

Table of Contents

heatload 1

heatload

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The function uses aspect, slope and latitude of the plot and calculates heat load or radiation according to equations published by Keon & McCune (2002).

Note: prior to 4/16/2019, the definition of this function had a bug and returned incorrect values; thanks to Tsung-Yi Lin (林宗儀) for noticing the problem and fixing it!

[heatload.r](#)

```
# Function heatload
# Calculates heatload or potential annual direct incident radiation,
# using the formulas published in
# McCune & Keon (2002) based on aspect, slope and latitude.
# Arguments:
# aspect - aspect of the plot, vector (either in degrees, or radians)
# slope - inclination of the plot, vector (in degrees)
# latitude - latitude of the plot, either vector of the same length as
# aspect or slope, or single value (in case that all plots are from the
# same relatively small region)
# method - default is "heatload", alternative is "radiation".
# units - default id "degrees", alternative is "radians".
# equation - the number of equation (1, 2 or 3); default is 3.
# Author: David Zeleny & Tsung-Yi Lin
heatload <- function (aspect, slope, latitude, method = 'heatload',
units = 'degrees', equation = 3)
{
  if (units == 'degrees') # convert degrees to radians
  {
    aspect <- aspect/180*pi
    slope <- slope/180*pi
    aspect[slope == 0] <- 0
    latitude <- latitude/180*pi
  }
  A <- if (method == 'heatload') abs (pi - abs (aspect - (5*pi/4)))
else pi - abs (aspect-pi)
  S <- slope
  L <- if (length (latitude) == 1) rep (latitude, length (A)) else
latitude
  if (equation == 1) res <- exp (-1.467 +1.582*cos(L)*cos(S)
-1.500*cos(A)*sin(S)*sin(L) -0.262*sin(L)*sin(S) +0.607*sin(A)*sin(S))
  if (equation == 2) res <- exp (-1.236 +1.350*cos(L)*cos(S)
-1.376*cos(A)*sin(S)*sin(L) -0.331*sin(L)*sin(S) +0.375*sin(A)*sin(S))
  if (equation == 3) res <- +0.339 +0.808*cos(L)*cos(S)
-0.196*sin(L)*sin(S) - 0.482*cos(A)*sin(S)
  return (res)
}
```

```
}
```

Example of the use on the dataset `grasslands.env` (acidophilous grasslands in Trebic region, Czech Republic). The `grasslands.env` contains variables `aspect`, `slope` and `latitude`, all in degrees. Dataset represents small plots (16-25m²) located on convex outcrops in the agricultural landscape, covered by seminatural grassland vegetation.

source

```
('http://anadat-r.davidzeleny.net/doku.php/en:customized_functions:heatload?do=export_code&codeblock=0') # reads the function definition from above
grasslands.env <- read.delim
('https://raw.githubusercontent.com/zdealveindy/anadat-r/master/data/grasslands-env.txt') # loads the file
# Calculate heat load and add it to the grasslands.env data.frame:
grasslands.env$heatload <- heatload (aspect = grasslands.env$aspect, slope =
grasslands.env$slope, latitude = grasslands.env$latitude)
```

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