Supplementary Materials

Enhancing runoff prediction in ungauged watersheds combining catchment-physical and hydrologic similarity in sub-tropical regions

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Contents:

SM-1: Calculation of the amount of available water content (*AD*).

$$FC\ (A\ horizon - no\ sand) = 21.977 - 0.168(S\%) + 2.601(OM\%) + 0.127(C\%) \quad \text{(I)}$$

$$FC\ (A\ horizon - sand) = 8.658 + 2.571(OM\%) + 0.296(L\%) \quad \text{(II)}$$

The value 59.6% of sand was considered as a threshold to classify A horizon as "no sand" (< 59.6%) and "sand" (> 59.6%).

$$CC\ (B\ horizon) = 18.448 - 0.125(S\%) + 1.932(OM\%) + 0.295(C\%) \quad \text{(III)}$$

$$PWP\ (A\ or\ B\ horizon) = -58.1313 + 0.5682(S\%) + 0.3718(OM\%) + 0.9755(C\%) + 0.6414(L\%) \quad \text{(IV)}$$

$$Da\ = 3.6725 - 0.0210(S\%) + 0.0531(OM\%) + 0.0221(C\%) + 0.0228(L\%) \quad \text{(V)}$$

where *FC* represents the field capacity, *PWP* is the permanent wilting point, *Da* is the apparent density, and *S%, OM%, C%, L%* represent the percentage of sand, organic matter, clay, and silt respectively.

Eq. (IV) is valid for A and B-horizons.

Once the *FC* and *PWP* were obtained, the amount of available water content for each horizon was calculated (AD_H):

$$AD_H = FC - CMP \quad \text{(VI)}$$

These values were multiplied by the respective apparent densities (DaH) and thicknesses (hH) to transform the content of available soil moisture in weight to volume and millimetres:

$$AD_H(\%\ water\ weight) = FC(H\%\ water\ weight) - CMP(H\%\ water\ weight) \quad \text{(VII)}$$

$$AD_H(H\%\ water\ volume) = FC(H\%\ water\ weight) - CMP(H\%\ water\ weight) \quad \text{(VIII)}$$

$$AD_H(mm) = AD_H(H\%\ water\ weight) \cdot Da_H \cdot h_H/10cm \quad \text{(IX)}$$

$$AD_S(mm) = \sum AD_H\ (mm) \quad \text{(X)}$$

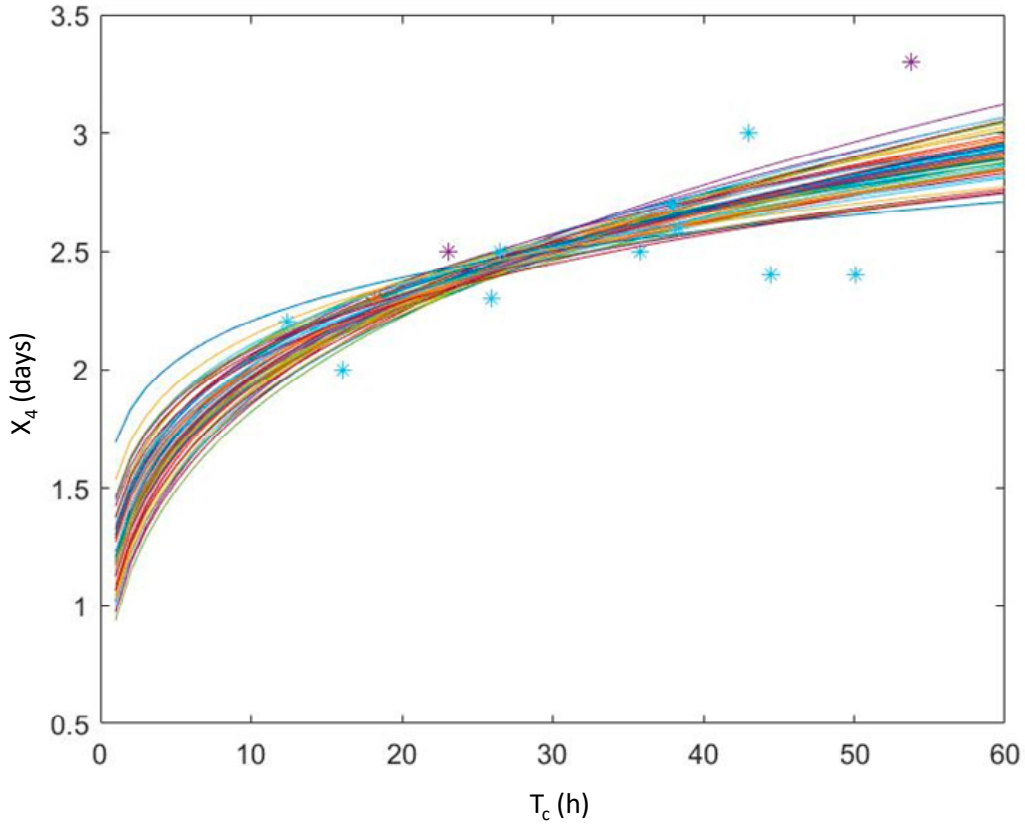
where $H\%$ is the soil moisture and ADS is the amount of available water content in the soil.

These calculations were made on the basis that the horizons granulometric is fully composed by fine soil (less than 2 mm).

SM-2: *Tc* and x_4 power relationships.

The best approximation to the *Tc* and x_4 was obtained using a relationship described by power law. These curves are graphically reported below and the following one has been considered as an average curve that represents all of them:

$$x_4 = 1.24 \cdot T_c^{\,0.205}$$



SM-3: Range of variation of *NSE* in the last stage of the cross-validation process (validation).

Basin	NSE max	NSE min
Casupa	0.75	0.5
Cebollati	0.81	0.61
Cuareim	0.76	0.5
Dayman	0.81	0.49
Maldonado	0.75	0.48
Olimar	0.77	0.48
San Carlos	0.8	0.47
San Salvador	0.7	0.48
Santa Lucía	0.75	0.48
Santa Lucía Chico	0.68	0.49
Tacuarembó Chico	0.81	0.57
Tacuari	0.74	0.5
Yi	0.73	0.49

SM-4: Comparison between observed and simulated flow-duration curve.

Comparison between observed (red line) and simulated flow-duration curve (blue line) at Tacuarembó Chico watershed.