Modeling Climate Change Impacts on Hydrology of a Small RVP Watershed of Southern India

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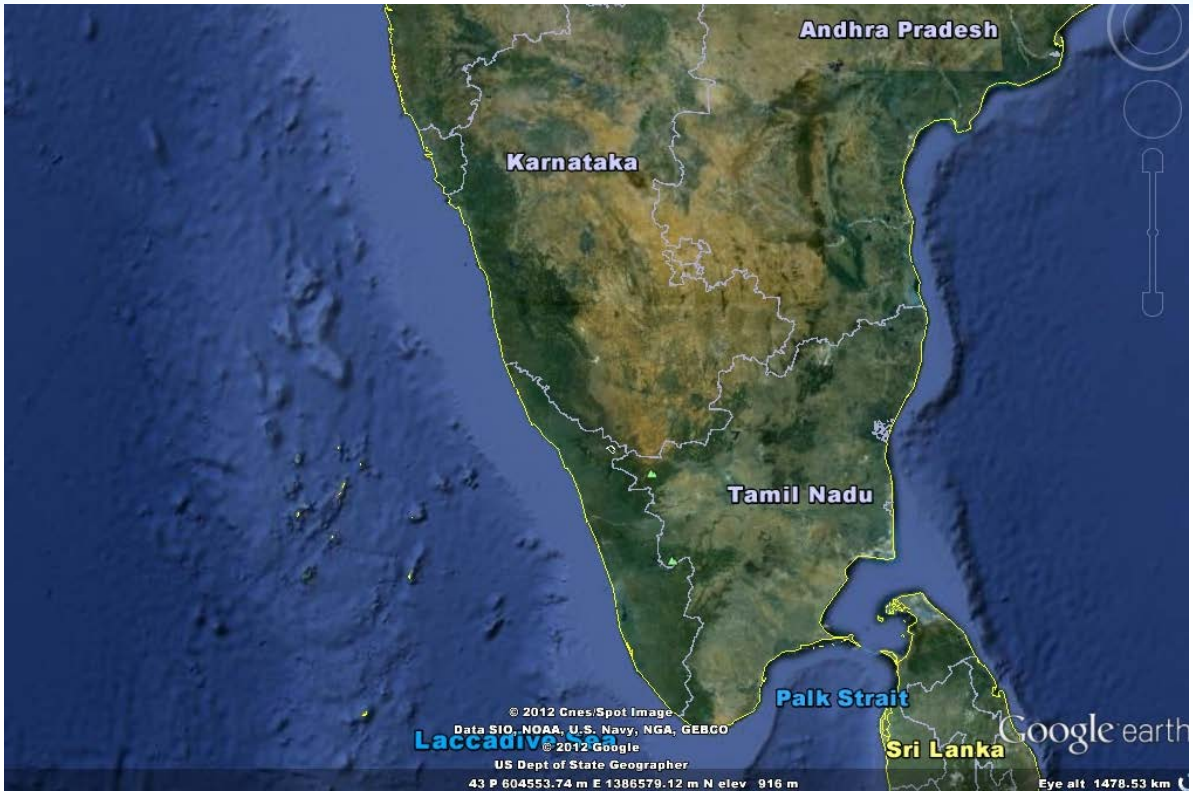
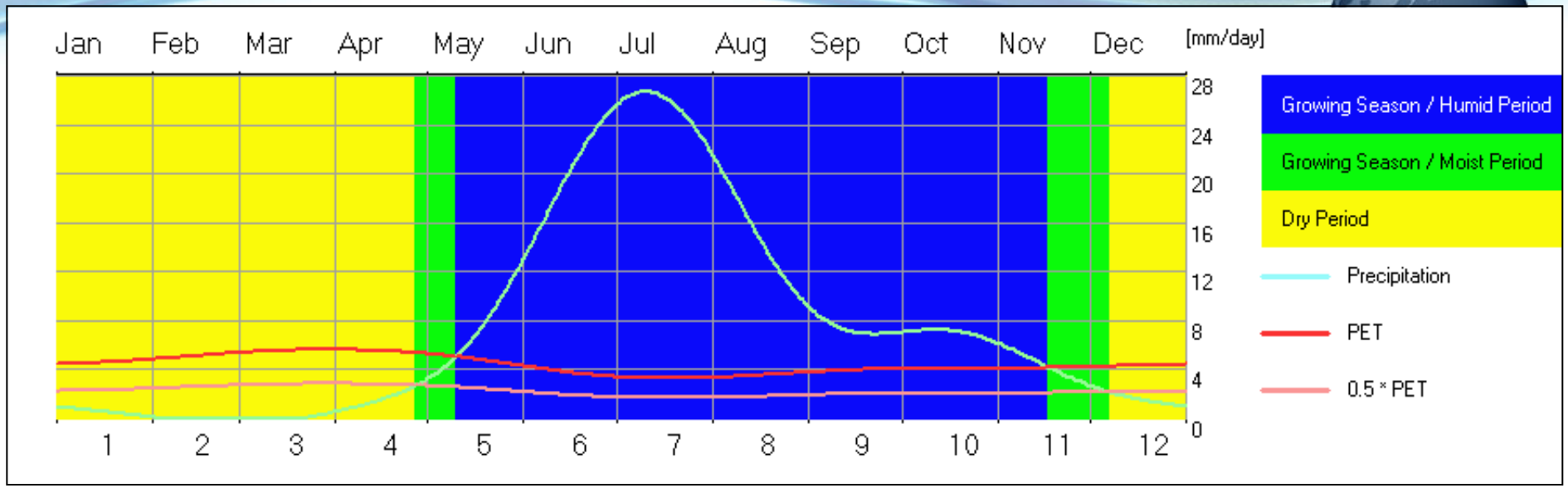
Location



