Spatial Visualisations

First maps in R

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Monday, October 20, 2014

Outline

Preparations

- Create a new directory - for this course
- Start Rstudio
- Open a new script and save it in your directory

Preparations

Write a header like this one:

```
1  ###################################
2  # Spatial Mannheim
3  # Jan-Philipp Kolb
4  # 17.10.2014
5  #
6  # Choropleths
7  #
8  ###################################
9
```

Preparations

- Copy the adress of your new directory to your script
- Change the backslashs to slashs
- And write the following:

```
graph.path <- "C:/Users/Kolb/Spatial"
```

Outline

R-package maps

Package 'maps'

September 22, 2014

Title Draw Geographical Maps

Version 2.3-9

Date 2014-09-22

Author Original S code by Richard A. Becker and Allan R. Wilks.
R version by Ray Brownrigg <Ray.Brownrigg@ecs.vuw.ac.nz>.
Enhancements by Thomas P Minka <tpminka@media.mit.edu>

Description Display of maps. Projection code and larger maps are in separate packages (mapproj and mapdata).

Depends R (>= 2.10.0)

LazyLoad yes

Suggests mapproj (>= 1.2-0)

License GPL-2

Maintainer Ray Brownrigg <Ray.Brownrigg@ecs.vuw.ac.nz>

http://cran.r-project.org/web/packages/maps/maps.pdf

R-package maps

Low resolution map of the world:

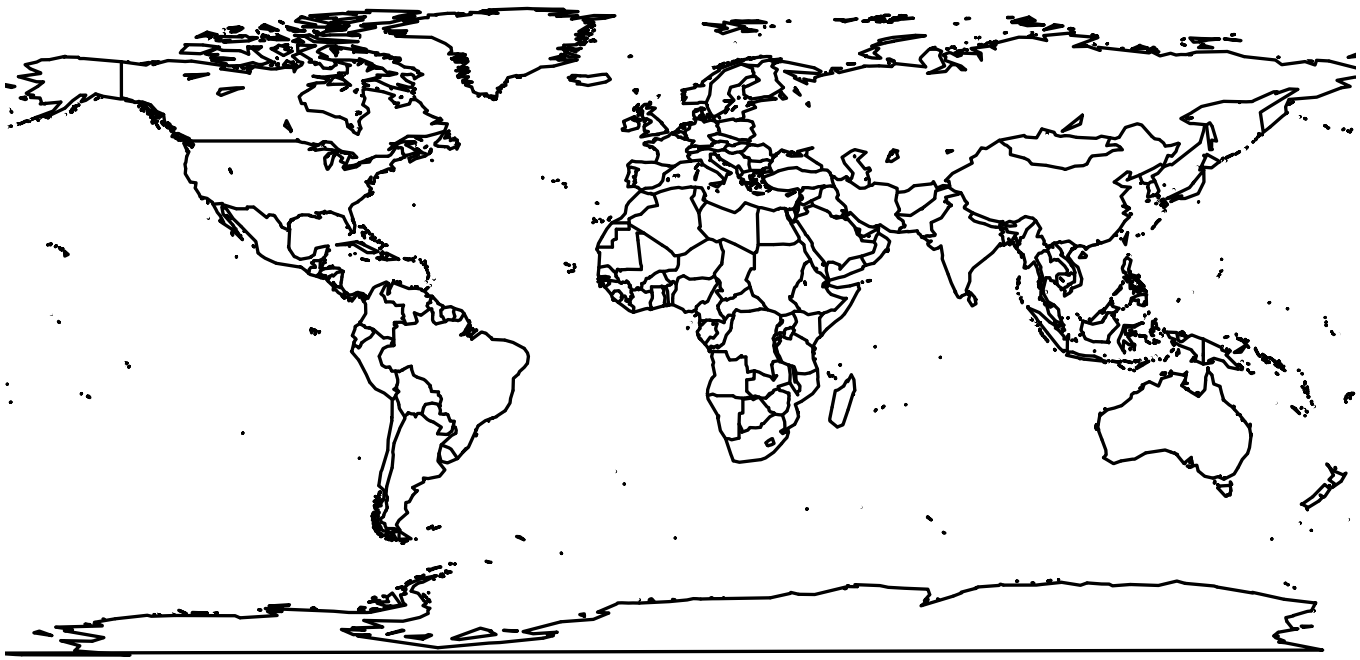
First you have to load the library:

```
library(maps)
```

Than the first command without arguments:

```
map()
```

R-package maps



How to get help

You get help for every command:

```
?map
```

map {maps} R Documentation

Draw Geographical Maps

Description

Draw lines and polygons as specified by a map database.

