HLWYM HEmails

From: Stuart Stothoff
Sent: Sunday, November 04, 2007 2:21 PM
To: 'Dani Or'
Subject: RE: Infilrtration report

Dani

Thanks for your comments.

This report was requested in order to document the inputs used for ITYM and aspects of the model that are not already publicly available. I take this to mean that we are limited in scope to discussing what was done (and why), supplemented by confirmatory analyses based on additional information we didn't have available at the time.

The "recycled" feel is indeed quite strong here, because most of the document was written in the late 1990s (sections 2 through 4) or 2000 (sections 5 through 7). Almost all of the material was slated for a major report in 2000, intended to summarize all of the CNWRA infiltration work (I was aiming to develop a NUREG report) and present a revised ITYM input file, but we ran out of time because of the volume of material and the ITYM revision was never done. An overland-flow chapter by Randy satisfied the milestone, then NRC lost interest in infiltration work because there were no outstanding issues at that time. In effect, we delayed most of this material for 7 years rather than delaying the milestone a few months and taking a hit for punctuality (I did put the sections that became sections 5 though 7 in my scientific notebook, which is now publicly available but very obscure). As a consultant at the time, I had little power to get it out, and I'd been talking it up since I got back here without much success. Now it is finally necessary because it provides the basis for the estimates in the million-year report. I used as much as possible of the previous work, in part due to time constraints and in part because (i) it documents code and inputs developed in the 1990s and (ii) it really should be credited to 2000.

The confirmatory analyses in sections 5 and 6, and the formal presentation of infiltration results in section 8, are pretty much the only new technical material in the report. I'm trying to add as much insight as I can get away with under the document guidelines.

I agree that chapter 7 is uncharacteristically detailed, which is why the section is last among the inputs (I actually trimmed it slightly before sending it off to you). I retained the detail because (i) this work has not been presented before, and (ii) the current DOE model does not consider systematic soil variation at all and I think it is important to add the methodology to the discussion about soil depth. Of course, it should have been added 7 years ago... Chapter 7 has been recast somewhat as a confirmatory analysis of the soil map used by ITYM, which is actually on a coarser grid (30 m) than the figures you see (7.5 m and finer).

I coined the capillary attractor term to describe the opposite capillary extreme of soil above an open fracture, i.e., soil above a permeable carbonate fill. You are absolutely correct that the capillary attractor idea is useful for infiltration into a dry profile. In the context of estimating net infiltration, you have to remember that almost all recharge (i.e., water passing out of the rooting zone) occurs in the first few days after a large storm, and this is exactly when one gets infiltration pulses into a dry profile. The capillary attractor would slurp the infiltration pulses up for drier soil. But I'd claim that the capillary attractor will also tend to retain water, thus evaporation will be slowed and allow wetting pulses to penetrate deeper.

I specifically avoided raising a specific issue of data availability in order to keep the document focused and to not dilute that issue.

I agree that the technical capability of creating a finer elevation map is far better now than the 1990s. We have a 10-m (I think) resolution grid on hand now, and as you noted the technical capability exists for a finer grid. We entered into discussions with a company to obtain a finer grid still - after huge contortions regarding the end user license agreement it turned they didn't have the information after all. I am surprised that you were able to get a grid at 10-cm resolution for 9 km2 so reasonably. I don't think I'd be able to perform calculations on a grid with 1e9 cells, though - 1e6 cells are near my limit.

Thanks again for your comments. I appreciate them greatly.

stu

-----Original Message-----
From: Dani Or [mailto:dani.or@epfl.ch]
Sent: Saturday, November 03, 2007 6:06 PM
To: 'Stuart Stothoff'
Subject: Infilrtration report

Hi Stu,
I am writing from Atlanta waiting for my next flight to New Orleans. The report reads well and I have only a few comments.
General

(1) It is not clear to me (reader) what is new and what was already reported in the two previous reports (and earlier than that) – a clear distinction somewhere prominent would help
(2) Related to the previous comment (and could be fixed at the same time) is the feeling the entire discussion is somewhat recycled work from the late 90's
(3) Chapter 7 is uncharacteristically detailed (relative to other parts of the report). The motivation and the place of this "alternative" and physical approach is not entirely justified. Perhaps it would be better to present this in an appendix not to disrupt the abstractions in the core of the report

A few specific comments

(1) I found the discussion at the bottom of section 3.4 very important (mw7d vs mw7) – I think that some of these issues of intensity and structure that would shape and determine a great deal of the MAI is a bit missing. I expect the MAI to be very sensitive to extreme values (hourly) – of course these are not easy to model directly, but some form of abstraction that would capture these within the Monte Carlo framework would and more credibility to the results
(2) Section 1.2 rather than "pass out" perhaps "by pass of the rooting zone"
(3) The discussion related to capillary attractor is not clear to me – primarily because the bedrock would never be drier (more negative matric potential) than the soil and sediments above, unlike the capillary barrier concept that may occur for finer or coarser underlying layers, the "capillary attractor" idea works primarily for infiltration into dry profile
(4) Discussing a bit the issue of data (origin and quality) would be helpful as this report is supposed to consolidate the knowledge to date. BTW, the scarcity of data in support of this important issue is troublesome (not a single "hard measurement" in my opinion).
(5) The DTM used is perhaps the best that could have been done in the 90's but now I just finished laser scanning of a hillslope 1/2 the area you are modeling with resolution of 10 cm (it took an hour and cost less than 4k) Would it be useful to urge a revision of the information for future activities?

Overall, looks good and provides useful information
Cheers
Dani

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