D21

Effect of large tidal variation on storm surge

○ Sooyoul Kim, Tomotsuka Takayama, Masahiro Yasuda

1. Introduction – The prediction of surge levels is an important problem to prevent a coastal area from inundating and to save the human lives and properties against a disaster. Further a storm intensity and an occurrence frequency have recently been increasing in terms of an atmospheric pressure and a wind speed. The surge induced by typhoon is superimposed simultaneously on the astronomical tide. In this case it is important to predict the tidal variation as well as the surge induced by typhoon because the rising surge level can be offset by the large tidal variation or vise versa. The purpose of study is how a large tidal variation influences on storm surge.

To investigate the effects of large tidal variation on storm surge the coupling system which allows the synchronous data transfer between a third generation wave model(SWAN) and a two dimensional tide/ surge model is constructed. To analyze the effects of tide on storm surge, the wave radiation stress is also investigated. The procedure is carried out to a coastal area from a deep sea by nesting scheme. The coupling system is applied to the numerical wind events in the simplified bathymetries and the two hindcasting storm events in the yellow sea and south sea of Korea, respectively.

2. Model setup

2.1 Wave model – The third-generation numerical wave model is implemented based on a Eulerian formulation of the discrete spectral balance of action density.

2.2 Hydrodynamic model – The hydrodynamic model(tide/surge) is a depth integrated two dimensional shallow water equations on cartesian coordinates. Typhoon model is used to estimate the wind field and the atmospheric pressure presented by Fusita. Tide is imposed on the open boundary by the ocean tide model representing major 16 constituents which allows the real tide predictions

2.3 Interaction between wave and tide – The water elevation and currents are transferred to the corresponding position in the wave grid. The wave radiation stress is also transferred to the corresponding position in the surge/tide grid.

3. Numerical Analysis

3.1 Numerical wind events – The bathymetric contours are constructed by the equilibrium beach profile theory and the wind profiles are also represented by the gauss distribution. Numerical tests are conducted with changing the water levels and depth contours.

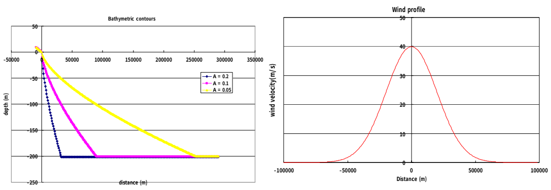

Fig.1 Cross-shore section and wind speed distribution

3.2 Typhoon Maemi - Typhoon Maemi which recorded the maximum wind velocity of 40m/s and the minimum pressure of 950hPa as landing at Sachon in Korea is chosen. The imaginary typhoon is also applied to yellow sea by taking the track of Prapiroon and the wind and pressure of Maemi.

4. Conclusion

For the prediction of water level during storm event, it is necessary to consider the wave effect, that is the radiation stress, in the large tidal region.