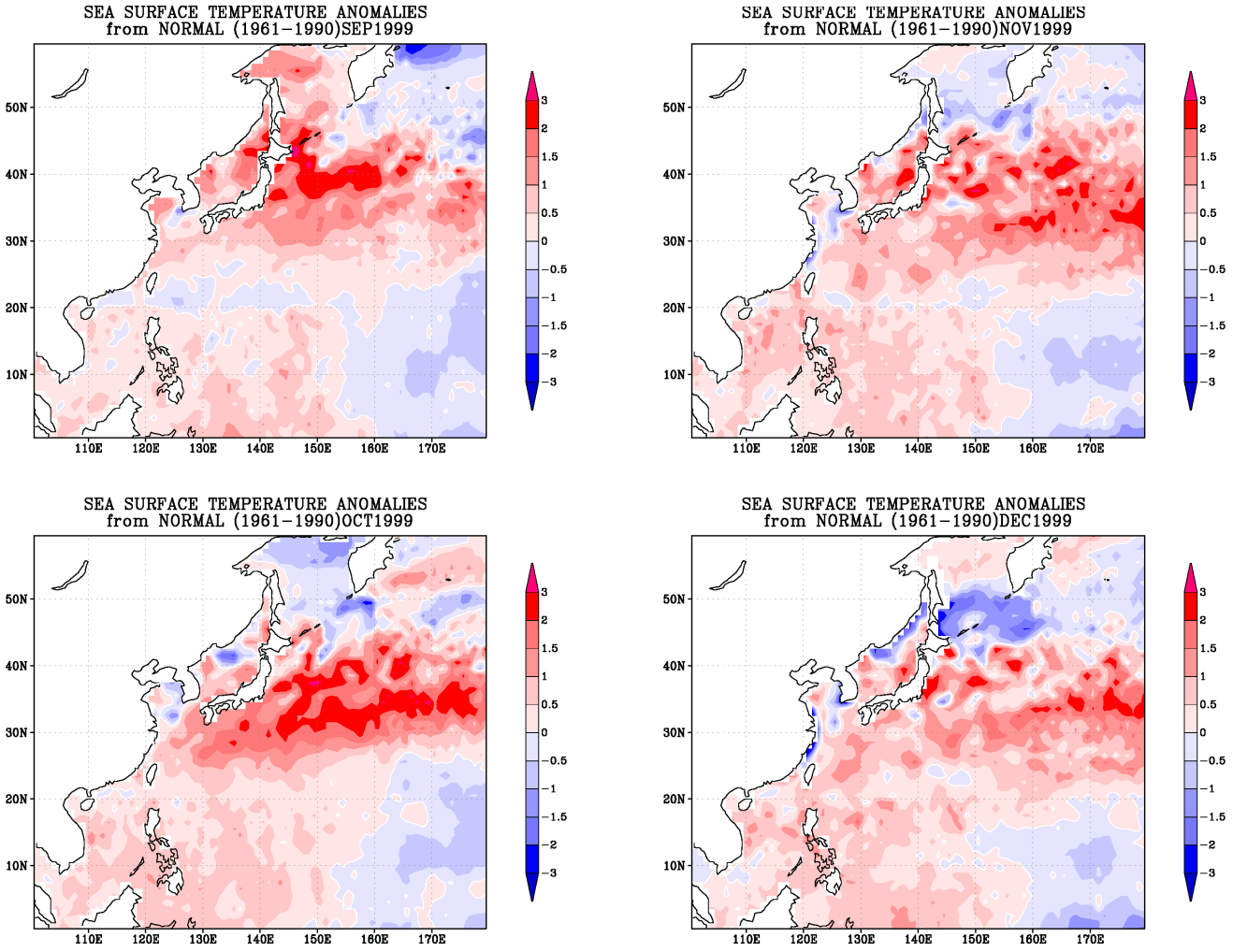


Fig. 1 Monthly mean sea surface temperature anomalies (°C). Anomalies are departures from JMA's 1961-1990 climatology.

