

Interactive comment on “Effect of DEM resolution on SWAT outputs of runoff, sediment and nutrients” by S. Lin et al.

S. Grimaldi

salvatore.grimaldi@unitus.it

Received and published: 19 July 2010

The manuscript describes an interesting comparison of SWAT model application on DEMs with several resolutions.

The topic is important and the manuscript is well written.

The present comment is on the DEM preprocessing method used to extract morphometric terrain characteristics considered in the manuscript.

Authors refer to ArcSWAT2.3.4 (Di Luzio et al. 2004) but it is not clear which is exactly the approach used to extract the drainage network:

C1490

- flowdirection method used;
- pit filling method used;
- flat area treatment method used.

This could be an important point because if ArcSWAT2.3.4 is based on the common routines included in ArcGIS, these latter are overcome by other ones present in literature (see the references at the end of this document).

The problem is that applying the bilinear interpolation for DEM resampling several new pits could be generated and some new flat areas could appear. Consequently the slope, for instance, could be affected by the pre-processing procedure.

A simple example is showed in the following.

Given a watershed DEM at 20 meter of resolution (Rigo Basin, an Italian watershed, 84Km²) and resampled with bilinear interpolation at 90m, two pre-processing procedures are applied:

A) the standard one using ArcGIS (D8, pit filling, flat areas with Jenson & Domingue 1988);

B) an advanced one (described in Grimaldi et al. in press).

Threshold area used for the drainage network extraction: 8Km²

The results of this simple test are:

—————MSSP——MSAP—————

DEM 20m.....8,08%...3,45%

DEM 90m.....6,06%...3,81%

MSSP: Mean slope of the drainage network extracted with standard procedure

MSAP: Mean slope of the drainage network extracted with advanced procedure

C1491

It is clear that resampling to 90 meter new pits will be created and in any case a large amount of flat areas are present in the drainage network.

So apparently the paper evaluates SWAT model performances using cells of different size but practically the results and conclusions could be meaningfully affected by ArcSWAT2.3.4 approach.

References related to this document:

GRIMALDI S., PETROSELLI A., ALONSO G., NARDI F., "Flow time estimation with variable hillslope velocity in ungauged basins" in press to *Advances in Water Resources*

GRIMALDI S., NARDI F., DI BENEDETTO F., ISTANBULLUOGLU E., BRAS R.L. (2007) "A physically-based method for removing pits in digital elevation models" *Advances in Water Resources*, Volume 30, Issue 10, pages 2151-2158.

JENSON, S. K. & DOMINGUE, J. O. (1988) Extracting topographic structure from digital elevation models. *Photogramm. Eng. Remote Sensing* 54, 1593–1600.

NARDI F., S. GRIMALDI, M. SANTINI, A. PETROSELLI AND L. UBERTINI (2008) "Hydrogeomorphic properties of simulated drainage patterns using digital elevation models: the flat area issue" *Hydrological Science Journal*, 53(6).

SANTINI M., GRIMALDI S., RULLI M.C., PETROSELLI A., NARDI F., (2009) "Pre-Processing algorithms and landslide modelling on remotely sensed DEMs" *Geomorphology*, vol. 113, pages 110-125.

Interactive comment on *Hydrol. Earth Syst. Sci. Discuss.*, 7, 4411, 2010.