A comparison of stream flow prediction using station and gridded meteorological datasets in IRAN

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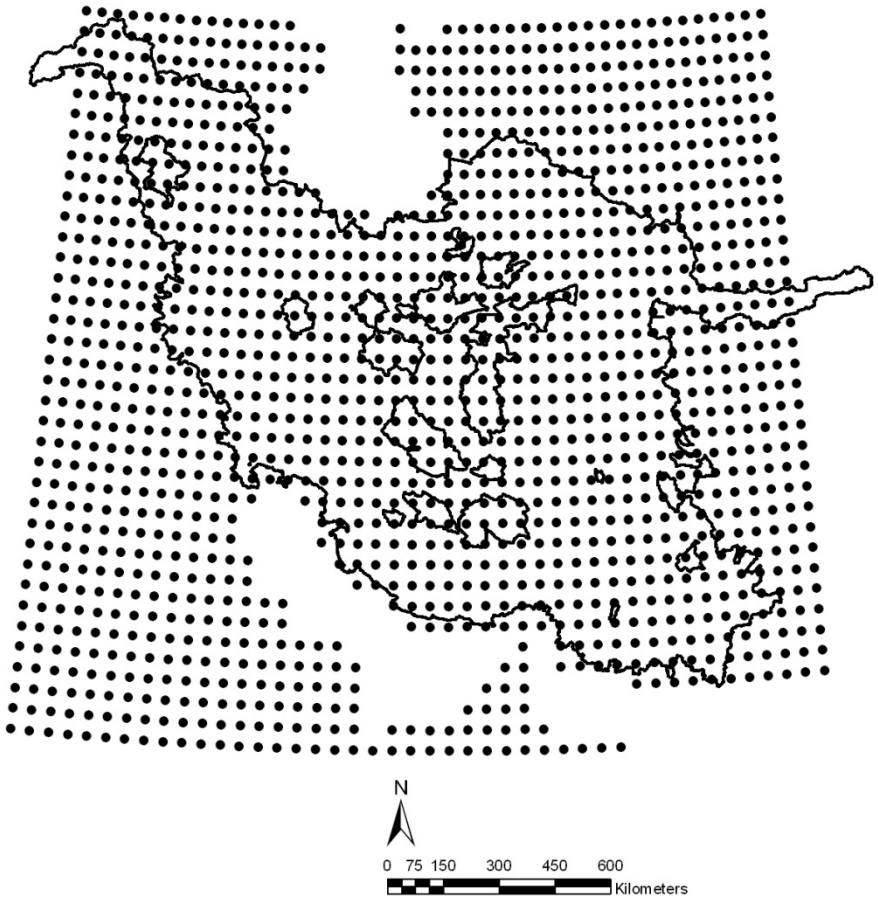
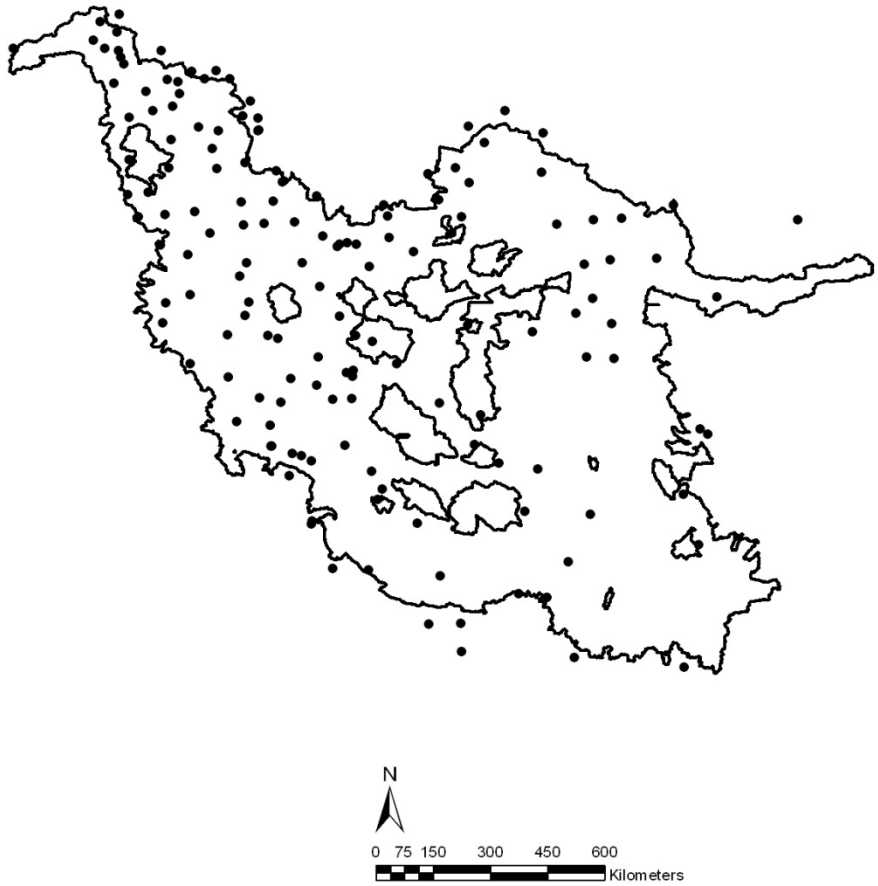
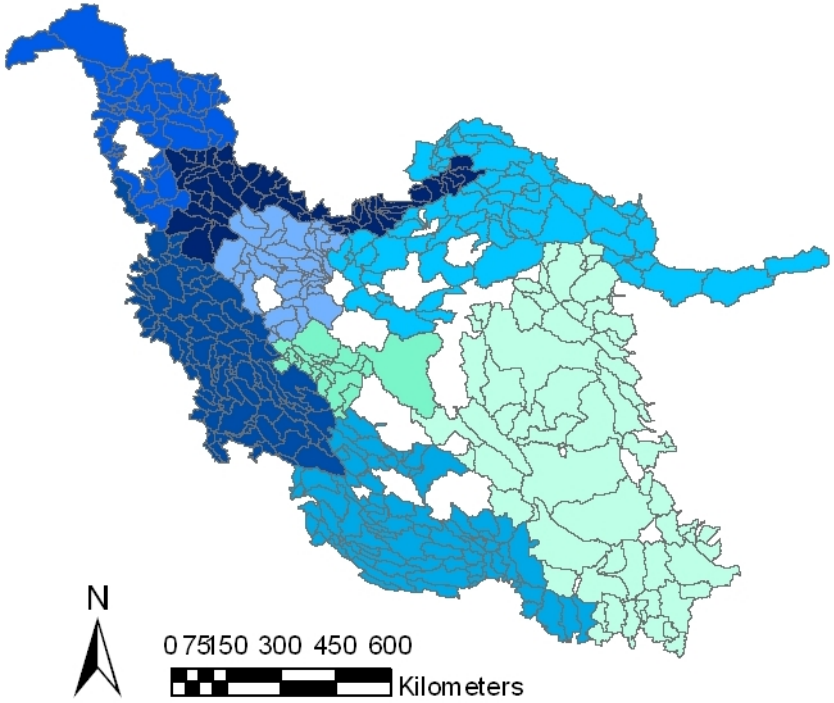


