

Daily variation of abnormal ocean conditions in the northwestern Pacific Ocean using NGSST satellite data

Young-Sang Suh¹ · Hiroshi Kawamura² · Sang-Woo Kim¹ ·
Lee-Hyun Jang¹ · Na-Kyung Lee¹ · Jin-Youn Choi¹

1) National Fisheries Research and Development Institute, Korea

2) Tohoku University, Japan

Introduction

The New Generation Sea Surface Temperature (NGSST) Development Group (Leader: Hiroshi Kawamura) has been working on a new satellite-based SST product, which utilizes benefits of the modern satellite/in situ-based ocean observing systems and overcomes weaknesses of the present operational SST products since 2000 (Guan and Kawamura, 2004). Real-time generation and distribution of the new SST products for open oceans have started.

The daily variations of SST in the northwestern Pacific Ocean were studied in this paper. Spatio-temporal variations which have global and short-term changes were captured by NGSST, in particular with respect to the abnormal phenomena such as cold water extension in the Yellow Sea, local heating in the East China Sea, cold and warm water patches caused by typhoon in the East/Japan Sea, and huge tidal front in the Kuril Islands.

Data and Method

We used the NGSST-open ocean products for 2 years (2004-2005) to understand daily variation in abnormal ocean conditions in the northwestern Pacific Ocean. Satellite SST observations from infrared radiometers (AVHRR, MODIS) and a microwave radiometer (AMSR-E) are objectively merged to generate the SST product, which is quality-controlled, cloud-free, high-spatial resolution (0.05 degree-gridded), wide-covering (50 degree x 50 degree), and daily SST digital map. Using the satellite-derived SSTs, a first guess (mean SST weighted by the auto-correlations in an observational window) is calculated, and then the grid SSTs are produced through an optimum interpolation scheme with de-correlation scales of 200 km in latitude/longitude directions

and 5 days of intervals in time. In order to represent the small-scale and high-frequency SST variations, these processes have been tested and established.

For the better understanding of the cause of the abnormal patches of cold and warm water in the northwestern Pacific Ocean, NOAA/AVHRR, SeaWiFS, Quikscat Satellite data, and in situ data were used.

Result and summary

Local heating occurred on the surface layer in the East China Sea for 15 days (August 4-18, 2004). The surface cooling cold water lower than 10°C suddenly extended from the coast of Shanghai-Qingdao in China to the southeastern part in the East China Sea for 5 days (March 25-28, 2005). Huge cold water mass lower than 10°C temporally varied in the Kuril Islands for 6 days (August 26-31, 2004). Abnormal cold and warm water caused by typhoon Megi occurred in the East/Japan sea for 7 days (August 19-25, 2004).

Occurring of daily abnormal ocean conditions are caused by typhoon, monsoon, sea surface wind, low salinity and tidal current in the northwestern Pacific Ocean.

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