Title: A NEW FORMULATION FOR CONJUNCTIVE FLOW IN WETLANDSAND UNDERLYING AQUIFER

Author: M. Gusyev and H. M. Haitjema
Affiliation: School of Public and Environmental Affairs, Indiana, University

Abstract:

An accurate assessment of water and nutrient balances in wetland systems, such as the Florida Everglades, requires conjunctive modeling of flow in these wetlands and underlying aquifers. The South Florida Water Management District (SFWMD) has used the finite difference code MODFLOW with a special Wetlands package in the Everglades to accomplish this. This model treats the wetland flow as laminar with a very high transmissivity that is proportional to the wetland water depth cubed. The MODFLOW solutions appear sensitive to this highly non-linear wetland transmissivity, particularly under conditions of low vegetation density when the wetland conductivity, and thus the transmissivity, is very high. In some cases the model fails to converge on a solution. We propose to formulate the governing differential equation in terms of a pseudo discharge potential instead of potentiometric heads as done in the current MODFLOW model. For the special case of a horizontal wetland bottom the pseudo discharge potential reduces to a true discharge potential. For this case very robust solutions to wetland water elevations and flows are obtained when compared to the formulation in terms of heads. We tested our approach to a few cases of one dimensional flow, both with and without a horizontal wetland bottom. For each case we compared both the robustness and the accuracy of the solution in terms of potentials with that in terms of heads. The results seem promising and may warrant implementation to real world wetland systems.