Soil moisture variability correlation with remotely sensed GLDAS Data using SWAT model output data for Upper Godavari River basin.

Presented by

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CONTENT

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- OBJECTIVE
- METHODOLOGY
- RESULT AND DISCUSSION
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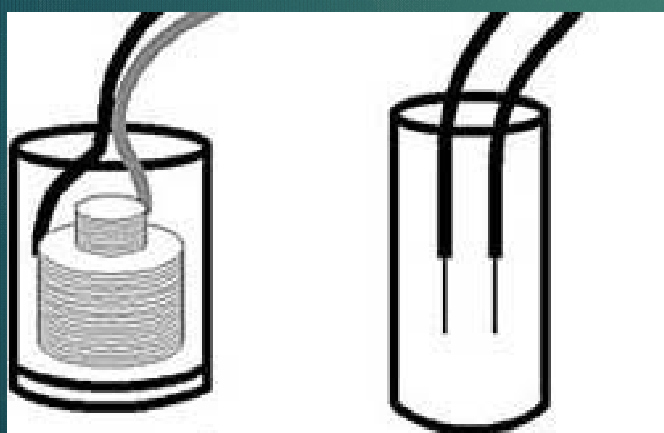
INTRODUCTION

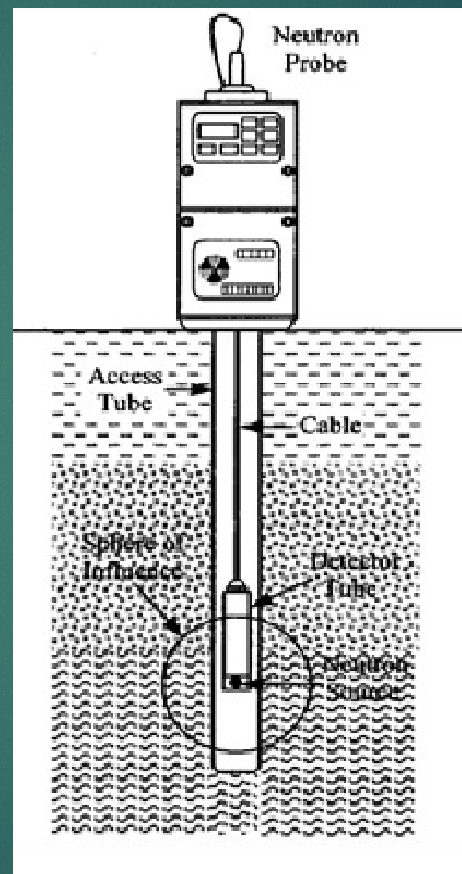
- Importance of Soil Moisture

- Key to understanding the hydrological cycle.
- Monitoring of Crop-Water requirement.
- Water resource management.
- To assess above and below ground water resources pertinent to Earth's climate system.
- To understand the implications of soil water storage on water and energy fluxes at land surfaces and atmosphere.
- For estimating surface and groundwater availability and retrievals.

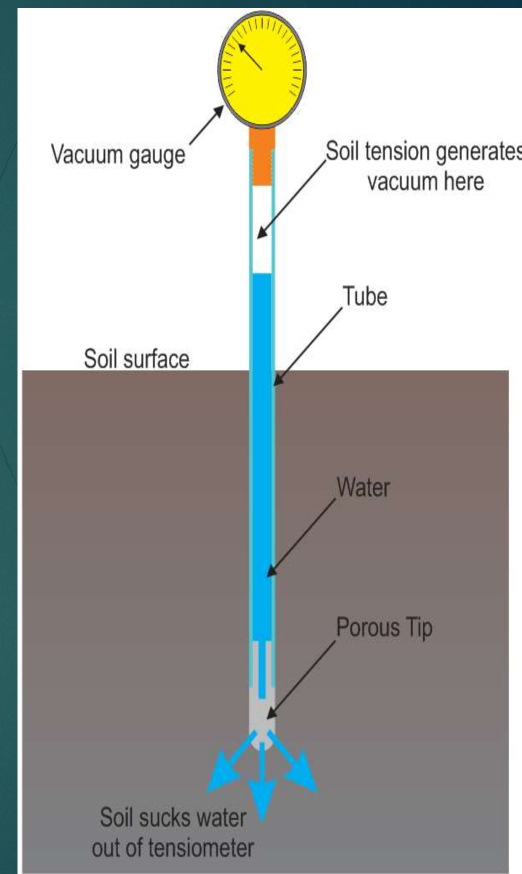
Gravimetric Method



Gypsum Block



Neutron Probe



Tensiometry

Disadvantages of Conventional Methods

Gravimetric Methods

- Destructive
- Requiring labour
- Time consuming

Neutron Probes

- High cost
- Licenced labour required
- Delay in receiving readings/reports

Tensiometry

- Only allow indirect estimation of SMC
- Fragile
- Automated operation impractical

