USING HYDROGEOMORPHOLOGICAL INTERPRETATION TO IMPROVE RUNOFF THRESHOLD ESTIMATION IN MEDITERRANEAN EPHEMERAL STREAMS *(RAMBLAS)*

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ABSTRACT

The runoff threshold (Po) is one of the key parameters in the study of catchment hydrological response. It is fundamental in the analysis of rainfall-runoff conversion processes, for estimating water budgets and for describing the genesis of *hortonian overland flow*.

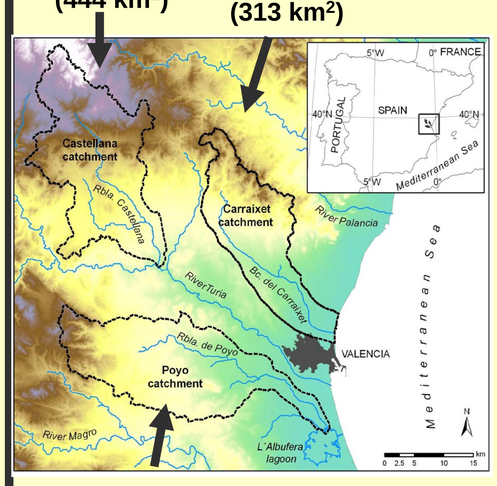
One of the most used models to estimate Po is that developed by the US Soil Conservation Service (SCS) in 1972, and modified for Spain by Témez (1978, 1991). This is a simple, easy to apply model, which uses slope values, vegetation, land use and soil hydrological group data. In spite of the generalized application of the model and its multiple adaptations, there are still many uncertainties, mainly related to the soil hydrological groups which, together with land use, are the most sensitive variables in runoff threshold estimation. These uncertainties are especially important in Mediterranean ephemeral streams where soils are generally very heterogeneous, not well developed, highly dependent on underlying rock and have been heavily exploited.

This paper proposes some modifications to the SCS/Témez method related to the assignation of the soil hydrological group in order to improve runoff threshold estimation in Mediterranean basins. In these environments, hydrological behavior is highly determined by the strong interaction between geomorphological structure, lithology and edaphology. These three variables are combined, in order to assign the soil hydrological group.

The method has been applied, using GIS, to several small basins located in the Mediterranean Spanish region. Although the estimation of runoff threshold using a GIS is a process which can be easily automated, the proposed modification requires the expert geomorphological knowledge of the catchment. Runoff thresholds obtained with this method are presented here. Although the results have to be checked with runoff threshold data obtained by water budget, so far they are consistent with the expected values for the study area from literature references.

STUDY AREA

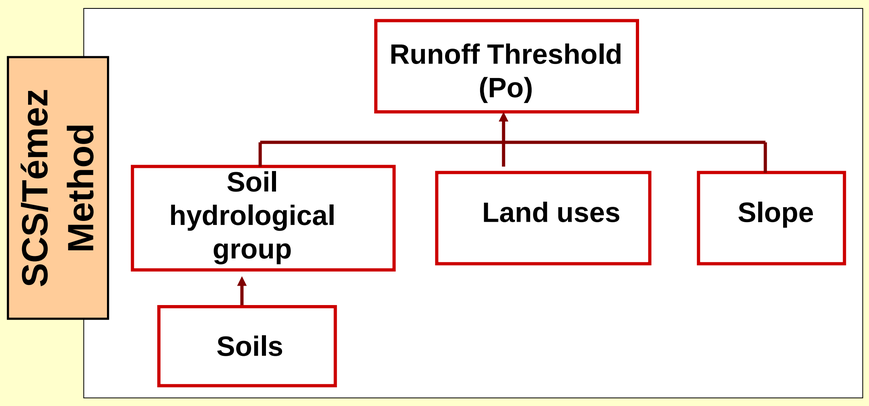
Three representative catchments of ephemeral streams: *ramblas*