Kabini River valley Project

Area of watershed = 6016 ha

Vegetation period

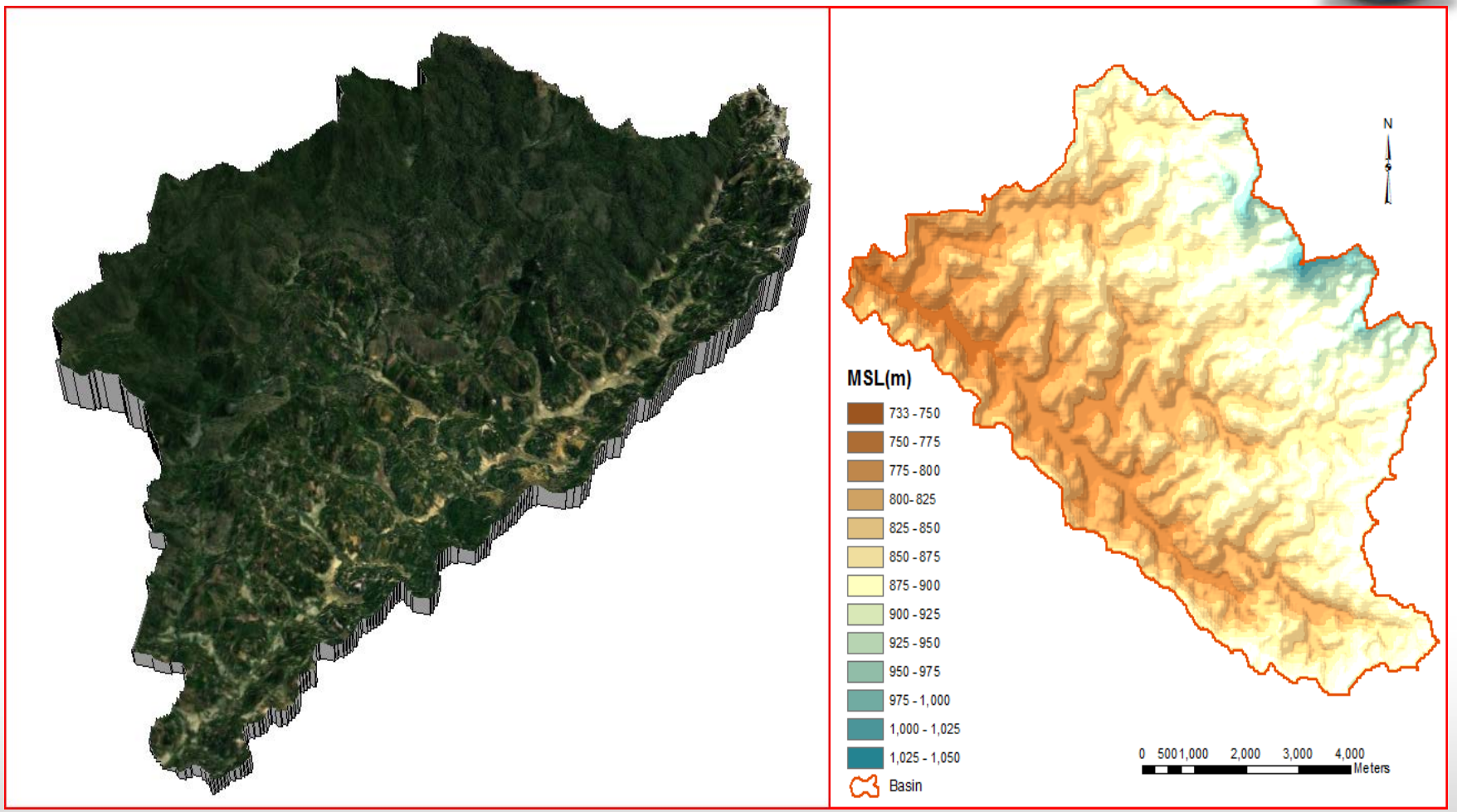


Period	Length	Begin	Begin	End	End	Precip.	PET
	Days	Date	Day	Date	Day	mm/day	mm/day
Dry	141	7 DEC	341	26 APR	116	0.6	5
Moist+Hum.	224	27 APR	117	6 DEC	340	11.9	3.9
Humid	191	10 MAY	130	16 NOV	320	13.4	3.8

General Climate of the Area

	Kundhichira Watershed (RVP, Kerala)
Longitude	76.183°
Latitude	11.71°
Altitude	740 m
Annual rainfall	3338 mm
Radiation index of Dryness	0.659
Budyko Evaporation	1479mm/year
Budyko Runoff	1279mm/year
Budyko Evaporation	53.6%
Budyko Runoff	46.4%
Aridity	humid
Aridity Index	1.74
Moisture Index	74%.
Precipitation Deficit	-1171mm/year
Climatic net primary production	Precipitation limited