Gypsum blocks

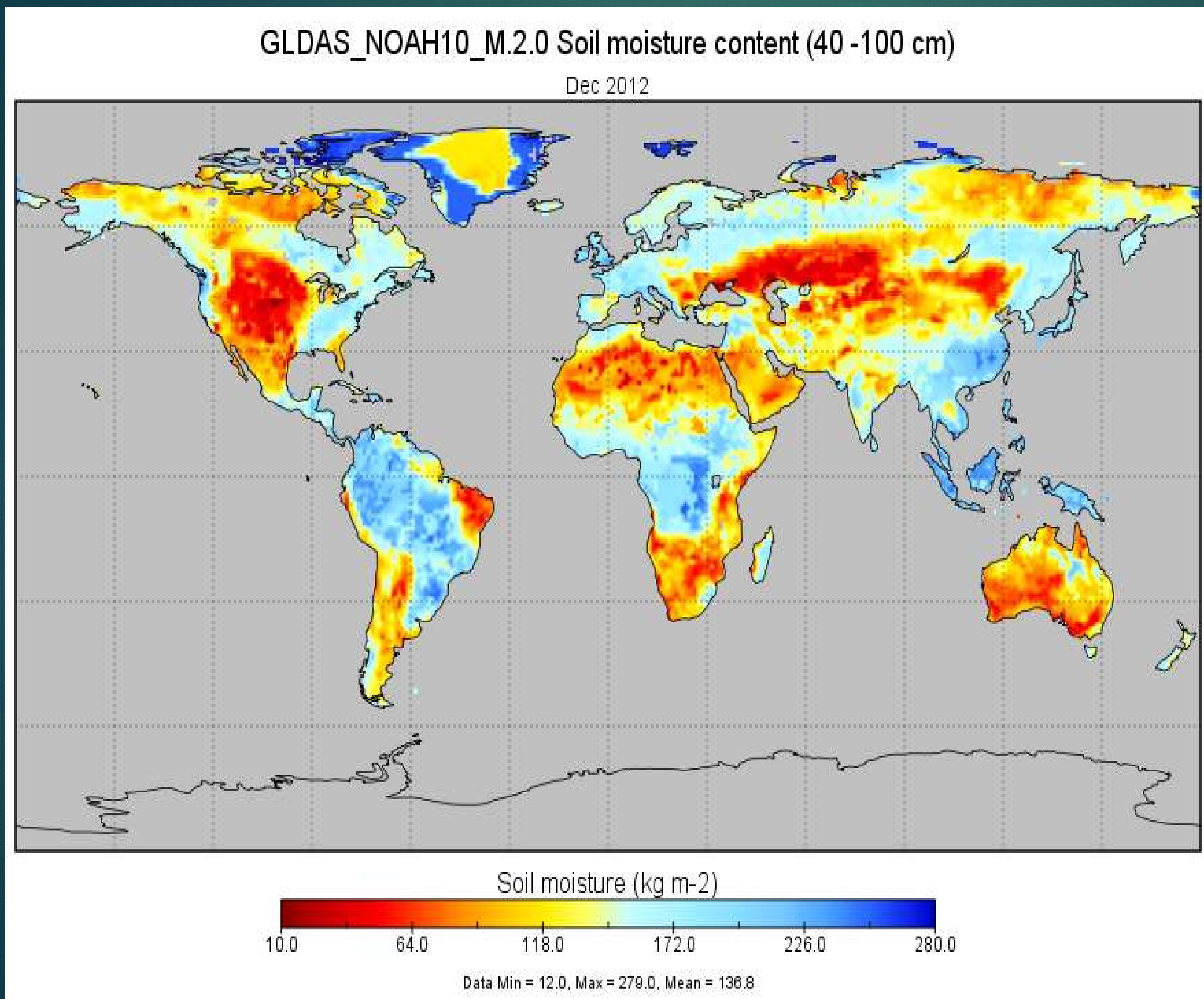
- Requires labour input to take readings or download to computer
- Lifetime can be reduced in some soil types

USE OF REMOTE SENSING DATA

- Challenges of direct soil moisture measurements

- Expensive
- Necessity of using surface meteorological observations
  - Not readily available over large areas
  - Produce point type measurements
  - Restricted to specific locations
- Satellite remote sensing offers a means of measuring soil moisture
  - Across a wide area
  - Continuous

Global Land Data Assimilation System (GLDAS)



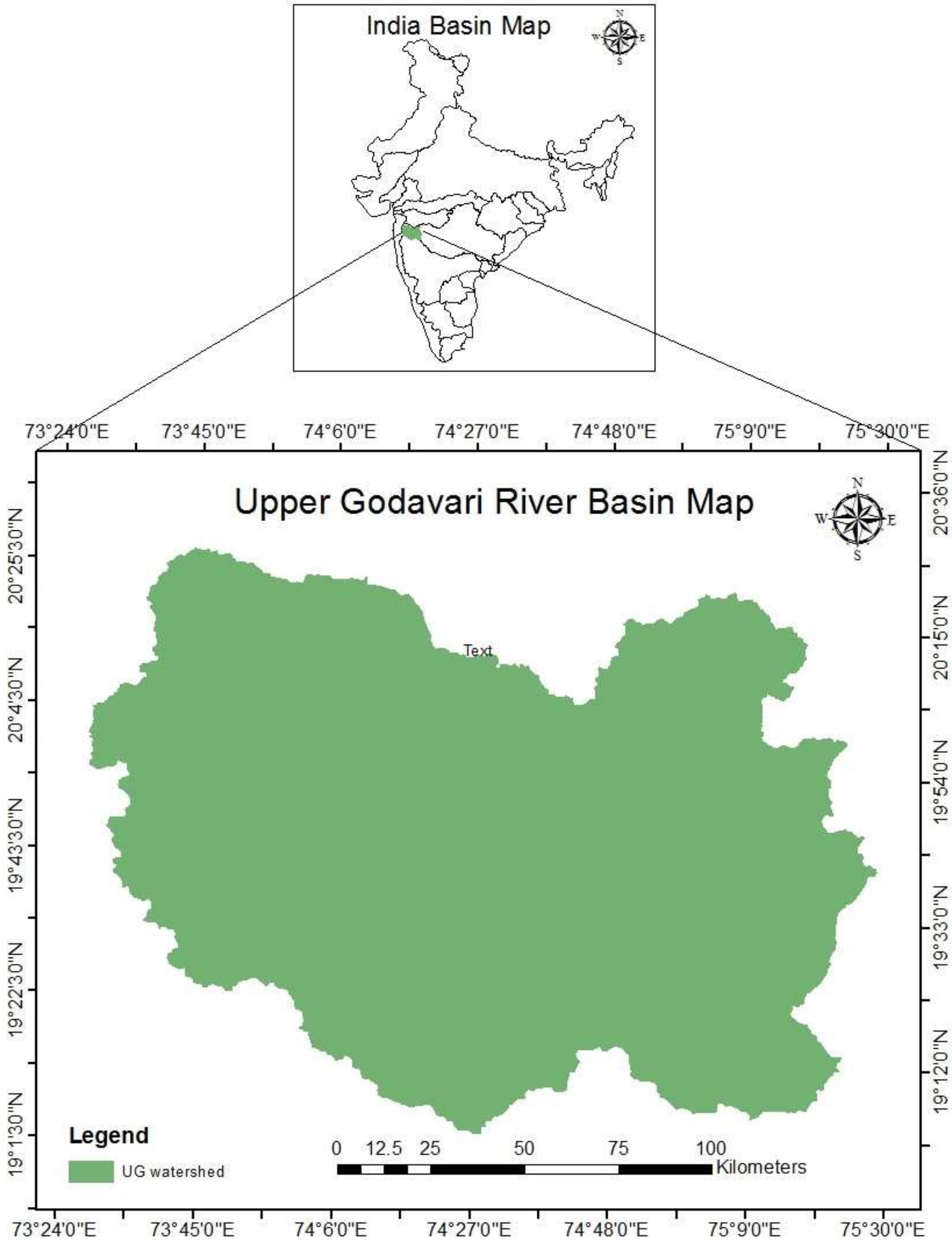
- Spatial Resolution - 0.25°
- Collecting soil moisture since 2000
- Soil moisture is mapped monthly