R-package maps

National boundaries:

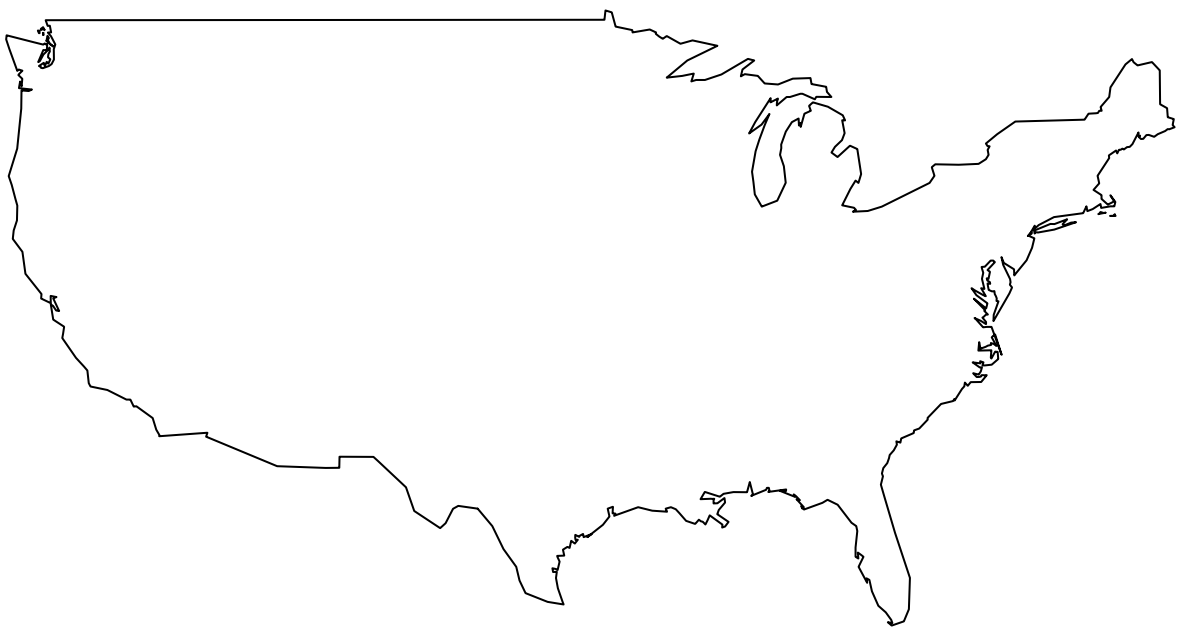
You need to do that only once:

```
library(maps)
```

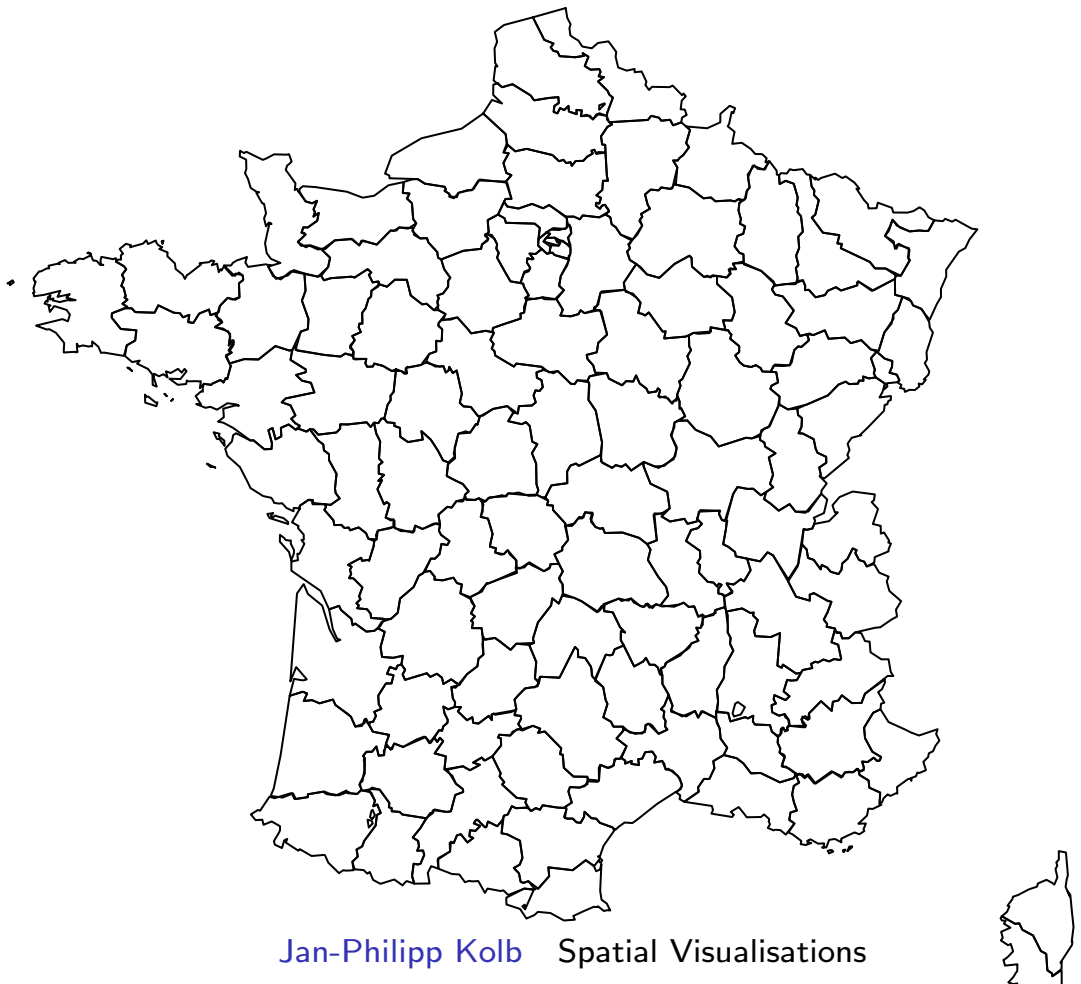
The same command with an argument:

```
map("usa")
```