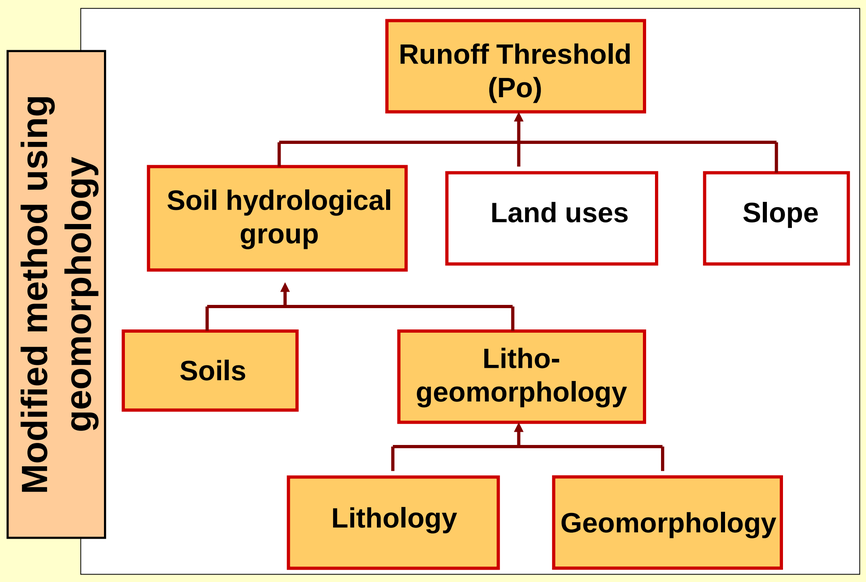


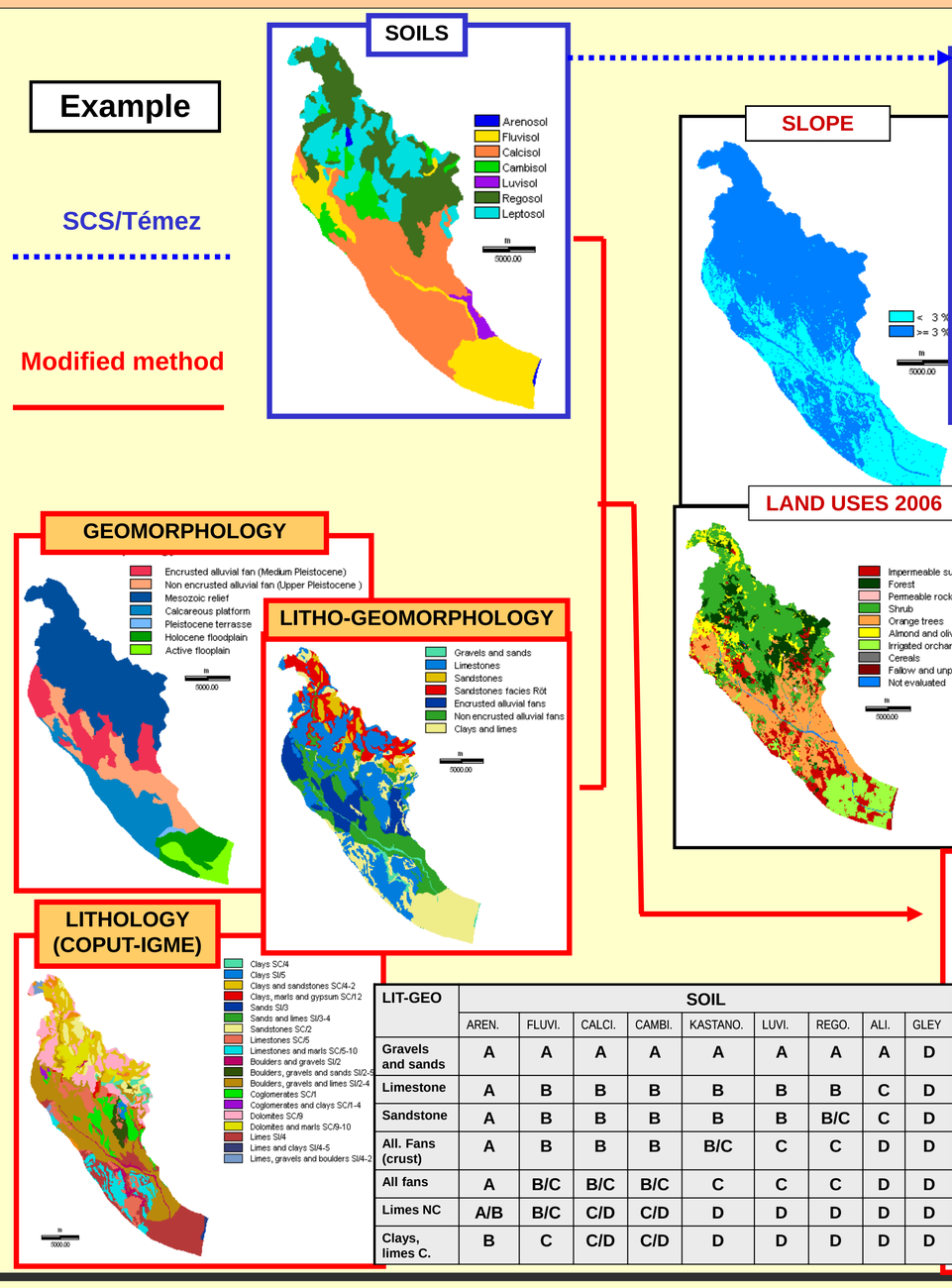
- **General physical features:**
- Mediterranean clima. Average annual rainfall: 500-650 mm.
- Steep slopes, sparse vegetation, thin soils and permeable rock.
- Ephemeral gravel-bed streams, hydrologically dependent on rainfall.

