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Water and nutrient balances in a large tile-drain agricultural catchment: a distributed modeling st

H. Li[1,2], M. Sivapalan[1,3,4], F. Tian[3,5], and D. Liu[3,5]

[1]Department of Civil and Environmental Engineering, University of Illinois Urbana-Champaign, Urbana, IL 61801, USA

[2]Pacific Northwest National Lab, Richland, WA 99352, USA

[3]Department of Geography, University of Illinois at Urbana-Champaign, U 61801, USA

[4]Department of Water Management, Faculty of Civil Engineering and Geo Delft University of Technology, Postbus 1048, Stevinweg 1, 2600 GA Delf Netherlands

[5]Department of Hydraulic Engineering, State Key Laboratory of Hydrosci Engineering, Tsinghua University, Beijing, 100084, China

Abstract. This paper presents the development and implementatic distributed model of coupled water nutrient processes, based on t representative elementary watershed (REW) approach, to the Upp Sangamon River Basin, a large, tile-drained agricultural basin locat central Illinois, mid-west of USA. Comparison of model predictions observed hydrological and biogeochemical data, as well as regiona estimates from literature studies, shows that the model is capable capturing the dynamics of water, sediment and nutrient cycles rea well. The model is then used as a tool to gain insights into the phy chemical processes underlying the inter- and intra-annual variabilit water and nutrient balances. Model predictions show that about 8 annual runoff is contributed by tile drainage, while the remainder c from surface runoff (mainly saturation excess flow) and subsurface It is also found that, at the annual scale nitrogen storage in the so depleted during wet years, and is supplemented during dry years. carryover of nitrogen storage from dry year to wet year is mainly c the lateral loading of nitrate. Phosphorus storage, on the other ha not affected much by wet/dry conditions simply because the leachi very minor compared to the other mechanisms taking phosphorous the basin, such as crop harvest. The analysis then turned to the m of nitrate with runoff. Model results suggested that nitrate loading hillslope into the channel is preferentially carried by tile drainage. the stream it is then subject to in-stream denitrification, the signifi spatio-temporal variability of which can be related to the variation hydrologic and hydraulic conditions across the river network.

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