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Dr. Guo received a B.Eng. degree from Tianjin University, China in 1988 and a Ph.D. degree from Ehime University, Japan in 1997. After a short postdoctoral period at University of Tokyo, he joined Frontier Research System for Global Change in 1997. He moved to Ehime University in 1999 as an Associate Professor in the Center for Marine Environmental Studies. He stayed at Old Dominion University in 2003 as a visiting scientist in the Center for Coastal Physical Oceanography. His research interests are in understanding the interaction between the Kuroshio Current and coastal waters such as East China Sea and Seto Inland Sea and the impact of such interaction on the environmental changes in coastal waters. At the same time, he also pays attention on some physical phenomena in coastal waters such as tidal currents, river plumes and wind-driven currents. Currently, he is working on the numerical modeling of current system and material transport in the East China Sea, Bohai Sea, Seto Inland Sea, and Chesapeake Bay and the observations of river plumes in the Bohai Sea and Seto Inland Sea.

Current Structure, Material Transport and Modeling of Persistent Organic Pollutants in Coastal Waters

The advection due to current and the diffusion due to turbulence significantly affect the fate of pollutants in coastal waters. Numerical modeling and field surveys are the ways to know current fields in a realistic bay. Using numerical modeling, we have investigated spatial and temporal variations of current fields in the East China Sea, Bohai Sea, Seto Inland Sea, Tokyo Bay, Sagami Bay, Suruga Bay and Chesapeake Bay. During recent years, we also carried out field surveys on the measurements of flow structures in the Seto Inland Sea and Bohai Sea. The combination of observations with numerical modeling provides the best way to quantitatively evaluate the temporospatial variations in the hydrographic conditions and flow fields in coastal waters. Through the above efforts in the coastal waters of our study area, we are trying to generalize the dynamics related to the flow structures in coastal waters.

On the other hand, we also paid attention on open ocean, in particular the impact of variations in the Kuroshio on the hydrographic conditions and flow fields in coastal waters. Furthermore, we studied the transport processes of terrestrial and oceanic nutrients and their contributions to ecosystem in coastal waters, from the viewpoint of physical oceanography.

As an extension of ecosystem modeling in coastal waters, we have started simulating the transport of persistent organic pollutants (POPs) in coastal waters. We have noticed that most modeling studies of POPs focused only on the biological roles in the transport processes of POPs and significantly simplified the spatial and temporal variations of physical and biological variables. This naturally causes difficulties in interpretation and application of simulation results of POPs modeling. Our recent modeling efforts, by inclusion of such physical variations in an ecosystem model and a POPs transport model, in the East China Sea and Seto Inland Sea will address the influences of the spatial and temporal variations of physical and biological variables on the fates of POPs

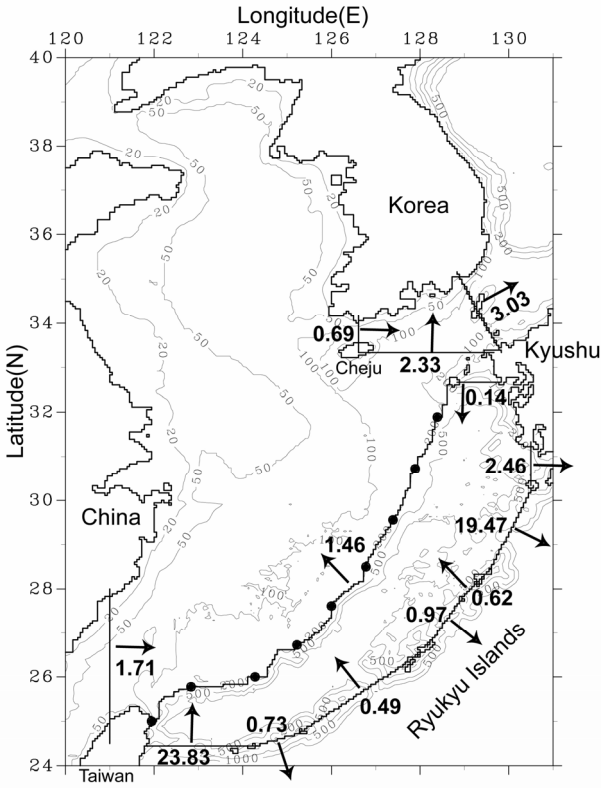

Fig.1. Annually averaged water budgets in the East China Sea, estimated by a numerical model. The number shows volume transport (1Sv=10^6 m3/s) through each section; the arrow indicates the direction of volume transport. The temporal variation of Kuroshio onshore flux across the 200m-isobath (1.46 Sv) is given in Fig. 2.

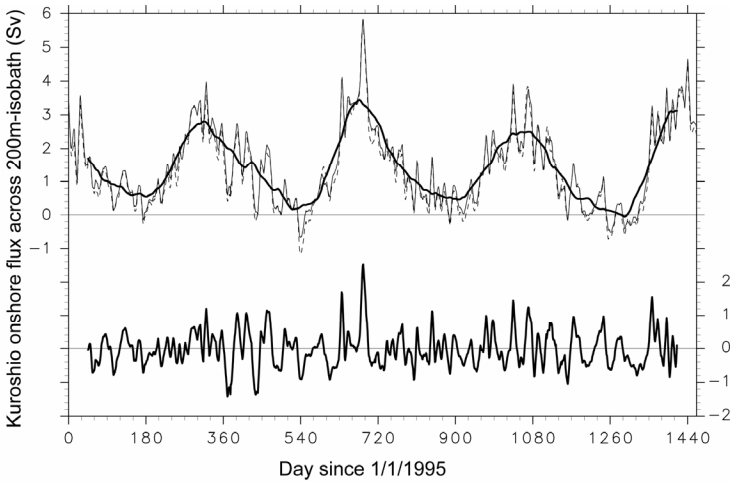

Fig.2. Daily Kuroshio onshore flux across the 200m-isobath (thin line); its 90-day running mean (upper thick line); difference between them (lower thick line); difference between daily volume transports through Tsushima Strait and Taiwan Strait (broken thin line).