

# Package ‘AquaBEHER’

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**Type** Package

**Title** Estimation of rainy season calendar and soil water balance for agriculture

**Version** 0.1.0

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**Description** This R package computes and integrates daily reference evapotranspiration (Eto) into FAO56 water balance model. The AquaBEHER package can estimate daily parameters of crop and soil water balances parameters for agricultural crops. The package can also estimate rainy season calendar (Onset, Cessation and Duration) based on agroclimatic approach.

**License** GPL (>= 3)

**Encoding** UTF-8

**LazyData** true

**RoxygenNote** 7.2.1

**Roxygen** list(markdown = TRUE)

**Suggests** knitr,  
rmarkdown

**VignetteBuilder** knitr

**Depends** R (>= 2.10)

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calcEto

*Potential Evapotranspiration***Description**

This function calculates Penman-Monteith, Priestley Taylor and Hargreaves-Samani Potential Evapotranspiration using the method described by Allen et al, (1998)

**Usage**

```
calcEto(data)
```

**Arguments**

data = a dataframe containing the required climate variables: Columns must contain the following parameters:

```
Station_Name: weather station name
Lat: latitude of the site in decimal degrees [°]
Lon: longitude of the site in decimal degrees [°]
Elev: elevation above sea level [m]
Year: year in YYYY format
Month: month in MM format
Day: day of record
Tmax: daily maximum temperature at 2m height [°C]
Tmin: daily minimum temperature at 2m height [°C]
```

**Value**

The function generates a list containing the following components:

ET.Daily: Daily estimations of reference crop evapotranspiration (mm/day)

Ra.Daily: Daily estimations of extraterrestrial radiation (MJ/m2/day)

Slope.Daily: Daily estimations of slope of vapour pressure curve (kPa/°C)

ET.type: Type of the estimation obtained

**References**

Allen, R.G., L.S. Pereira, D. Raes, and M. Smith. 1998. 'Crop evapotranspiration-Guidelines for Computing Crop Water requirements

**Examples**

```
calcEto(climateData)
```

calcSeasCal

*Rainy Season Calendar***Description**

This function calculates rainy season calendar based on Agroclimatic approach

**Usage**

```
calcSeasCal(
  data,
  onsetWind.start,
  onsetWind.end,
  e_thresh = 0.25,
  AW_thr = 10,
  soilWHC
)
```

**Arguments**

data	= a dataframe. It should be an object as returned by calcWatBal
onsetWind.start	onset start
onsetWind.end	onset end
e_thresh	threshold
AW_thr	PAW
soilWHC	Water holding capacity of the soil

**Value**

The function generates a data frame containing the following components:

Year: year  
 Onset.DOY: onset in DOY  
 Onset.index: onset index  
 Cessation.DOY: ce in DOY  
 Cessation.index: ce in index  
 SeasDur: duration of the season

**References**

Allen, R.G.; Pereira, L.S.; Raes, D.; Smith, M. Crop Evapotranspiration: Guidelines for Computing Crop Water Requirements; FAO Irrigation and Drainage Paper no. 56; FAO: Rome, Italy, 1998; ISBN 92-5-104219-5.

Doorenbos, J. and Pruitt, W.O. 1975. Guidelines for predicting crop water requirements, Irrigation and Drainage Paper 24, Food and Agriculture Organization of the United Nations, Rome, 179 p.

## Examples

```
data(climateData)

Eto.daily <- calcEto(climateData)

climateData$Eto <- Eto.daily$ET.Daily

soilWHC = 100

watBal.daily <- calcWatBal(climateData, soilWHC)

onsetWind.start = "1980-09-01"
onsetWind.end = "1981-01-31"

seasCal.dF <- calcSeasCal(watBal.daily, onsetWind.start, onsetWind.end,
                          e_thresh = 0.25, AW_thr = 10, soilWHC)
```

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calcWatBal

*Soil Water Balance*


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## Description

This function calculates a daily water balance computation for the root zone according to algorithms described in the FAO Irrigation and drainage paper 56

## Usage

```
calcWatBal(data, soilWHC)
```

## Arguments

**data** = a dataframe containing the required climate variables: Columns must contain the following parameters:

```
Station_Name: weather station name
Lat: latitude of the site in decimal degrees
Lon: longitude of the site in decimal degrees
Elev: elevation above sea level (m)
Year: year in YYYY format
Month: month in MM format
Day: day of record
Rain:
Tmax: daily maximum temperature at 2m height (°C)
Tmin: daily minimum temperature at 2m height (°C)
Eto:
```

**soilWHC** Whater holding capacity of the soil

**Value**

The function generates a data frame containing the following components:

cumRAIN:

DEMAND:

RUNOFF:

ERATIO:

AVAIL:

**References**

Allen, R.G.; Pereira, L.S.; Raes, D.; Smith, M. Crop Evapotranspiration: Guidelines for Computing Crop Water Requirements; FAO Irrigation and Drainage Paper no. 56; FAO: Rome, Italy, 1998; ISBN 92-5-104219-5.

Doorenbos, J. and Pruitt, W.O. 1975. Guidelines for predicting crop water requirements, Irrigation and Drainage Paper 24, Food and Agriculture Organization of the United Nations, Rome, 179 p.

**Examples**

```
data(climateData)

Eto.daily <- calcEto(climateData)

climateData$Eto <- Eto.daily$ET.Daily

soilWHC = 100

watBal.daily <- calcWatBal(climateData, soilWHC)

plot(watBal.daily$ERATIO*100, ty="l")
lines(watBal.daily$Eto, col="red")
lines(watBal.daily$Rain, col="blue")
```

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climateData

*Raw Climate Data Required for Calculating Evapotranspiration*


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**Description**

A example data set contains the raw climate data including the variables required for calculating evapotranspiration in function calcEto over the period between 1/1/1980 and 12/31/1984 at Nam-pula station in Mozambique.

**Usage**

```
data(climateData)
```

**Format**

A data frame with 1827 rows and 11 variables:

Station\_ID weather station ID

Station\_Name weather station name

Lat latitude of the site in decimal degrees

Lon longitude of the site in decimal degrees

Elev elevation above sea level in (m)

Year year of record "yyyy"

Month month of record "mm"

Day day of record "dd"

Rain daily rainfall in (mm)

Tmax daily maximum temperature at 2m height in (°C)

Tmin daily minimum temperature at 2m height in (°C)

**Source**

INAM - Instituto Nacional de Meteorologia, Mozambique

**Examples**

```
data(climateData)
```

```
head(climateData)
```

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