Abstract

Results of a data assimilative ocean model (JCOPE2) from 1993 to 2012 were used to examine the correlation between the Pacific Decadal Oscillation (PDO) index and interannual variations of the Kuroshio transport in the East China Sea (ECS), the influence of mesoscale eddies on this correlation and elucidate the influence of the interannual variations of the Kuroshio transport to the throughflow in the straits of East Asian Marginal Seas.

In a period from 1993 to 2002, the Kuroshio transport estimated from the JCOPE2 reanalysis has a positive correlation with the PDO index. This well known correlation became weak or even disappeared when the analysis period was extended from 1993-2002 to 1993-2012. This occurs because the variation range of the PDO index became small during enhanced mesoscale eddy activity southeast of Taiwan in years after 2002. The eddies caused a larger variation in the Kuroshio transport in the years after 2002 than before 2002, and therefore changed the correlation between the PDO index and Kuroshio transport in the ECS. The influence of mesoscale eddies on the Kuroshio transport has strong regional dependence: the Kuroshio transport from the area east of Taiwan to the midway along the shelf break in the East China Sea depends mainly on eddies arriving from southeast of Taiwan, while transport from the midway along the shelf break to the Tokara Strait depends mainly on the eddies arriving from northeast of Okinawa Island. The combination of PDO-related signals and eddy-related signals determines the interannual variations of the Kuroshio transport in the ECS.

Interannual variations in the Kuroshio transport in the ECS have significant

negative correlation to the interannual variations in the transport through the Tsushima Strait that is the main entrance of the Japan Sea.

In the Japan Sea, the mechanism of inflow water from the Pacific Ocean to the Japan Sea for the seasonal timescale is mainly controlled by the sea level difference between the area around the Tsushima Strait and those around Tsugaru and Soya Straits. The interannual variation in the sea level difference between the Tsushima Strait to those of Tsugaru and Soya Straits still plays a role in controlling the transport through the Tsushima Strait. The stronger Kuroshio in the ECS induces a lower sea level inside the ECS that in turn induces a weaker throughflow in the Tsushima Strait, and vice versa.