The State of the Western North Pacific in the First Half of 2012

by Shiro Ishizaki

Sea surface temperature

Figure 1 shows monthly mean sea surface temperature (SST) anomalies in the western North Pacific from January to June 2012, 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, MetOp/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 the 9 regions indicated in the bottom panel. From January to April, SSTs were above normal from 15°N, 155°E to 25°N, 180°E. In the seas around 25°N, 180°E, positive SST anomalies remained until the end of the period. From January to March, positive anomalies dominated in the western equatorial Pacific (west of 150°E), while negative anomalies prevailed east of 160°E along the equator. In March, positive anomalies exceeding +1°C were seen in the South China Sea. In May, positive anomalies were found in the seas from the area east of the Philippines to the area around the Mariana Islands. Negative anomalies exceeding –1°C appeared in the seas east of Japan during the entire period except in May. In April, negative anomalies prevailed in the seas adjacent to Japan. In June, negative anomalies exceeding –1°C existed in the seas south of Japan.

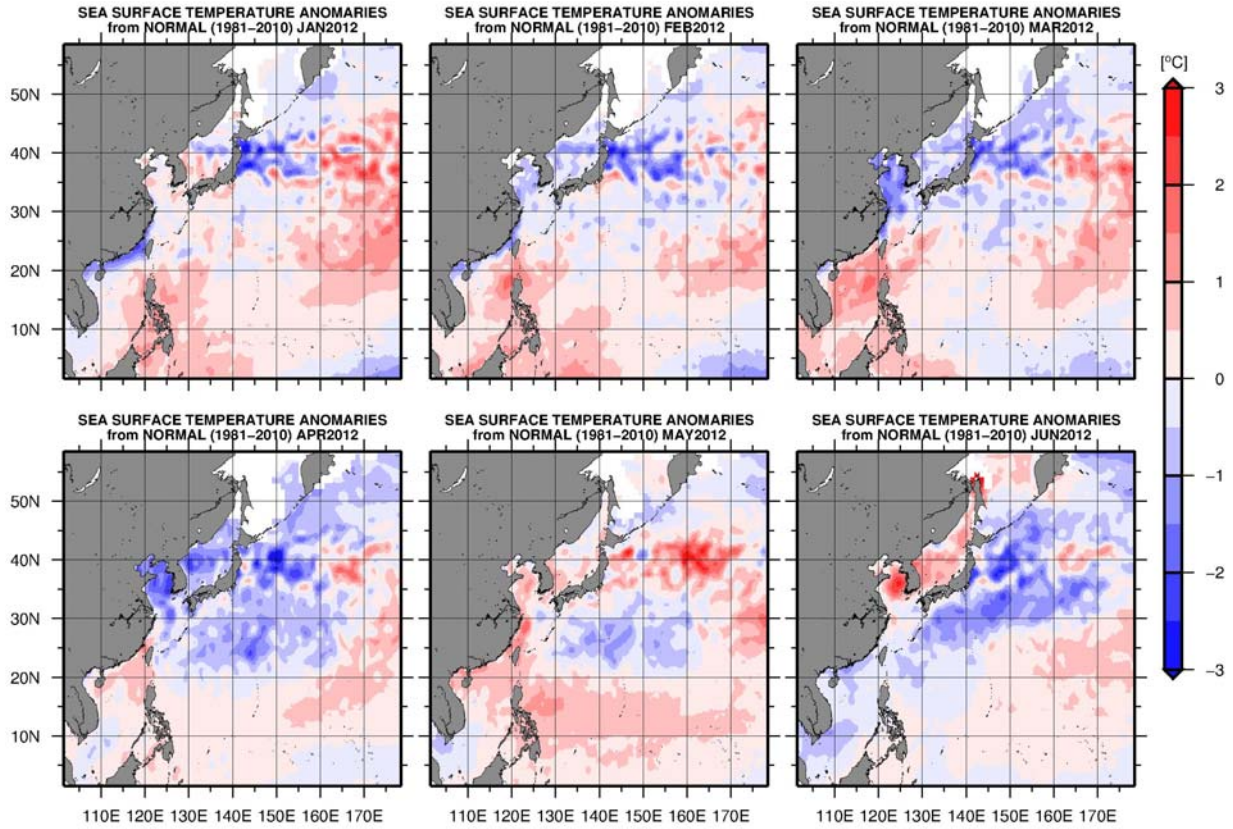
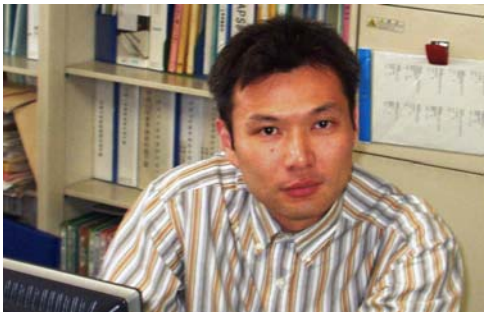


