Interannual variability of the Cold Eddy in East China Sea

Jian Lan, Jianfeng Wang, Gang Wang
Physical Oceanography Laboratory, College of Physical and Environmental Oceanography, Ocean University of China
Qingdao, P.R.China

ABSTRACT

A simple index, called CEECS eddy (Cold Eddy in East China Sea) index, is developed. Based on the index time series, the interannual variation of the CEECS is analyzed. The CEECS shows interannual variations on the 2-4 yrs band scale. The maximum correlation coefficient of the CEECS eddy index with Nino3 index is 0.29 with Nino3 index leading by 23 months. The notably positive CEECS index anomalies in 1999 should be lag response to 97/98 strong El Nino event, and the weak positive CEECS index anomalies in 2003-2004 and 2004-2005 should be lag response to the two recent weak El Nino events of 2002-2003 and 2004-2005. The results indicate the close correlation between the CEECS eddy and El Nino.

KEY WORDS: Cold Eddy in East China Sea; index; interannual variation; El Nino.

INTRODUCTION

The East China Sea (ECS) experiences complicated current system (Fig.1), which determines the ECS’s hydrographic features and eddies to a great extent. The Yellow Sea Warm Current (YSWC), a branch of the Kuroshio, moves northwestward near the Cheju Island of South Korea from the ECS into the Yellow Sea (YS), raising the sea surface temperature of the central YS several degrees above those of the coastal waters. The China Coastal Current brings water of low salinity southward from the YS into the ECS. The Taiwan Warm Current carries water of oceanic properties northward, some of it as an offshoot from the Kuroshio and some through Taiwan Strait (Tomczak and Godfrey, 1994). Eddies may then dominate the region.

A well defined cyclonic eddy is the Cold Eddy of the ECS (CEECS), located about 150km southwest of the Cheju Island. The scales of the CEECS are 100-200km horizontally and 50m vertically. The CEECS was first reported by the Inoue (1975), based on the ‘artificial jellyfish’ data spanning the period of November 7-8, 1969. The data of bottom current showed a cyclonic circulation over a wide region southwest of Cheju Island. Analyzing historical summer hydrographic data, Hu et al. (1980, 1984) and Lan et al. (1996) suggested that the CEECS exits not only in autumn and winter but also in summer. The multiyear existence of the eddy has been identified with thermal structure and current measurements by Mao et al. (1986). The fact that position and dimension of a distinct circular-shaped region of clayey mud coincides with those of the CEECS supports its existence and domain (Hu et al., 1980; Mao et al., 1986).

While our knowledge of the seasonal characteristics of the CEECS has increased steadily over past years, understanding of its interannual variability, especially in terms of its intensity, remains far from satisfactory. This is mainly owing to the lack of long-term observation which continuous temporally and spatially. With the development of remote sensing technique, it is possible for us to focus on the CEECS’s interannual variability. The purpose of this paper is to propose some proper indexes to describe the CEECS’s intensity and to examine its variability on the interannual scale.