rdwd - an R package to select, download and read climate data from the German Weather Service

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github.com/brry/rdwd

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- Too much for manual inspection
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Screenshot of FTP server:

Index von ftp://ftp-cdc.dwd.de/pub/CDC/observations_germany/climate/daily/more_precip/recent/

In den übergeordneten Ordner wechseln

Name	Größe	Zuletzt verändert
BESCHREIBUNG_obsgermany_climate_daily_more_precip_recent_de.pdf	67 KB	25.04.2016 00:00:00
DESCRIPTION_obsgermany_climate_daily_more_precip_recent_en.pdf	66 KB	25.04.2016 00:00:00
RR_Tageswerte_Beschreibung_Stationen.txt	1094 KB	27.01.2017 09:45:00
tageswerte_RR_00015_akt.zip	5 KB	27.01.2017 05:12:00
tageswerte_RR_00019_akt.zip	6 KB	26.01.2017 00:13:00
tageswerte_RR_00020_akt.zip	6 KB	26.01.2017 00:13:00
tageswerte_RR_00021_akt.zip	6 KB	26.01.2017 00:13:00
tageswerte_RR_00022_akt.zip	6 KB	26.01.2017 00:13:00
tageswerte_RR_00023_akt.zip	6 KB	26.01.2017 13:17:00
tageswerte_RR_00041_akt.zip	6 KB	26.01.2017 13:17:00
tageswerte_RR_00044_akt.zip	6 KB	26.01.2017 13:17:00
tageswerte_RR_00053_akt.zip	6 KB	27.01.2017 06:33:00

R saves the day

R package `rdwd` $->$ easy usage of the datasets

Overview

- Motivation
- Usage
- Applications
- Community

Usage

- get URL
- download
  - read
  - plot
  - map

U1/5: Get dataset URL with `selectDWD`

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```
library("rdwd")
```

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```
link <- selectDWD("Potsdam", res="daily",
                  var="kl", per="recent")
```

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```

```
## ftp://ftp-cdc.dwd.de/pub/CDC/observations_germany/
## /climate/daily/kl/recent/tageswerte_KL_03987_akt.zip
```

U2/5: Download dataset with `dataDWD`

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```
file <- dataDWD(link, read=FALSE)
```

```
##  dataDWD -> dirDWD: creating directory 'C:/Users/boessenkool/Dropbox/Public/rdwd/presentation/DWDdata'
##  dataDWD -> fileDWD: creating 1 file:  'daily_kl_recent_tageswerte_KL_03987_akt.zip'
```

U2/5: Download dataset with dataDWD

```
file <- dataDWD(link, read=FALSE)
```

```
##  dataDWD -> dirDWD: creating directory 'C:/Users/boessenkool/Dropbox/Public/rdwd/presentation/DWDdata'
##  dataDWD -> fileDWD: creating 1 file:  'daily_kl_recent_tageswerte_KL_03987_akt.zip'
```

```
file
```

```
## [1] "daily_kl_recent_tageswerte_KL_03987_akt.zip"
```

U3/5: Unzip file and read + convert data with `readDWD`

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```
clim <- readDWD(file)
```

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```
clim <- readDWD(file)
```

