2010 International SWAT Conference,
August 4-6, 2010, , Seoul, Korea

The effect of map spatial resolution on simulation result of SWAT, case study: chelchay watershed, Golestan, Iran

Ali Najafinejad, Akram Arefi, Farshad Kiani

Gorgan university of agriculture and natural resources,

Watershed management Dept.

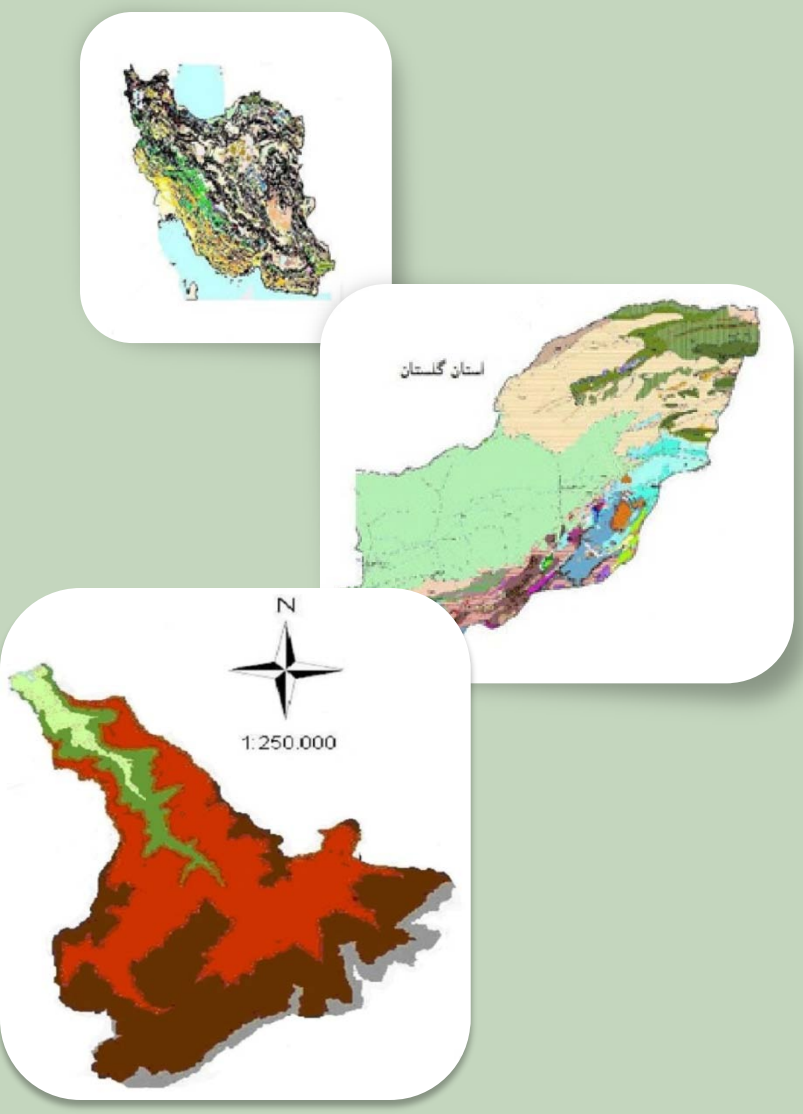
Gorgan, Iran

Introduction

- Management practices has different effects in watersheds.
- complexity of the natural watershed system make direct study of management effects difficult.
- There are many models to estimate runoff, sediment, and water quality, in example HSPF, WARMF, SWAT.
- The accuracy of agricultural nonpoint source pollution models such as SWAT depends to input spatial parameters

- Chaplot(2005) evaluated the impact of DEM mesh size and soil map scale on SWAT runoff, sediment, predictions. The study indicated that there might be no significant increase in the accuracy of models, as a result of more precise topographic or soil information.
- Bingner et al.(1997) evaluated sub-watershed size dependency of the SWAT model to adequately simulate annual runoff and fine sediment from the 21.3 km2 Goodwin Creek Watershed. The results showed that runoff volume is not affected by the number and size of sub-watersheds.
- The aim of this paper is study of spatial resolutions impact of input maps on runoff and sediment results of SWAT in a medium size watershed in Iran.