Fig. 1 Monthly mean sea surface temperature anomalies (°C) from January to June 2012. Anomalies are deviations from JMA's 1971–2000 climatology.



Shiro Ishizaki (s_ishizaki@met.kishou.go.jp) is a Scientific Officer of the Office of Marine Prediction at the Japan Meteorological Agency. 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.

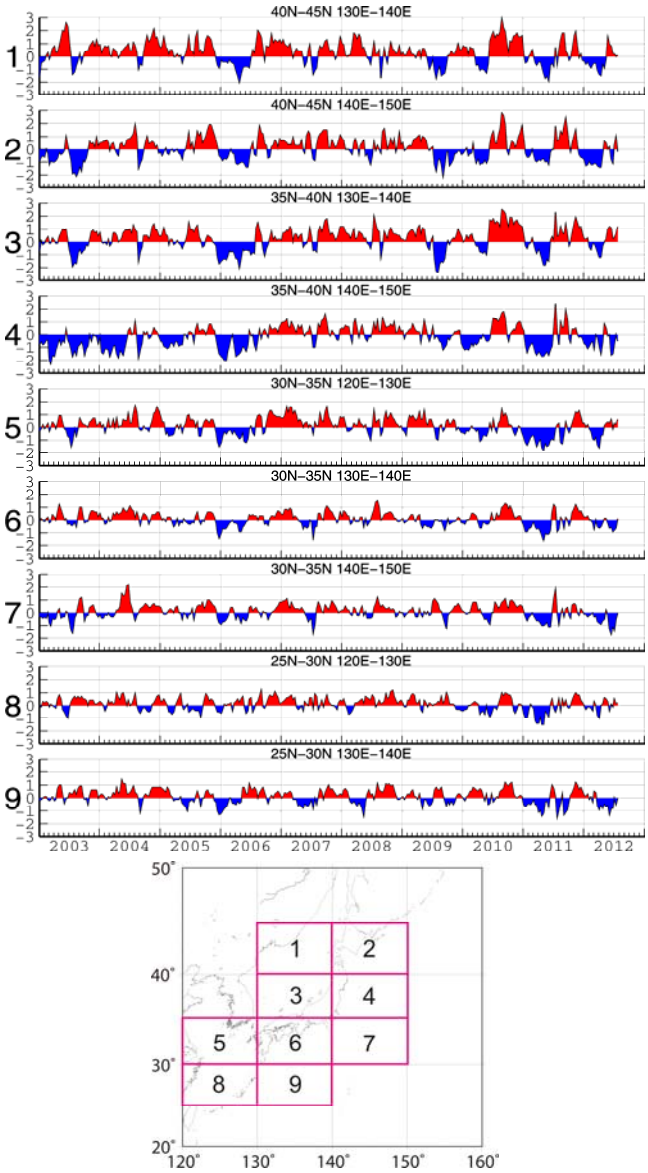


Fig. 2 Time series of 10-day mean sea surface temperature anomalies (°C) averaged for the sub-areas shown in the bottom panel. Anomalies are deviations from JMA's 1971–2000 climatology.