```
str(clim)
```

```
## 'data.frame': 550 obs. of  18 variables:
##  $ STATIONS_ID             : int  3987 3987 3987 3987 3987 3987 3987 3987 3987 3987 ...
##  $ MESS_DATUM              : POSIXct, format: "2015-08-02" "2015-08-03" ...
##  $ QUALITAETS_NIVEAU       : int  3 3 3 3 3 3 3 3 3 3 ...
##  $ LUFTTEMPERATUR          : num  22.4 23.8 25.8 20.6 25.2 27.8 24.5 22.5 25.3 25.8 ...
##  $ DAMPFDRUCK              : num  11.7 13.3 15.7 15.4 15.8 17.4 18.6 15.3 17.7 19.1 ...
##  $ BEDECKUNGSGRAD          : num  4.5 2 2.9 4.9 3.6 3.4 4.4 2.3 3.3 4 ...
##  $ LUFTDRUCK_STATIONSHOEHE : num  1007 1006 1002 1007 1004 ...
##  $ REL_FEUCHTE             : num  46.8 49.4 52.4 66.2 54.1 ...
##  $ WINDGESCHWINDIGKEIT     : num  3 3 5 3.4 3.4 4 4.3 3.5 3.8 3.8 ...
##  $ LUFTTEMPERATUR_MAXIMUM  : num  30 32.3 35.3 26.3 34.6 37.6 33.3 29.5 33.5 33.1 ...
##  $ LUFTTEMPERATUR_MINIMUM  : num  15.1 14 18.4 16.4 16.1 21.2 19.2 16.6 17.1 19.4 ...
##  $ LUFTTEMP_AM_ERDB_MINIMUM: num  11.6 11.7 16.1 14.9 13.5 18.1 17.8 15.5 16.1 18.7 ...
##  $ WINDSPITZE_MAXIMUM      : num  8.1 9.2 17.3 9.1 9.6 9.1 12.5 8.2 8.4 11.7 ...
##  $ NIEDERSCHLAGSHOEHE      : num  0 0 4.1 0 0 0 0.1 0 0 0 ...
##  $ NIEDERSCHLAGSHOEHE_IND  : int  0 0 6 0 0 0 6 0 0 0 ...