R-package maps



R-package maps - France



Choropleths - package maps

There is also a map for Italy:

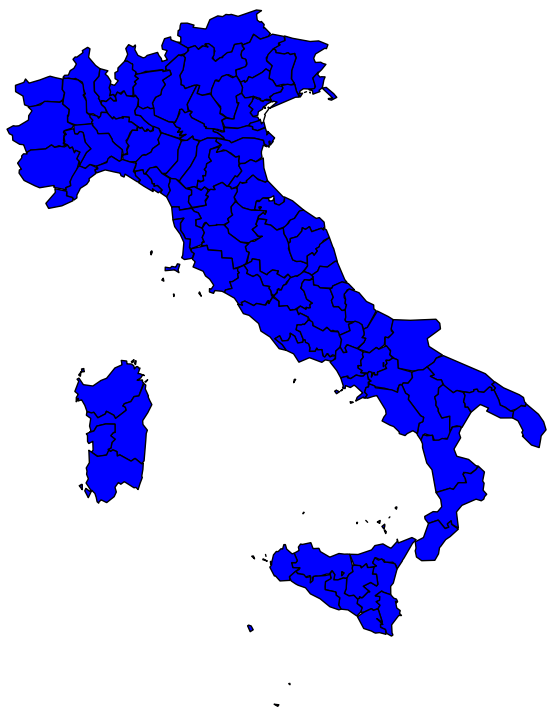
```
library(maps)
map("italy", col = "blue")
```

Get the borders in blue color:

Choropleths - package maps

If we want the areas in blue:

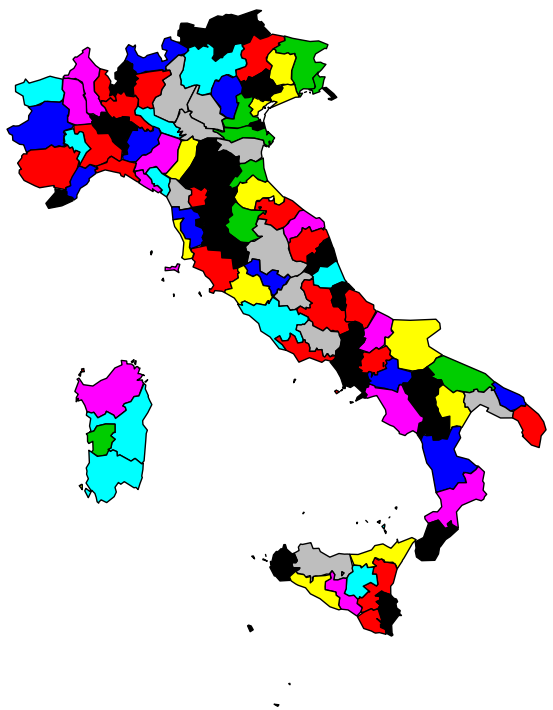
```
map("italy",fill=T, col = "blue")
```



Choropleths - package maps

We can also have different colors:

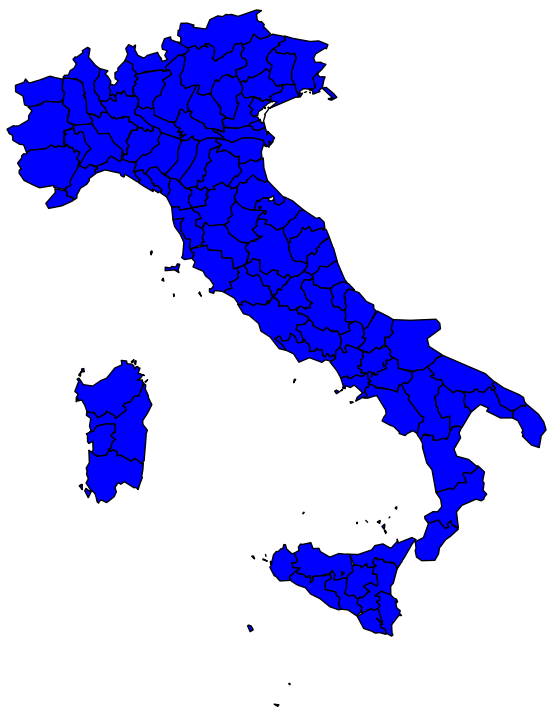
```
map("italy",fill=T, col = 1:10)
```



Choropleths - package maps

If you only type 4 you get blue:

```
map("italy",fill=T, col = 4)
```



Excursus: more colors!

