Characteristics of SST Variation/Change in the Coastal Region of the East China Sea

Jianli Zhang, Manchun Chen, Meixiang Chen, Hui Wang, Juncheng Zuo

1 National Marine Data & Information Service, Tianjin, China
2 College of Physical and Environmental Oceanography, Ocean University of China, Qingdao, Shandong, China
3 Key Laboratory of Coastal Disaster and Defence, Ministry of Education, Hohai University, Nanjing, Jiangsu, China

ABSTRACT

Based on the 50 years sea surface temperature (SST) data of nine hydrological observation stations, the seasonal variation and the long term trend of SST in the coastal region of the East China Sea are investigated. The research results show that the mean SST in the coastal region of the East China sea is 19.3°C. Impacted by solar radiation, as a whole, the SST is higher in south than north. The SST along the coast of East China Seas takes on strong seasonal variation. The annual range shows larger values in the north than in the south, in the north, the range can reaches 20°C and the south with the range of 12°C. The SST also shows prominent inter-annual variation and inter-decade variation besides the seasonal variation, the prominent terms are 2year, 3.5year and 11year. According to 50 years SST data along the East China Sea, the SST shows obvious increasing trend, the average rising rate of nine the stations is 0.017°C/yr. The increasing range of SST in winter is most, the weakest in the summer, so the warm winter is the important factor to increasing SST.

Key words: SST variation; East Sea of China; trend; inter-annual variation; inter-decadal variation

INTRODUCTION

The last century saw a global climate change with a main characteristic of warming. It is pointed out in the Fourth IPCC Assessment Report that the global mean surface temperature in the 20th century has increased by 0.74±0.18°C with the last decade from 1995 being the warmest decade of the century and the warming will last in the coming 50~100 years till an increase of 1.1~6.4°C of the surface temperature at the end of the current century occur and at the same time, the temperature of the ocean will increase significantly. The China Sea Level Bulletin of 2007 shows that in the last 30 years, the mean air temperature and sea surface temperature along the coast of China has increased 1.1°C and 0.9°C and high correlation can be found between them. Climate change in the latest 100 years has greatly influenced the natural ecosystems and social economy both of the world and China and the influence will be more profound in the future.

The sea surface temperature is an important thermodynamic tracer of the upper ocean in the ocean-atmospheric coupled system, and also a sensitive indicator of climate change, affected by the thermodynamic, dynamic processes and ocean-atmosphere interaction. It is an important variable in the research of sea surface water and heat flux, ocean circulation, water mass, ocean front, upwelling current and sea water mixing (Wu et al., 2005).

Mao and Ren studied the spatial distribution and seasonal variation of the sea temperature in the East China Sea (ECS) in the 1960s (Mao, 1964; Ren et al., 1964). Based on the hydrological observation data at stations from 1955–1986, Tan discussed the seasonal distribution, variation and their physical mechanisms of the sea temperature in the north ECS (Tang et al., 1989). Yan studied the sea temperature variation of the last 100 years in the ECS with the Comprehensive Ocean-Atmosphere Data Set (COADS) temperature data and station observation data and pointed out that both the SST and air temperature in the ECS oscillated on the periods of 5~7a and quasi-2a (Yan and Lin, 1997). From the Hadley sea temperature data of 1901–2004, Zhang found the sea temperature in the China seas is increasing in the last 100 years especially after 1980s and the period after 1990s is the warmest (Zhang, 2005).

In this paper, we utilize the SST data obtained from nine hydrological observation stations to analysis the characteristics of seasonal, inter-annual and long term variation/change of SST in the coastal region of the ECS, and preliminarily document the reason for SST variation/change.

DATA AND METHOD

Data

The data used in this paper includes the monthly sea surface temperature from 1960 to 2007 of 9 hydrological observation stations and monthly air temperature at 3 stations among them during 1966–007. (Fig.1). The stations are all on the coast of East China Sea.

Fig.1 Stations selected along the coast of ECS