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Category: Ocean and Atmospheres

Paper ID: 57-OOA-A1711

Title: (57-OOA-A1431) The Kuroshio path states in the northern Okinawa Trough of the East China Sea: Observations and numerical experiments

Abstract: Using several observational data, the author describes some aspects of the Kuroshio path states in the northern Okinawa Trough between the continental slope and the Tokara Strait in the East China Sea. Drifter buoy trajectories show that the Kuroshio paths in the northern Okinawa Trough are quasi-bimodal in character consisting of the northern paths and southern ones, which are associated with anticyclonic and cyclonic Kuroshio circulations, respectively. The Kuroshio position time series in the Tokara Strait show that the Kuroshio paths in the northern Okinawa Trough repeatedly undergo transitions between the stable and unstable path regimes, and the northern paths tend to be persistent and intermittently transition to southern paths at periods of 1-3 months in the unstable path regime. Moored current variations in the slope area and the Kuroshio path variations in the Tokara Strait are highly coherent near periods of 1-3 months due to the meander motions resulting from the transitions between the northern and southern paths. Successive NOAA SST images and shipboard ADCP current fields show that the transition from the northern path to the southern one is associated with a spatially growing cyclonic eddy, which is initially generated from a downstream-propagating frontal meander with wavelength of about 200 km. Using a primitive equation regional model driven by inflow/outflow conditions, the author furthermore examines the Kuroshio path states in the northern Okinawa Trough. A parameter study is performed to analytically formulated inflow structures parameterized by the maximum surface velocity location (xf: distance from the continental shelf) and the velocity decreasing rate against depth (zs). The principal features of the model results are as follows: 1) there are three path states: the stable northern-path state in the small xf and zs range (i.e., volume transport, VT < about 20 Sv), the stable southern-path state in the large xf and zs range (VT > about 25 Sv), and the unstable path state in the intermediate xf and zs range (VT ~ 20-25 Sv); 2) temporal variations of the unstable path states consist of two types: the step-like transition between the stable northern/southern-path and unstable path regimes, and the aperiodic oscillation between the northern and southern path patterns. The comprehensive grasp based on the observational results and the model ones imply that the stable northern-path state was dominant in the smaller Kuroshio transport period of 1962-75 while the unstable path state was dominant in the larger Kuroshio transport period since 1975. The Kuroshio path states since 1975 may have repeatedly undergone transitions between the stable and unstable path regimes, following the self-sustained mechanism in the northern Okinawa Trough.

Presentation Mode: Oral

Keywords: Kuroshio path, Kuroshio meander, nonlinear dynamics, Okinawa Trough, East China Sea, NOAA/SST, Mooring observation, Drifter buoy, Numerical experiment, POM

Status: Pending.

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