##  $ SONNENSCHEINDAUER       : num  13.4 14.4 11.6 10.7 13.3 ...
##  $ SCHNEEHOEHE             : int  0 0 0 0 0 0 0 0 0 0 ...
##  $ eor                     : Factor w/ 1 level "eor": 1 1 1 1 1 1 1 1 1 1 ...
```

U4/5: Data can be plotted with regular R code

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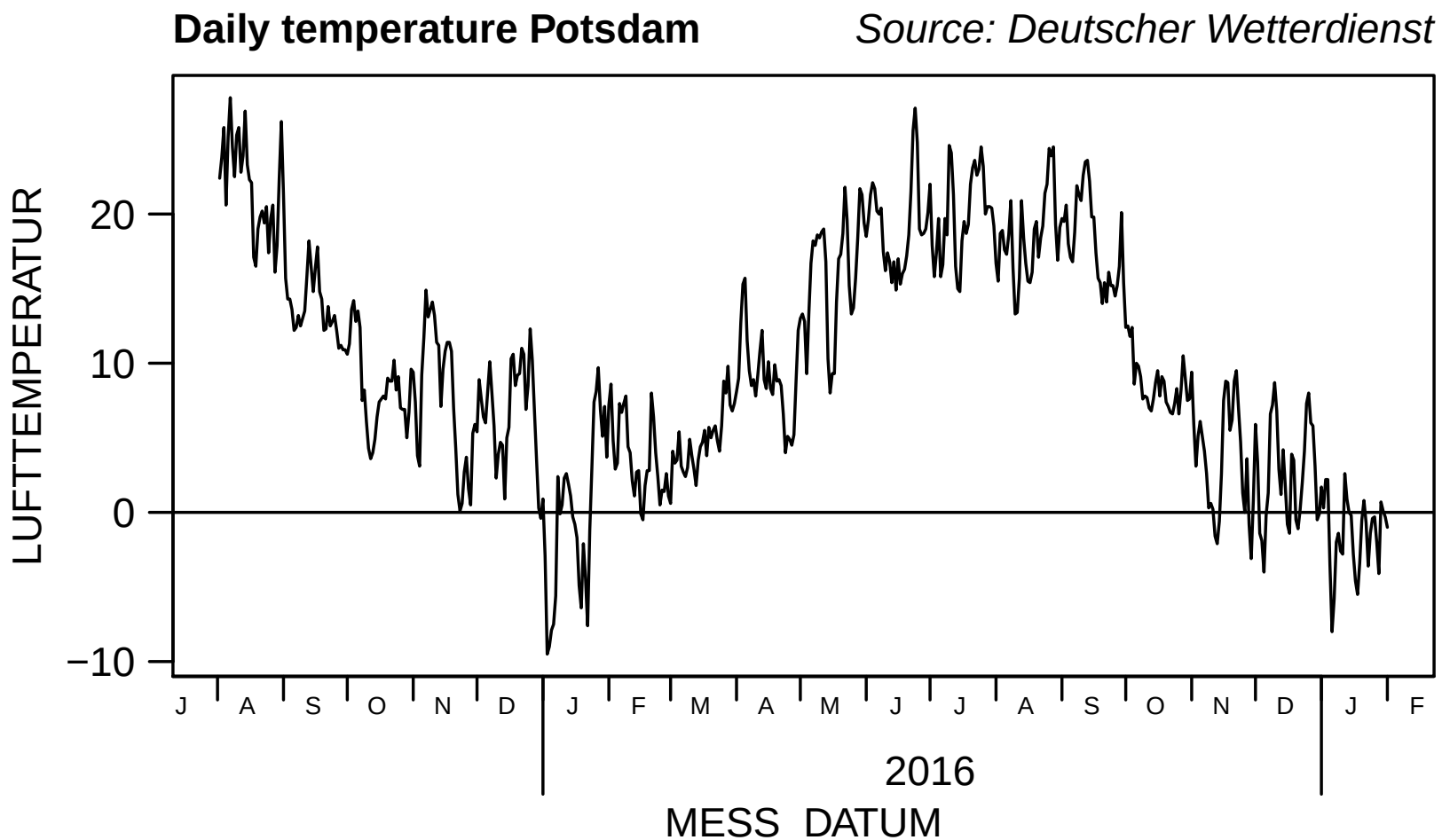
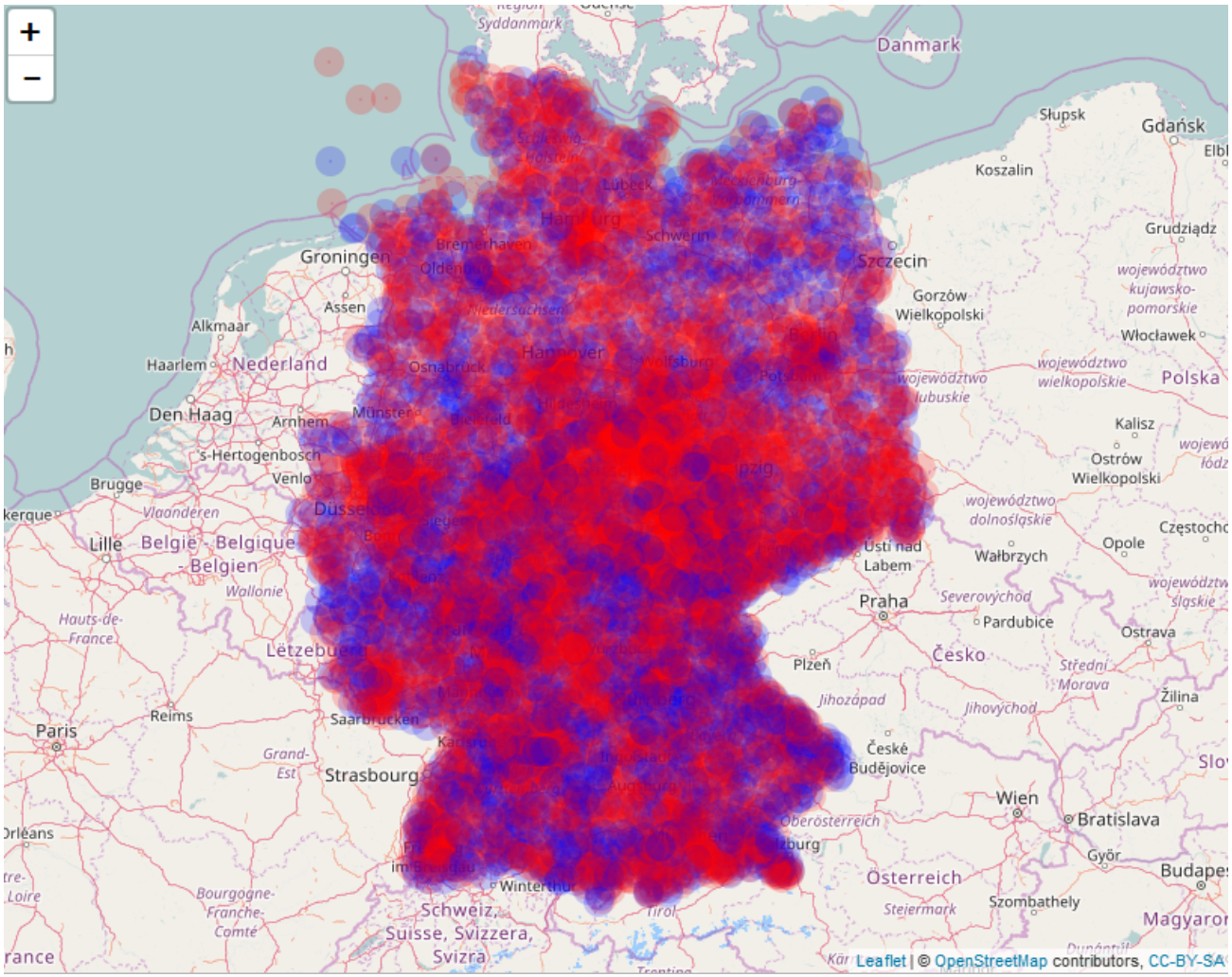
```
plot(clim[,c(2,4)], type="l", xaxt="n", las=1)
berryFunctions::monthAxis(ym=TRUE)   ;   abline(h=0)
```

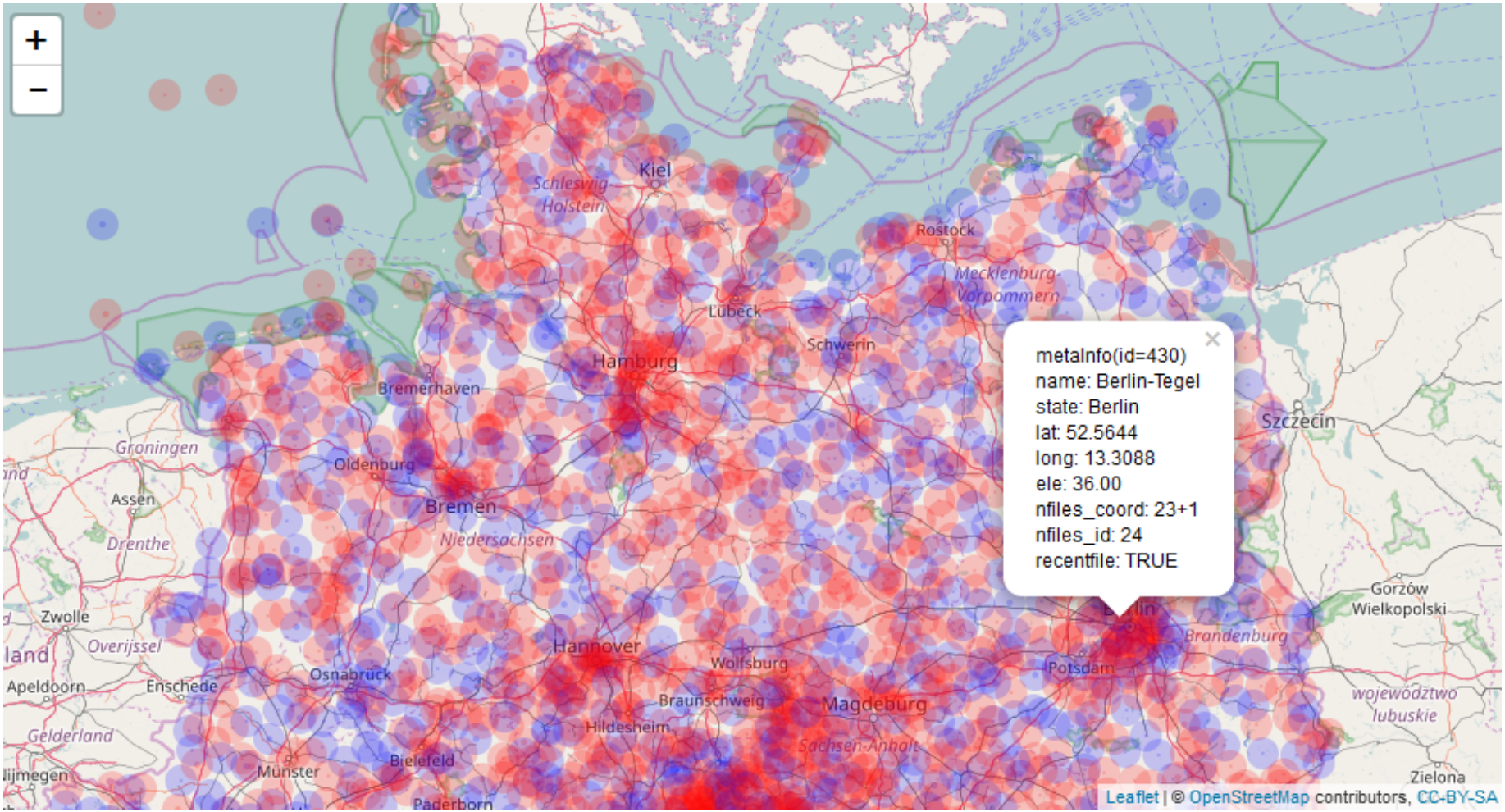


U5/5: Interactive map (local)

