Monton Anongponyoskun 2007: Application of Numerical Model on the Water Circulation and Suspended Solid Dispersion in the Upper Gulf of Thailand. Doctor of Philosophy (Marine Science), Major Field: Marine Science, Department of Marine Science. Thesis Advisor: Associate Professor Shettapong Meksumpun, Ph.D. 101 pages.

In the numerical modeling of dispersion process caused by total suspended solid, the diffusion coefficient plays an important role. In this study, the diffusion coefficient was calculated by using the statistical procedure of periodicity of the tidal current data. When the autocorrelation coefficient became insignificantly different from zero after some time lag, the estimating of diffusion coefficient was straightforward. In the Upper Gulf of Thailand, the diffusion coefficient along the north-south direction was higher than in the east-west direction which agreed well with the stronger tidal current condition in the north-south direction.

The seawater level was calculated by using phase lag and amplitude of 25 tidal constituents as follow: $S_a$, $S_{sa}$, $M_m$, $M_{sf}$, $M_f$, $Q_1$, $O_1$, $M_1$, $P_1$, $S_1$, $K_1$, $OO_1$, $2N_2$, $\mu_2$, $N_2$, $\nu_2$, $M_2$, $\lambda_2$, $L_2$, $T_2$, $S_2$, $K_2$, $M_3$, $M_4$ and $M_6$. The predicted seawater level matched nicely to the observed data especially during spring tide. Each tidal constituent had the same phase lag and tidal range for the whole Upper Gulf of Thailand. Sea levels rose from the eastern part to the western part.

The Hydrodynamic and TSS dispersion model was based on Finite difference methods were used to study the variations of flow pattern and distribution of TSS pattern in the Upper Gulf of Thailand. The Hydrodynamic model was based on the conservation of water mass and momentum equations. The depth averaged two dimensional model was used to study the tidal circulation in a discrete representation of continuum problem with a variety of computational procedures and boundary condition. By using POM (Princeton Ocean Model), the numerical model was developed to achieve the proposed solutions. Calibration of the results showed satisfactory comparison of observed and computed current speed and direction.

The TSS dispersion model was based on the principle of conservation of mass. The model was used to study the TSS concentration fields in the immediate vicinity of the rivers mouth and in the Upper Gulf of Thailand. The verification had been done by comparing the predicted diffusion patterns with the satellite image. The comparison of the TSS dispersion pattern between the observed TSS dispersion and the simulated result was quite similar. It appeared that it might be possible to obtain TSS information in the Upper Gulf of Thailand by using the TSS dispersion model.

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