You can also use the `rgb()` command to create your own colors:

```
map("italy",fill=T, col = rgb(0,1,0))
```

Try also:

```
map("italy",fill=T, col = rgb(1,0,0))
map("italy",fill=T, col = rgb(1,1,1))
map("italy",fill=T, col = rgb(1,0.5,0.4))
```

Choropleths - package maps

If you want to know, which region is at which place:

```
italy <- map("italy", plot = F)
head(italy$names)
```

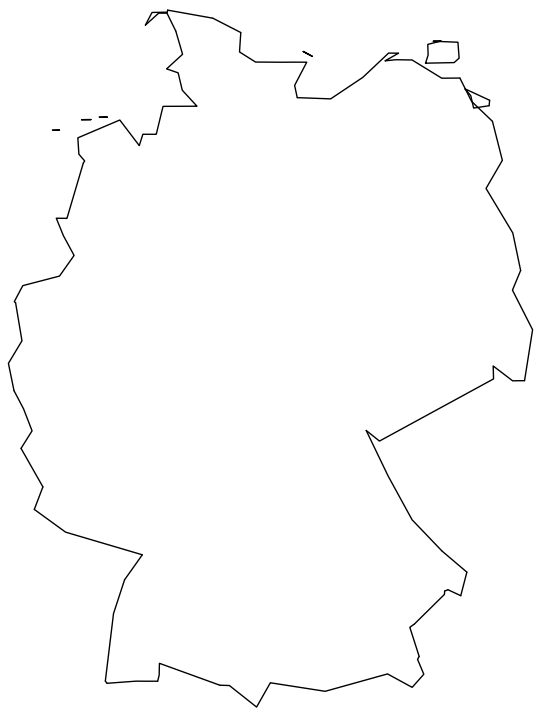
And you get the following results:

```
[1] "Bolzano-Bozen" "Belluno" "Udine" "Sondrio"
[5] "Trento" "Novara"
```

http://blog.lib.umn.edu/moor0554/canoemoore/R_Workshop_Spatial_032609.pdf

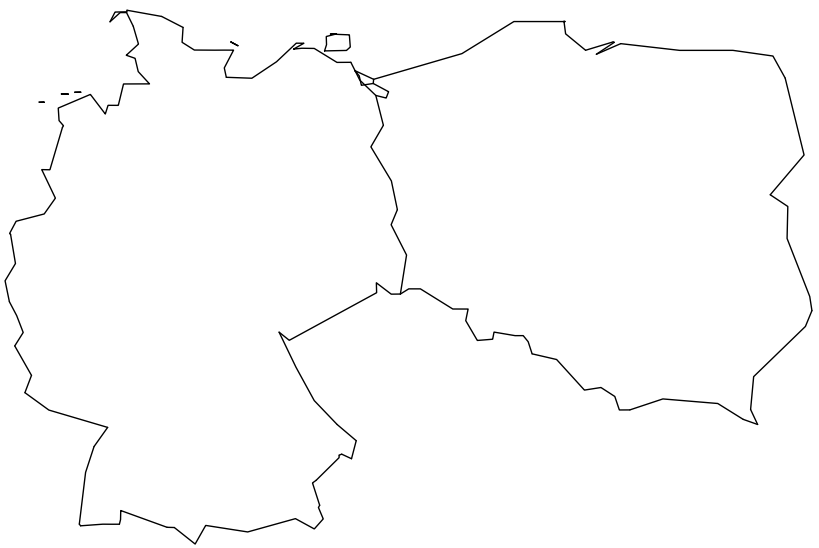
Choropleths

```
library(maps)
map("world", "Germany")
```



Choropleths - package maps - two countries

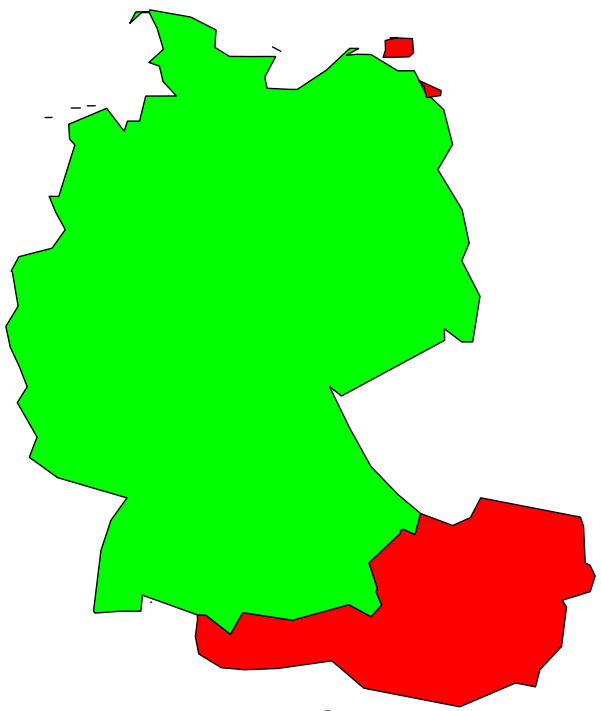
```
map("world", c("Germany","Poland"))
```



