

# Package ‘RadioSonde’

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**Title** Tools for Plotting Skew-T Diagrams and Wind Profiles

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**Description** A

collection of programs for plotting SKEW-T,log p diagrams and wind profiles for data collected by radiosondes (the typical weather balloon-borne instrument). The format of this plot with companion lines to assess atmospheric stability are both standard in meteorology and difficult to create from basic graphics functions. Hence this package. One novel feature is being able add several profiles to the same plot for comparison. Use ```help(ExampleSonde)``` for an explanation of the variables needed and how they should be named in a data frame. See <https://github.com/dnychka/Radiosonde> for the package home page.

**License** GPL (>= 2)

**URL**

**Depends** R (>= 4.0), fields

**Repository** CRAN

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## Description

The R data frames `sonde1` and `sonde2` are examples of high resolution (vertical) soundings of the atmosphere. The balloons were launched on July 4, 2015 02:59:33 and 04:59:23 (UTC) as part of the PECAN field study lead by the National Center for Atmospheric Research ( see [https://www.eol.ucar.edu/field\\_projects/pecan](https://www.eol.ucar.edu/field_projects/pecan). Refer to the Data Access tab on the PECAN home page to download the data collected during this study where "upper air" indexes radiosonde observations. The interest in this close spacing was to compare how the vertical structure of the atmosphere changed at this location in the Northwest corner of Kansas (-101.370712,39.357468) over a short amount of time.

These data frames contain the following named components:

<code>time</code>	Time in seconds from the ballon's release, a numeric vector.
<code>press</code>	Pressure (mb), a numeric vector
<code>temp</code>	Dry-bulb Temperature (deg. C), a numeric vector
<code>dewpt</code>	Dew point temperaure (deg. C), a numeric vector
<code>rh</code>	Relative humidity (%), a numeric vector
<code>uwind</code>	East-West component of the wind, a numeric vector
<code>vwind</code>	North-South component of the wind, a numeric vector
<code>wspd</code>	wind speed (m/s), a numeric vector
<code>dir</code>	Wind direction, a numeric vector
<code>dz</code>	rate of ascent in m/s
<code>lon</code>	Longitude, a numeric vector
<code>lat</code>	Latitude, a numeric vector
<code>az</code>	azimuth (angle along horizon), a numeric vector
<code>alt</code>	altitude (m), a numeric vector
<code>qp</code>	QC flag for pressure, a numeric vector
<code>qt</code>	QC flag for temperature, a numeric vector
<code>qh</code>	QC flag for humidity, a numeric vector
<code>qu</code>	QC flag for U component, a numeric vector
<code>qv</code>	QC flag for V component, a numeric vector
<code>quv</code>	QC flag for ascension rate, a numeric vector

## Details

Raw ( ascii/text) data files are in the github RadioSonde R package repository <https://github.com/dnychka/Radiosonde>. along with the R script that converts to a data frame useful in R. The NCAR/PECAN original data files are those ending in the extention `.eol` and are the standard format for radiosonde profiles collected by this lab. Note that in this proccess the original variable names were converted to those used in this package. E.g. `Press` changes to `press`. Also the metadata units that are in the header of the original file is included as an *attribute* in the R versions.

**Examples**

```

data(sonde1)

# look at the metadata
cat( attributes( sonde1)$metaData, fill=TRUE)

# and the units
cat( attributes( sonde1)$units, fill=TRUE)

skewtPlot( sonde1, winds=TRUE)

data(sonde2)
# skewt with wind barbs.

skewtPlot( sonde1, sonde2, winds=TRUE)

```

---

plotWind

*Winds Profile Plot*


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**Description**

Creates a wind profile in the standard atmospheric notation. Each full barb = 10 m/s, half barb = 5 m/s, and a filled triangle for 50 m/s. The maximum wind speed that can be plotted without amending the program is 65 m/s.

**Usage**

```

plotWind(sondeData, sizeBarb = NULL, ylim = c(1050, 100),
         thin=NULL, legend = FALSE, lwd=1, col="green4",
         axis=TRUE)

```

**Arguments**

sondeData	Data frame for sounding data, must have components for wind speed <code>wspd</code> , wind direction <code>dir</code> , and pressure <code>press</code> .
sizeBarb	change the thickness of the plotted lines
thin	Max number of wind barbs to draw.
axis	If TRUE add an axis in pressure.
col	Color of barbs
lwd	Line width for barbs
ylim	Plot extent, in units of pressure. Note this is a reversed axis.
legend	explains wind barb convention

**Details**

the dataframe must have components for wind speed `wspd`, wind direction `dir`, and pressure `press`. Missing values may be coded as either NA or 999. and are not plotted.

The standard atmospheric wind symbol is a vector of fixed length with barbs proportional to wind speed. A full barb for each 10 m/s, half barbs for 5 m/s and a triangular barb for 50 m/s.

**Value**

None – creates a plot.

**Author(s)**

Doug Nychka, Eric Gilleland

**See Also**

[skewtPlot](#), [station.symbol](#)

**Examples**

```
# Example 1:
data(sonde1)

plotWind(sonde1, sizeBarb =1.0, legend=TRUE )
```

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skewt.lines

*Overlays data on a SKEW-T, log p axis*

---

**Description**

Overlays observations as lines on a SKEW-T, log p axis (as created by `skewt.axis`).

