The influence of Topography on Trajectories of Mesoscale eddy east of Okinawa Island based on Satellite Altimetry

Takashi Moriyama* Shailesh M. Pednekar** Masanao Hara***
Jun Suwa**** Susumu Kanno***** Yasuhiro Sugimori**

Abstract

The main objective of the present study is to detect manually individual anomaly trajectories using filtered sea surface height (SSH) anomaly to the east of Okinawa Island and to understand the influence of bathymetry on their life cycles. Initially seasonal monthly mean background is computed using running mean in space (1000 km x 1000 km) and time (five months) using composite sea level anomaly maps of TOPEX/POSEIDON (T/P) and ERS-1&2 altimeters. These seasonal mean background is removed from each original Maps of Sea Level Anomaly (MSLA) cycles to get the filtered SSH anomaly to detect individual mesoscale eddy trajectories based on certain criteria. Spectral power in frequency domain along 25.875° N latitude using the filtered SSH anomaly shows maximum peaks in 50, 136-150, and 365 day's periods. Trajectories of ARGOS drifting buoys east of Okinawa Island show large meandering of a drifting buoy around Daito Island. In this region high (>0.8℃) variability is detected using root-mean-square (rms) of sea surface temperature. The typical scale of the detected mesoscale eddy was 350 km and the lifetime was 115 days. The total number of the detected warm and cold eddies is 94 in six years period. More typical eddies are located in deeper region compared with shallow region. Seasonal distribution of mesoscale eddies changes in space and time. The warm (cold) core eddies are coming from southeast (northeast) direction avoiding Daito Sea mount. Passage of trajectory of eddies are through deeper ocean. It has been found that along Ryukyu ridge region eddies decay around shallow continental steep slope. It seems that the trajectory of eddies is crucially affected by bathymetry. These bathymetric features may have an important role on the generation and growth of mesoscale anomalies.