Choropleths - package maps - two countries

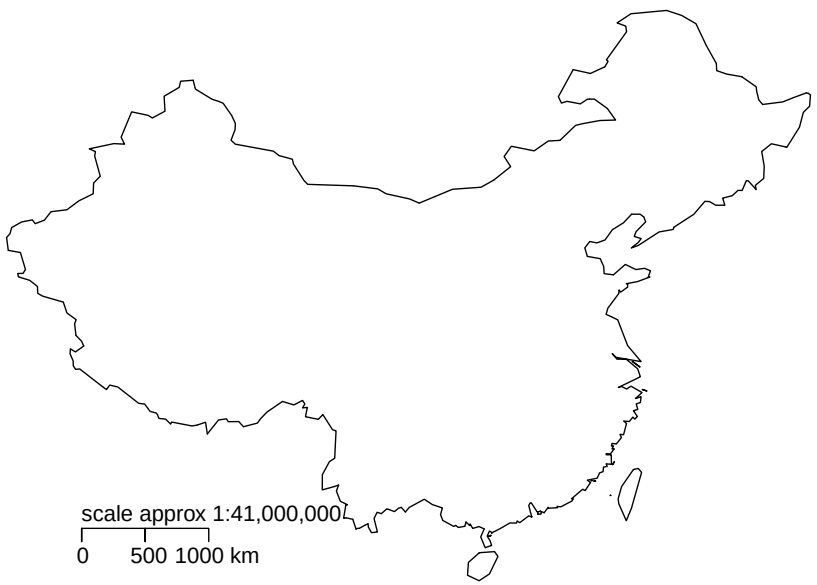
Something similar with color:

```
map("world", c("Germany","Austria"),fill=T,
col=c("red","green"))
```



Choropleths - package maps - additional features

```
map("world", "China")
map.scale()
```

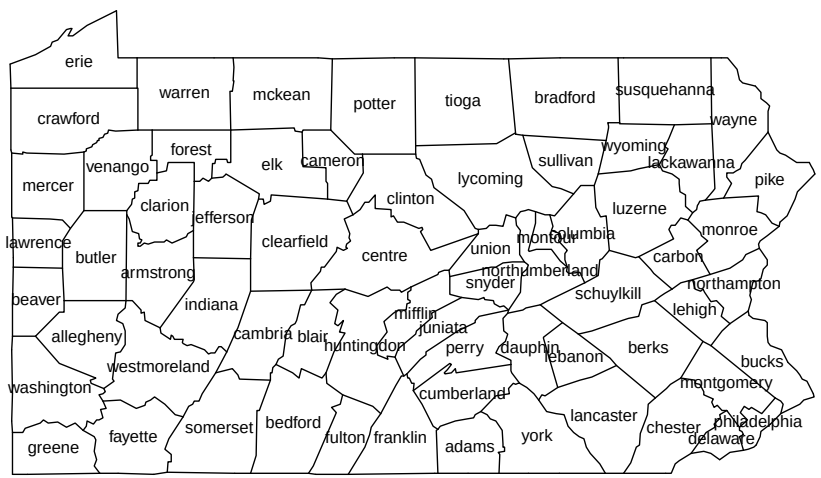


Choropleths - package maps - additional features

Like map, but labels the regions:

```
map.text("county", "penn")
```

Pennsylvania counties:



R-package maps - World cities

`data()` loads specified data sets, or lists the available data sets.

```
data(world.cities)
```

`head()` - Return the First Part of an Object

```
head(world.cities)
```

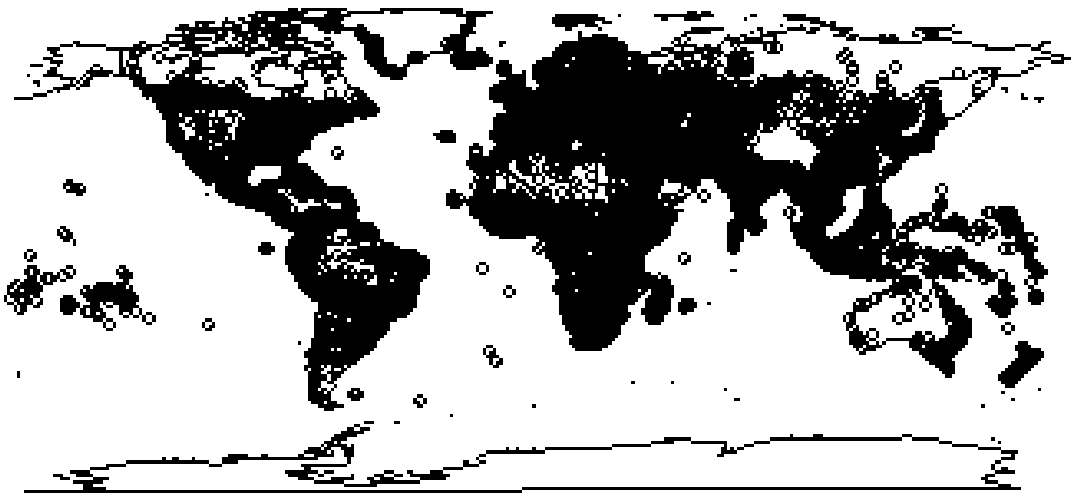
R-package maps - World cities

	name	country.etc	pop	lat	long	capital
1	'Abasan al-Jadidah	Palestine	5629	31.31	34.34	0
2	'Abasan al-Kabirah	Palestine	18999	31.32	34.35	0
3	'Abdul Hakim	Pakistan	47788	30.55	72.11	0
4	'Abdullah-as-Salam	Kuwait	21817	29.36	47.98	0
5	'Abud	Palestine	2456	32.03	35.07	0
6	'Abwein	Palestine	3434	32.03	35.20	0