OBJECTIVE

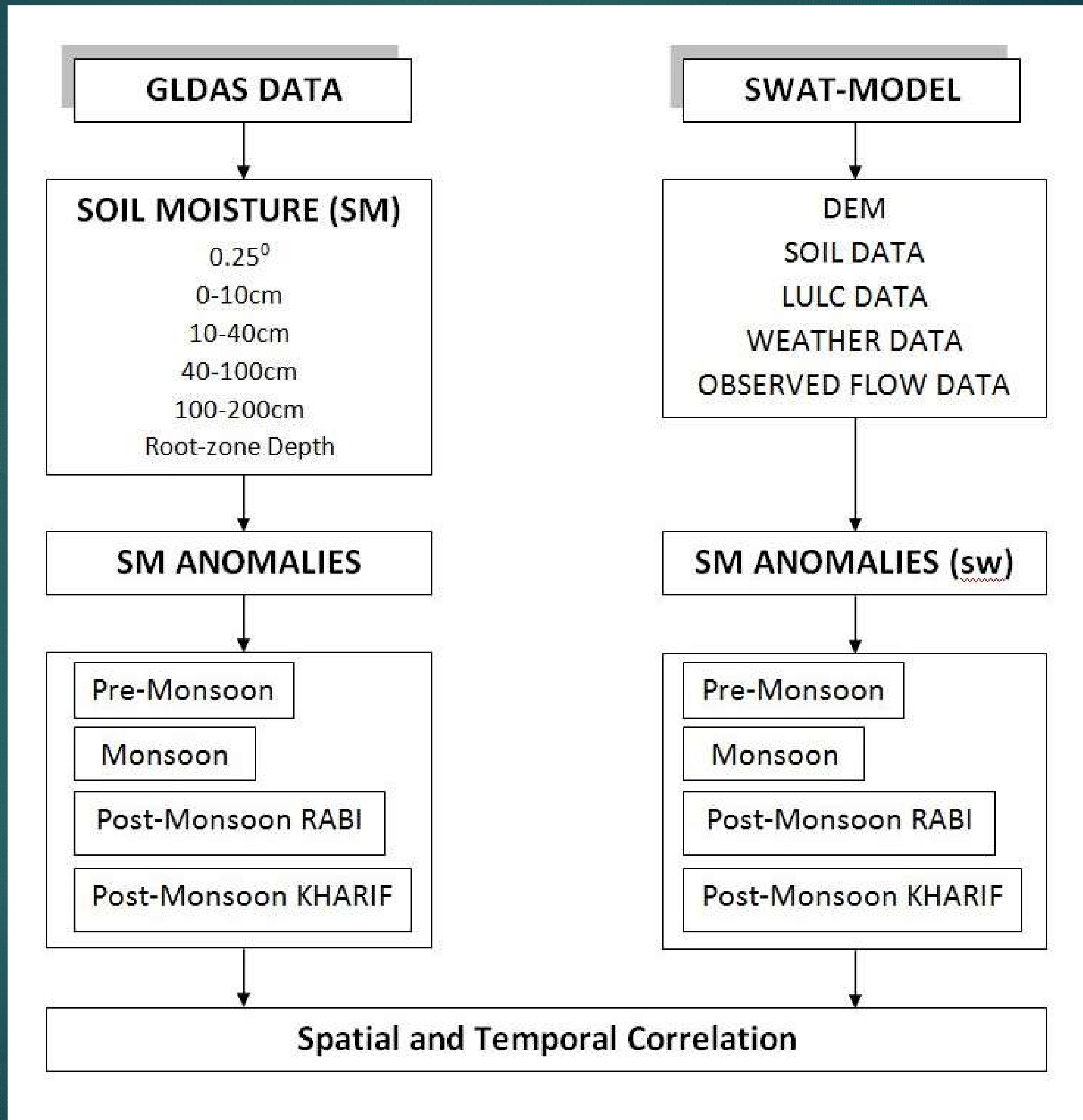
- Extracting soil moisture data from Global Land Data Assimilation System
- Calculating spatial variability of soil moisture of study area
- Calculating the soil moisture using SWAT-MODEL
- Establishing the spatial correlation between GLDAS data and SWAT-MODEL output data.