Material and method:



Study area:

- Chelchy: in Golestan province in north of Iran.
- Subbasins of Gorgan river
- Area: 25683 ha.

Study area:

- Minimum and maximum height is 190m and 2500m.
- 59% of watershed has 30-60% slope.
- Average annual precipitation is 766 mm.
- maximum and minimum average of temperature is 21 and 6 C.
- land use: forest (48.98%), pasture (1.3%) and dry farming (50.83%).

Model inputs

Table - simulation inputs properties

Simulation	Data type	properties	Source
Sim1	DEM	50m*50m	Topographic map 1:50000 scale from mapping organization country
	Land use map	1:25000	Department of Natural Resources forestry project in Golestan Province
	Soil map	1:25000	Department of Natural Resources forestry project in Golestan Province
Sim2	DEM	90m*90m	USGS/NASA-SRTM
	Land use map	Resolution 1 km2	GLCC-USGS
	Soil map	Resolution 10 km2	FAO1995

* http://www.eawag.ch/idex_EN

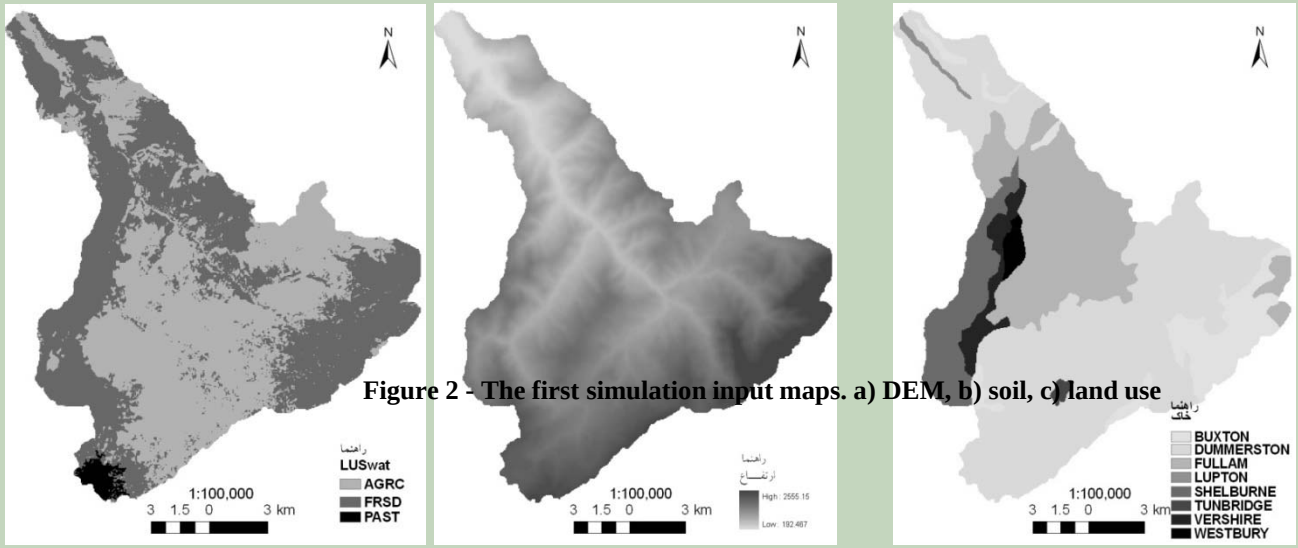


Figure 2 - The first simulation input maps. a) DEM, b) soil, c) land use

Figure: The first simulation input maps. a) DEM, b) soil, c) land use

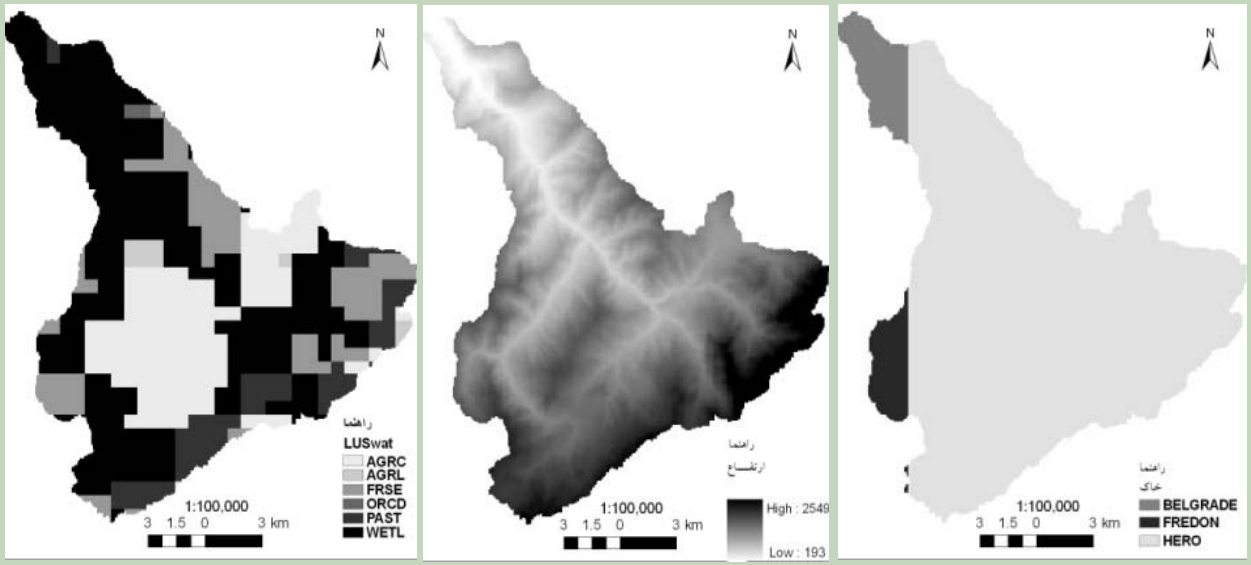
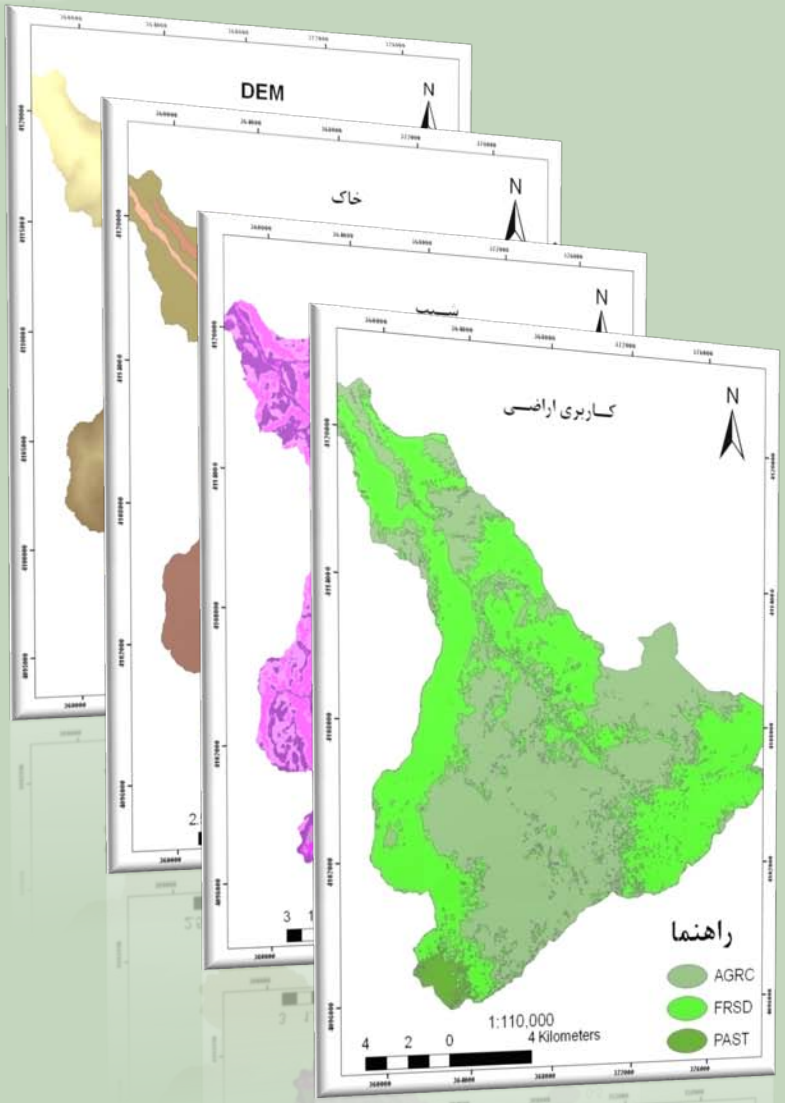
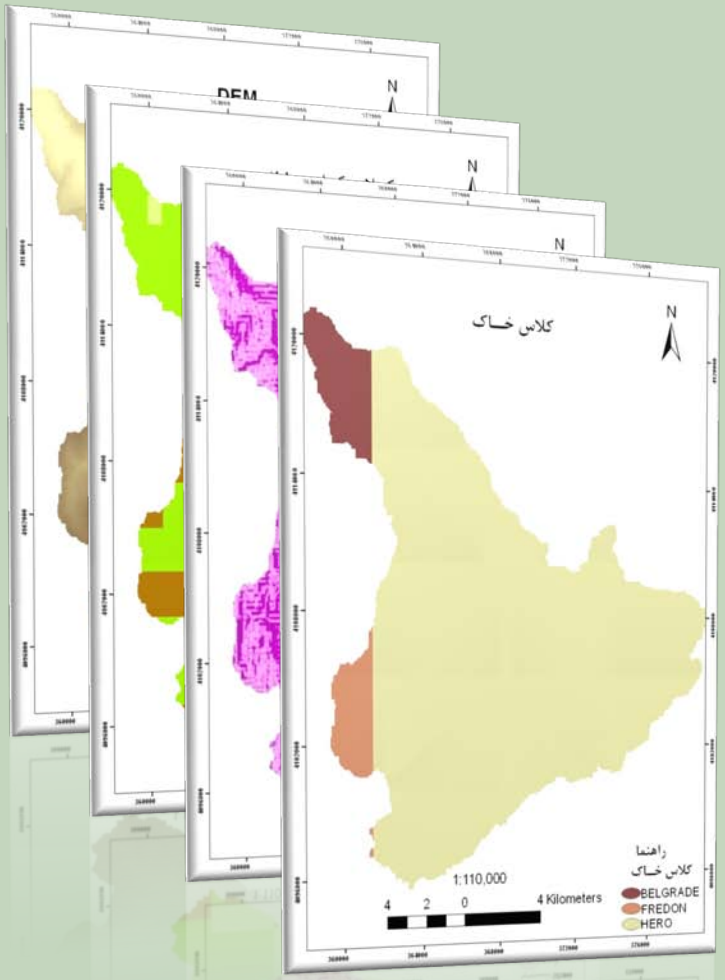


