Package 'MODISFire'

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Type Package

Title Fire-Regime parameters from standard MODIS products

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Author David Frantz, Marion Stellmes

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Depends R (>= 3.2.0)

Imports rgdal

Description This package provides a small set of tools that may be used to produce fire-regime related parameters from MODIS Burned Area and MODIS Active Fire data as documented in: Stellmes, M., Frantz, D., Finckh, M., and Revermann, R. (2013). Fire frequency, fire seasonality and fire intensity within the Okavango region derived from MODIS fire products. In Oldeland, J., Erb, C., Finckh, M., and Juergens, N. (Eds.), Special Volume: Environmental Assessments in the Okavango Region, Biodiversity & Ecology 5, 351-362. DOI: 10.7809/b-e.00288.

License GPL (>= 3)

NeedsCompilation no

R topics documented:

MODISFire-package *Fire-Regime parameters from standard MODIS products*

Description

Fire-Regime parameters from standard MODIS products

Details

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Version:	1.0.0
Date:	2016-03-10
Author:	David Frantz, Marion Stellmes
Maintainer:	David Frantz <frantz@uni-trier.de>
Depends:	R (>= 3.2.0)
Imports:	rgdal
Description:	This package provides a small set of tools that may be used to produce fire-regime related parameters from MC
License:	GPL (>= 3)

Index of help topics:

Main functions: mfACTIVEFIRE, mfBURNEDAREA

Author(s)

David Frantz, Marion Stellmes

Maintainer: David Frantz <frantz@uni-trier.de>

References

Stellmes, M., Frantz, D., Finckh, M., and Revermann, R. (2013). Fire frequency, fire seasonality and fire intensity within the Okavango region derived from MODIS fire products. In Oldeland, J., Erb, C., Finckh, M., and Juergens, N. (Eds.), Special Volume: Environmental Assessments in the Okavango Region, Biodiversity & Ecology 5, 351-362. DOI: 10.7809/b-e.00288

See Also

mfACTIVEFIRE, mfBURNEDAREA

`mfACTIVEFIRE` *Derive Active Fire Products.*

Description

This function derives the Active Fire products documented in the scientific publication.
The MODIS images (MOD14A1 & MYD14A1 products) can be automatically downloaded.
This function can process multiple MODIS tiles in a batch.
The requested period of time can be specified.

Usage

```
mfACTIVEFIRE(dir.in, dir.out, download = TRUE, collection = 5,
             ylim = NULL, hlim = NULL, vlim = NULL)
```

Arguments

`dir.in`	Directory for the MODIS standard products.
`dir.out`	Directory for the derived Active Fire products.
`download`	(optional) Download the data? Defaults to TRUE.
`collection`	(optional) MODIS standard product collection number. Defaults to 5.
`ylim`	(optional) The years to be considered [2000,today]. Either NULL or 2-length vector.
`hlim`	(optional) The horizontal tiles to be considered [0,35]. Either NULL or 2-length vector.
`vlim`	(optional) The vertical tiles to be considered [0,17]. Either NULL or 2-length vector.

Details

`dir.in` must be an existing directory. All required MODIS images (MOD14A1 and MYD14A1 products in hdf format) must be placed in this directory, subdirectories are not allowed. If `download` == TRUE, the MOD14A1 and MYD14A1 products will be downloaded to this directory automatically; see details to `download` below. If `download` == FALSE, the images must be acquired prior to running this tool.

`dir.out` must be an existing directory, and will be used for the generation of the Active Fire products described in the scientific publication.

`download` enables the automatic download of the requested MODIS products from the HTTP Data Pool of LP DAAC Data Pool of the LP DAAC. Existing images won't be downloaded again. Note that the URL, or the access situation may change at any time without notice, in which case the

download functionality will be broken. Note that server maintenance is scheduled weekly, which will temporariliy disable the download functionality. Internet access is required.

The method was developed with `collection` 5 data. It may be possible to also process data from other collections, though we do not guarantee this.

The requested period of time may be specified with `ylim`. Note that MODIS was commissioned in 2000, which is the allowed minimum, the current year is the allowed maximum. If `ylim` is not specified, all available data will be considered.

The requested spatial extent may be specified with `hlim`, and `vlim`. These numbers refer to the Sinusoidal Tile Grid used by the MODIS land products. If none of these parameters is specified, all available data will be considered, i.e. global coverage. Note that this will take considerable time.