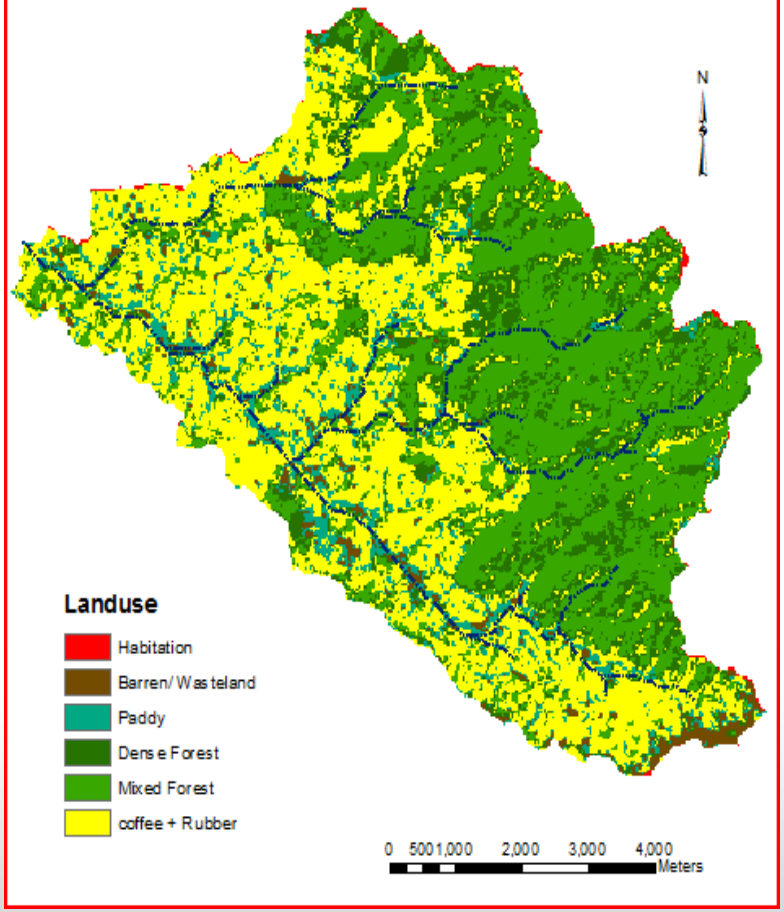
DEM derived from ASTER 30 m dataset

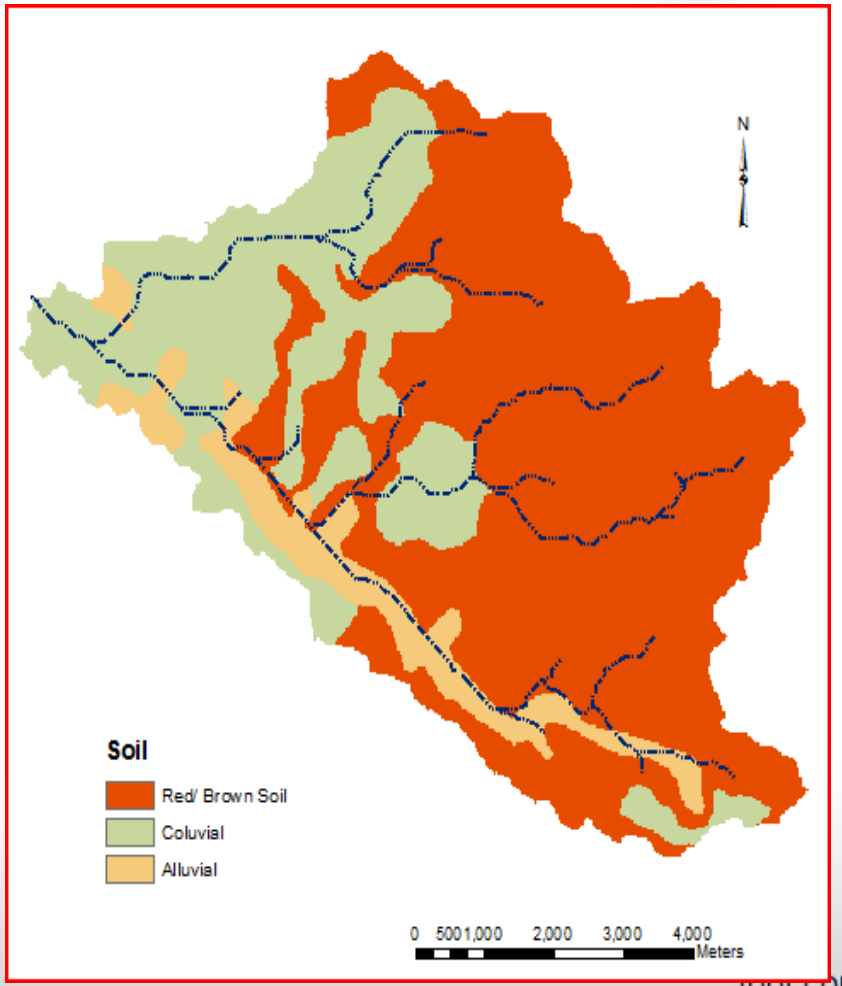


Land use and soil map

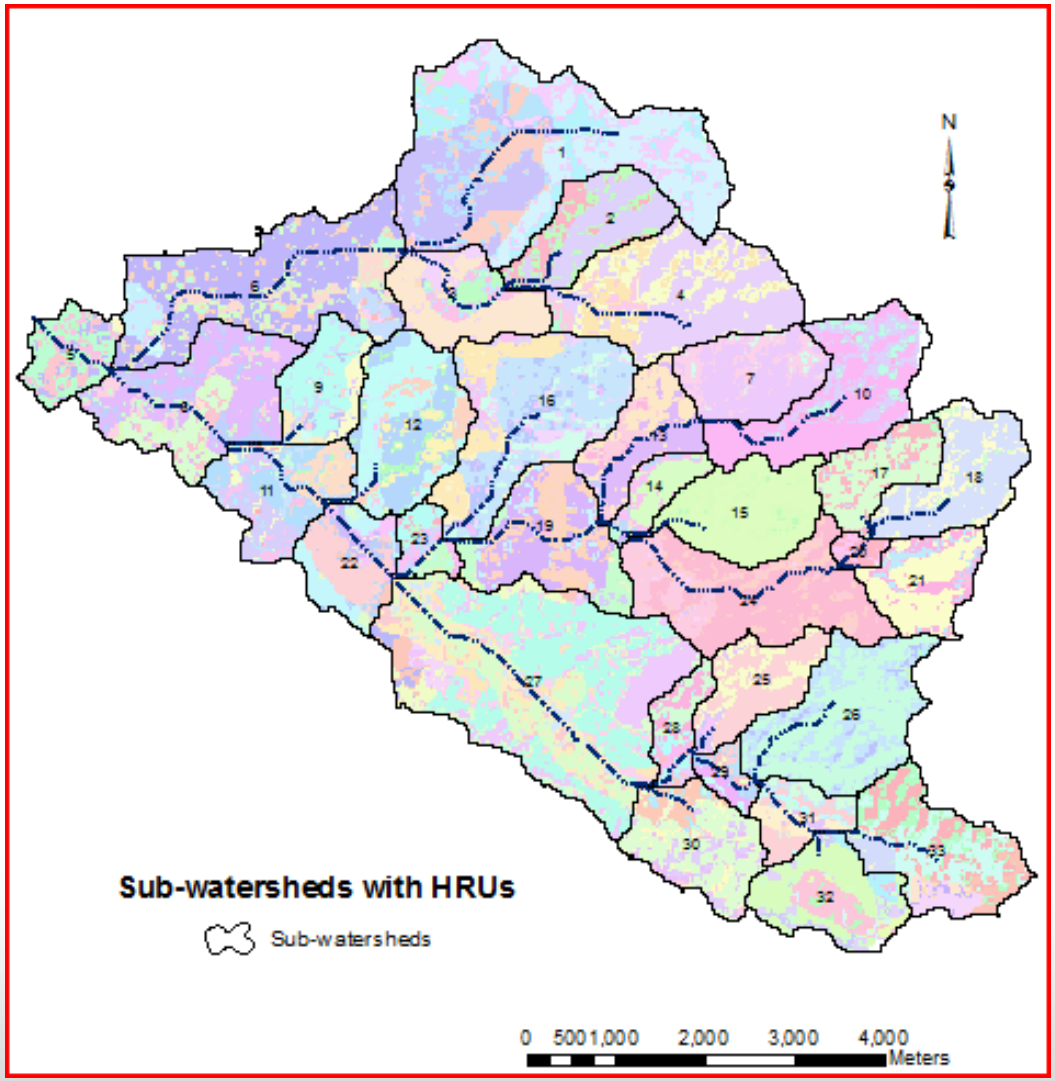
Landuse	% area
Habitation	0.44
Barren/ Wasteland	2.79
Paddy	7.37