Kuroshio and Oyashio

A time series outlining the location of the Kuroshio's path from January to June 2012, at intervals of 10 days, is presented in Figure 3. The current took a non-large-meandering path off the southern coast of Honshu Island, between 135°E and 140°E. East of 135°E, several small perturbations propagated eastward along the Kuroshio. Corresponding to the passage of each perturbation, the latitude of the current's axis over the Izu Ridge (around 140°E) moved north and south. In March, May and most of June, the Kuroshio flowed south of Hachijo Island (33°N, 140°E). Figure 4 shows monthly mean subsurface temperature at a depth of 100 m in the seas east of Japan for April 2012 generated using a numerical ocean data assimilation system (MOVE/MRI.COM-WNP).

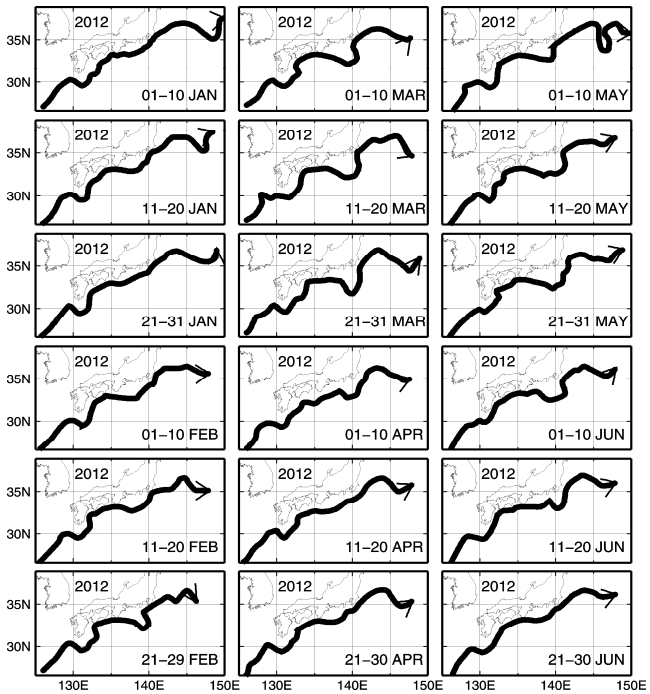


Fig. 3 Location of the Kuroshio path from January to June 2012.

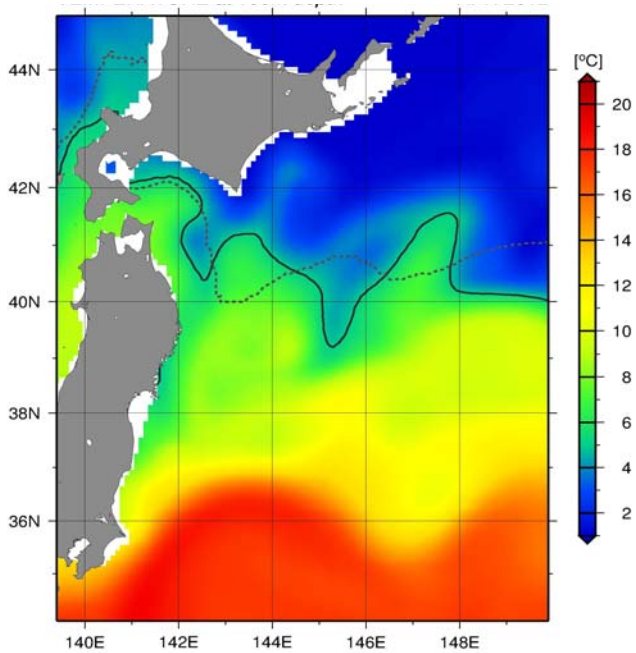


Fig. 4 Subsurface temperatures (°C) at a depth of 100 m east of Japan for April 2012. The solid line denotes the 5°C isotherm, while the dotted line is its climatology (26-year average values from 1985 to 2010).

The Oyashio cold water (defined as areas with temperatures of less than 5°C in Fig. 4) is known to extend southward in spring and return northward from summer until autumn (indicated by the green line in Fig. 5). From January to February, the coastal branch of the Oyashio cold water was located south of its normal position. From March to April, however, it moved significantly northward and stayed north of its normal position after April (Fig. 5).