CRU climate data grid points (0.5 °*0.5 °)

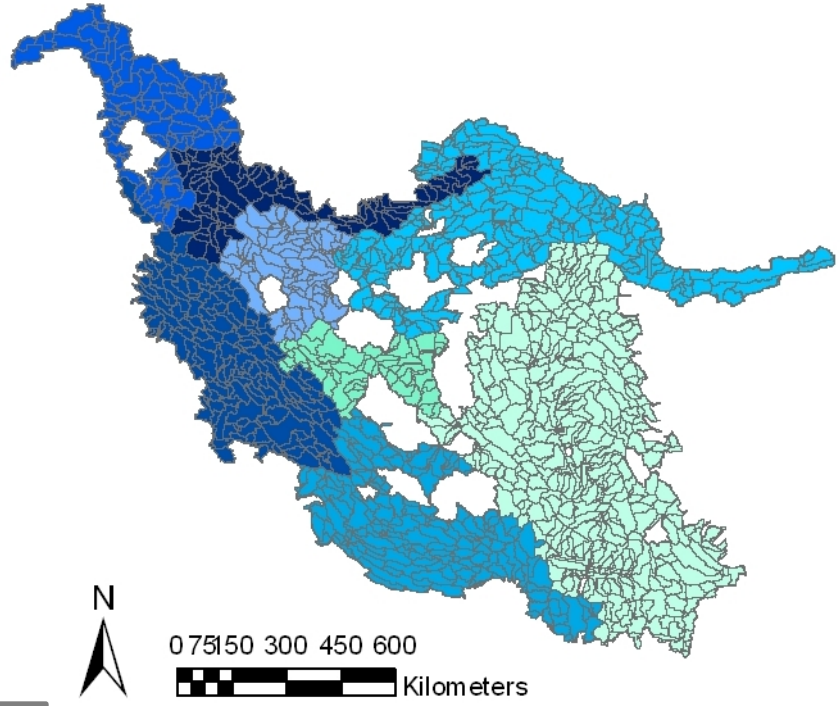


Observed climate stations

506 subbasin delineation



1269 subbasin delineation



Area: 1,648,000 km2 (165 million hectare)
Altitude: -80 to 5670 m
Average annual precipitation: 252 mm
Precipitation range: 20-2000 mm
Temperature: -44 to 56 degree C

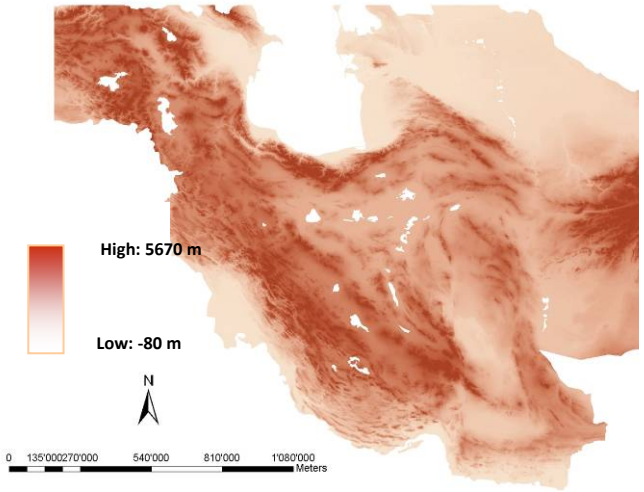
Main objectives:

- Compare the effect of two climate datasets (observed and gridded) on the prediction of the stream flow

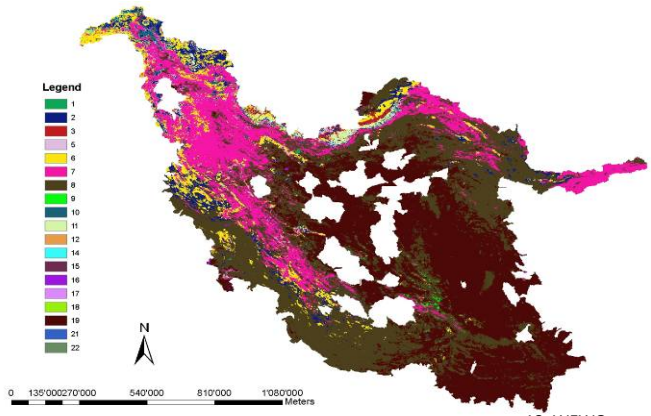
- Showing the relationship between resolution of the rain gauge network and subbasin size

Model Input

DEM (Extracted from global USGS DEM map)

