Comparative study of Evapotranspiration Estimation using Penman-Monteith method with MODIS NDVI data and SWAT Hydrological model

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Introduction

Evapotranspiration (ET), describe two processes of water loss from land surface to atmosphere

- evaporation
- transpiration

- > Evapotranspiration
- **>** Reference Evapotranspiration
- > Potential Evapotranspiration

In most hydrological systems, *evapotranspiration* (ET) and *precipitation* are the largest components of the water balance, which are difficult to estimate.

The concept of the evapotranspiration was introduced to study the *evaporative demand* of the atmosphere independent of crop type, crop development, and management practices.

Meteorological factors determining ET

- Solar radiation
- <u>Air temperature</u>
- <u>Air humidity</u>
- <u>Wind speed</u>

Objectives and Scope of the Work

- To study the variation in the spatial distribution of evapotranspiration in the study area with the help of MODIS NDVI data.
- Potential of the remote sensing data in the comparative study of evapotranspiration estimation in the watershed.
- Draught monitoring in the study area.
- Planning, designing, and management of irrigation resource systems.
- Improving water use efficiency and developing exact irrigation scheduling.

Location of the Study Area

Total Area of the Basin= 46120 Sq. Km

Basin of the Upper Bhima River, the major tributary of the Krishna river.



Methodology (Penman-Monteith Method)



Methodology (SWAT Analysis)



SRTM DEM of the study area with 90m resolution.



Land use land cover map with 18 different classes which is used as input for SWAT model.



Soil map used as input for SWAT model



Inlets, Outlets, Streams and Sub-basins in the watershed



Results and Discussion

















Comparison of ET using Penman-Monteith method and SWAT Hydrological Model



Conclusions

- The evaporation values calculated by conventional method (Penman-Monteith method) and SWAT model varies in summer season.
- Evaporation values are more in summer considering all possible climatic conditions such as maximum and minimum temperature, relative humidity and wind speed by Penman-Monteith method.
- SWAT model gives the evaporation values considering the actual condition of the climate and present situations (land use, soil maps and slope definition) of the study area.

Scope of the Future Work

- Evapotranspiration estimation using another 2 methods i.e. **Priestley-Taylor method and Hargreaves method**.
- Calibration and validation in SWAT CUP.
- Comparison with MODIS ET (OD 16 A2) data with all output values.

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Thank You