STUDY AREA

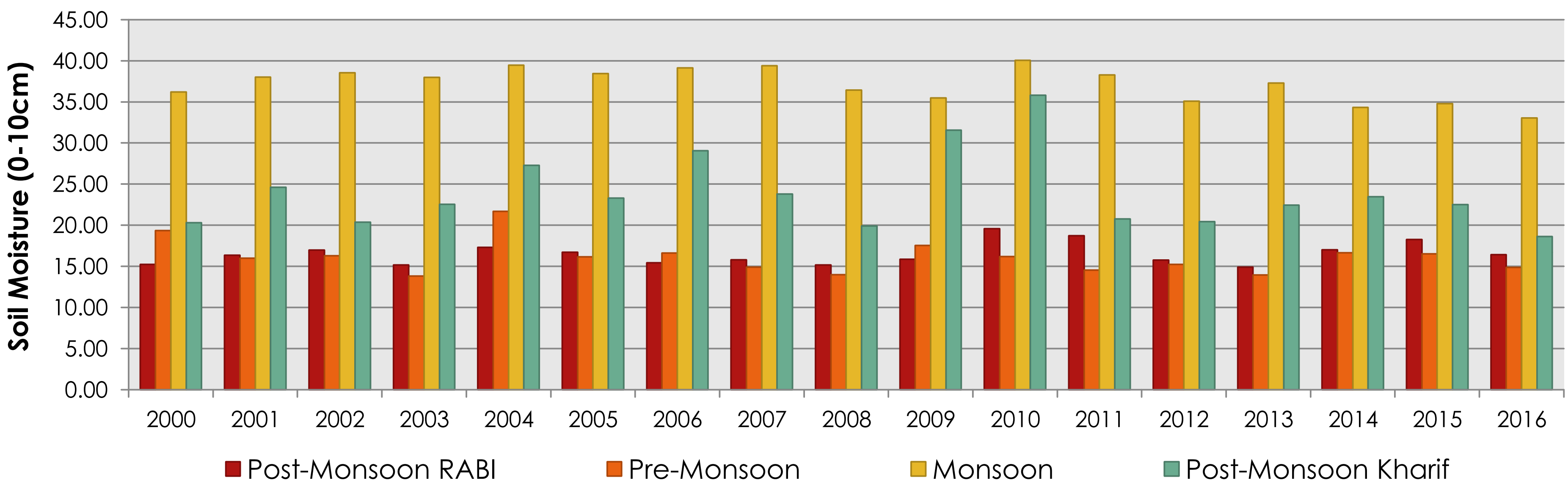
- Sub-Basin – Godavari Upper
- Area – 21443.23 km^2



METHODOLOGY



Relationship of Soil Moisture with Cropping seasons from GLDAS data



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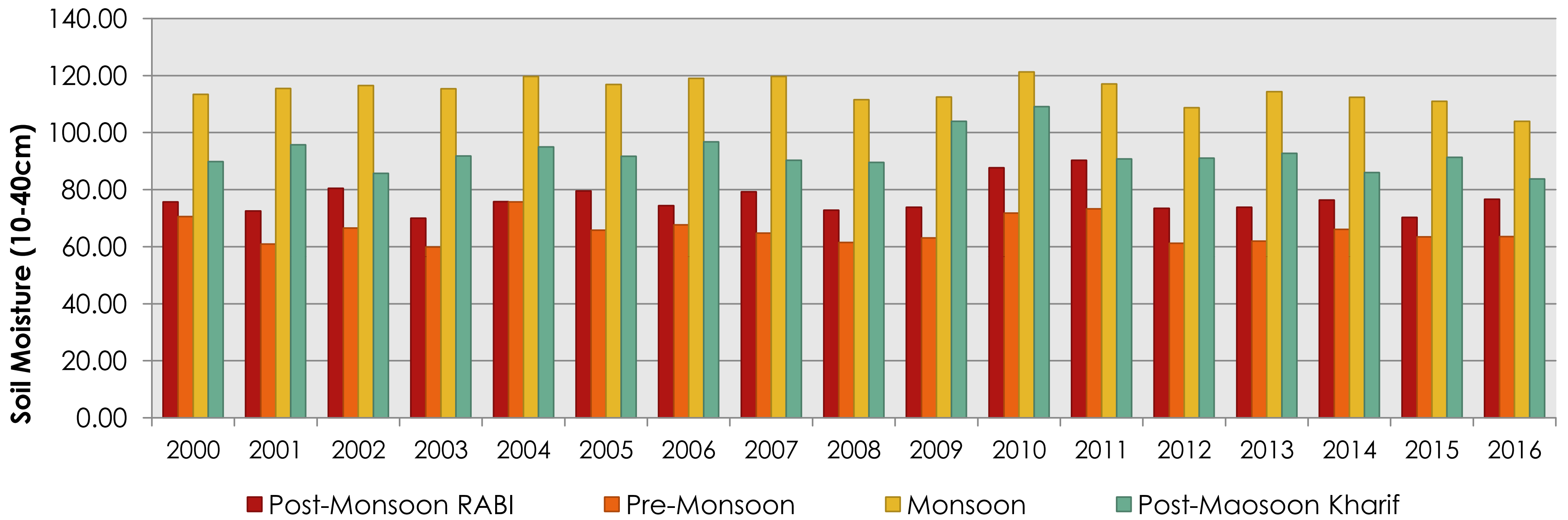

