

Package ‘soilwater’

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Title soilwater: Implements parametric formulas for soil water retention or conductivity curve

Type Package

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Description It contains implementations of parametric formulas for soil water retention or conductivity curve. At the moment, only Van Genuchten (for soil water retention curve) and Mualem (for hydraulic conductivity) were implemented. See reference [url{http://en.wikipedia.org/wiki/Water_retention_curve}](http://en.wikipedia.org/wiki/Water_retention_curve). Any contributions or suggestions are warmly welcomed.

Suggests raster

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In views Environmetrics

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Collate 'hydraulic_diffusivity.R' 'soilwater-package.R' 'volume.R'

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soilwater-package	<i>soilwater: Implements parametric formulas for soil water retention or conductivity curve</i>
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Description

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Details

Package:	soilwater
Type:	Package
Version:	1.0
Date:	2012-12-4
License:	GPL (>= 2)
LazyLoad:	yes
Suggests:	raster

Note

soilwater is a on-going project. All criticism, comments and suggestions are well welcomed.

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References

NULL

SWC

*Soil water Retantion Curve and Unsaturated Hydraulic Conductivity***Description**

Soil Water Retention Curve 'swc', Hydraulic Conductivity 'khy', Soil Water Capacity 'cap', Soil Water (Hydraulic) Diffusivity 'diffusivity'

Usage

```
swc(psi = 0.5, alpha = 1, n = 1.5, m = 1 - 1/n,
    theta_sat = 0.4, theta_res = 0.05,
    saturation_index = FALSE, type_swc = "VanGenuchten",
    ...)

khy(psi = 0.5, v = 0.5, ksat = 0.01, alpha = 1, n = 1.5,
    m = 1 - 1/n, theta_sat = 0.4, theta_res = 0.05,
    type_swc = "VanGenuchten", type_khy = "Mualem", ...)

cap(psi = 0.5, alpha = 1, n = 1.5, m = 1 - 1/n,
    theta_sat = 0.4, theta_res = 0.05,
    type_swc = "VanGenuchten", ...)

diffusivity(psi = 0.5, v = 0.5, ksat = 0.01, alpha = 1,
    n = 1.5, m = 1 - 1/n, theta_sat = 0.4,
    theta_res = 0.05, ...)
```

Arguments

psi	soil wwater pressure head
alpha	inverse of a length - scale parameters in Van Genuchten Formula
n	shape parameter in Van Genuchten Formula
m	shape parameter in Van Genuchten Formula. Default is 1-1/n
theta_sat	saturated water content
theta_res	residual water content
ksat	saturated hydraulic conductivity
v	exponent in Mualem Formula for Hydraulic Conductivity
saturation_index	logical index, If TRUE (Default) the function swc() returns soil water content, otherwise a saturation index between 0 and 1.
type_swc	type of Soil Water Retention Curve. Default is "VanGenuchten" and actually the only implemented type
type_khy	type of Soil Hydraulic Conductivity Curve. Default is "Mualem" and actually the only implemented type
...	further arguments which are passed to swc() and khy()

Examples

```
library(soilwater)
soiltype <- c("sand","silty-sand","loam","clay")
theta_sat <- c(0.44,0.39,0.51,0.48)
theta_res <- c(0.02,0.155,0.04,0.10)
alpha <- c(13.8,6.88,9.0,2.7) # 1/meters
n <- c(2.09,1.881,1.42,1.29)
m <- 1-1/n
v <- array(0.5,length(soiltype))
ks <- c(1.5e-1,1e-4*3600,3.3e-2,4.1e-4)/3600 # meters/seconds

psi <- -(1:2000)/1000

D <- as.data.frame(array(0.1,c(length(psi),length(soiltype))))
names(D) <- soiltype
for (it in names(D)) {

  i=which(names(D)==it)
  D[,i] <- diffusivity(psi=psi,v=v[i],ksat=ks[i],alpha=alpha[i],n=n[i],m=m[i],theta_sat=theta_sat[i],theta_res=

}
# plot diffusivity on log scale
lty <- 1:length(names(D) )

plot(psi,D[,1],lty=lty[1],main="Diffusvity vs psi",xlab="psi [m]",ylab="D [m^2/s]",type="l",ylim=range(D),ylog=
for (i in 2:ncol(D)) {
  lines(psi,D[,i],lty=lty[i])
}
legend("topleft",lty=lty,legend=names(D))
Dinv <- 1/D

# pot diffusivity on log scale
lty <- 1:length(names(D) )

plot(psi,Dinv[,1],lty=lty[1],main="1/Diffusvity vs psi",xlab="psi [m]",ylab="1/D [s/m^2]",type="l",ylim=range(D
for (i in 2:ncol(Dinv)) {
  lines(psi,Dinv[,i],lty=lty[i])
}
legend("topright",lty=lty,legend=names(D))
```

watervolume

Water volume in function of water-table depth or height 'swc', Hydraulic Conductivity 'khy', Soil Water Capacity 'cap', Soil Water (Hydraulic) Diffusivity 'diffusivity'

Description

Water volume in function of water-table depth or height 'swc', Hydraulic Conductivity 'khy', Soil Water Capacity 'cap', Soil Water (Hydraulic) Diffusivity 'diffusivity'

Usage

```
watervolume(d = H - h, H = 1, h = NA, nstep = 100,  
            Gamma = 1, soilwaterretentioncurve = swc, ...)
```

Arguments

d	water-table depth (under surface)
h	water-table heigth (over bedrock)
H	soil thickness
Gamma	liner coefficient for hydrostatic profile (Default is 1)
nstep	number of vertical spatial cells. Default is 100
soilwaterretentioncurve	function describing the soil water retention curve. Default is swc
...	parametes for <code>soil.water.retention.curve</code>

Note

the water volume per topographical area unit obtained by vertical integration off soil water content profile

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