Figure: The second simulation input maps. a) DEM, b) soil, c) land use

Data layers


DEM
N
خاک
N
N
کاربری اراضی
N
راهنما
AGRC
FRSD
PAST
1:110,000
4 Kilometers
4 2 0


زیر حوزه
N
واحدهای همگن هیدرولوژیک
N
1:110,000
4 Kilometers
4 2 0


DEM
N
کلاس خاک
راهنما
کلاس خاک
BELGRADE
FREDON
HERO
1:110,000
4 2 0
4 Kilometers


زیرحوزه
N
واحدهای همگن هیدرولوژیک
شبیه سازی ۲
1:110,000
4 2 0
4 Kilometers

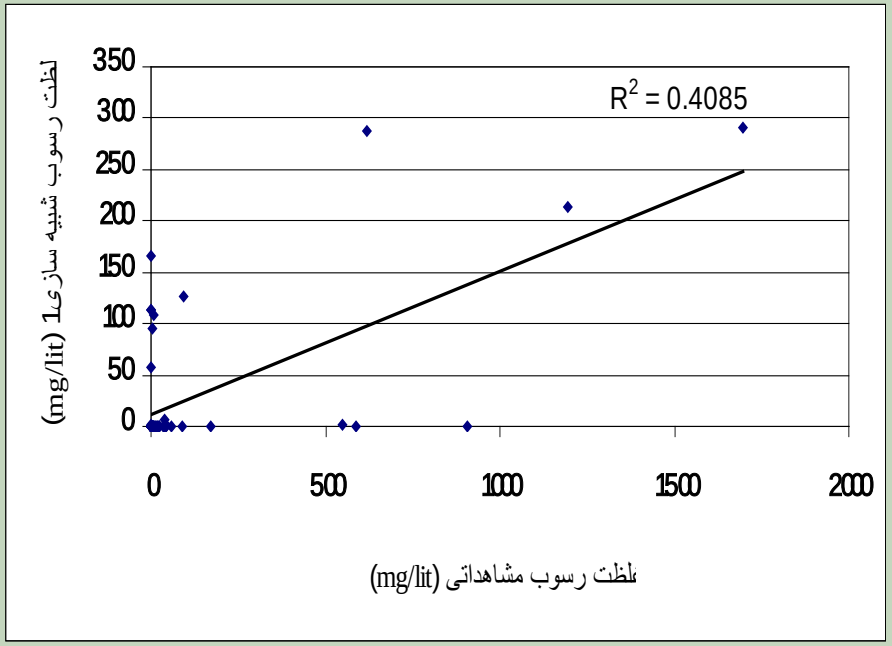
Results

Table- Number of sub basin and HRU

variable	simulation	Value
Sub basin	1	134
	2	139
HRU	1	1578
	2	1145

Table- R^2 values for each of simulations

variable	Simulation	R^2
Daily runoff	1	0.7
	2	0.1
Daily sediment concentration	1	0.4
	2	0.03



