

# The state of the western North Pacific in the first half of 2006

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 2006, computed with respect to JMS's (Japan Meteorological Agency) 1971–2000 climatology. Monthly SSTs are calculated from JMA's MGDSST (Merged satellite and *in-situ* data Global Daily SST), which is based on NOAA/AVHRR and 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).

During the entire period, SSTs were generally below normal north of 35°N (regions 1–4 in **Fig. 2**). In particular, negative SST anomalies exceeding  $-2^{\circ}\text{C}$  were found east of the northern part of Japan. Negative SST anomalies detected in January around 25°N, 140°E were reduced in magnitude and turned to positive anomalies in May and June.

SSTs were above normal south of 20°N. While negative SST anomalies were sustained in the northern part of the

East China Sea (region 5 in **Fig. 2**), SSTs were above normal in the South China Sea throughout the period. Negative SST anomalies prevailed around 36°N, 165°E in June.

## Kuroshio and Oyashio

**Figure 3** shows the Kuroshio path for 10-day periods from January to June 2006. The Kuroshio took a small meandering path south of Kyushu Island (30°N, 132°E) in January, February and May. East of 133°E, several small perturbations propagated eastward along the Kuroshio during the entire period. Corresponding to the passage of each perturbation, the latitude of the Kuroshio axis over the Izu Ridge moved from north to south.

The subsurface temperature at the depth of 100 m east of Japan for February 2006 is presented in **Figure 4**. This chart is based on the numerical ocean data assimilation system (JMA's Ocean Comprehensive Analysis System).

The Oyashio cold water (defined as temperatures less than  $5^{\circ}\text{C}$  in **Fig. 4**) is known to extend southward in spring

