

IMPROVING WATER RESOURCES EVALUATION BASED ON REMOTE SENSING TECHNIQUES: FOSTERING STRATEGIES OF ADAPTATION

Objectives

- Assessment of climate change impacts on water resources of a head basin of Segura River Basin (Fuensanta reservoir basin), based on Regional Climate Models (RCMs) and observed data.
- Analysis of usefulness of MODIS TERRA product of actual evapotranspiration (ETact) at monthly scale, for improvement of hydrological model parameterization.

Introduction

The geographical and socio-economic characteristics of Spain, making it vulnerable to climate change and variability. The population growth and intense consumptive uses in South-East of Spain, where agriculture constitutes the 80% of use of water, generate pressures on water resources. This is the case of the Segura River Basin, where a future scenario of water shortage is projected. Increasing knowledge about plausible impacts on components of the hydrological cycle at basin scale is a step in the objective of building adaptive capacity to the impacts.

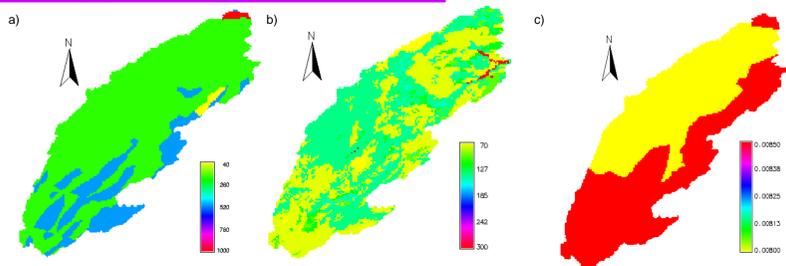
Methods and datasets

Study Area

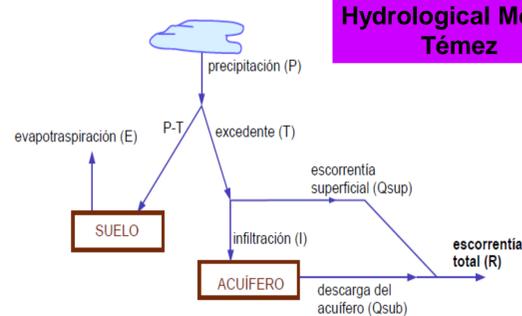


- Algorithms of a continuous hydrological model at monthly scale (Témez, 1977), was incorporated below GRASS Geographic Information System.
- Observed meteorological datasets Spain02 (Herrera et al., 2010). Time period: 1950-2007. Spatial resolution: 20x20km.
- RCMs. Simulated data by Regional Climate Models provided by the European project ENSEMBLES (Christensen et al., 2009). RCMs
 - KNMI-RACMO2. Time period: 1950-2100, spatial resolution: 25x25 km.
 - MPI-M-REMO. Time period: 1951-2100, spatial resolution: 25x25 km.
- MOD16 Product of MODIS TERRA of ETact. Time period: 2000-2005. Spatial resolution: 1km x 1km.

Key parameters of the model



- a)Maximum Infiltration (I_{max})
- b)Storage maximum capacity of soil water (H_{max})
- c)Aquifer coefficient (α)



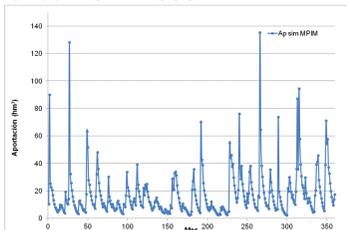
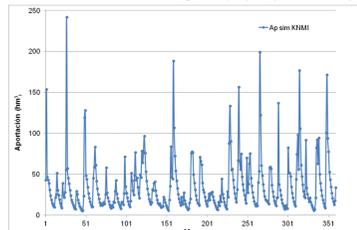
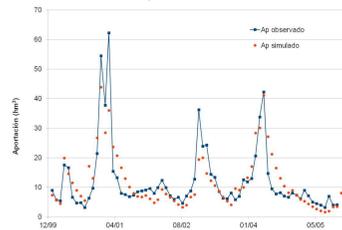
Hydrological Model: Témez