Dense Forest	17.19
Mixed Forest	34.16
Coffee+Rubber	38.05

Agri.834/91 (AISLUS)





33 sub-basins 299 HRUs



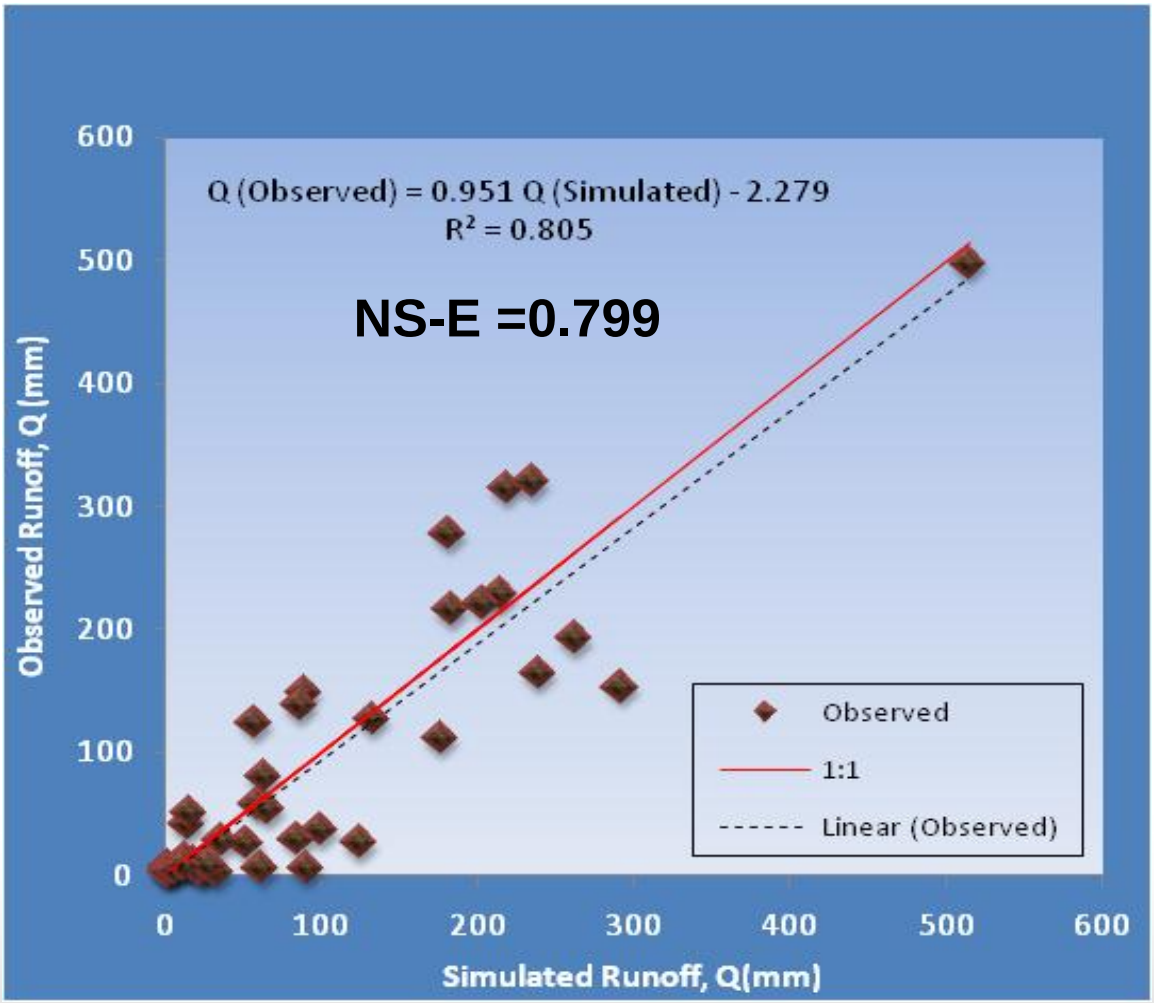
SWAT-CUP was used to calibrate or validate the model using Sequential uncertainty fitting (SUFI ver2).