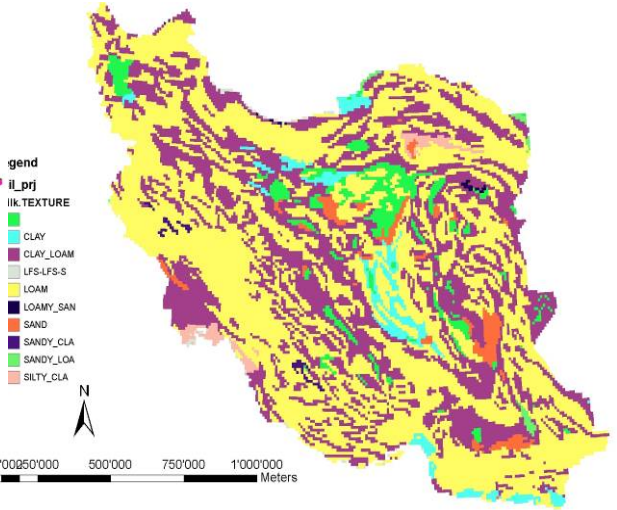


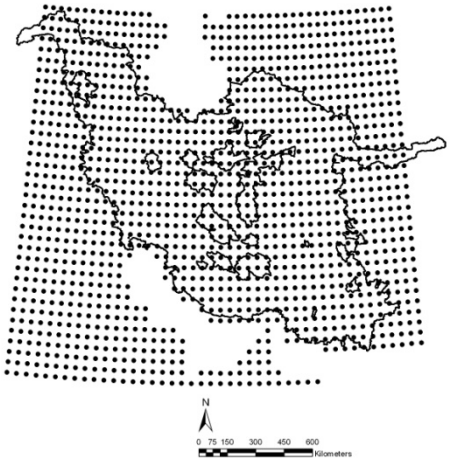
Landuse (Extracted from global USGS landuse/land cover)



1: URMD
2: CRDY
3: CRIR
5: CRGR
6: CRWO
7: GRAS
8: SHRB
9: MIGS
10: SAVA
11: FODB
12: FODN
14: FOEN
15: FOMI
16: WATB
17: WEHB
18: WEWO
19: BSVG
21: TUWO
22: TUMI

Soil (Extracted from global FAO soil map, 1995)





Model Setup

- **Scenario 1:** 506 subbasins using observed climate dataset of WSIMO
- **Scenario 2:** 1269subbasins using observed climate dataset of WSIMO
- **Scenario 3:** 506 subbasins using CRU gridded climate dataset
- **Scenario 4:** 1269 subb climate dataset

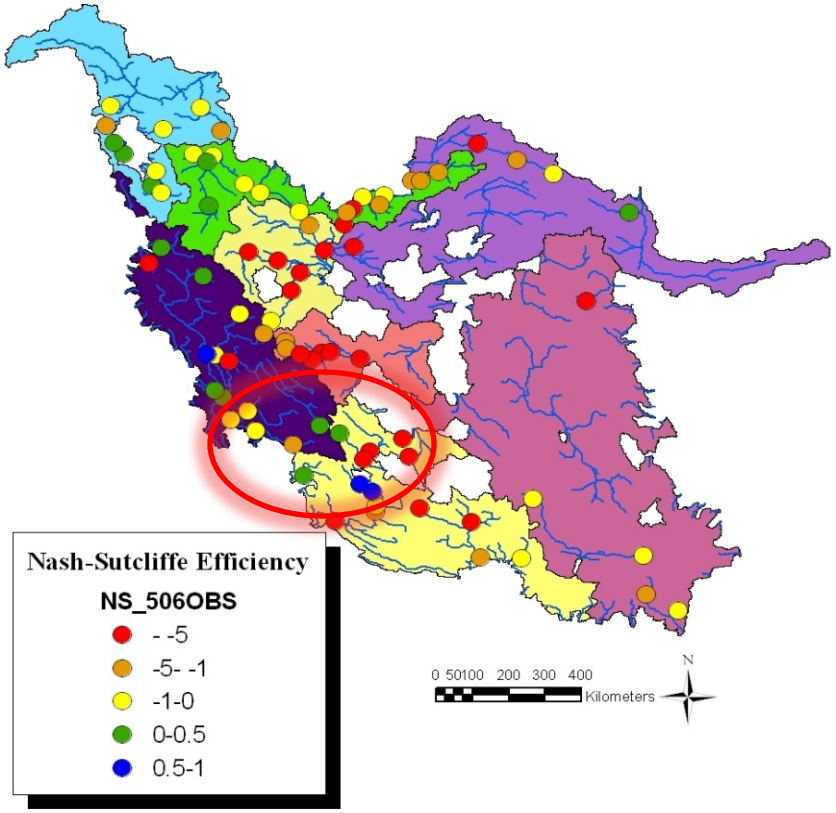
Simulation Setup	
Simulation time	1987-2002
Warm-up period	3 years
Number of observed stations Number of gridded points(CRU)	150 1200
ET calculation method	Hargreaves

Nash-Sutcliffe Efficiency (NSE)