Output

1] Fire counts
ACTIFIRE-hxxvxx-02-2_1M.dat: Fire [0/1] per month?
ACTIFIRE-hxxvxx-03-2_1Y.dat: # of fire-months per year
ACTIFIRE-hxxvxx-03-3_1Y.dat: Fire [0/1] per year?
ACTIFIRE-hxxvxx-04-2_OA.dat: # of fire-months in complete time-series
ACTIFIRE-hxxvxx-04-3_OA.dat: # of fire-years in complete time series
ACTIFIRE-hxxvxx-04-4_OA.dat: Fire [0/1] in complete time-series?
ACTIFIRE-hxxvxx-05-2_1M.dat: # of fire-years per month [Jan-Dec]
ACTIFIRE-hxxvxx-03-T_1Y.dat: Month of latest fire per year

2] Fire intensity
ACTI-INT-hxxvxx-02-1_1M.dat: Max. FRP per month in MW
ACTI-INT-hxxvxx-03-1_1Y.dat: Max. FRP per year in MW
ACTI-INT-hxxvxx-03-2_1Y.dat: Sum of FRP per year in MW
ACTI-INT-hxxvxx-03-3_1Y.dat: Mean of FRP per year in MW
ACTI-INT-hxxvxx-04-1_OA.dat: Max. FRP in complete time series in MW
ACTI-INT-hxxvxx-04-2_OA.dat: Sum of FRP in complete time series in MW
ACTI-INT-hxxvxx-04-3_OA.dat: Mean of FRP in complete time series in MW
ACTI-INT-hxxvxx-05-1_OA.dat: Max. FRP per month [Jan-Dec] in MW
ACTI-INT-hxxvxx-05-2_OA.dat: Sum of FRP per month [Jan-Dec] in MW
ACTI-INT-hxxvxx-05-3_OA.dat: Mean of FRP per month [Jan-Dec] in MW

3] Invalid observations
ACTIQUAL-hxxvxx-02-0_1M.dat: % of invalid data per month
ACTIQUAL-hxxvxx-03-0_1Y.dat: % of invalid data per year
ACTIQUAL-hxxvxx-04-0_OA.dat: % of invalid data in complete time-series
ACTIQUAL-hxxvxx-05-0_1M.dat: % of invalid data per month [Jan-Dec]

4] Date-Files
DATELIST-hxxvxx-02-0_1M.txt: List of all available months
DATELIST-hxxvxx-03-0_1Y.txt: List of all available years
DATELIST-hxxvxx-05-0_1M.txt: List of all months [Jan-Dec]

Acknowledgements

The MOD14A1/MYD14A1 products are retrieved from the Data Pool, courtesy of the NASA EOS-DIS Land Processes Distributed Active Archive Center (LP DAAC), USGS/Earth Resources Observation and Science (EROS) Center, Sioux Falls, South Dakota, https://lpdaac.usgs.gov/data_access/data_pool.

Warning

It has to be noted that this function may not be working on a standard Windows installation. MODIS data are distributed in the Hierarchical Data Format, version 4. To our knowledge, there exists no R package with native HDF4 support in Windows. This function relies on the rgdal package for reading the MODIS data, and rgdal must be built with HDF4 support. This is standard in Linux builds, but not in Windows. Note that we cannot provide support for building rgdal. We encourage the user to use a Linux system. :

Author(s)

David Frantz

References

Stellmes, M., Frantz, D., Finckh, M., and Revermann, R. (2013). Fire frequency, fire seasonality and fire intensity within the Okavango region derived from MODIS fire products. In Oldeland, J., Erb, C., Finckh, M., and Juergens, N. (Eds.), Special Volume: Environmental Assessments in the Okavango Region, Biodiversity & Ecology 5, 351-362. DOI: 10.7809/b-e.00288

Giglio, L., Descloitres, J., Justice, C.O., Kaufman, Y.J. (2003): An Enhanced Contextual Fire Detection Algorithm for MODIS. Remote Sensing of Environment 87: 273-282. DOI: 10.1016/S0034-4257(03)00184-6

See Also

mfBURNEDAREA

Examples

```
## Not run:
# Download and Process the full global time series.
# Not adviced, though.
mydir1 <- "path-for-download"
mydir2 <- "path-for-products"
mfACTIVEFIRE(mydir1, mydir2)

# Download and Process the full Southern African time series.
mfACTIVEFIRE(mydir1, mydir2, hlim=c(19,21), vlim=c(9,12))

# same as last, but only use data from 2005-2010
mfACTIVEFIRE(mydir1, mydir2, hlim=c(19,21), vlim=c(9,12), ylim=c(2005,2010))
```

```
# same as last, without download.
# images were acquired otherwise.
mfACTIVEFIRE(mydir1, mydir2, download=FALSE, hlim=c(19,21), vlim=c(9,12), ylim=c(2005,2010))


## End(Not run)
```

---

mfBNAMES *Add bandnames to ENVI header*

Description

This function adds/replaces bandnames to an existing ENVI header file (*.hdr).
This function is called by the higher level routines, e.g. mfACTIVEFIRE and \codemfBURNEDAREA.