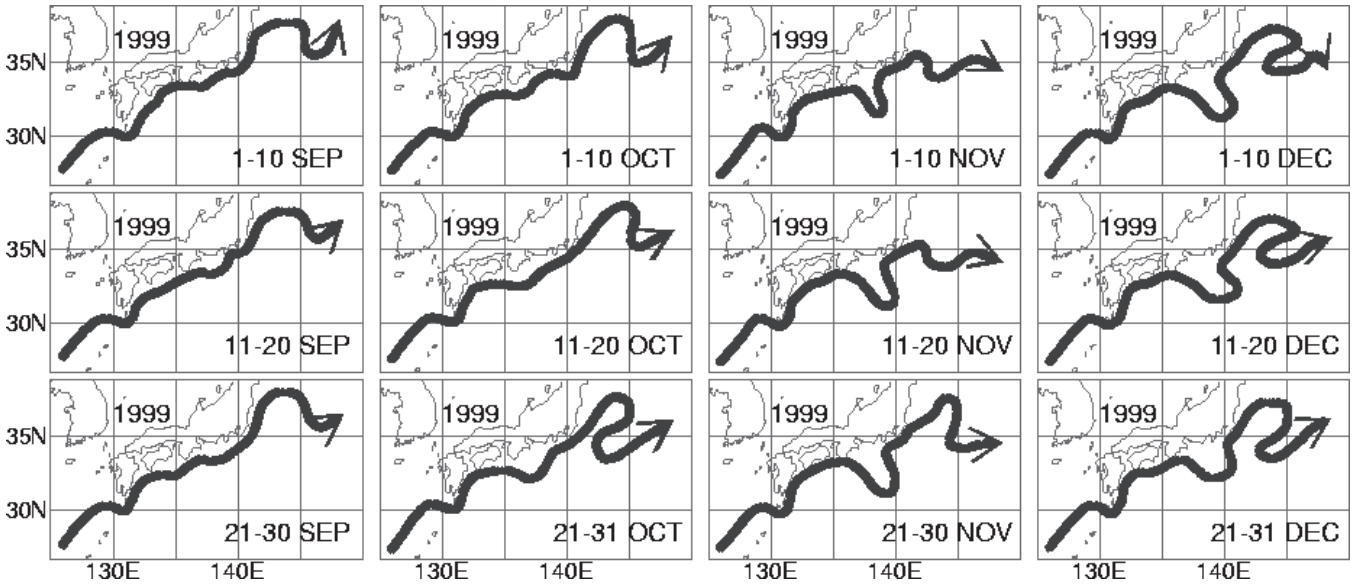
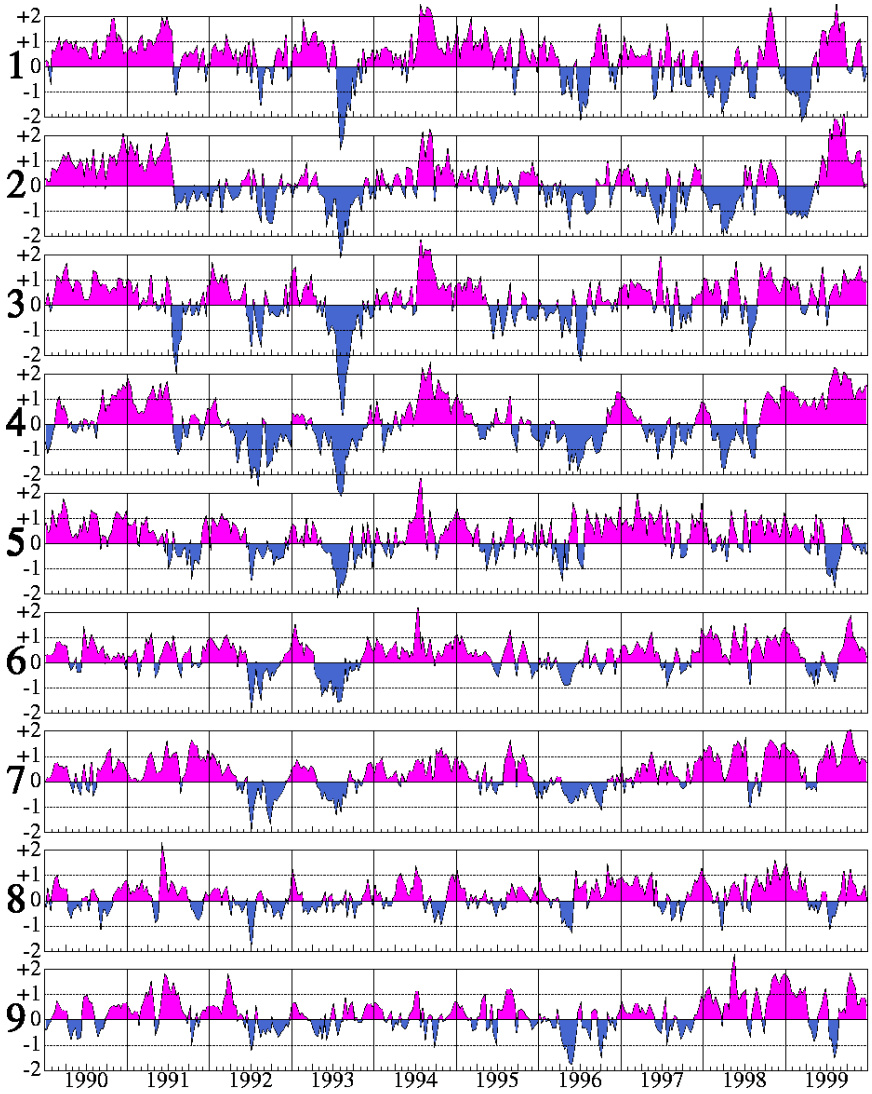


Fig. 2 Location of the Kuroshio axis from September to December 1999.



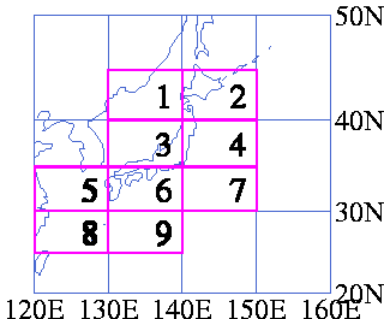


Fig. 3 Time series of the ten-day mean sea surface temperature anomalies (°C), computed from JMA's 1961-1990 climatology for the areas shown in the side panel.

Carbon Dioxide

JMA observed the distribution of carbon dioxide concentration (partial pressure, pCO_2) in the western North Pacific on board the R/V *Ryofu Maru* from September to November 1999. Figure 4 shows the distribution of the difference ($DpCO_2$) in pCO_2 between the surface water and the overlying atmosphere. One of the most remarkable features of this observation is that large $DpCO_2$ values of 45-65 µatm were observed in the equatorial region (155-165°E), similar to those in October 1998. It is interesting that both periods were under La Niña conditions. Such a large $DpCO_2$ value could be attributed to a strong upwelling of CO_2-rich water during a La Niña event.

Fig. 4 Difference in pCO_2 between the surface water and the atmosphere in September-November 1999. Red upward pillars indicate the emission of CO_2 from the ocean and blue downward pillars indicate atmospheric CO_2 absorption by the ocean.