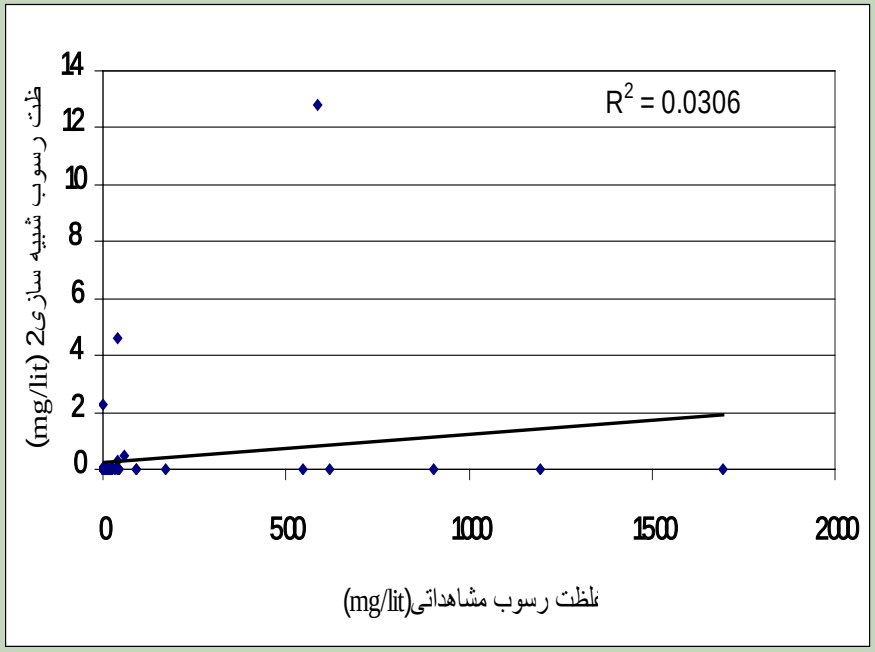


Figure - correlation of simulated value and observed a) sim1 b) sim2

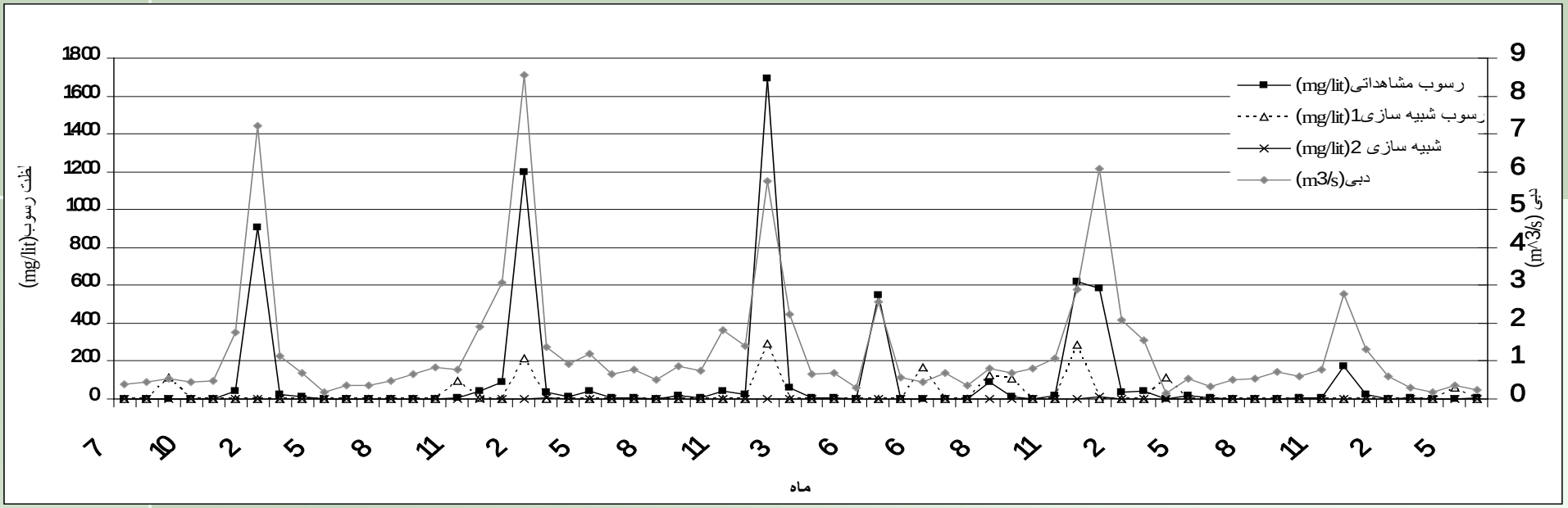


Figure: simulated daily sediment concentration values 1 and 2 and observed sediment and runoff values

Discussion and conclusion

- Model make more sub basins and HRU with increasing spatial resolution data.
- In simulation 1, inputs with high spatial resolution data, runoff simulates are closer to observed data.
- In both of simulation amount of runoff was more than observed runoff.
- In case of daily sediment estimation of simulation 1 was more than simulation 2.

- Estimated daily sediment by SWAT was less than observed amount.
- Using maps with higher accuracy as the model input, in sediment estimating seems to be necessary.
- Generally SWAT, is more sensitive in sediment estimation than runoff.
- So in sediment studies using maps with higher resolution is necessary.

Thanks for your attention