Results and Discussion

Calibration. Time period: 2000-2005

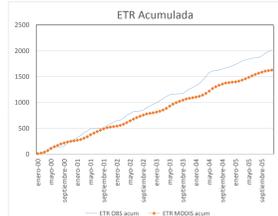
Simulation. Time period: 2021-2050

Runoff observed vs. RCMs

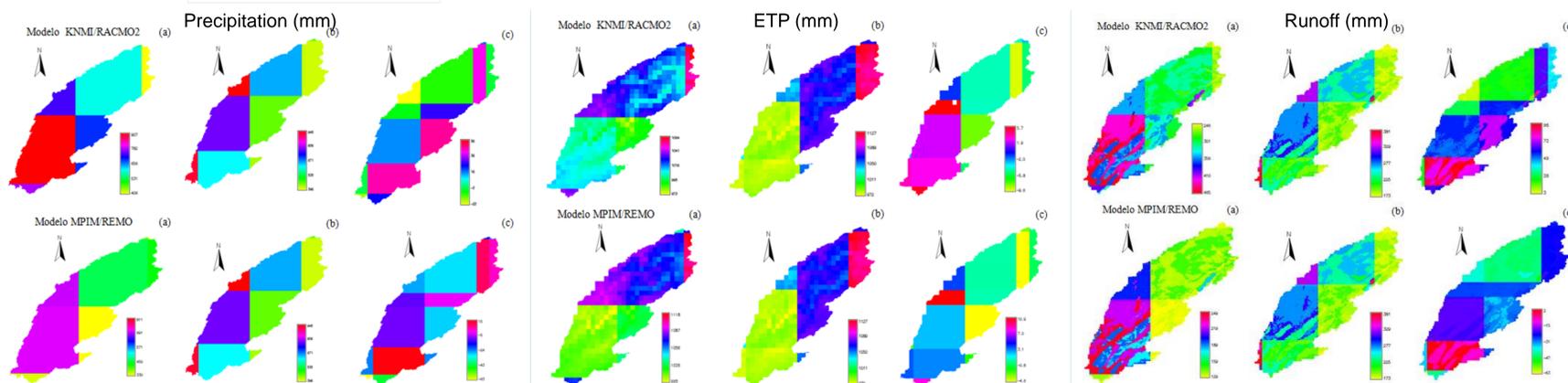
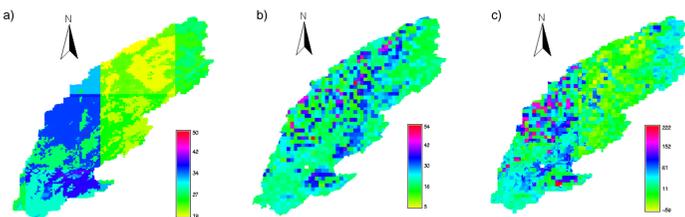


Data	Period	Runoff (hm ³)	Contrast %
Observed (C.H.S.)	1961-1990	7.757	
KNMI/RACMO2	2021-2060	12.618	62
MPIM/REMO	2021-2060	6.194	-20

ETact from remote sensing vs. ETact simulated by the model



Maps of mean annual ETact for 2001 year: (a) average of observed data (mm), (b) average of MOD16 (mm), and (c) Percentage of variation (%).



Spatial distribution of mean annual precipitation, ETP and runoff (mm) and variation (%) for KNMI/RACMO2 and MPIM / REMO models: (a) average for the period 2021-50, (b) average for the period 1961-1990 of observed data, and (c) Percentage of variation

Conclusions

Divergent trends of rainfall simulation were identified from the RCMs considered, in comparison with observed data. Therefore, ensemble methodologies of RCMs should be used to increase the reliability of climate and hydrological projections. The product MOD16 underestimates the ETact simulated by the hydrological model. ETact MOD16 is not suitable for wet areas, such as the study basin. Therefore, future lines of research are oriented to generate monthly ETactual from daily products of MODIS sensor, applying several approaches (triangle methods) for calibration of hydrological model parameters. Additionally, climate ensemble will be used as inputs to distributed hydrological models used.

Acknowledgments:

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References

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