The state of the western North Pacific in the second half of 2006

by Shiro Ishizaki

Sea surface temperature

Figure 1 shows the monthly mean sea surface temperature (SST) anomalies in the western North Pacific from July to December 2006, computed with respect to JMA's (Japan Meteorological Agency) 1971–2000 climatology. Monthly mean SSTs are calculated from JMA's MGDSST (**M**erged satellite and *in-situ* data **G**lobal **D**aily **SST**), which is based on NOAA/AVHRR data, microwave sensor (AQUA/ AMSR-E) data, and *in-situ* observations. Time series of 10-day mean SST anomalies are presented in **Figure 2** for 9 regions indicated in the bottom panel.

SSTs were generally above normal in the seas adjacent to Japan from August to December, except east of Honshu in October (**Figs. 1** and **2**). Positive SST anomalies exceeding +2°C prevailed west of Hokkaido from August to December. These anomalies correspond to positive anomalies for Region 1 in **Figure 2**. Positive SST anomalies exceeding +1°C were also found in the East China Sea from August to December. These anomalies are confirmed in **Figure 2** (Regions 5 and 8). In July, negative SST anomalies existed in a broad area except south of Honshu. Around the Philippines, negative SST anomalies dominated from July to October. After that, positive SST anomalies appeared from November to December.

Kuroshio path

Figure 3 shows time series of the location of the Kuroshio path for this period. The Kuroshio took a small meandering path at the south end of Kyushu Island (30°N, 132°E) in July, October and December. East of 133°E, several small perturbations propagated eastward along the Kuroshio during the whole period. Corresponding to the passage of each perturbation, the latitude of the Kuroshio axis over the Izu Ridge moved from north to south.

Carbon dioxide

JMA has been conducting observations for carbon dioxide (CO_2) in the surface ocean and atmosphere in the western North Pacific, on board the R/V *Ryofu Maru* and the R/V *Keifu Maru*. **Figure 4** illustrates the distribution of the difference in CO_2 partial pressure (pCO_2) between the surface seawater and the overlying air (denoted as ΔpCO_2) observed in the western North Pacific Ocean in each