Parameters used for calibration and their value.

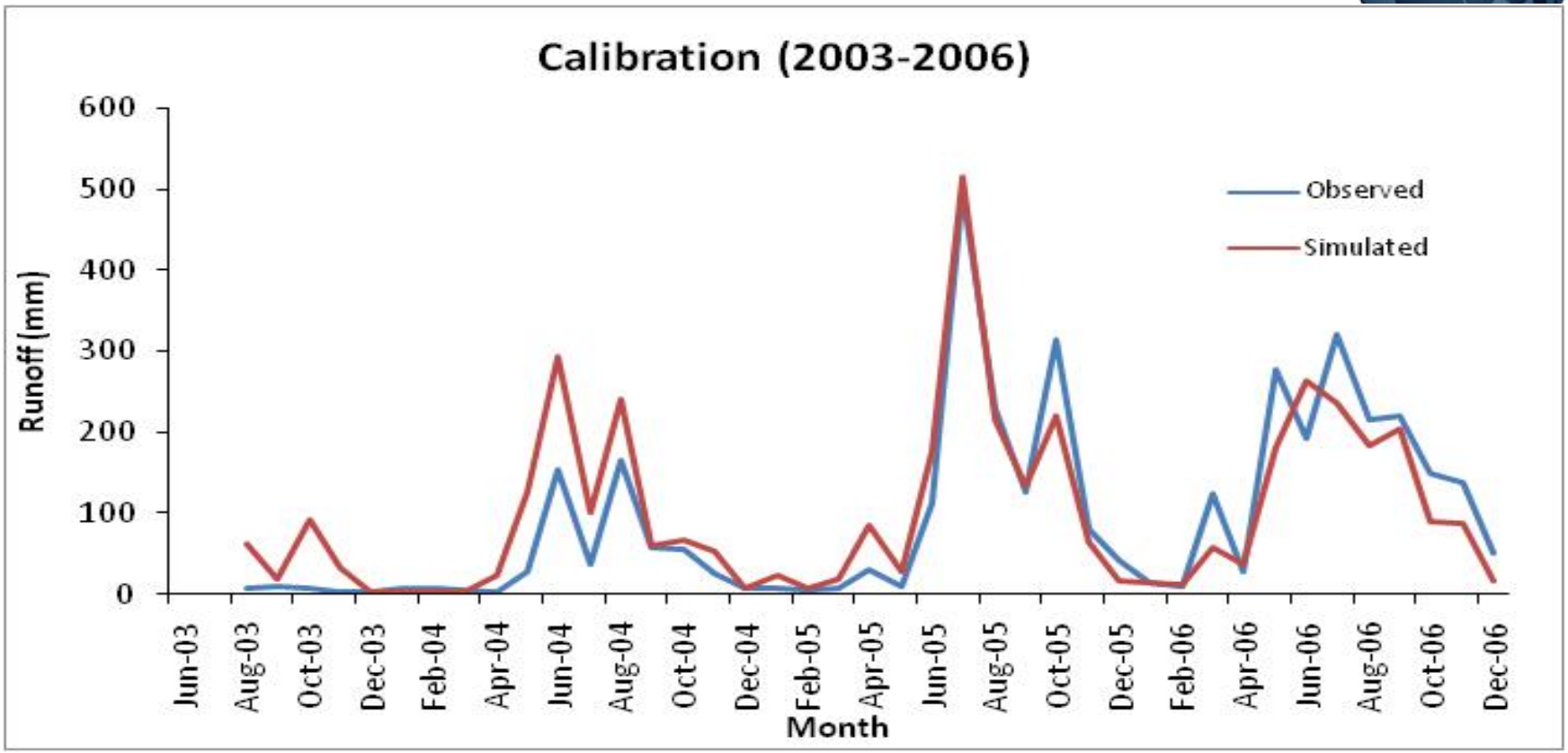
Sl.No.	Parameter_Name	Fitted_Value	Min_value	Max_value
1	r__CN2.mgt	0.4654	0.30	0.90
2	r__SOL_AWC().sol	0.1557	0.10	0.30
3	r__SOL_BD().sol	-0.0016	-0.01	0.01
4	r__SOL_K().sol	0.6470	0.00	1.00
5	v__ALPHA_BF.gw	0.0659	0.04	0.07
6	v__ALPHA_BNK.rte	0.0051	0.00	0.10
7	v__ESCO.bsn	0.0804	0.00	0.10
8	v__GW_DELAY.gw	17.04	15	25
9	v__Gw_revap.gw	573.4	400	600
10	v__Gwqmn.gw	1612.8	1500	2000
11	v__Revapmn.gw	0.0494	0.00	0.10