R-package maps - World cities

```
map()
map.cities(world.cities)
```

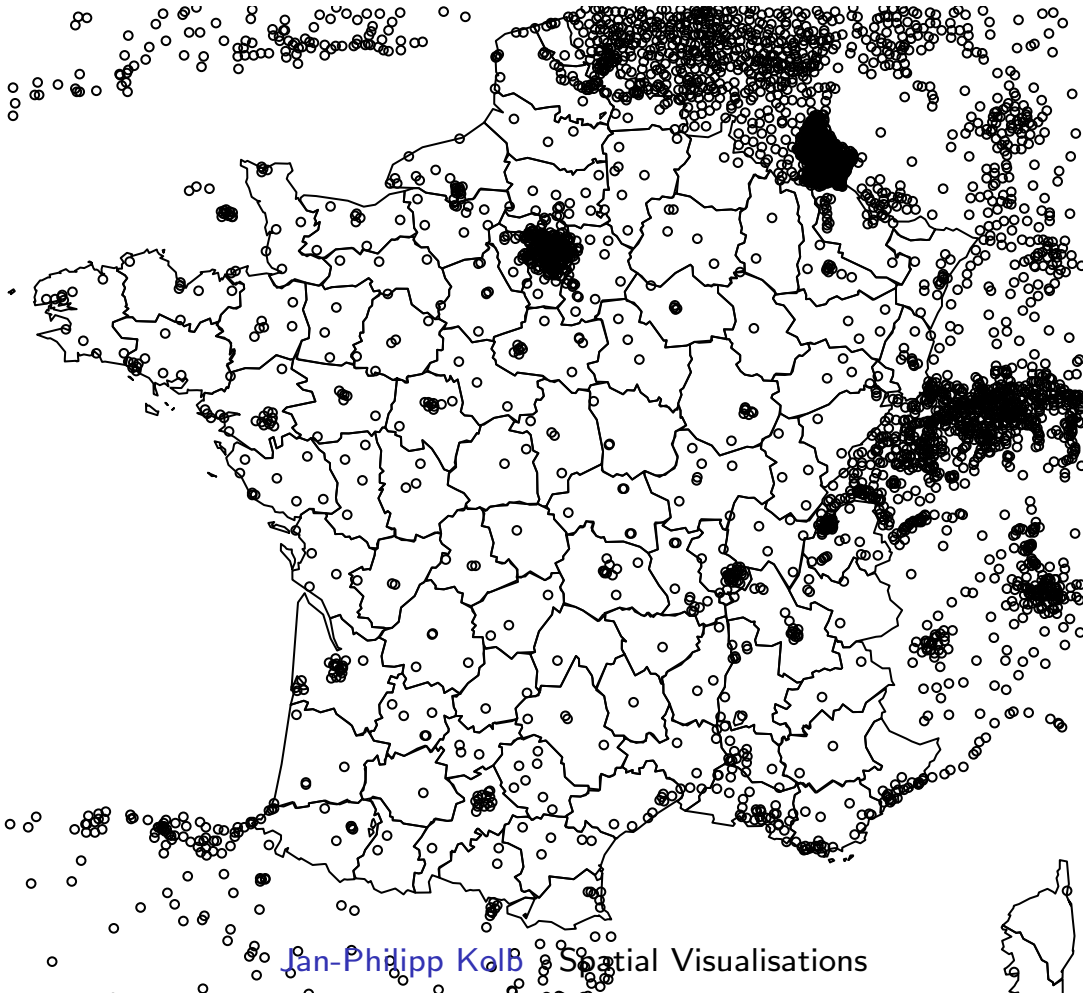
R-package maps - World cities



R-package maps - Cities france

```
data(world.cities)
map("france")
map.cities(world.cities)
```

R-package maps - Cities france



R-package maps - Cities france

We only want to have the french cities:

```
FrenchCity <- world.cities$country.etc=="France"
```

```
FCit <- world.cities[FrenchCity,]

head(FCit)
```

R-package maps - Cities france

	name	country.etc	pop	lat	long	capital
195	Abbeville	France	26656	50.12	1.83	0
318	Acheres	France	23219	48.97	2.06	0
477	Agde	France	23477	43.33	3.46	0
479	Agen	France	34742	44.20	0.62	0
643	Aire-sur-la-Lys	France	10470	50.64	2.39	0
648	Aix-en-Provence	France	148622	43.53	5.44	0