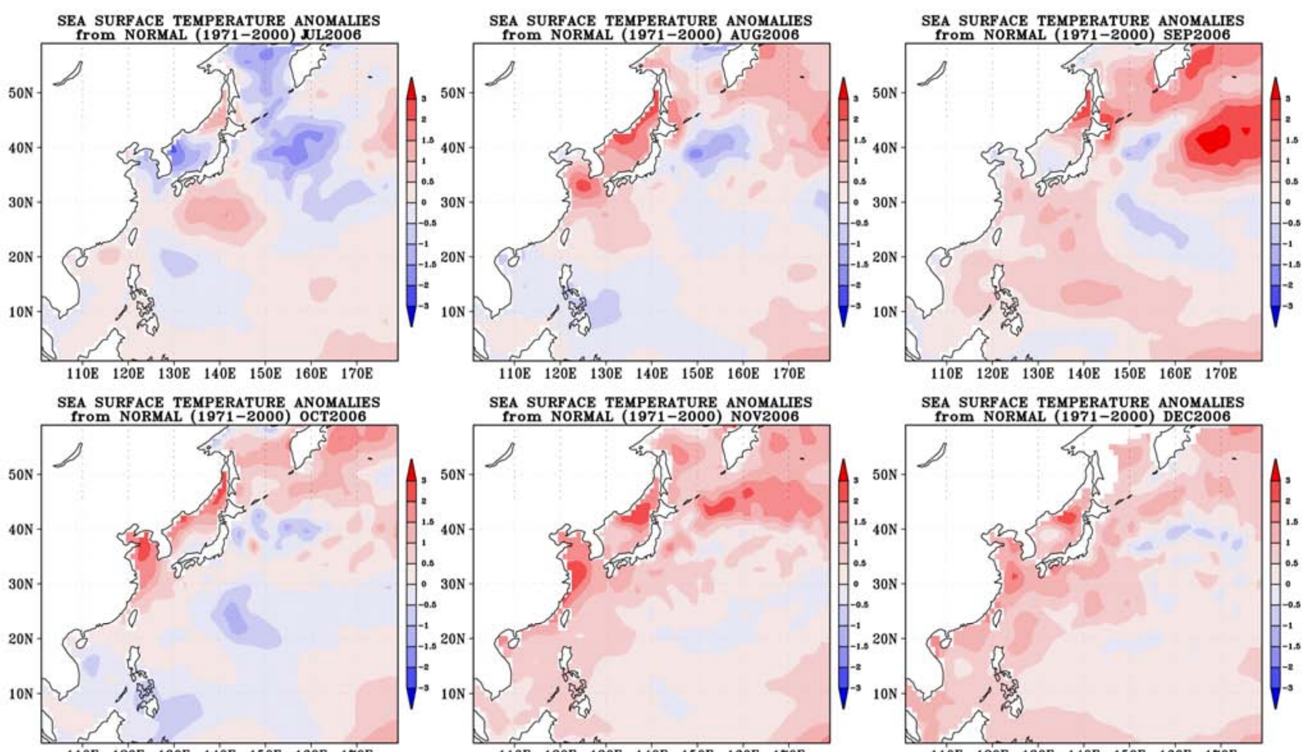
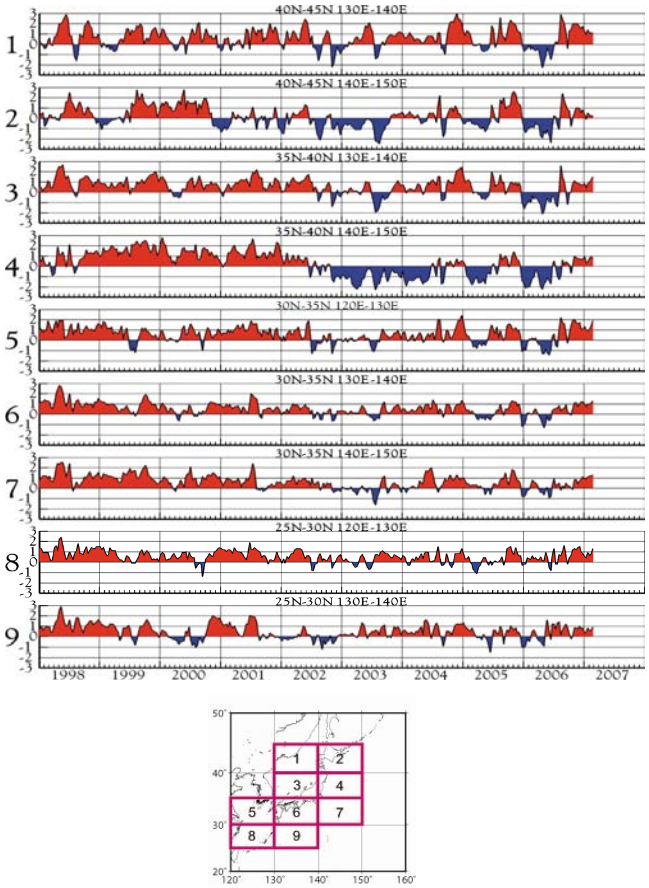
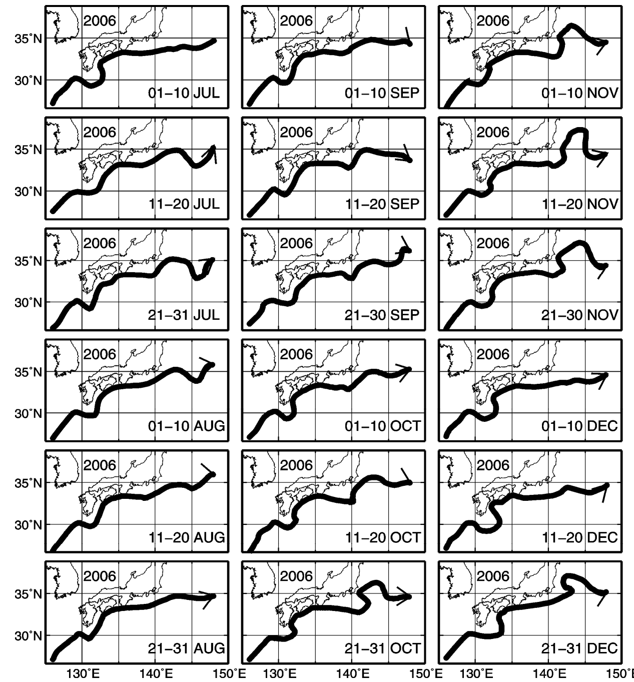