Usage

```
mfBNAMES(image, names, num = TRUE)
```

Arguments

image	Filename of the corresponding image; with *.dat extension.
names	Vector with bandnames.
num	Number the band names? Defaults to TRUE.

Details

Make sure that the number of band names matches the number of bands in the image.

Note

In most cases, there shouldn't be a need to call this function.

Author(s)

David Frantz

`mfBURNEDAREA` *Derive Burned Area Products.*

Description

This function derives the Burned Area products documented in the scientific publication.
The MODIS images (MCD45A1 product) can be automatically downloaded.
This function can process multiple MODIS tiles in a batch.
The requested period of time can be specified.

Usage

```
mfBURNEDAREA(dir.in, dir.out, download = TRUE, collection = 5,
             ylim = NULL, hlim = NULL, vlim = NULL)
```

Arguments

`dir.in`	Directory for the MODIS standard products.
`dir.out`	Directory for the derived Burned Area products.
`download`	(optional) Download the data? Defaults to TRUE.
`collection`	(optional) MODIS standard product collection number. Defaults to 5.
`ylim`	(optional) The years to be considered [2000,today]. Either NULL or 2-length vector.
`hlim`	(optional) The horizontal tiles to be considered [0,35]. Either NULL or 2-length vector.
`vlim`	(optional) The vertical tiles to be considered [0,17]. Either NULL or 2-length vector.

Details

`dir.in` must be an existing directory. All required MODIS images (MCD45A1 products in hdf format) must be placed in this directory, subdirectories are not allowed. If `download` == TRUE, the MCD14A1 products will be downloaded to this directory automatically; see details to `download` below. If `download` == FALSE, the images must be acquired prior to running this tool.

`dir.out` must be an existing directory, and will be used for the generation of the BUrned Area products described in the scientific publication.

`download` enables the automatic download of the requested MODIS products from the HTTP Data Pool of LP DAAC Data Pool of the LP DAAC. Existing images won't be downloaded again. Note that the URL, or the access situation may change at any time without notice, in which case the download functionality will be broken. Note that server maintenance is scheduled weekly, which will temporariliy disable the download functionality. Internet access is required.

The method was developed with `collection` 5 data. It may be possible to also process data from

other collections, though we do not guarantee this.

The requested period of time may be specified with `ylim`. Note that MODIS was commissioned in 2000, which is the allowed minimum, the current year is the allowed maximum. If `ylim` is not specified, all available data will be considered.

The requested spatial extent may be specified with `hlim`, and `vlim`. These numbers refer to the Sinusoidal Tile Grid used by the MODIS land products. If none of these parameters is specified, all available data will be considered, i.e. global coverage. Note that this will take considerable time.

Output

1] Fire counts
BURNAREA-hxxvxx-02-2_1M.dat: Fire [0/1] per month?
BURNAREA-hxxvxx-03-2_1Y.dat: # of fire-months per year
BURNAREA-hxxvxx-03-3_1Y.dat: Fire [0/1] per year?
BURNAREA-hxxvxx-04-2_OA.dat: # of fire-months in complete time-series
BURNAREA-hxxvxx-04-3_OA.dat: # of fire-years in complete time series
BURNAREA-hxxvxx-04-4_OA.dat: Fire [0/1] in complete time-series?
BURNAREA-hxxvxx-05-2_1M.dat: # of fire-years per month [Jan-Dec]
BURNAREA-hxxvxx-03-T_1Y.dat: Month of latest fire per year

2] Invalid observations
BURNQUAL-hxxvxx-02-0_1M.dat: % of invalid data per month
BURNQUAL-hxxvxx-03-0_1Y.dat: % of invalid data per year
BURNQUAL-hxxvxx-04-0_OA.dat: % of invalid data in complete time-series
BURNQUAL-hxxvxx-05-0_1M.dat: % of invalid data per month [Jan-Dec]

3] Date-Files
DATELIST-hxxvxx-02-0_1M.txt: List of all available months
DATELIST-hxxvxx-03-0_1Y.txt: List of all available years
DATELIST-hxxvxx-05-0_1M.txt: List of all months [Jan-Dec]

Acknowledgements

The MCD45A1 product is retrieved from the Data Pool, courtesy of the NASA EOSDIS Land Processes Distributed Active Archive Center (LP DAAC), USGS/Earth Resources Observation and Science (EROS) Center, Sioux Falls, South Dakota, https://lpdaac.usgs.gov/data_access/ data_pool.