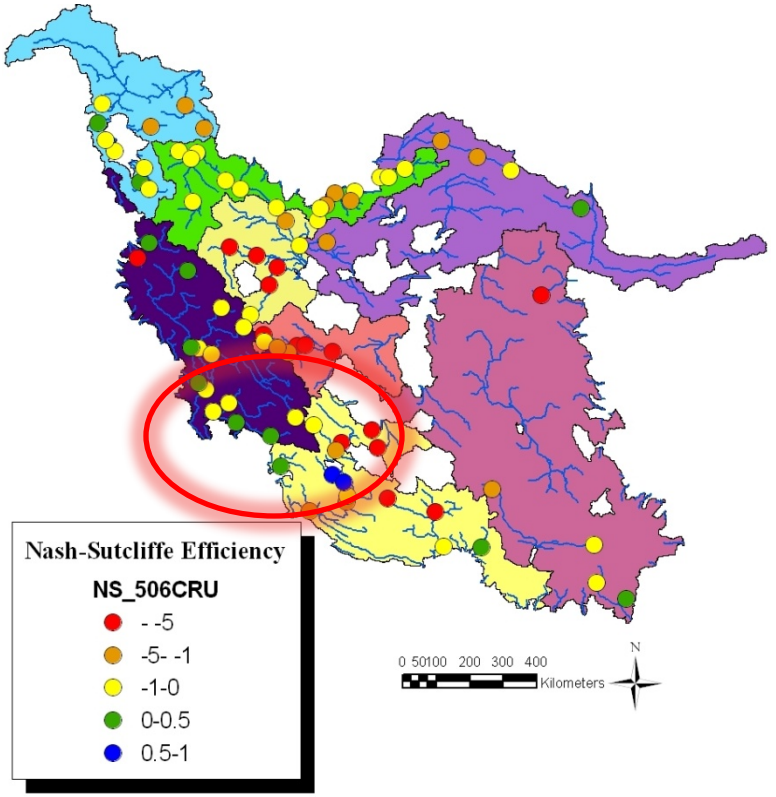
$$NS = 1 - \frac{\sum_{i=1}^{n}(O_i - P_i)^2}{\sum_{i=1}^{n}(O_i - \overline{O})^2}$$

- Evaluates the model performance with reference to the mean of the observed data
- Its value can vary from 1 to -∞

506 subbasins delineation

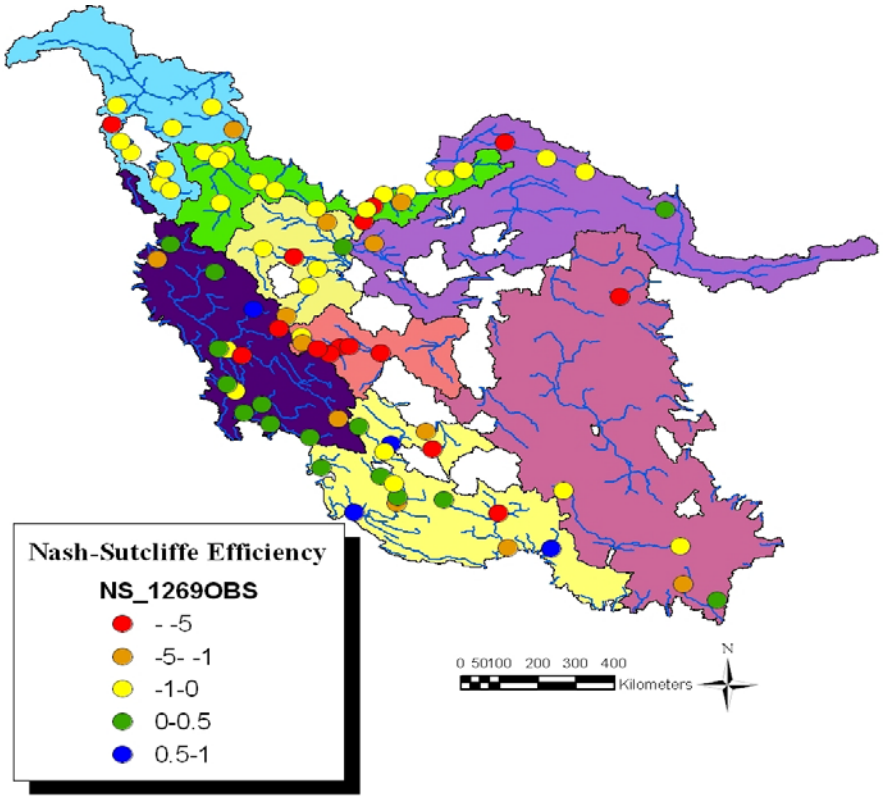


NSE
(station climate data)

