R documentation

of 'waterbalance.Rd'

January 7, 2022

`waterbalance` *waterbalance Internal function for the water balance model*

Description

waterbalance Internal function for the water balance model

Usage

```
waterbalance(twilt, tfield, precipitation, GAI, date, ET0, L, alpha = 0.7)
```

Arguments

`twilt`	wilting point (0 to 1)
`tfield`	field capacity (0 to 1)
`precipitation`	daily precipitations (mm)
`GAI`	gren area index daily values
`date`	date vector
`ET0`	Evapotranspiration (calculated based on PET and GAI)
`L`	soil depth (mm)

Details

The formulas come mainly from Allen et al., 1998 https://www.fao.org/3/x0490e/x0490e00.htm and it is used to simulate the soil water balance. The calculation is done through multiple steps, iterated for each timestep:

Step 1: Soil water W is initialized assuming saturation, based on the depth L and volumetric capacity

$$W[1] = \Theta_f * L$$

| Step 2: The single crop coefficient Kc is calculated based on GAI

$$K_c = 1.3 - 0.5 * exp(-0.17 * GAI)$$

| Step 3: calculation of crop evapotranspiration (ETc) under standard condition

$$ET_c = ET_0 * K_c$$

| Step 4: the intercepted water It is calculated based on crop ET, GAI and precipitation P

$$It = min(P, ET_c, 0.2 * GAI)$$

| Step 5: potential evapotraspiration is calculated

$$E_{pot} = (ET_c - It)$$

| Step 6: Calculation of the percolation. Water (W_b, water bypass) is lost when above field capacity, but allowing saturation for one day

$$W_b = max(0, W - (\Theta_f * L))$$

| Step 7: Soil evaporation reduction coefficient

$$Kr = max(0, (1 - (0.9 * tfield - \Theta)/(0.9 * tfield - \alpha * twilt))^2)$$

(Kr cannot be above one) Step 8: Actual evapotraspiration is calculated

$$E_{act} = E_{pot} * Kr$$

| Step 9: The water balance is calculated (stepwise)

$$W[i+1] = W[i] + P[i] - E_{act}[i] - It - W_b[i]$$

|

Value

The function returns a data frame with water balance and date (days)

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