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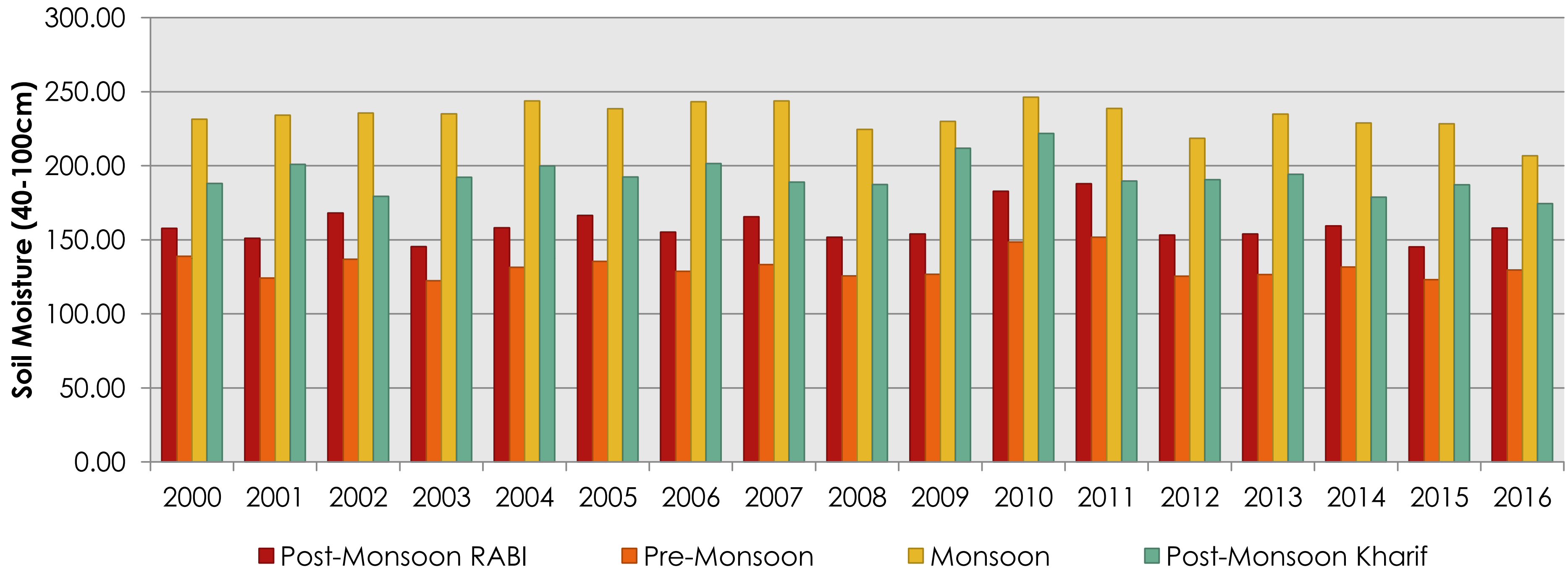

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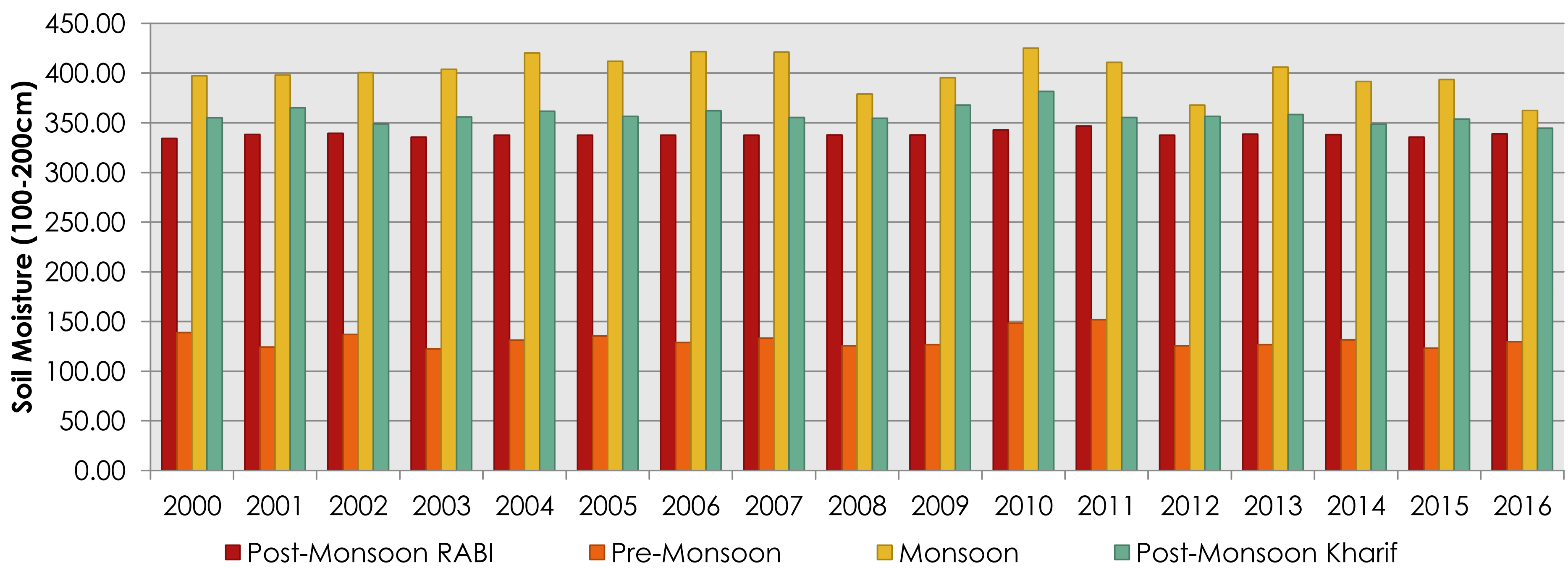