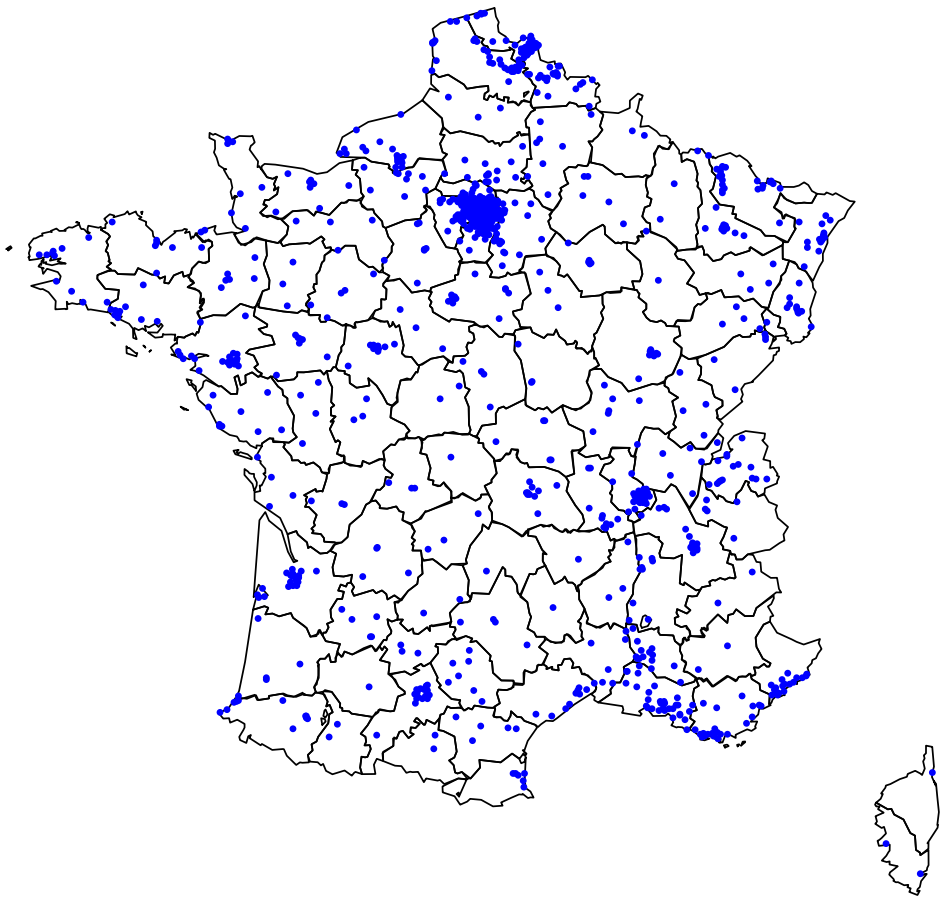
R-package maps - Cities france

Now it is possible to map only the french cities:

```
map("france")
map.cities(FCit,col="blue",pch=20)
```

pch - plotting character, i.e., symbol to use.

R-package maps - Cities france



R-package maps - Cities france

Read the dataset:

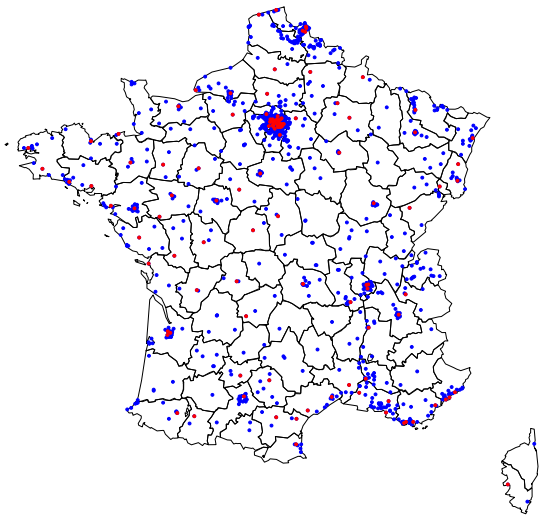
```
library(maps)
data(world.cities)
```

Create an object for the french cities:

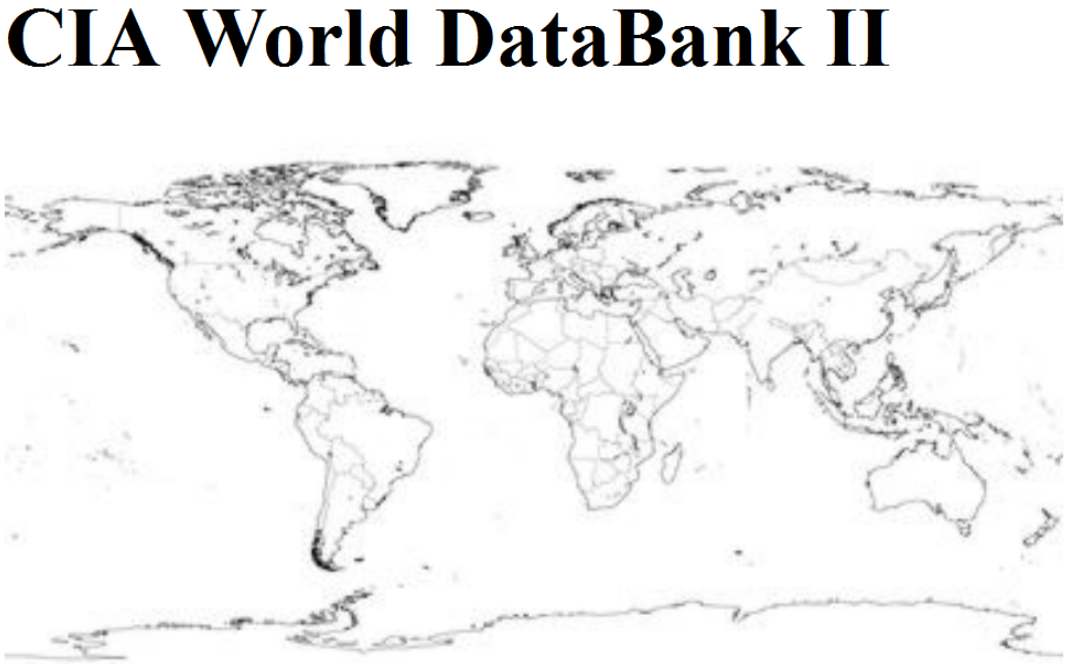
```
FCit<-world.cities[world.cities$country.etc=="France",]
FCit_Bc<-FCit[FCit$pop>50000,]
```