(r prefix refers to 1+ value to be multiplied to the original parameters used in original model setup, where as v prefix refer to eact replacement of variable)

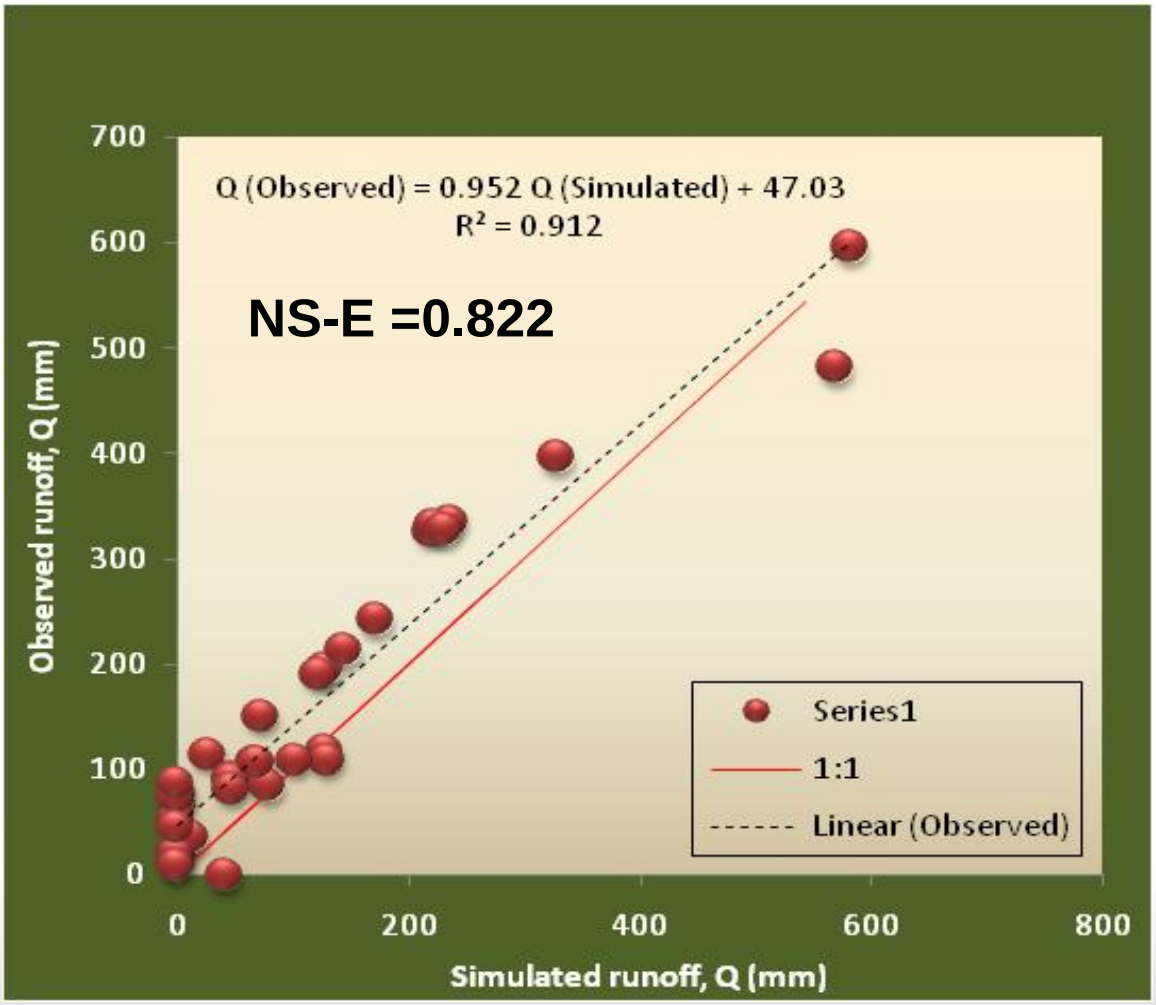
Calibration (2003-2006)



Calibration of model time-series simulation and their observed time-series.