**Usage**

```
skewt.lines(temp, pressure, ...)
```

**Arguments**

<code>temp</code>	Temperature in degrees C.
<code>pressure</code>	Pressure in millibars
<code>...</code>	Any graphical arguments

**Details**

`skewt.lines` overlays observations on a SKEW-T, log p axis

**See Also**[skewtPlot](#)


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skewtPlot	<i>A skewt plot wind wind barbs.</i>
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**Description**

Creates a SKEW-T, log p diagram with dry-bulb temperature and dewpoint temperature traces versus (log) pressure. Optionally plots the vertical wind profile using wind barbs.

**Usage**

```
skewtPlot(
  ..., winds = FALSE, colTemp = c("grey40", "blue2"),
        colDew = colTemp, lty = c(1, 1), lwd = 1.5, windplot =
        NULL, windAxis = FALSE, sizeBarb = NULL, thin = NULL,
        magicRatio = 13, skewplot = NULL, mar.skewt = c(3.1,
        5.1, 4.1, 2.1)
)
```

**Arguments**

...	One or more data frames where rows indexes the time ( or height) and the columns are the variables measured. The variables must be names as: c( "press", "temp", "dewpt") corresponding to pressure (hPa), temperature (C) and dew point temperature (C).
winds	If TRUE will add wind barbs to the side of the skewt plot.
colTemp	Colors(s) to plot temperature.
colDew	Colors(s) to plot dew point temperature.
lty	Line type for the plotted curves.
lwd	Line width for the curves.
skewplot	Vector of 4 figure coordinates that define the skewt plot portion of figure. By default c( 0, magicRatio/(magicRatio + L), 0, 1).
windplot	A matrix of the 4 figure coordinates where each row defines the figure region for the wind barbs.
windAxis	If TRUE include a height axis alongside the wind barbs.
sizeBarb	Controls relative size of the wind barbs.
thin	Total number of equally selected wind barbs to plots. This avoids too much overplotting.
mar.skewt	Margins for the labels of the skewt plot.
magicRatio	Relative space in horizontal for the skewt plot and the panel with vertical wind barbs.

## Details

We recommend that the plots be drawn using the the pdf output device with a 8 by 6 inch size.

## Author(s)

Doug Nychka, Eric Gilleland, Tim Hoar, Kate Young

## References

1. Department of Defense, 1969, "USAF SKEW-T, log p DIAGRAM," DOD-WPC-9-16-1, Aeronautical Chart and Information Center, United States Air Force, St. Louis, Missouri 63118.
2. List, R.J. (editor), 1958, *Smithsonian Meteorological Tables*, Smithsonian Institute, Washington, D.C.
3. Nordquist, W.S., 1973, "Numerical Approximations of Selected Meteorological Parameters for Cloud Physics Problems," ECOM-5475, Atmospheric Sciences Laboratory, US Army Electronics Command, White Sands Missile Range, New Mexico 88002.
4. Stipanuk, G.S., 1973, "Algorithms for Generating a SKEW-T, log p Diagram and Computing Selected Meteorological Quantities," American Sciences Laboratory, US Army Electronics Command, White Sands Missile Range, New Mexico 88002.

## See Also

[skewt.lines](#)

## Examples

```
data(sonde1)
# skewt with wind barbs.

skewtPlot( sonde1, winds=TRUE)

# mulitple profiles

data(sonde2)
skewtPlot( sonde1, sonde2)
```

---

station.symbol

*Adds a meteorological surface station annotation to a plot.*

---

## Description

Adds a meteorological surface station annotation at the given coordinates. The annotation includes speed and direction of the wind, temperature, pressure, dewpoint ... to a given plot.

**Usage**

```
station.symbol(  
cx, cy, direction = 0, speed = NA, fill = rep(0,  
length(cx)), temp = NA, press = NA, dewpt = NA, circle  
= TRUE, cex = 1, spdcolor = "green", lwd = 2  
)
```

**Arguments**

cx	x coordinate for location of the annotation.
cy	y coordinate for the annotation.
direction	Wind direction.
speed	Wind speed.
fill	Fill for visibility: 0 = clear skies, 1 = 25% obscured, 2 = 50% obscured, 3 = 75% obscured, 4 = no visibility
temp	Temperature value to plot symbol (must be a scalar). If NULL then no temperature value will be annotated.
press	Pressure value to plot symbol (must be a scalar). If NULL then no pressure value will be annotated.
dewpt	Dewpoint Temperature value to plot symbol (must be a scalar). If NULL then no dewpoint value will be annotated.
circle	If TRUE, will plot the usual station symbol with a circle at its base.
cex	Usual plotting parameter.
spdcolor	Glyph color
lwd	barb line width

**Author(s)**

Doug Nychka, Eric Gilleland

**See Also**

[plotWind](#)

**Examples**

```
plot(0:1, 0:1, type="n")  
station.symbol(0.5, 0.5, direction=130, speed=30, fill=3,  
temp=31, press=987, dewpt=26, cex=5)  
title("Wind Barb")
```

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