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Modelling critical source areas in an agricultural watershed

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Abstract Water pollution is the main threat to sustainable environmental and social-economic development in Taihu basin, China. To resolve conflicts between population growth and food supply, high-efficiency agricultural practices were implemented with the benefit of the reduction of farming lands and an increase in food production. As a consequence, large amounts of fertilizers were consumed, which resulted in serious diffuse pollution from agriculture in the region. The fate of this diffuse agricultural pollution is closely related to hydrologic processes. The hydrologic response mechanisms are the basis for understanding diffuse pollutant transport. A distributed hydrologic model system (HMS) which couples various components of the watershed hydrologic cycle such as surface water, channel water, soil water and groundwater, as well their interactions, was used to simulate various hydrologic processes in the Meilin watershed. Driven by the distributed hydrologic model, the diffuse pollution forecasting model was established by simplifying nitrogen (N) and phosphorous (P) dynamics. The model showed good simulation results and obtained the distribution of the critical source areas of total nitrogen (TN) and total phosphorous (TP) export in the Meilin watershed. The research results provide a scientific basis for the effective control of agricultural diffuse pollution in the Taihu basin.

Key words distributed hydrologic model; diffuse pollution; runoff generation; pollutant transport