Package 'CanopyPhotosynthesis'

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Type Package

Title Canopy photosynthesis testbed

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Description Testbed for canopy scaling and modeling of Photosynthesis and GPP

Depends XML

Suggests testthat

SystemRequirements

OS_type Windows, unix, mac

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LazyLoad yes

LazyData FALSE

RoxygenNote 5.0.1

R topics documented:

Func_Canopy_Radiation_Transfer
Func_Canopy_Radiation_Transfer

Description

Function for revised DF1997 model to partition canopy LAI into sunlit/shade leaves LAI and partition canopy Vcmax into sunlit/shade leaves Vcmax clumping index was added to original DF1997 model, following the reference from Ryu et al. 2011

Usage

```
Func_Canopy_Radiation_Transfer(FLAG, SZA, LAI, Ib0, Id0, Vcmax0_25, CI)
```

Arguments

FLAG	Model version controller; 0–Lloyd et al. 2010 Model for Vcmax-LAI relationship; 1–Mercado et al. 2006 Model for Vcmax-LAI relationship in the tropics
SZA	solar zenith angle, in degrees
LAI	Canopy leaf area index
Ib0	direct beam at canopy top
Id0	diffuse irradiance at canopy top
Vcmax0_25	Vcmax at reference 25 centi-degree for canopy top leaves
CI	Clumping inedx; 0.63 for tropical evergreen forests (Chen et al, 2005)

Details

Goal: Use revised DF1997 model to partition canopy LAI into sunlit/shade leaves LAI and partition canopy Vcmax into sunlit/shade leaves Vcmax clumping index was added to original DF1997 model, following the reference from Ryu et al. 2011

Value

List containing: PAR0 - ; Ib0 - ; Id0 - ; Lsun - Sunlit LAI; Lshade - Shade LAI; Ic - Canopy total absorbed irradiance; Isun - Sunlit leaf absorbed irradiance; Ishade - Shade leaf absorbed irradiance; Vc - Canopy total Vcmax; Vcsun - Sunlit leaf Vcmax; Vcshade - Shade leaf Vcmax

Author(s)

Jin Wu

Shawn Serbin

References

dePury and Farquhar, 1997; Ryu et al., 2011

Func_Leaf_FvCB_Photosynthesis_Model

Func_Leaf_FvCB_Photosynthesis_Model

Description

Leaf level FvCB Photosynthesis model (Farquhar et al. 1980)

Usage

```
Func_Leaf_FvCB_Photosynthesis_Model(Vcmax25, Jmax25, Tleaf, Topt, I, Ci, Press,
  PSII_in, Phi_in)
```

Arguments

Vcmax25	Vcmax at 25 degrees C
Jmax25	Jmax at 25 degrees C
Tleaf	Leaf temperature
Topt	Temperature optimum for Jmax
I	incident light
Ci	internal CO2 concentration in umols/mol or ppm
Press	Atmospheric pressure in Pa
PSII_in	Input PSII for maximum quantum yield
Phi_in	Input curvature factor for light response function

Func_Light_Partitioning

Func_Light_Partitioning

Description

Function to partitioning incident radiatoin into direct and diffuse radiation, based on the Weiss and Norman, 1985 light partitioning approach

Usage

```
Func_Light_Partitioning(SZA, P, PAR)
```

Arguments

SZA	solar zenith angle, in degrees
P	Atmospheric Pressure, in pa
PAR	measured total PAR? umol/m2/s

Details

Weiss and Norman, 1985 light partitioning approach

Value

List containing: SZA - solar zenith angle, PAR - PAR, SV - total Visible light, SN - total NIR light, Ratio - the ratio between total measured light and total modeled light, fV - fraction of visble direct beam, fN - fraction of NIR direct beam, Model_DV - direct visible light, Model_dV - diffuse visible light, Model_DN - direct NIR light, Model_dN - diffuse NIR light

Author(s)

Jin Wu

Shawn Serbin

References

Weiss and Norman, 1985

`Func_Temperature_Bernacchi`
Func_Temperature_Bernacchi

Description

Bernacchi temperature response function for photosynthesis parameters

Usage

```
Func_Temperature_Bernacchi(delta_H, c, T)
```

Arguments

`delta_H`	Activation energy
`c`	Scaling constant
`T`	leaf temperature in degrees C

Details

Bernacchi temperature response function for photosynthesis parameters

Value

temperature scale factor

Author(s)

Jin Wu

Shawn Serbin

`Func_Temperature_June` *Func_Temperature_June*

Description

June temperature response function for photosynthesis parameters

Usage

```
Func_Temperature_June(P25, Topt, T)
```

Arguments

`P25`	Vcmax/Jmax at 25 degrees C
`Topt`	Temperature optimum of Vcmax/Jmax
`T`	leaf temperature in degrees C

Details

June temperature response function for photosynthesis parameters

Author(s)

Jin Wu

Shawn Serbin

References

Bernacchi et al. 2013 and June et al. 2004

`Func_Temperature_Response` *Func_Temperature_Response*

Description

Temperature response functions for scaling leaf-level photosynthesis parameters

Usage

```
Func_Temperature_Response(V25, J25, T, Topt, Press)
```

Arguments

`J25`	Jmax at 25 degrees C
`T`	leaf temperature in degrees C
`Topt`	Temperature optimum of Vcmax/Jmax
`Press`	Atmospheric pressure in Pa
`VC25`	Vcmax at 25 degrees C

Details

Temperature response functions for scaling leaf-level photosynthesis parameters

Value

List containing: Vcmax - Vcmax at leaf temperature, Jmax - Jmax at leaf temperature, Tau_star - Tau* at leaf temperature, Kc - Kc MM constant at leaf temperature, Ko - Ko MM constant at leaf temperature, PSII - PSII at leaf temperature, Phi - Phi at leaf temperature, Rd - leaf respiration at leaf temperature, Vomax - Vomax (max oxygen evolution) at leaf temperature

Author(s)

Jin Wu

Shawn Serbin

References

Bernacchi et al., 2002, 2003, 2013

`model.options` *parse model.options.xml file used to set parameters and other options for model runs*

Description

Read model.options.xml file

Usage

```
model.options(input.file = NULL)
```

Arguments

`input.file`	model.options.xml file containing information needed for run

Author(s)

Jin Wu, Shawn P. Serbin

Examples

```
## Not run:
opt <- model.options()
model.options <- model.options('/home/$USER/model.options.xml')

## End(Not run)
```

Index