Hydrological regime of a tidal system in the Red River Delta, northern Vietnam

LUU THI NGUYET MINH[1], DIDIER ORANGE[2], TRAN HONG THAI[3], JOSETTE GARNIER[4], LE LAN ANH[1] & TRINH ANH DUC[1]

1 Institute of Chemistry, Vietnam Academy of Science and Technology, 18 Hoang Quoc Viet, Cau Giay, Hanoi, Vietnam
mlle_nguyetminh@yahoo.com
2 IRD, UMR211-BIOEMCO, University Paris 6, France
3 Institute of Meteorology Hydrology Environment, MONRE, Hanoi, Vietnam
4 CNRS, UMR7619-SISYPHE, University of Paris 6, Paris, France

Abstract The Red River Delta (RRD) in northern Vietnam represents a complex hydrological network of tributaries and distributaries receiving large and seasonally fluctuating water flows from the upper Red River basin. The 14 300 km^2 of the Red River Delta are subject to tidal influence due to the very flat relief. This study deals with the Day-Nhue River system (DNR), which is one of the three main branches of the Red River Delta, with 20% of the total annual discharge of the Red River. This sub-basin is on the right side where the city of Hanoi is located and it provides water supply to the main part of the total population of the RRD. In consequence, the surface water and groundwater of the DNR are polluted by organic and inorganic contaminants. Very few studies have discussed the impact of the tidal movement in the wastewater mitigation. In this study, we investigated the tidal influence on the river discharge through several ADCP gauging measurements during repetitions of 24 h-long surveys. The integration of the measurements over the entire tidal cycle allowed the calculation of daily residual discharge. It was observed that the instantaneous discharges could vary from +150 m^3/s to –250 m^3/s. The consequence of this inversion of the river current means the same mass of water passed across the same river section three times. A second consequence is that the discharge values describe a daily cycle with one daily maximum, one daily minimum and a short period of stream current at value zero. These two facts could imply a significant impact on the sediment transport and water quality behaviour. It becomes impossible to calculate the river discharge by a classical calibration equation linking water level and discharge, since there is no univocal relationship.

Key words Red River Delta; tidal influence; daily residual discharge; inversed discharge