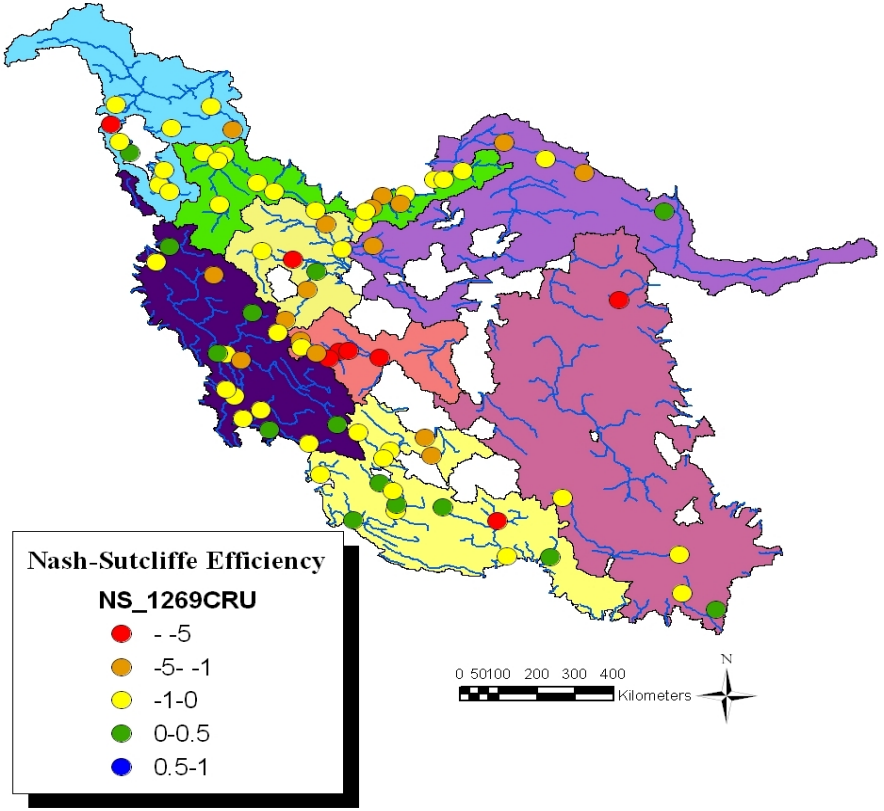


NSE
(CRU)

1269 subbasins delineation



NSE
(station climate data)



NSE
(CRU)

Performance of the SWAT prediction when…

	NSE (station climate data) S1	NSE (CRU) S2
HR1	-1.97	-0.68
HR2	-0.40	-0.90
HR3	-1.69	-1.34
HR4	-29.25	-5.68
HR5	-87.25	-153.54
HR6	-53.33	-16.64
HR7	-19.83	-41.01
HR8	-5.76	-2.00

506 Subbasin

	NSE (station climate data)S3	NSE (CRU) S4
HR1	-1.52	-0.76
HR2	-0.36	-0.50
HR3	-0.53	-0.22
HR4	-8.34	-3.52
HR5	-10.40	-11.52
HR6	-116.46	-18.17
HR7	-7.46	-25.26
HR8	-2.11	-1.36

1269 subbasin

Results

- CRU high resolution grid dataset is useful for the hydrological simulation

- Improvement was significant in more subbasin delineation

- Global CRU climate dataset can be used in regions of climate data scarcity with high confidence

outlook

- Using elevation band
- Calibration, Validation and Uncertainty analysis
- Using more Efficiency criteria like:
  - Coefficient of determination (R^2)
  - Root Mean Square Error (RMSE)
  - br^2
  - Percent Bias (PBIAS)

Thank you for your attention.
Your comments are most welcome!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