Validation (2007-2009)



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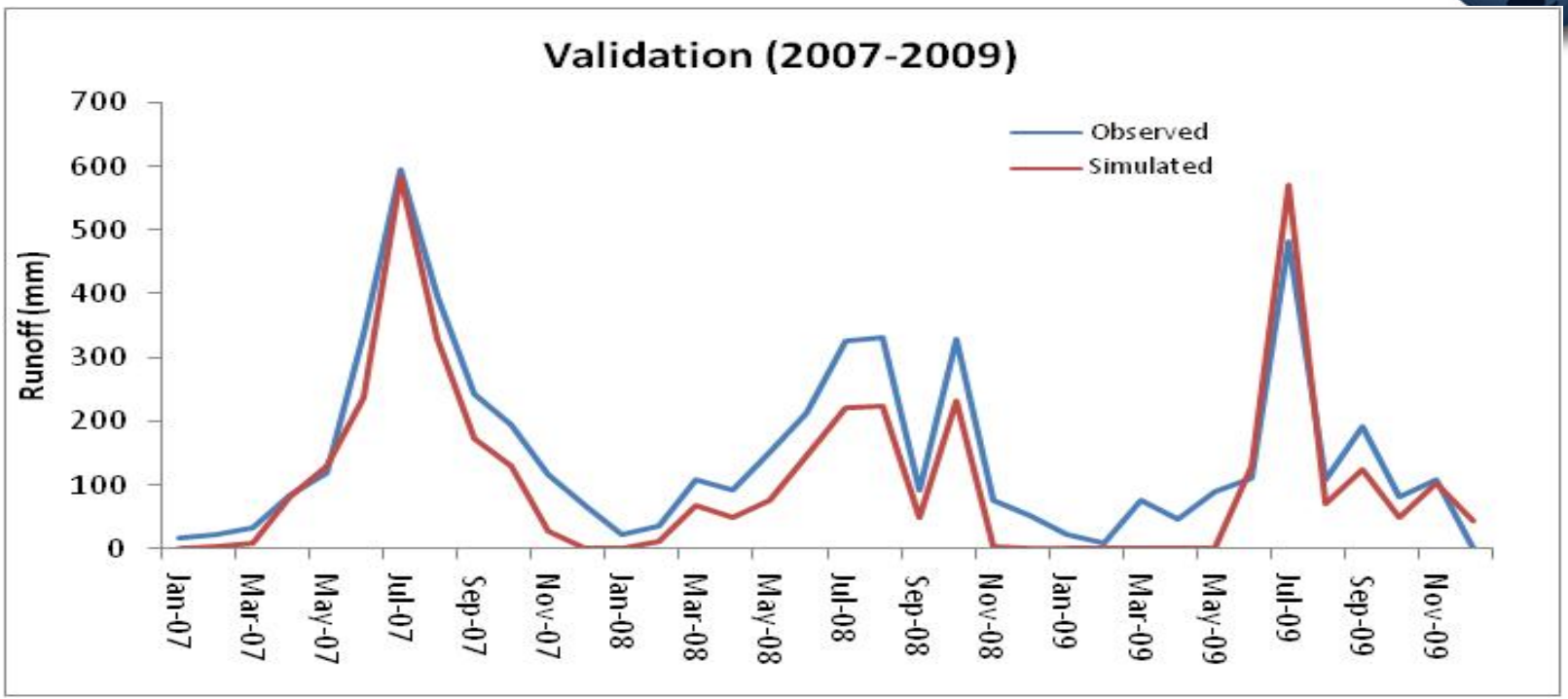
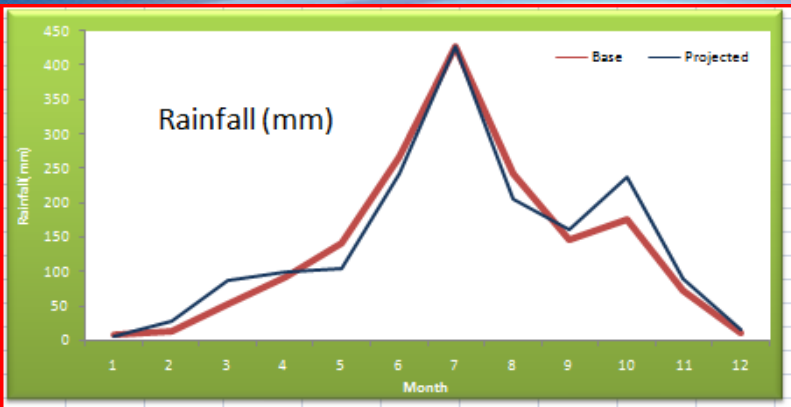