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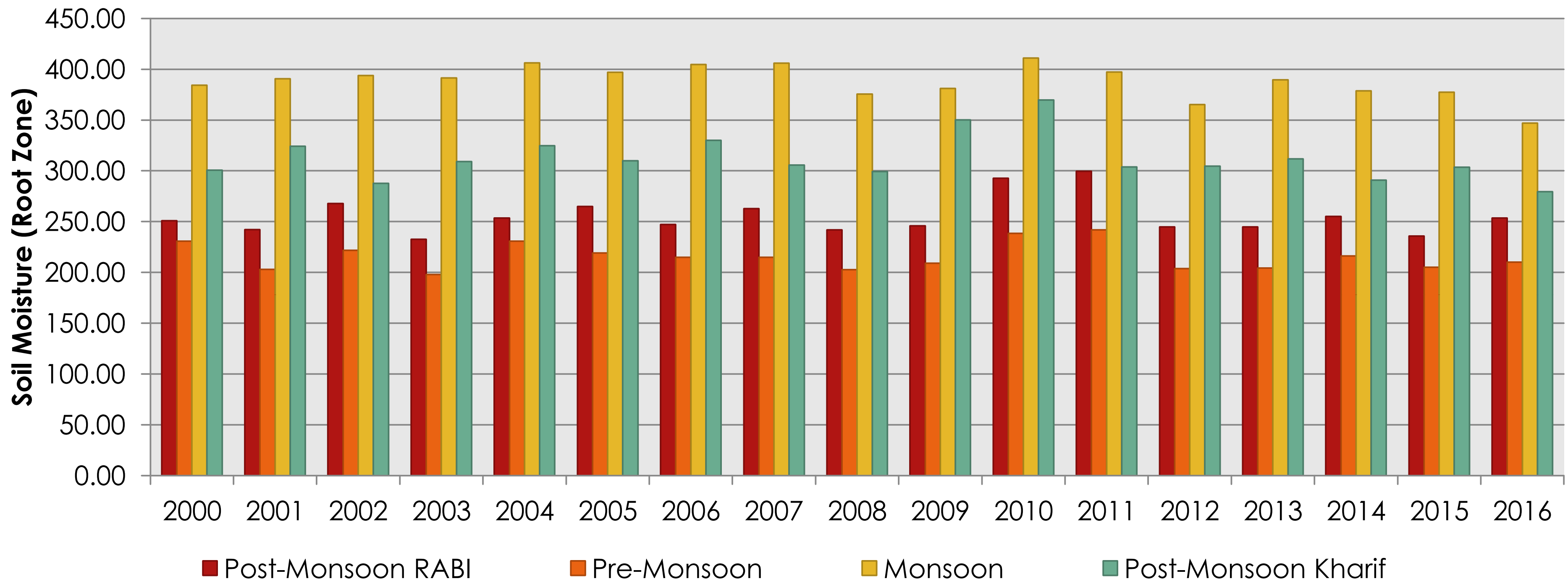
