The State of the Western North Pacific in the Second Half of 2007

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 2007, 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, 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 below normal north of 30°N in July. In August, the negative SST anomalies in the seas adjacent to Japan turned positive and remained so for the rest of the year. These changes in SST anomalies were confirmed for regions 1 through 7 (**Fig. 2**). Positive SST anomalies exceeding +2°C prevailed east of Japan in September. In August, negative SST anomalies exceeding –2°C were found around 40°N, 165°E. These negative values had dwindled by September.

In November, positive SST anomalies dominated in the western equatorial Pacific (west of 150°E), while the negative values appeared east of 160°E along the equator. This contrasting distribution of SST anomalies corresponds to the pattern often observed during La Niña events.

Kuroshio path

Figure 3 shows a time series of the location of the Kuroshio path for this period. The Kuroshio took a small meandering path to the south of Honshu Island (between 135°E and 140°E) in August and November. When this small meander crossed the Izu Ridge (about 140°E), the latitude of the Kuroshio axis 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 for each season of 2007. 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.

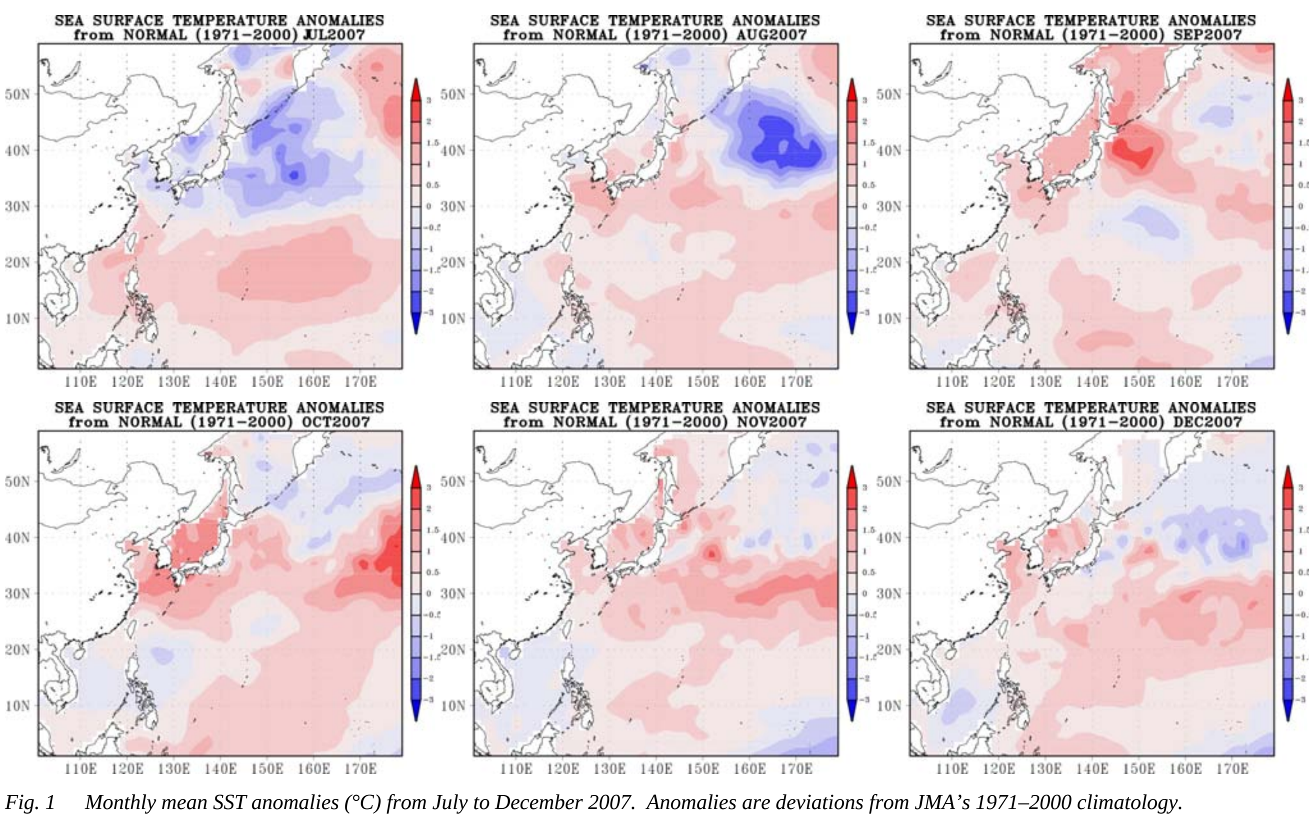
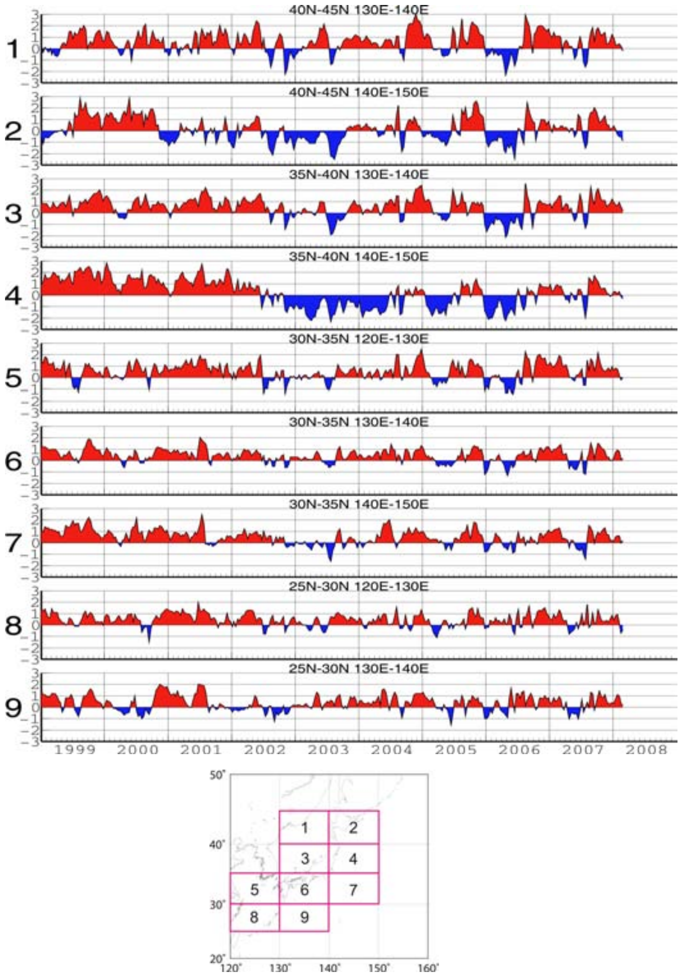
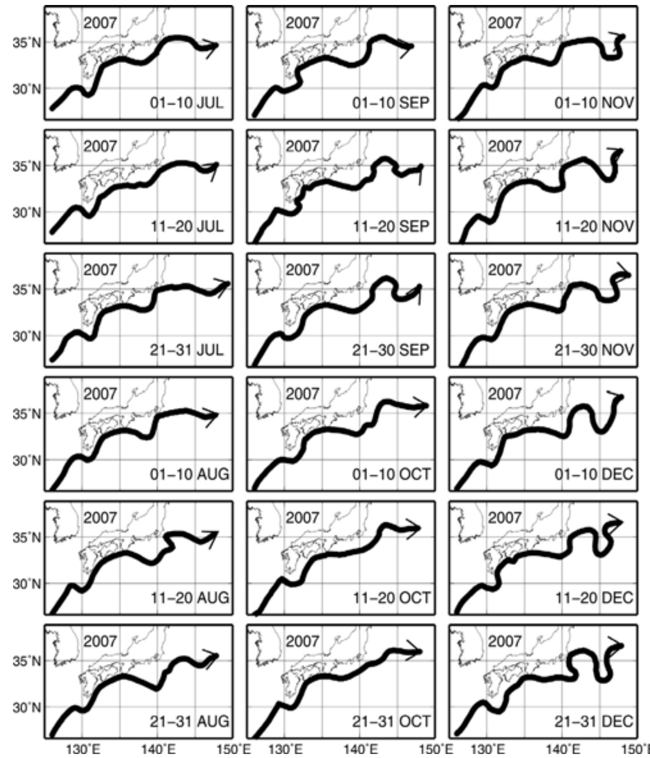