PROPOSAL TO ESTIMATE RUNOFF THRESHOLD (SCS/TEMEZ METHOD) USING GEOMORPHOLOGY

Authors propose some modifications to the SCS/Témez method related to the assignation of the soil hydrological group. This parameter is obtained not only from hydrological features of soil, but using a combination of three variables that determine hydrology behaviour in Mediterranean environments: geomorphology, lithology and edaphology.

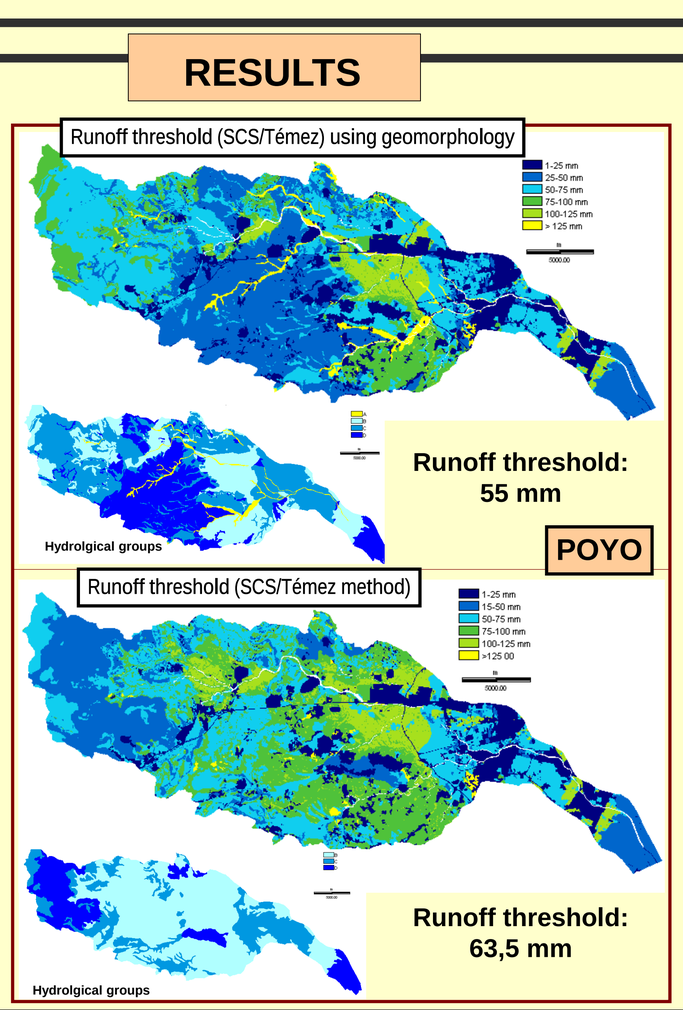


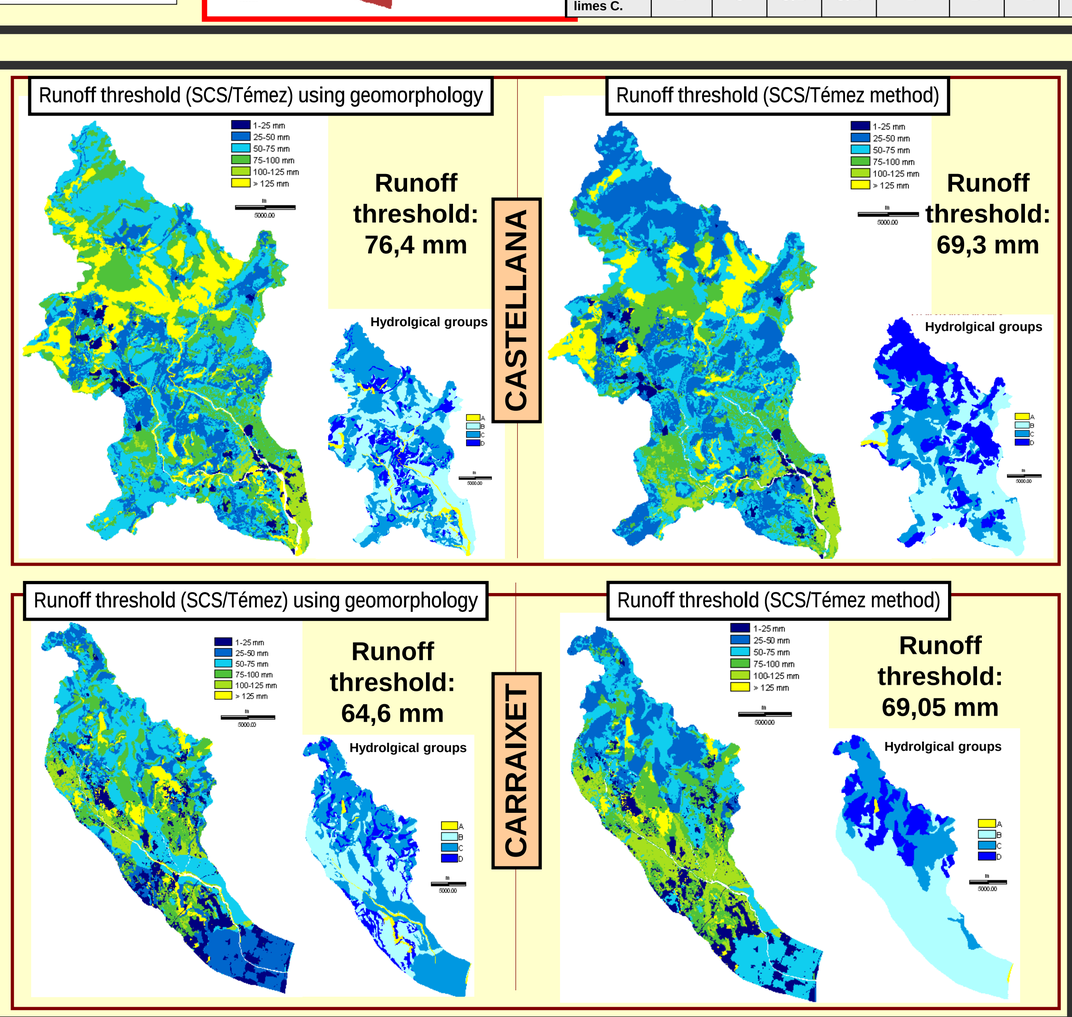




LIT-GEO	SOIL								
	AREN.	FLUVI.	CALCI.	CAMBI.	KASTANO.	LUVI.	REGO.	ALI.	GLEY
Gravels and sands	A	A	A	A	A	A	A	A	D
Limestone	A	B	B	B	B	B	B	C	D
Sandstone	A	B	B	B	B	B	B/C	C	D
All. Fans (crust)	A	B	B	B	B/C	C	C	D	D
All fans	A	B/C	B/C	B/C	C	C	C	D	D
Limes NC	A/B	B/C	C/D	C/D	D	D	D	D	D
Clays, limes C.	B	C	C/D	C/D	D	D	D	D	D

RESULTS





CONCLUSIONS

- **Runoff thresolds** obtained rank from 55 mm (Poyo) to 76,4 (Castellana) and they are **consistent** with those estimated by literature.

- **At basin scale, figures** obtained using geomorphological interpretation **do not differ significantly** from those estimated by SCS/Témez method (ranking from 4,4 mm in Carraixet to 8,5 mm in Poyo).

-**However, spatial differences are very important**, most of all in the cases of catchments where soils are quite homogeneous in relation to the underlying geomorphology (case of Poyo).

-This **issue** is particularly **interesting regarding ephemeral streams** because soils are very thin and not well developed. So hydrological behaviour depends largely on the combined influence of soil, lithology and geomorphology.

- From the **applied point of view**, hydrogeomorphological interpretation can improve the work of **hydrological distributed models**, since they are based on spatial assessement of variables.