

Application of the OPUS model to Simulate Water and Nutrient Movement in South Africa's Umgeni River Watershed

Chung T. Nguyen¹, Congrong Yu¹, Gregory A. Kiker¹, Rafael Muñoz-Carpena¹, and Yuncong Li²

¹Department of Agricultural and Biological Engineering;

² Soil and Water Department, University of Florida

The Umgeni river catchment (South Africa) is an upland area subject to various agricultural and forestry land uses. The changing water regime and nutrient loads in the catchment are two emerging issues in the area affected by the current land uses. The nutrient loads in the area originate from various sources such as precipitation, erosion from surface runoff, and drainage from subsurface flow. Simulation of nutrient and water movements can be useful for the agricultural and forestry management of this area. OPUS is a modeling tool that has not been widely applied but shows promise to simulate the surface and subsurface transport of water and nutrient in highland regions. There are different methods to simulate the nutrient and water movement in the OPUS model depending on the available input data. OPUS usually simulates the system by utilizing daily temperature, radiation, and precipitation data if these data are available. If these daily data are not available, OPUS will create a daily dataset from the monthly values by meteorological algorithms built in the model. In this research, we simulate the water and nutrient movement (nitrogen and total phosphorous) in the surface and subsurface flows by combining both the daily data and monthly data due to the lack of readily available daily water and nutrient data. This is the first effort to get a detailed assessment of nutrient balances in the basin. These results will help the local government and water providers to manage land uses effectively in this African region.

Key words: Opus model, water movement, and nutrient movement