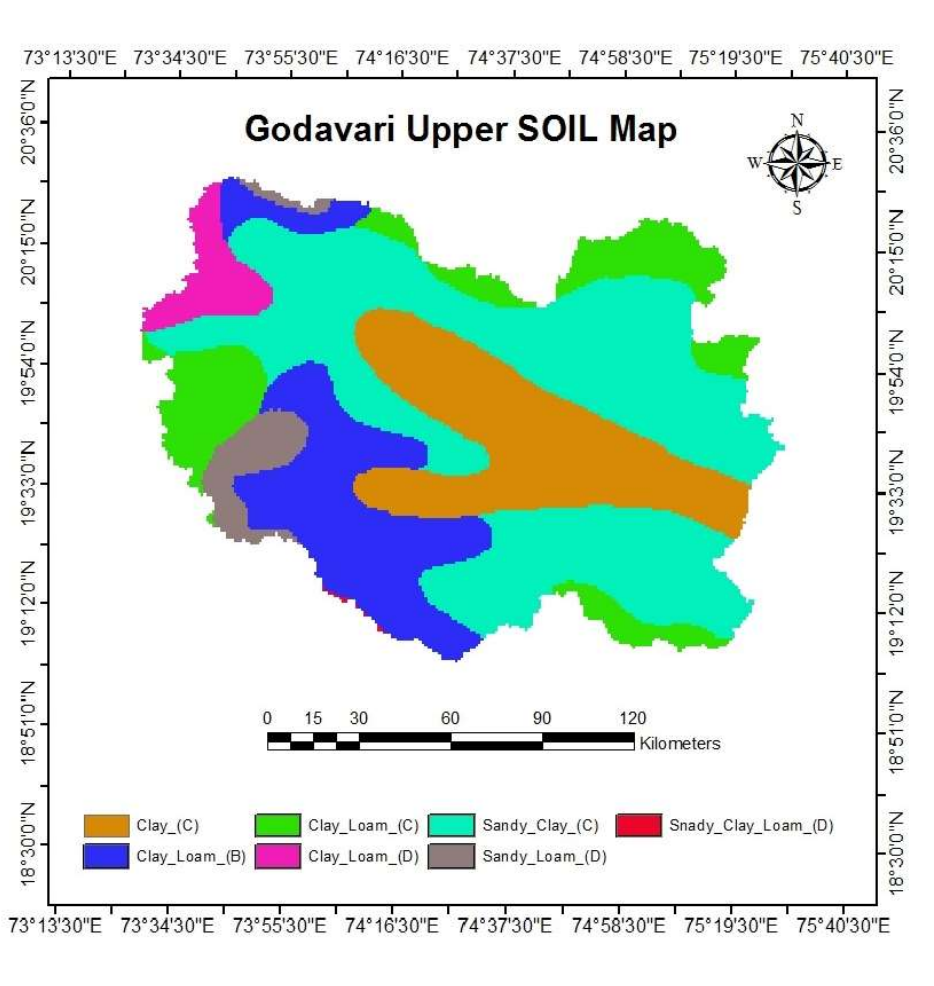
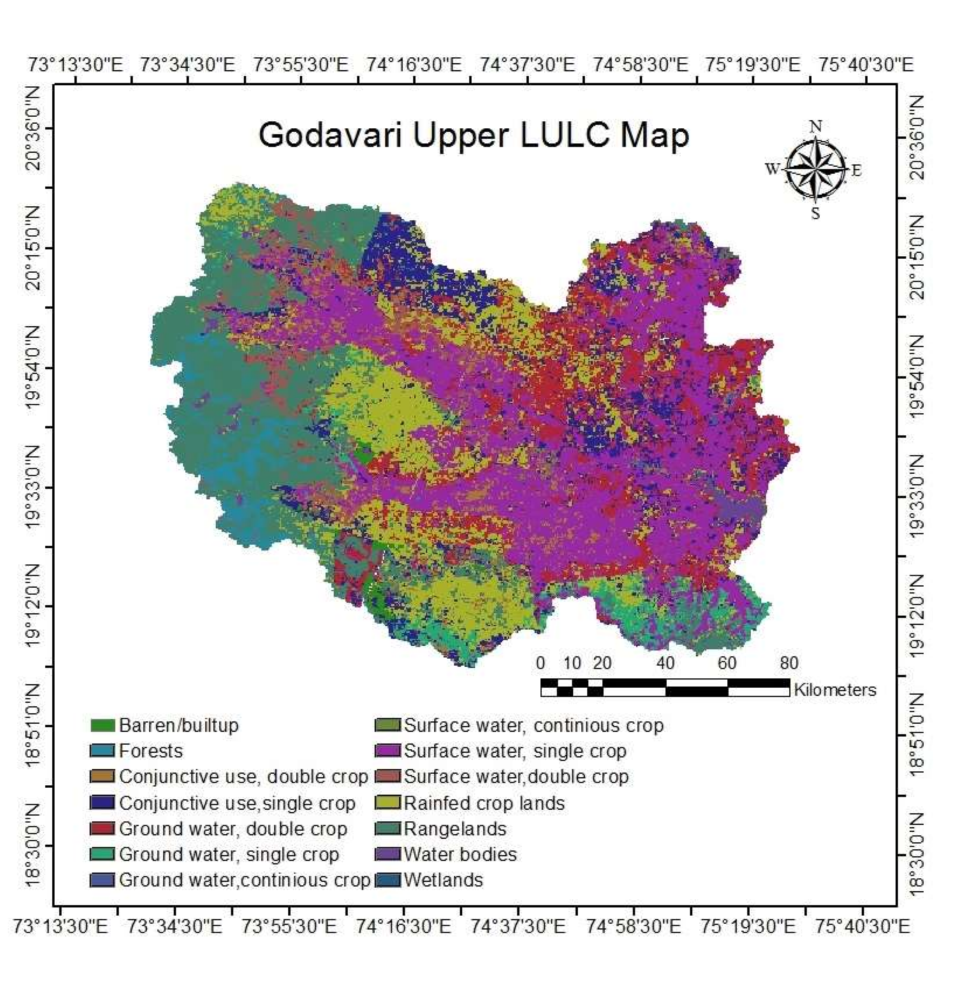
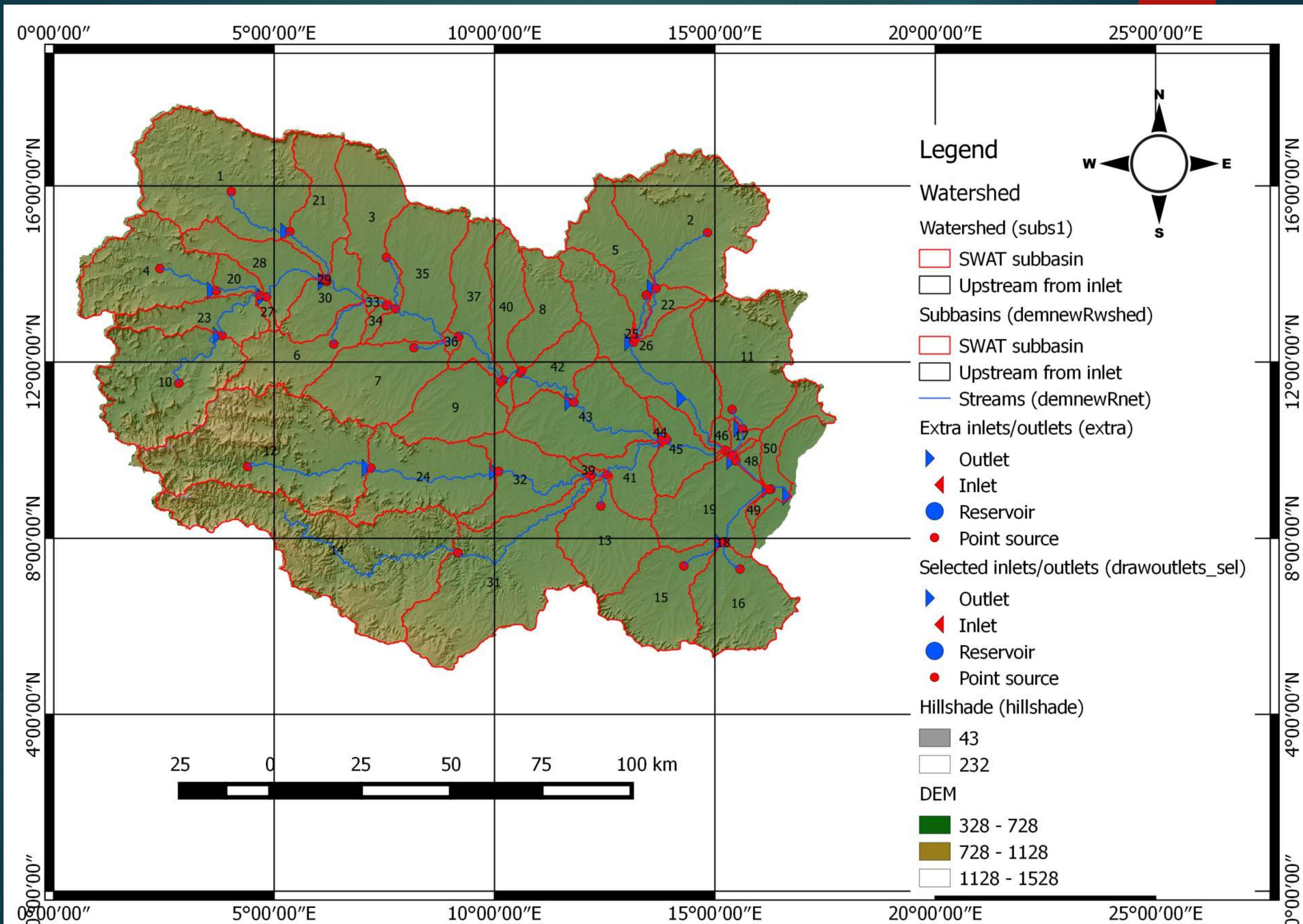