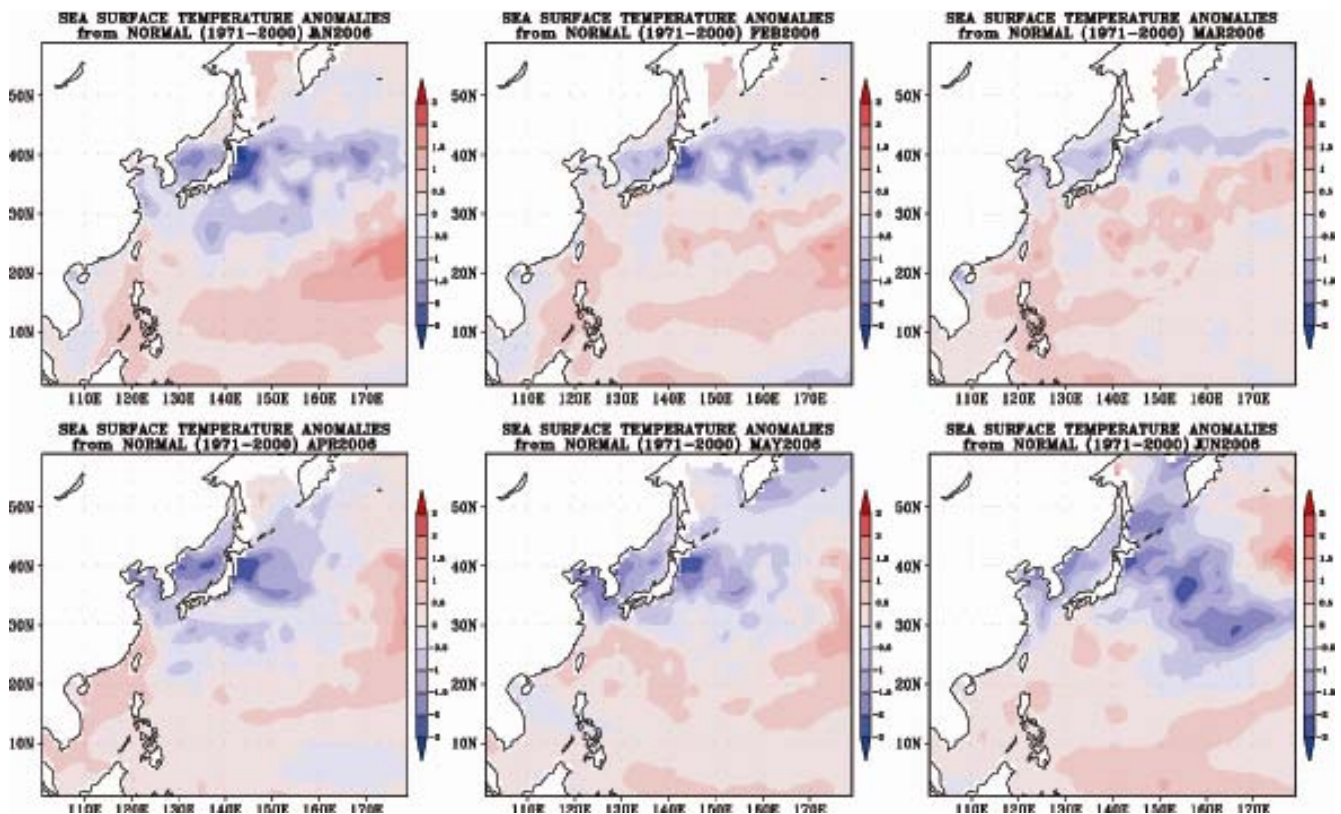


Fig. 1 Monthly mean sea surface temperature anomalies ( $^{\circ}\text{C}$ ) from January to June 2006. Anomalies are deviations from JMA's 1971–2000 climatology.

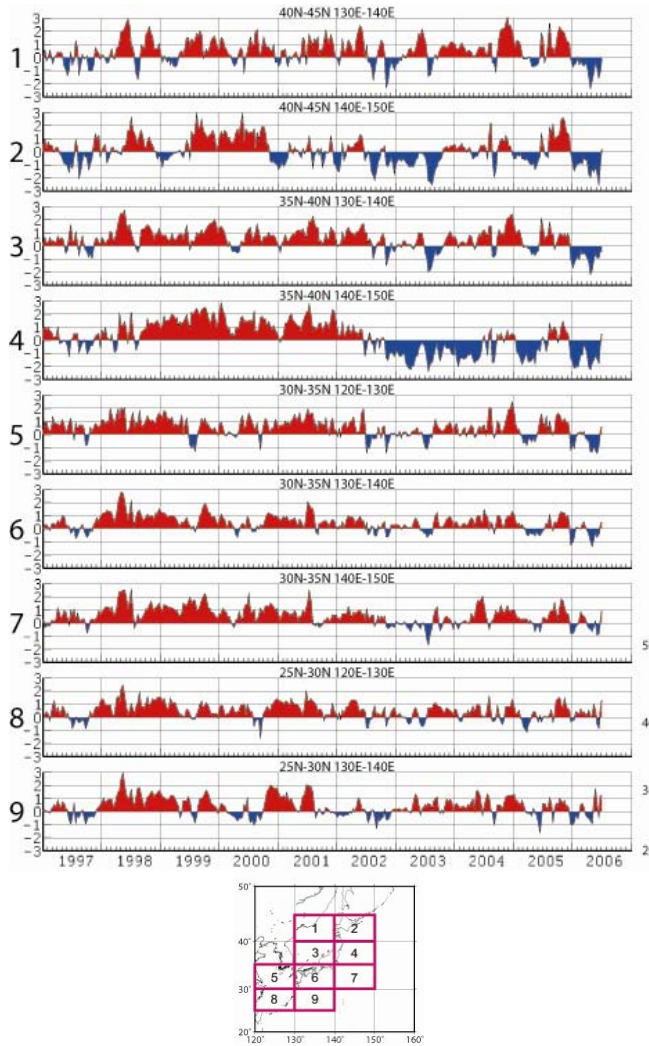


Fig. 2 Time series of the 10-day mean sea surface temperature anomalies ( $^{\circ}\text{C}$ ) averaged for the areas shown in the bottom panel. Anomalies are deviations from JMA's 1971–2000 climatology.

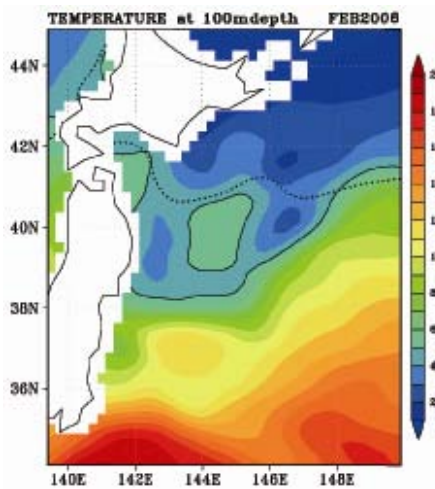


Fig. 4 Subsurface temperature ( $^{\circ}\text{C}$ ) at the depth of 100 m east of Japan for February 2006. The solid line denotes the  $5^{\circ}\text{C}$  isotherm, and the dashed line that of the climatology (30-year averaged values from 1971 to 2000).

and return northward from summer to autumn (as indicated by the green line in Fig. 5). The coastal branch of the Oyashio cold water extended southward significantly in February 2006, while it returned to almost the same latitude as normal after May (Fig. 5). The southernmost point in February was  $37.5^{\circ}\text{N}$ ,  $142.0^{\circ}\text{E}$ , which is 180 km south of the 30-year average.