Warning

It has to be noted that this function may not be working on a standard Windows installation. MODIS data are distributed in the Hierarchical Data Format, version 4. To our knowledge, there exists no R package with native HDF4 support in Windows. This function relies on the rgdal package for reading the MODIS data, and rgdal must be built with HDF4 support. This is standard in Linux builds, but not in Windows. Note that we cannot provide support for building rgdal. We encourage the user to use a Linux system. :

Author(s)

David Frantz

References

Stellmes, M., Frantz, D., Finckh, M., and Revermann, R. (2013). Fire frequency, fire seasonality and fire intensity within the Okavango region derived from MODIS fire products. In Oldeland, J., Erb, C., Finckh, M., and Juergens, N. (Eds.), Special Volume: Environmental Assessments in the Okavango Region, Biodiversity & Ecology 5, 351-362. DOI: 10.7809/b-e.00288

Roy, D.P. , Lewis, P.E. , Justice, C.O. (2002). Burned area mapping using multi-temporal moderate spatial resolution data - a bi-directional reflectance model-based expectation approach. Remote Sensing of Environment 83: 263-286. DOI: 10.1016/S0034-4257(02)00077-9

Roy, D.P. , Jin, Y. , Lewis, P.E. , Justice, C.O. (2005). Prototyping a global algorithm for systematic fire-affected area mapping using MODIS time series data. Remote Sensing of Environment 97: 137-162. DOI: 10.1016/j.rse.2005.04.007

See Also

mfACTIVEFIRE.

Examples

```
## Not run:
# Download and Process the full global time series.
# Not adviced, though.
mydir1 <- "path-for-download"
mydir2 <- "path-for-products"
mfBURNEDAREA(mydir1, mydir2)

# Download and Process the full Southern African time series.
mfBURNEDAREA(mydir1, mydir2, hlim=c(19,21), vlim=c(9,12))

# same as last, but only use data from 2005-2010
mfBURNEDAREA(mydir1, mydir2, hlim=c(19,21), vlim=c(9,12), ylim=c(2005,2010))

# same as last, without download.
# images were acquired otherwise.
mfBURNEDAREA(mydir1, mydir2, download=FALSE, hlim=c(19,21), vlim=c(9,12), ylim=c(2005,2010))


## End(Not run)
```

---

mfDOWNLOAD *Download of MODIS data.*

Description

This function automatically downloads MODIS products.
This function is called by the higher level routines, e.g. `mfACTIVEFIRE` and `mfBURNEDAREA`.

Usage

```
mfDOWNLOAD(url, archive, t0 = NULL, t1 = NULL, h0 = NULL, h1 = NULL,
                         v0 = NULL, v1 = NULL, natt = NULL, tatt = NULL)
```

Arguments

`url`	URL to the product in the MODIS Data Pool, e.g., "http://e4ftl01.cr.usgs.gov/MOLT/MOD14A1.005/".
`archive`	Directory for storing the downloaded data.
`t0`	(optional) First date to be downloaded, must be given in YYYYMMDD format.
`t1`	(optional) Last date to be downloaded, must be given in YYYYMMDD format.
`h0`	(optional) First horizontal tile to be considered.
`h1`	(optional) Last horizontal tile to be considered.
`v0`	(optional) First vertical tile to be considered.
`v1`	(optional) Last vertical tile to be considered.
`natt`	(optional) Number of attempts for server connections (default=10).
`tatt`	(optional) Halting time between failed server connections in seconds (default=60).

Details

Specified products are automatically downloaded from the HTTP Data Pool of LP DAAC Data Pool of the LP DAAC. Existing images won't be downloaded again. Note that the access situation may change at any time without notice, in which case the download functionality will be broken. Note that server maintenance is scheduled weekly, which will temporariliy disable the download functionality. Internet access is required.

The requested period of time may be specified with `t0` and `t1`. If `t0` and `t1` is not specified, all available data will be considered.

The requested spatial extent may be specified with `h0` and `h1`, and `v0` and `v1`. These numbers refer to the Sinusoidal Tile Grid used by the MODIS land products. If none of these parameters is specified, all available data will be considered, i.e. global coverage. Note that this will take considerable time.

Acknowledgements

MODIS products are retrieved from the Data Pool, courtesy of the NASA EOSDIS Land Processes Distributed Active Archive Center (LP DAAC), USGS/Earth Resources Observation and Science (EROS) Center, Sioux Falls, South Dakota, https://lpdaac.usgs.gov/data_access/data_pool.

Author(s)

David Frantz

`mfENVIHDR` *Write ENVI header*

Description

This function writes a basic ENVI header.
This function is called by the higher level routines, e.g. `mfACTIVEFIRE` and \ codemfBURNEDAREA.

Usage

```
mfENVIHDR(image, ny, nx, nb, dt, bo, desc)
```

Arguments

`image`	Filename of the corresponding image; with *.dat extension.
`ny`	Number of rows.
`nx`	Number of columns.
`nb`	Number of bands.
`dt`	ENVI datatype.
`bo`	Band Interleave. `bandorder` %in% c("bsq", "bil", "bip").
`desc`	Description string.

Details

Make sure that the arguments match with the image properties.

Note

In most cases, there shouldn't be a need to call this function.

Author(s)

David Frantz

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