Development of SWAT–model for groundwater recharge estimation


Godavari Upper SOIL Map
73°13'30"E 73°34'30"E 73°55'30"E 74°16'30"E 74°37'30"E 74°58'30"E 75°19'30"E 75°40'30"E
20°36'0"N 20°15'0"N 19°54'0"N 19°33'0"N 19°12'0"N 18°51'0"N 18°30'0"N
N S W E
0 15 30 60 90 120 Kilometers
Clay_(C)
Clay_Loam_(C)
Sandy_Clay_(C)
Snady_Clay_Loam_(D)
Clay_Loam_(B)
Clay_Loam_(D)
Sandy_Loam_(D)


Godavari Upper LULC Map
73°13'30"E 73°34'30"E 73°55'30"E 74°16'30"E 74°37'30"E 74°58'30"E 75°19'30"E 75°40'30"E
20°36'0"N 20°15'0"N 19°54'0"N 19°33'0"N 19°12'0"N 18°51'0"N 18°30'0"N
N S W E
0 10 20 40 60 80 Kilometers
Barren/builtup
Forests
Conjunctive use, double crop
Conjunctive use,single crop
Ground water, double crop
Ground water, single crop
Ground water,continious crop
Surface water, continious crop
Surface water, single crop
Surface water,double crop
Rainfed crop lands
Rangelands
Water bodies
Wetlands


0°00′00″
5°00′00″E
10°00′00″E
15°00′00″E
20°00′00″E
25°00′00″E
16°00′00″N
12°00′00″N
8°00′00″N
4°00′00″N
0°00′00″
N
W
E
S
25 0 25 50 75 100 km
Legend
Watershed
Watershed (subs1)
SWAT subbasin
Upstream from inlet
Subbasins (demnewRwshed)
SWAT subbasin
Upstream from inlet
Streams (demnewRnet)
Extra inlets/outlets (extra)
Outlet
Inlet
Reservoir
Point source
Selected inlets/outlets (drawoutlets_sel)
Outlet
Inlet
Reservoir
Point source
Hillshade (hillshade)
43
232
DEM
328 - 728
728 - 1128
1128 - 1528

RESULTS AND DISCUSSION

Post-Monsoon RABI	SWAT OUTPUT (SW) Pearson	Spearman
SM_0-10 cm	0.40	0.32
SM_10-40 cm	0.56	0.27
SM_40-100 cm	0.57	0.31
SM_100-200 cm	0.64	0.51
SM_RZ	0.55	0.28

Pre-Monsoon	SWAT OUTPUT (SW) Pearson	Spearman
SM_0-10 cm	0.36	0.27
SM_10-40 cm	0.62	0.65
SM_40-100 cm	0.34	0.35
SM_100-200 cm	0.34	0.35
SM_RZ	0.49	0.54

Monsoon	SWAT OUTPUT (SW) Pearson	Spearman
SM_0-10 cm	0.56	0.28
SM_10-40 cm	0.51	0.53
SM_40-100 cm	0.48	0.57
SM_100-200 cm	0.48	0.68
SM_RZ	0.50	0.56

Post-Monsoon RABI	SWAT OUTPUT (SW) Pearson	Spearman
SM_0-10 cm	0.66	0.44
SM_10-40 cm	0.74	0.55
SM_40-100 cm	0.72	0.47
SM_100-200 cm	0.75	0.46
SM_RZ	0.72	0.48

CONCLUSION

The spatial and temporal correlation of soil moisture between GLDAS-DATA and SWAT-MODEL DATA are harmonize in nature.

0-10cm	**Pre-monsoon**
100-200cm	**Post-monsoon RABI and KHARIF**

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THANK YOU