

Topic: Estimate of the Drainage Discharge of Tidally River with Reverse Flow due to Variation of Sea Levels

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ABSTRACT

The lower reach of a tidal river is strongly influenced by both flows from upstream and tides from downstream. The lower reach of the tidal river area consists of many complicated patterns of hydrodynamic processes. The aims of this research are to investigate the hydrodynamics of tidal river and to estimate the discharge in tidal river with partial reverse flow in the Lower Chao Phraya River. The Acoustic Doppler Current Profile (ADCP) was used to collect the data of velocity and discharge at Bang Sai, Pakkred, and Fort Chula stations in the period from June to October 2012. Curve analysis is used to determine stage, discharge, and velocity profiles. At Fort Chula station, the rising of the water level from low to maximum water levels takes about 7 hours while at Pakkred and Bang Sai stations, 70 km and 112 km from the river mouth, the time is reduced to about 5 hours. During the period of falling water level, the roughness friction between water and river bed has a significant effect on the changing of the water level.

The net discharge of the spring tide at Fort Chula and Bang Sai stations had higher drainage potential than those in the neap tide. The stage and discharge hydrographs can be applied to drainage system by using the lag time of curve of each station. The ebb tide especially falling water level has ability to drain the water. The estimate discharge method is based on velocity area principle. Mean velocities are computed by constant ratio of cross-section and maximum velocities of cross-section. The constant ratio is ratio of mean velocities and maximum velocities of each cross section. While maximum velocities are obtained by the location of average Y-axis. The cross-sectional areas can be estimated by the relationship between cross-sectional areas and water level in form of power regression. The Bang Sai station has the most accuracy and reliable of estimated discharge because it has lower effect of tidal than other stations.

Keywords: Acoustic Doppler Current Profile (ADCP), Chao Phraya River, Drainage, Estimated discharge, Loop rating curve, Tidal river.