

Development and application of a Polder Hydrology and Phosphorus Simulator (PHPS)

Renhua Yan (1), Jiacong Huang (), and Junfeng Gao ()

(1) China (yrh036@163.com), (2) School of Geographical Sciences, Southwest University, Chongqing 400715, PR China

Phosphorus transportation of polders is critical to eutrophication problems of downstream freshwater ecosystems. Some equations that account for groundwater transport of phosphorus were introduced to the phosphorus module of Phosphorus Dynamic model for lowland Polder systems(PDP). Then this revised phosphorus module was coupled to WALRUS-paddy to produce a new tool called Polder Hydrological and Phosphorus Modeling system (PHPS). It explicitly represents the migration and transformation of phosphorus in the surface water, notably phosphorus releasing and resuspension from sediment, phosphorus absorbing by plant and settling to the sediment, mineralization of particulate phosphorus during the long retention time of runoff water in the ponds and ditches. Based on the hydro-climate data from Jianwei polder, China, HydroPSO and k-fold cross validation method are used to calibrate and validate PHPS. The modeled results show that a good performance can be achieved in reproducing phosphorus. The phosphorus export from polder to surrounding aquatic ecosystems is substantially reduced because of the hydraulic regulation effect of pumping stations and the settling, uptake and natural degradation of nutrients at the rententaion stage of surface water. This implies that lowland polders play an important role in intercepting and absorbing nutrients to alleviate the problem of surrounding water pollution, compared to non-polder catchment.