```
vignette("mapDWD", package="rdwd")
```



U5/5: Interactive map (CRAN)



Applications

- climate graph
- event analysis
- rainfall extremes

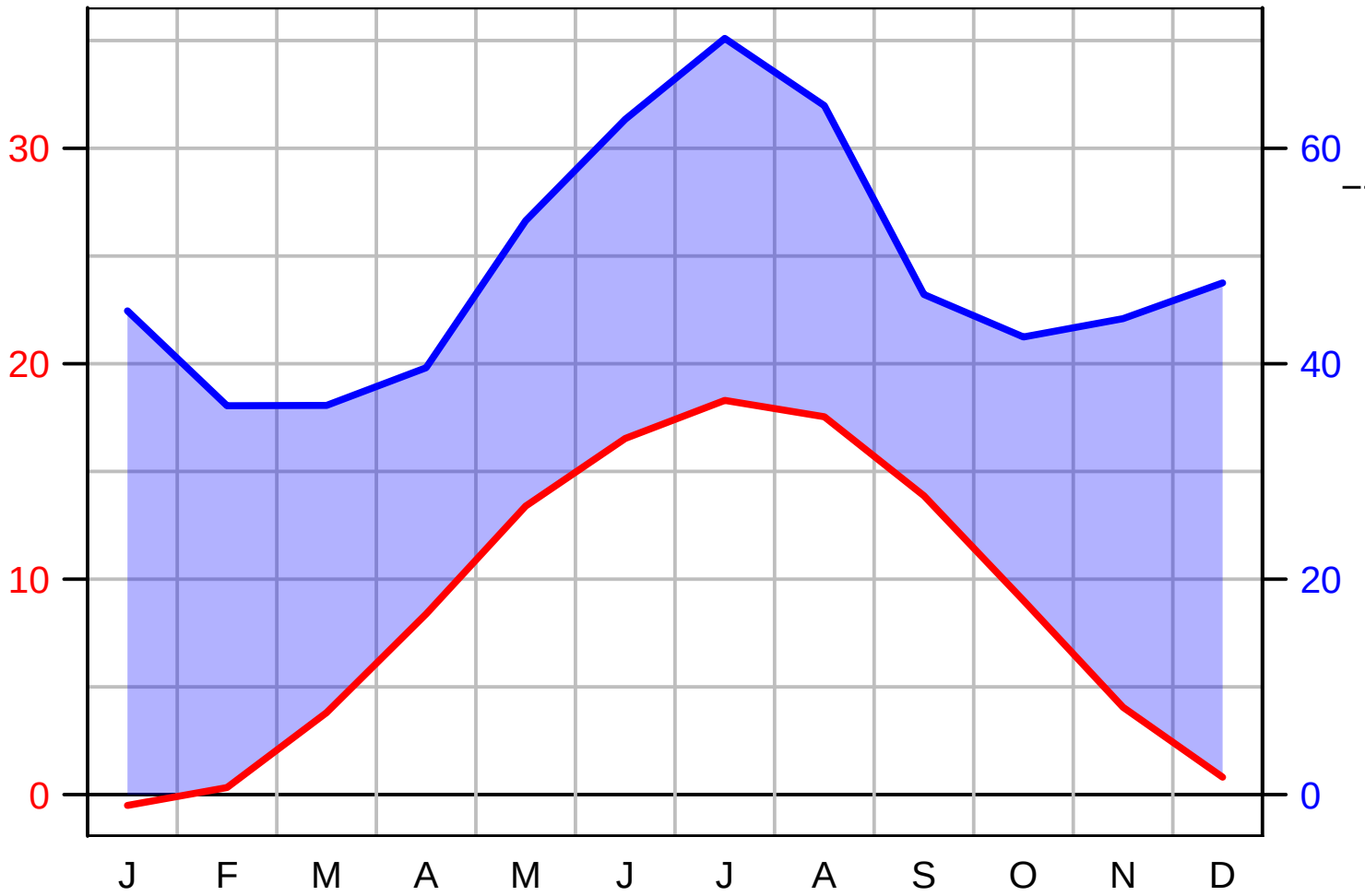
A1/3: Long term climate graph (Potsdam 1893:2015)

