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Ocean Circulation Response to Inflow from Abukuma River Outlet

○Josko TROSELJ, Yosuke YAMASHIKI, Kaoru TAKARA

Modeling of a contact zone between a river coming from potentially contaminated basin and an ocean is especially sensitive case for HSE due to significant risk of major environmental disaster which can occur in the case of contamination of the coastal zone. Therefore, it is of great importance to study and develop integrated modeling approach to comprehend the complex interaction processes in the contact zone in order to minimize disaster risk potential, which can consequently cause undesirable social and economical costs. Moreover, all land-induced activities influence the downstream catchment and related fishery production.

The focus of the completed GCOE-HSE Advanced Capstone Project undertaken in Yokohama at JAMSTEC was to study and understand the fundamental concept and philosophy of the Land-Ocean coupling modeling approach applicable for the bay and estuary zone affected by river inflow and associated pollution from the river basin. The modeling approach has been studied by combining hydrological modeling and ocean circulation modeling (MESSAGE) which runs within supercomputer (ES2), and associated data manipulation techniques for boundary conditions of hydrological and oceanographic modeling.

Abukuma river outlet was chosen as a sample site for the contact Land-Ocean zone, and the ocean circulation response to the induced inflow from the river side was considered. Barometry data were provided from ETOPO1 global relief model with 500 m spatial resolution. Ocean pressure and temperature data as well as salinity gradient data were provided from World Ocean Atlas 2005 database. The sample model was set up with 200*200 cells, resolution of 300 m with 52 depth layers of 1 meter increment and 1 day data output increment, with river outlet placed in the central west point of the model. The first step in the modeling process was inducing ocean to reach its own circulation cycle from the initial stationary conditions. Fig. 1 illustrates modeling output of 2D velocity field on the ocean surface layer 10 days after initialization of ocean circulation process. The following step was inducing the ocean circulation cycle with border conditions given from the river outlet.

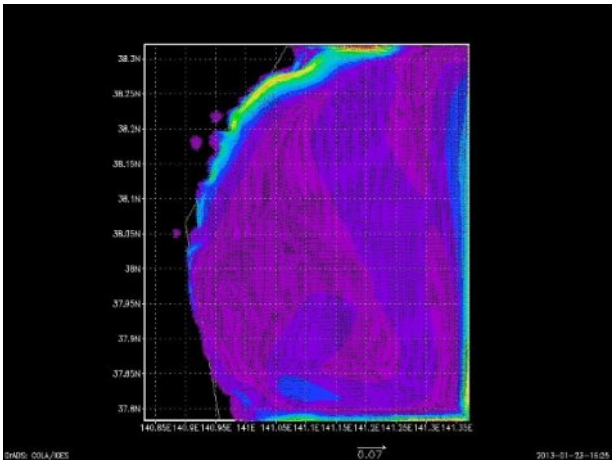

Fig 1.

The internship is still ongoing and will finish at 8th of February, so the abstract will be updated according to upcoming progress of the internship