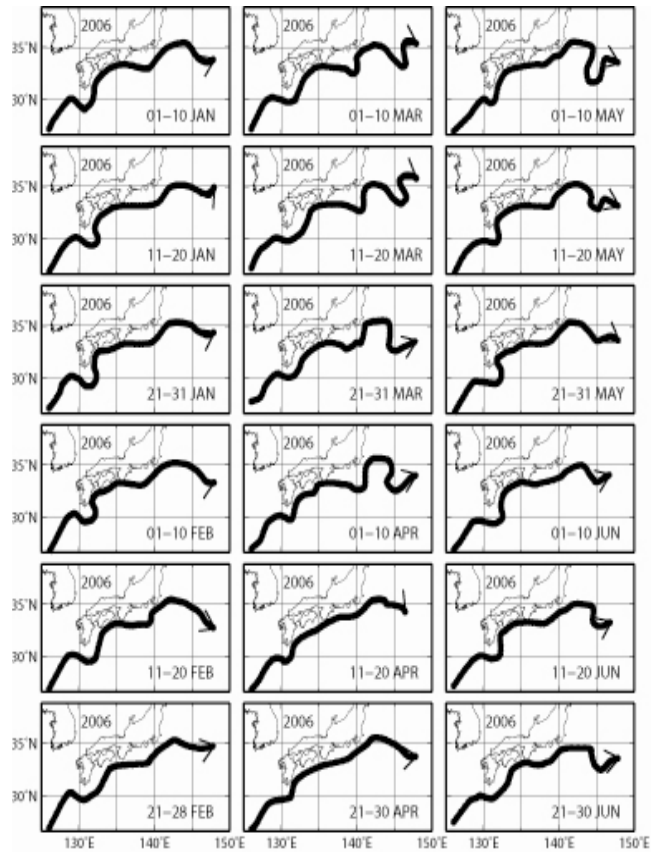


Fig. 3 Location of the Kuroshio path from January to June 2006.

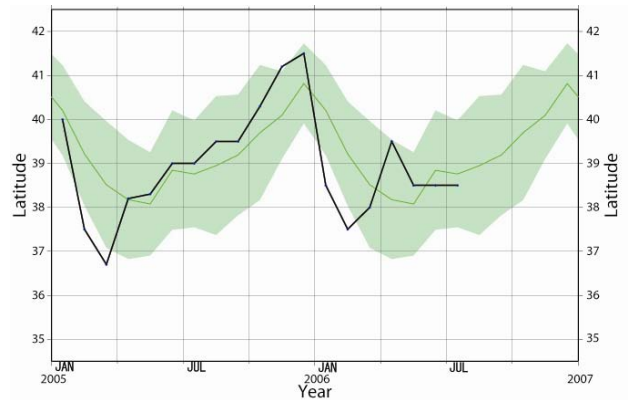


Fig. 5 The southernmost position of the coastal branch of the Oyashio cold water from January 2005 to July 2006 (black line), and the 30-year averaged values (green line), with the range of one standard deviation (green shade) from 1971 to 2000.

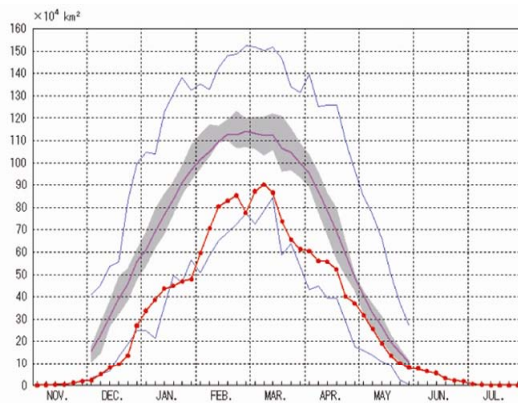
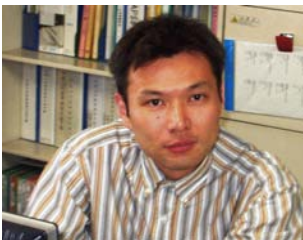


Fig. 6 Time series of sea ice extent in the Sea of Okhotsk from November 2005 to July 2006 (pink line – JMA’s 1971–2000 climatology; red line – 2005–2006 analysis; blue lines – maximum/minimum of sea ice extent since 1971; grey area – within the normal range).

