An irregularly shaped warm eddy observed by Chinese underwater gliders

*Huabin MAO[1]

1. South China Sea Institute of Oceanology

Mesoscale eddies are important for transporting oceanic energy and matter. We investigated the three-dimensional structure
of an irregularly shaped warm eddy using three Chinese underwater gliders and satellite data during May 2015 in the northern
South China Sea. The warm eddy lasted for 2 months, remained quasi-steady, and had a mean radius of ~ 70 km from May
10 to May 31. The heat contents observed along the two glider tracks differed markedly, by 2 ×109 J/m2, which reflected an
imbalance in the geostrophic and tangential velocity distributions of the eddy. The geostrophic/tangential velocity decreased/
increased with depth within the warm eddy. The maximum tangential velocities calculated using the datasets from the two
gliders were 0.8 and 0.25 m/s, respectively, confirming that the shape of the warm eddy was horizontally asymmetrical.
Large errors can arise when the heat, energy, and matter transport for an irregularly shaped eddy are estimated using a regular
circular model. We suggest that more intersecting glider tracks should be used to retrieve the three-dimensional eddy structure,
and that those tracks should be better designed. The irregular shape of the warm eddy was likely induced by oceanic
currents such as the wind-induced Ekman current. Further study is needed to elucidate the eddy–current interactions and
the mechanisms thereof.

Keywords: Irregular shape, Warm eddy, Chinese underwater glider