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Coastal hydrodynamics

Fluctuation Of Residual Current In Sendai Bay.

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The tsunami generated by the 2011 off the Pacific coast of Tohoku Earthquake caused catastrophic damage to the Sanriku area (north east part of Japan). On the other hand, risks of the arsenic and heavy metals are known to be high in the plains part of Miyagi Prefecture (a part of Sanriku area) where the deposit exists in the mountainous district. And, these materials are discharged to Sendai Bay that is the Miyagi Prefecture offing. That is, it is expected that an environmental risk related to the arsenic and heavy metals exists at the bottom of Sendai bay. These facts suggest that the arsenic and heavy metals on the bottom of Sendai bay were carried to land, and the arsenic and heavy metals on land were discharged to Sendai bay by the tsunami. And we worry that these materials influence the environment. Therefore, we aimed at the clarification of the characteristics of the sediment transport in Sendai bay, to evaluate environmental risks that relate to the arsenic and heavy metals. As a first, water flow in Sendai bay was calculated by using the numerical model due to the clarification of the characteristics of the sediment transport. In this paper, the yearly fluctuation of the residual current is mainly introduced. 1. Numerical Model Model domain includes Sendai bay and the surrounding sea. The horizontal grid size is 500m x 500m, and that domain is vertically sliced to 11 levels (Thickness of each level : 5m, 5m, 10m, 10m, 10m, 20m, 40m, 100m, 100m, 100m, 100m). 16 component tides are given by NAO.99b (tide model provided by National Astronomical Observatory of Japan), water temperature and salinity are given using JCOPE2 (data set calculated by JAMSTEC) at the open boundary. An initial value of temperature and salinity is obtained by using JCOPE2. The wind stress is given by using MSM data (data set provided by Japan Meteorological Agency) at the surface of the sea. And Sea surface heat flux is calculated by using the data that the Sendai meteorological observatory had observed, to be given at the surface of the model sea. The river discharge from four rivers located around Sendai bay (Old Kitagami Riv., Naruse Riv., Natori Riv., Abukuma Riv.) is considered (river discharge data was provided by the Ministry of Land, Infrastructure and Transport, Japan.). To verify the model experiment result, the calculated values by the model are compared with several observed values. The calculation period is one year from March 5, 2011 to March 10, 2012. 2. Fluctuation of the residual current Sendai bay bounds to the open ocean by the continental sloop and depth of Sendai bay is shallower than almost 100m. The model results in this area were

analyzed, and the residual current (daily mean current) was investigated. As a result, phenomena in the open ocean are predominant in the area that is deeper than 200m. On the other hand, the residual current in Sendai bay fluctuates through the year. As a result of comparing the fluctuation of river discharge and wind with the fluctuation of the residual current, it is revealed that river discharge and wind strongly influence the fluctuation of the residual current in Sendai bay. Furthermore, the residual current in bottom level fluctuates through the year, too. This fact suggests that, sediment transport on the sea bed fluctuates through the year. We are analyzing the sediment transport on the sea bed by using the results of model experiment, now. The characteristic of the sediment transport on the sea bed will be clarified in the near future.