### Sea ice in the Sea of Okhotsk

The extent of the sea ice in the Sea of Okhotsk was below normal (30-year averaged values from 1971 to 2000) throughout the period from December 2005 to May 2006 (Fig. 6). The sea ice area reached its seasonal maximum of  $90.38 \times 10^4 \text{ km}^2$  on March 10, which was the second lowest value since 1971 (the lowest value was  $85.81 \times 10^4 \text{ km}^2$  in 1984). The accumulated sea ice extent, defined as the sum of the 5-day sea ice areas from December to May, was  $1651.7 \text{ km}^2$ , which was the smallest since 1971 (normal value is  $2574.3 \text{ km}^2$ ).



Shiro Ishizaki ([s\\_ishizaki@met.kishou.go.jp](mailto:s_ishizaki@met.kishou.go.jp)) 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 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  $0.25 \times 0.25$  degree resolution for waters adjacent to Japan. He is now involved in developing a new analysis system for temperature, salinity, and currents that will be altered with the Ocean Comprehensive Analysis System.

## Latest and upcoming PICES publications

### PICES Scientific Report Series, 2006-2007

- Takeda, S. and Wong, C.S. (Eds.) 2006. Proceedings of the 2004 Workshop on *In Situ* Iron Enrichment Experiments in the Eastern and Western Subarctic Pacific. *PICES Sci. Rep.* No. 31.
- Miller, C.B. and Ikeda, T. (Eds.) 2006. Report of the 2005 Workshop on Oceanic Ecodynamics Comparison in the Subarctic Pacific. *PICES Sci. Rep.* No. 32.
- Kruse, G.H., Livingston, P., Overland, J.E., Jamieson, G.S., McKinnell, S. and Perry, R.I. 2006. Report of the PICES/NPRB Workshop on Integration of Ecological Indicators of the North Pacific with Emphasis on the Bering Sea. *PICES Sci. Rep.* No. 33.
- Dickson, A.G. (Ed.) 2007. Guide to Best Practices for Oceanic CO<sub>2</sub> Measurements and Data Reporting. *PICES Sci. Rep.* No. 34.

### PICES Technical Report Series, 2007

- Megrey, B.A., Macklin, S.A., Bahl, K. and Klawitter, P.D. (Eds.) 2007. Metadata Federation of PICES Member Countries. *PICES Tech. Rep.* No. 1.

### Special issues of primary journals, 2006-2008

- Marine ecosystem structure and dynamics (Guest Editors: G.L. Hunt, Jr. and S. McKinnell) – *Prog. Oceanogr.*, 2006, Vol. 68, Nos. 2–4, pp. 115–342.
- Top predator “hot spots” in the North Pacific (Guest Editors: W.J. Sydeman, A. Bychkov, R. Brodeur, C. Grimes and S. McKinnell) – *Deep-Sea Res. II*, 2006,

Vol. 53, Nos. 3–4, 247–479.

- Canadian SOLAS: Subarctic Ecosystem Response to Iron Enrichment (SERIES) (Guest Editors: P.J. Harrison, P.W. Boyd, M. Lvasseur, A. Tsuda, R.B. Rivkin, S.O. Roy and W.L. Miller) – *Deep-Sea Res. II*, 2006, Vol. 53, Nos. 20–22, 2005–2454.
- Selected papers on NEMURO and NEMURO.FISH models (Guest Editors: M.J. Kishi, B.A. Megrey, S.I. Ito and F.E. Werner) – *Ecol. Modelling* (2007).
- Selected papers from the symposium on “Climate variability and sub-arctic marine ecosystems” (Guest Editors: K. Drinkwater, G.L. Hunt, D.L. Mackas and S. McKinnell) – *Deep-Sea Res. II* (2007).
- Selected papers from the symposium on “Time series of the Northeast Pacific: A symposium to mark the 50<sup>th</sup> anniversary of Line-P” (Guest Editors: A. Peña, A. Bychkov and S. Bograd) – *Prog. Oceanogr.* (2007).
- Selected papers from the symposium on “Climate variability and ecosystem impacts on the North Pacific” (Guest Editors: H. Batchelder and S. Kim) – *Prog. Oceanogr.* (2007–2008).
- Selected papers from the PICES XV Topic Session on “The human dimension of jellyfish blooms” (Guest Editor: H. Iizumi) – *Plankton and Benthos Res.* (2007–2008).
- Selected papers from the 2006 CREAMS/PICES workshop on “Model-data inter-comparison for the Japan/East Sea” (Guest Editors: K.-I. Chang, S. McKinnell and C. Mooers) – *J. Mar. Systems* (2008).