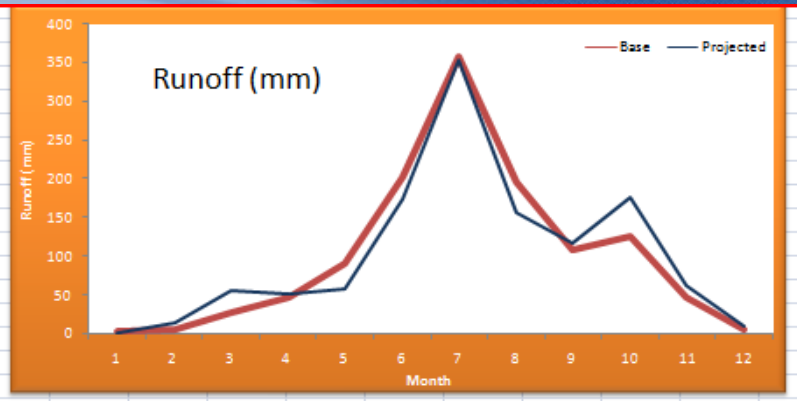
Climate Projection Scenario

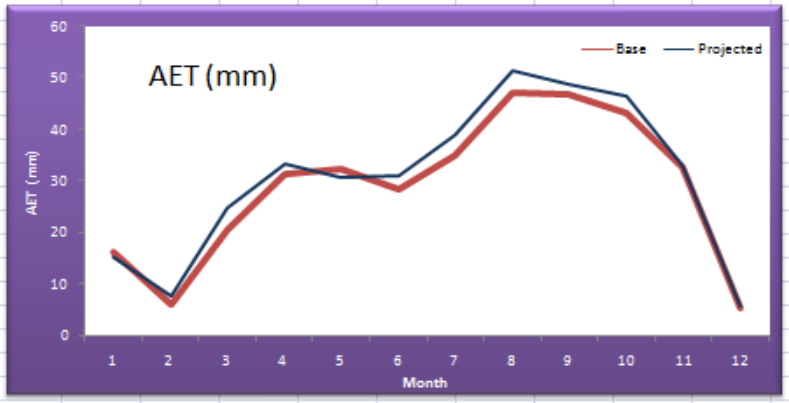
- IITM, PUNE PRECIS data
- Baseline (1961-1990)
- Statistical Scaling to available year data (2003-2009)
- SRES Scenario A2a (2071-2100)
- CO_2 =667 ppm

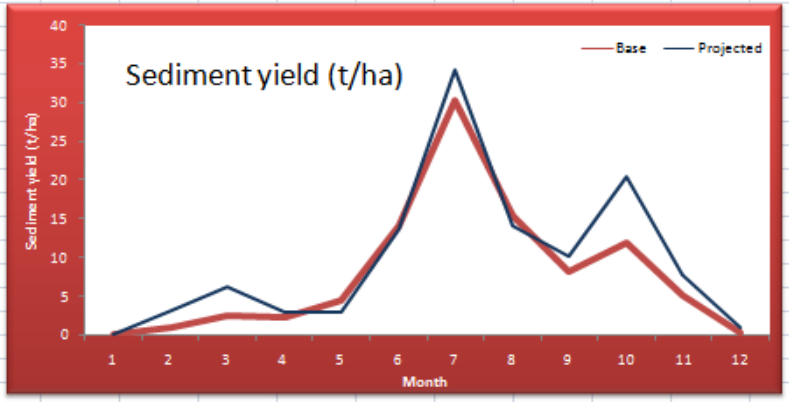
Climatic projectionon hydrological fluxes from Kundhichira watershed.

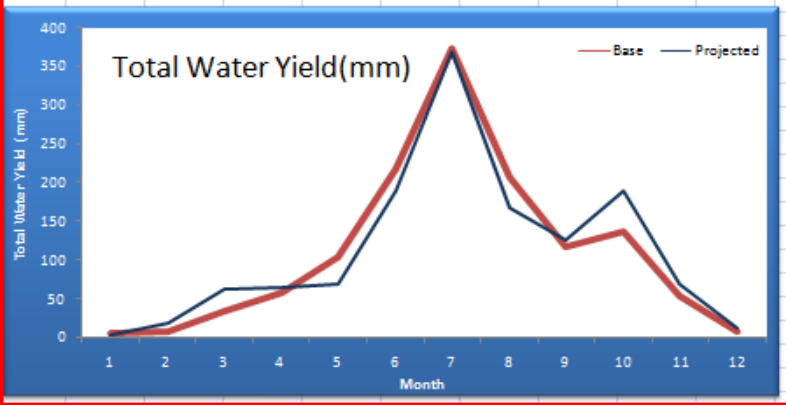
Simulation variables	Baseline (2003-2009)	Projected scenario (A2a)	% change in Projected w.r.t to baseline (%)
Precipitation (mm)	1658.4	1707.7	2.97
Surface runoff Q (mm)	1221.8	1240.9	1.56
Lateral soil discharge (mm)	99.2	107.20	8.06
Total aquifer recharge (mm)	8.8	7.73	-12.16
Total water yield (mm)	1316.9	1343.35	2.01
Percolation out of soil (mm)	2.47	1.43	-42.11
ET (mm)	344.6	367.9	6.76
PET (mm)	3955.1	4696.5	18.75
Transmission losses (mm)	6.35	6.33	-0.31

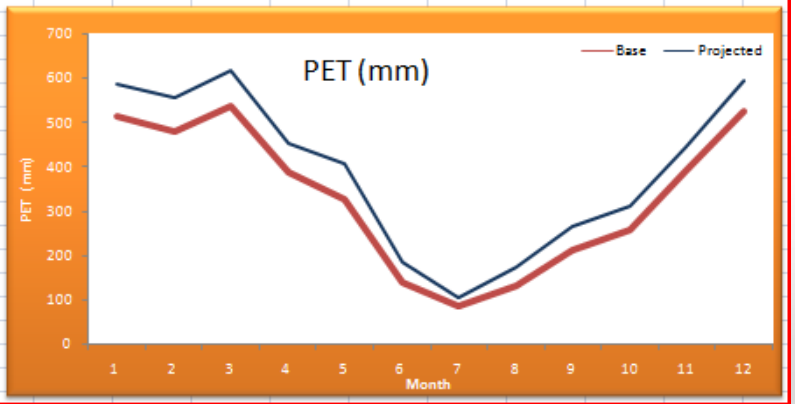

Rainfall (mm)
Base
Projected
Rainfall (mm)
Month


Runoff (mm)
Base
Projected
Runoff (mm)
Month


AET (mm)
Base
Projected
AET (mm)
Month


Sediment yield (t/ha)
Base
Projected
Sediment yield (t/ha)
Month


Total Water Yield(mm)
Base
Projected
Total Water Yield (mm)
Month


PET (mm)
Base
Projected
PET (mm)
Month

Thank You