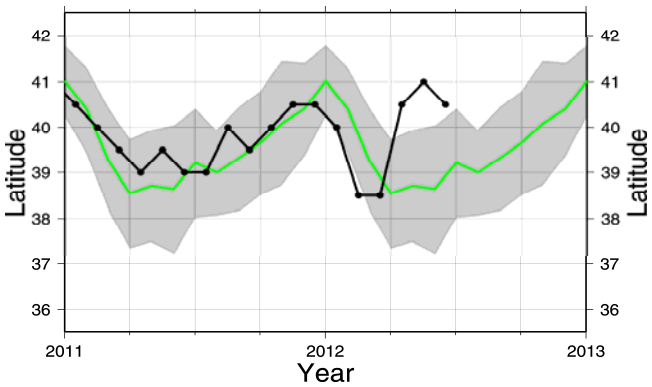


Fig. 5 The monthly southernmost position of the coastal branch of the Oyashio cold water from January 2011 to July 2012 (black line), and the 26-year average values (green line), with a range of one standard deviation (grey shading) from 1985 to 2010.

Sea ice in the Sea of Okhotsk

The sea ice extent in the Sea of Okhotsk was near normal from December 2011 to May 2012 (Fig. 6), and reached its season maximum of 112.26 × 10^4km^2 (slightly below the normal of 116.92 × 10^4km^2) on March 31, 2012. Figure 7 presents interannual variations in the maximum sea ice extent and accumulated sea ice extent in the Sea of Okhotsk for the period from 1971 to 2012. Although both parameters show large interannual variations, there are long-term decreasing trends of 173 [63–282] × 10^4 km^2 per decade (the number in square brackets indicate the two-sided 95% confidence interval) in the accumulated sea ice extent, and 5.8 [2.0–9.6] × 10^4km^2 (equivalent to 3.7% of the Sea of Okhotsk's total area) per decade in the maximum extent.

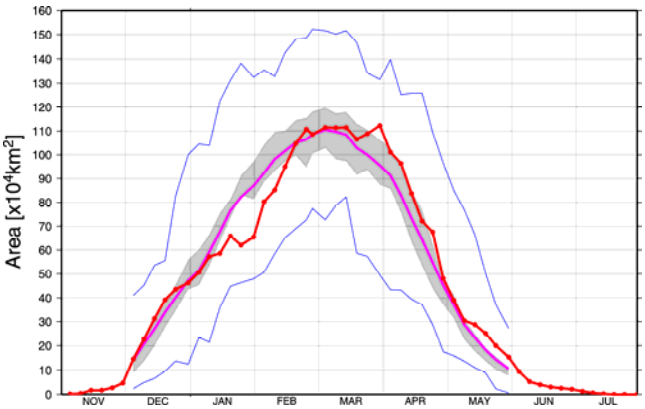


Fig. 6 Time series of the sea ice extent in the Sea of Okhotsk from November to July (red line: 2011–2012 analysis; pink line: JMA's 1981—2010 climatology; blue lines: maximum/minimum sea ice extent since 1971; grey area: normal range).

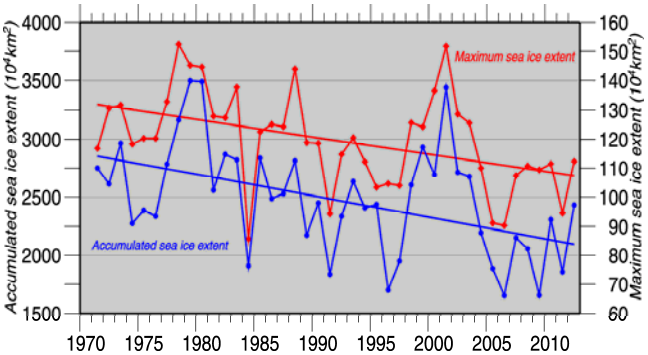


Fig. 7 Interannual variations in the maximum sea ice extent (red line) and accumulated sea ice extent (blue line) in the Sea of Okhotsk from 1971 to 2012. The accumulated sea ice extent is defined as the sum of 5-day sea ice extents from December to May.