```
clim <- dataDWD(selectDWD("Potsdam", res="monthly",
                          var="kl", per="h"))
clim$month <- substr(clim$MESS_DATUM_BEGINN,5,6)
temp <- tapply(clim$LUFTTEMPERATUR, clim$month, mean)
prec <- tapply(clim$NIEDERSCHLAGSHOEHE, clim$month, mean)
berryFunctions::climateGraph(temp, prec, main="")
```

A1/3: Long term climate graph (Potsdam 1893:2015)

Ø 8.8 °C

∑ 587.5 mm



m	T °C	P mm
J	−0.5	45
F	0.3	36
M	3.8	36
A	8.4	40
M	13.4	53
J	16.5	63
J	18.3	70
A	17.5	64
S	13.9	46
O	9.0	42
N	4.1	44
D	0.8	48

A2/3: Flashflood event rainfall analysis (Taskforce report)

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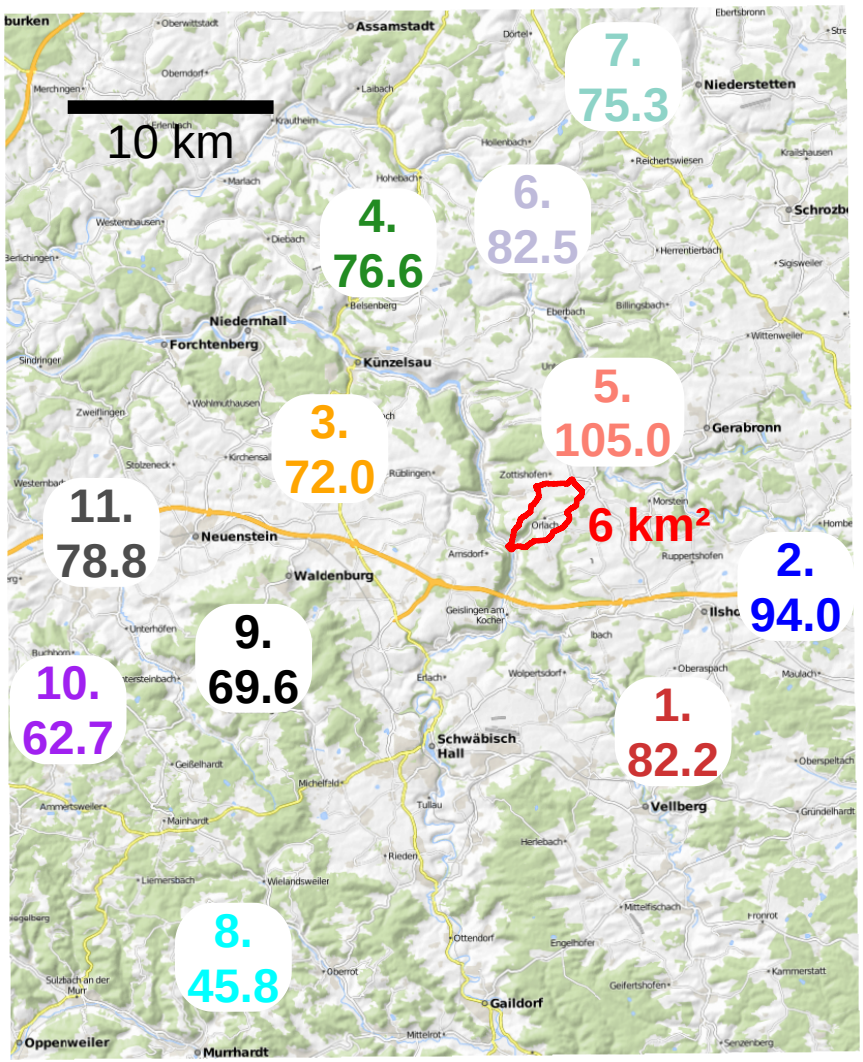
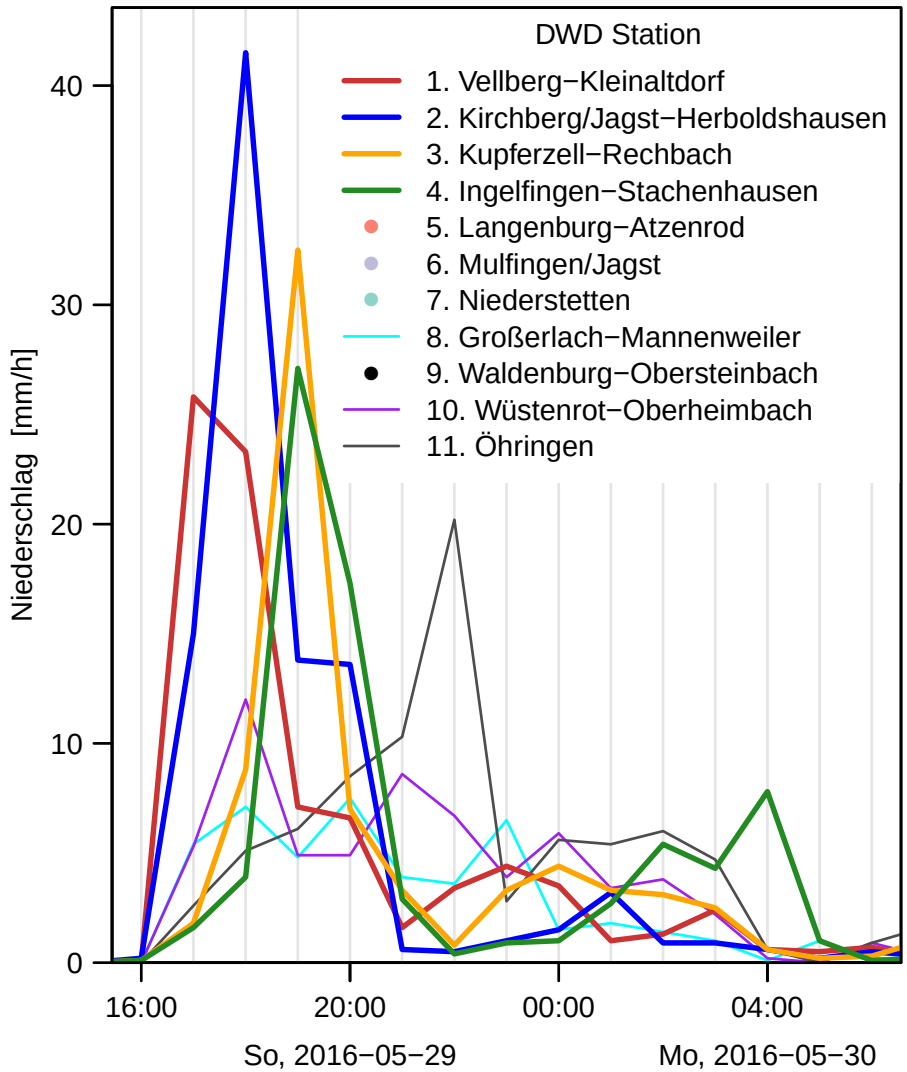
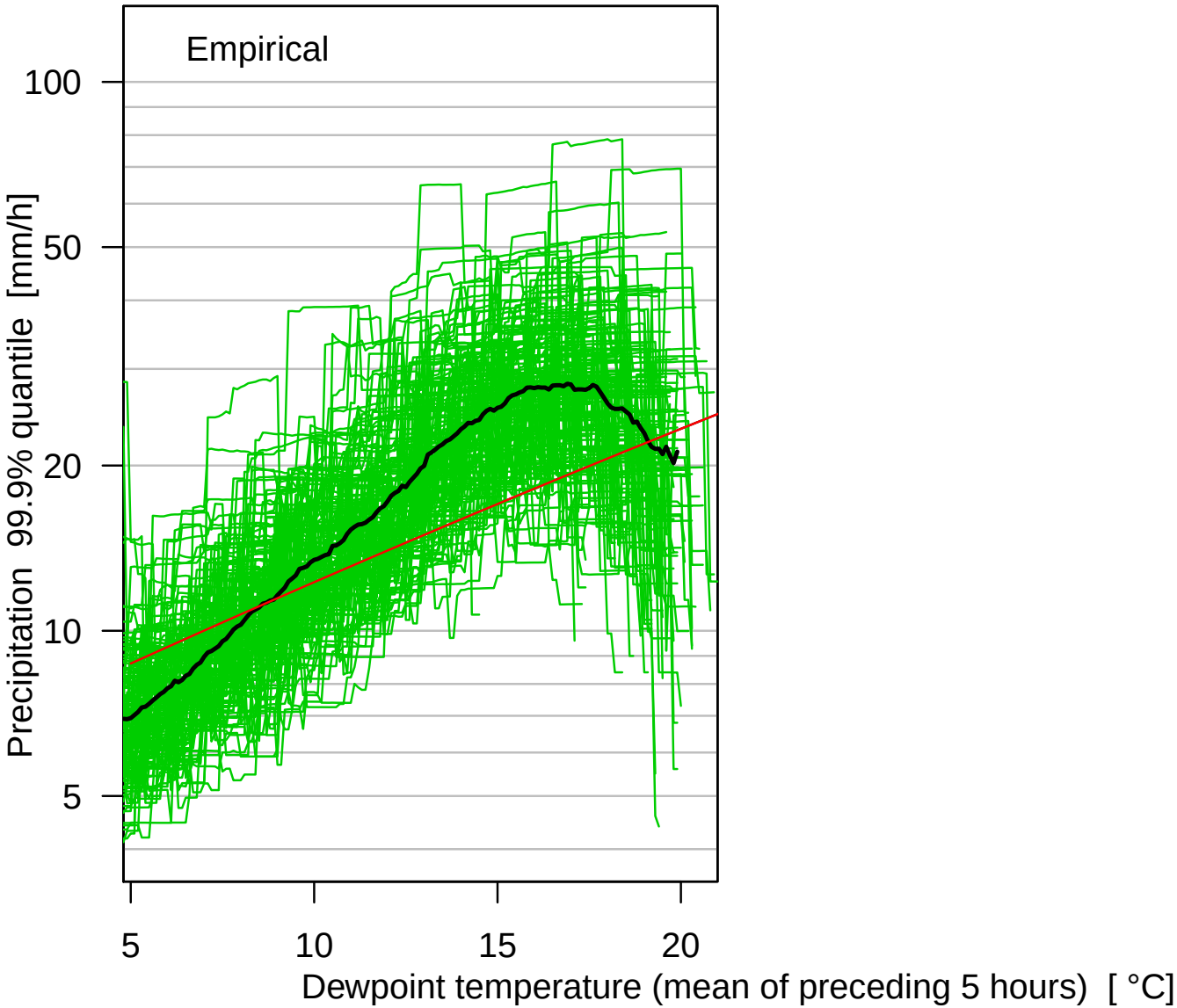
DWD−Stationen bei Braunsbach



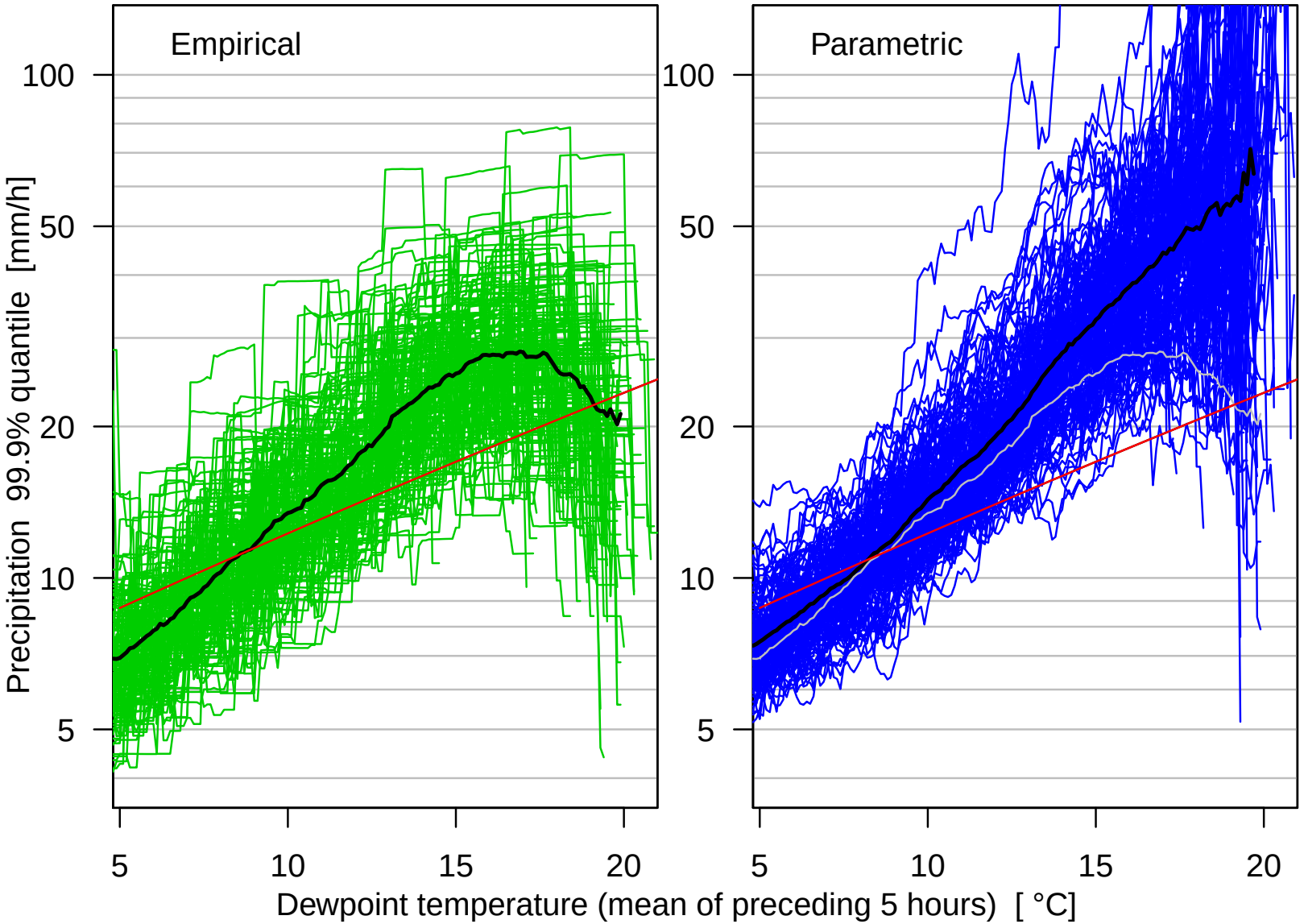
Niederschlagsverlauf



A3/3: Extreme rainfall over temperature (github.com/brry/prectemp)



A3/3: Extreme rainfall over temperature (github.com/brry/prectemp)



The FOSS community role

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- Stackoverflow for programming help
- Lobbying DWD into publishing tax-paid data
- Package distribution infrastructure (CRAN)
- `leaflet` interactive map really easy to create

Conclusion

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- FOSS is awesome
- DWD is awesome
- Usage of the data is easy with `rdwd`