Fig. 1 Monthly mean SST anomalies (°C) from July to December 2007. Anomalies are deviations from JMA's 1971–2000 climatology.





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.

Right column:

Fig. 3 Location of the Kuroshio path from July to December 2007.

In the subtropical Pacific, oceanic pCO_2 was lower than atmospheric pCO_2 in the winter, spring and autumn of 2007, indicating that the region is a sink for atmospheric CO_2. On the other hand, CO_2 source regions were found in the summer of 2007. The equatorial Pacific acted as a weak CO_2 sink in winter, but the region turned into a CO_2 source (relatively higher between 157°E and 165°E) in the summer of 2007. The spring and summer seasons of the year were characterized by the La Niña event, and the eastern CO_2-rich surface water might have moved westward in response to zonal wind changes.

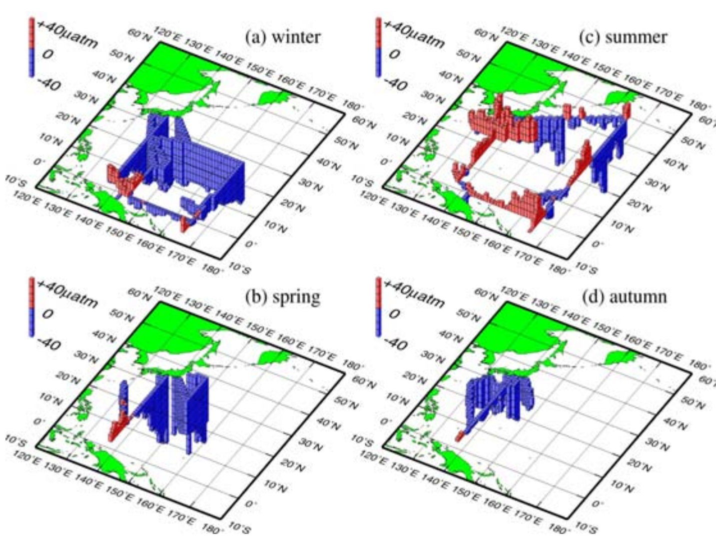


Fig. 4 Difference in CO_2 partial pressure between the ocean and the atmosphere in the western North Pacific in 2007. Red/blue pillars show that oceanic pCO_2 is higher/lower than atmospheric pCO_2. Seasons are for the Northern Hemisphere.

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.