Fig. 1 Monthly mean sea surface temperature anomalies (ºC) from July to December 2006. Anomalies are deviations from JMA's 1971–2000 climatology.





Left column:

Fig. 2 Time series of 10-day mean SST anomalies (°C) averaged for the sub-areas shown in the bottom panel. Anomalies are deviations from JMA's 1971–2000 climatology.

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Fig. 3 Location of the Kuroshio path from July to December 2006.

season of 2006. The sign of ΔpCO_2 determines the direction of CO_2 gas exchange across the air–sea interface, indicating that the ocean is a source (or sink) for atmospheric CO_2 in the case of positive (or negative) values of ΔpCO_2. A strong CO_2 source region was found in the equatorial Pacific between 158°E and 166°E in the winter of 2006 (in the Northern Hemisphere). As this season was during the La Niña event continued from the autumn of 2005 to the spring of 2006, the eastern CO_2-rich surface water might have moved to the west in response to the change of zonal wind. This equatorial region returned to a weak CO_2 source and/or sink region in the summer of 2006, when the equatorial region was under normal conditions. CO_2 sink regions were found in summer between 10°N and 30°N. This condition is greatly different from that in the summer of 2005 when the entire region between 10°N and 30°N acted as a CO_2 source.

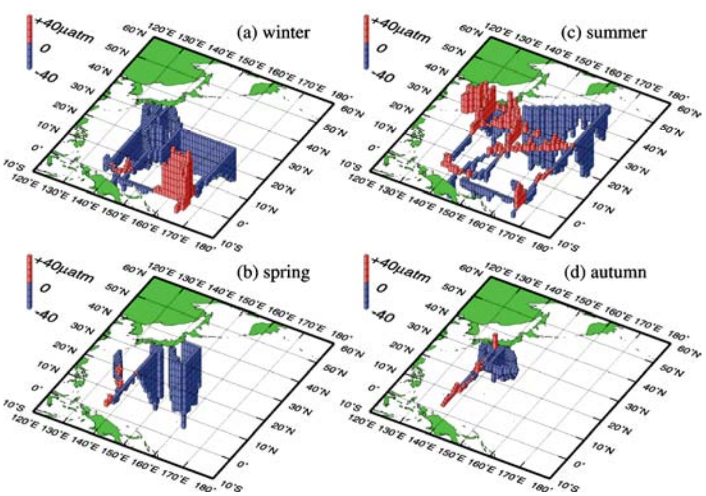

Fig. 4 Difference in CO_2 partial pressure between the ocean and atmosphere in the western North Pacific in 2006. Red/blue pillars show that oceanic pCO_2 is higher/lower than atmospheric pCO_2. Seasons are for the Northern Hemisphere.

Shiro Ishizaki (s_ishizaki@met.kishou.go.jp) is a Scientific Officer of the Office of Marine Prediction at the Japan Meteorological Agency (JMA). He works as a member of a group in charge of oceanic information in the western North Pacific. Using the data assimilation system named "Ocean Comprehensive Analysis System", this group provides an operational surface current prognosis (for the upcoming month) as well as seawater temperature and an analysis of currents with a 0.25 × 0.25 degree resolution for waters adjacent to Japan. Shiro is now involved in developing a new analysis system for temperature, salinity, and currents that will be altered with the Ocean Comprehensive Analysis System.