SWIMV2 IN APSIM: AN INTEGRATED PLANT, SOIL WATER AND SOLUTE MODELLING FRAMEWORK

N.I. Huth[1], B.A. Keating[1], K.L. Bristow[2], K. Verburg[3] and P.J. Ross[2]

[1]CSIRO Division of Tropical Crops and Pastures, 306 Carmody Road, St Lucia, Qld 4067
[2]CSIRO Division of Soils, PMB, PO Aitkenvale, Townsville, Qld 4814
[3]CSIRO Division of Soils, 306 Carmody Road, St Lucia, Qld 4067

SWIM Version 2 (1) is a soil water and nutrient balance model based on a numerical solution of the Richards' and Convection-Dispersion equations. APSIM (2) is a modular agricultural production systems modelling environment specially designed to allow a plug-in-pull-out approach for the integration of various simulation models. SWIMv2 has recently been incorporated into the APSIM framework to combine the benefits of each, and to provide an alternative to the currently available cascading soil water balance module, SoilWat (2). APSIM-SWIM can now be used to calculate all flows of water and nutrients into, through, and out of soils under a wide range of conditions.

METHODS

One of the strengths of SWIMv2 is its ability to automatically adjust its time steps as needed to deal with rapidly changing processes such as partitioning of rainfall between infiltration and runoff during high intensity rain storms. This has however required careful matching of SWIMv2 calculations with those carried out by other modules in APSIM which use a fixed time step, usually one day. Having achieved a successful coupling, crop modules in APSIM can now be easily configured to take advantage of SWIM's soil water and solute transport capabilities, its physically based methods for describing flows across the soil-plant interface, and its ability to deal with changing surface conditions and wide range of boundary conditions. APSIM-SWIM has also been configured to transport multi-solutes with the water. At this stage the solutes are assumed to move through the soil matrix without interacting with each other.

RESULTS AND DISCUSSION

Benefits derived from using APSIM-SWIM come from SWIM's ability to describe water and solute movement under a wider range of field conditions. An example of APSIM-SWIM performance in dealing with nitrate leaching below sugarcane crops is described in these proceedings (3). It should also be noted that APSIM-SWIM can be used to perform any water and solute simulation currently carried out with SoilWat. Future challenges lie in gaining a better understanding and improved quantification of rainfall intensity requirements and the time dependence of surface property parameters required by SWIM.

REFERENCES

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