R-package maps - Cities france

```
map("france")
map.cities(FCit,col="blue",pch=20)
map.cities(FCit_Bc,col="red",pch=20)
```



R-package maps - data basis - CIA World DataBank II



The CIA World DataBank is a collection of world map data, consisting of vector descriptions of land outlines, rivers, / political boundaries. It was created by U.S. government in the 1980s.
`http://www.evl.uic.edu/pape/data/WDB/`

Outline

R-package maptools

Package 'maptools'

July 2, 2014

Version 0.8-30

Date 2014-06-05

Title Tools for reading and handling spatial objects

Encoding UTF-8

Depends R (>= 2.10), sp (>= 1.0-11)

Imports foreign (>= 0.8), methods, grid, lattice, stats

Suggests rgeos (>= 0.1-8), spatstat (>= 1.18), PBSmapping,RColorBrewer

Enhances maps, gpclib, RArcInfo

Description Set of tools for manipulating and reading geographic data, in particular ESRI shapefiles; C code used from shapelib. It includes binary access to GSHHG shoreline files. The package also provides interface wrappers for exchanging spatial objects with packages such as PBSmapping, spatstat, maps, RArcInfo, Stata tmap, WinBUGS, Mondrian, and others.

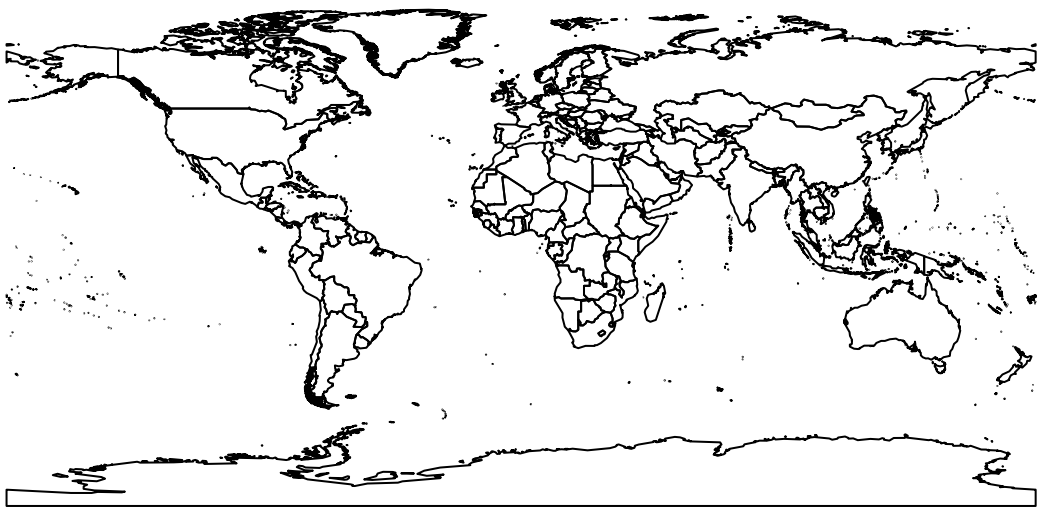
R-package maptools - World

Many roads lead to Rome....

```
data(wrld_simpl)
plot(wrld_simpl)
```

http://www.innet-project.eu/sites/default/files/Bibiko_HowToDrawAMapmap_New.pdf

R-package maptools - World



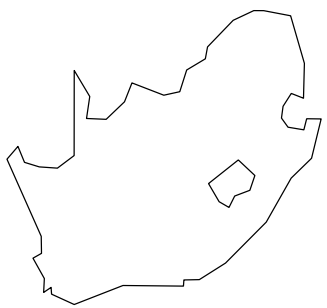
R-package maptools

- Looks like maps-package
- But there is much more information included
- The information is organized in a different way:

```
head(wrld_simpl@data)
```

R-package maptools - South Africa

```
SouthAfrica <- wrld_simpl[
wrld_simpl@data$NAME =="South Africa",]
plot(SouthAfrica)
```



R-package maptools - Poland

We create an indicator:

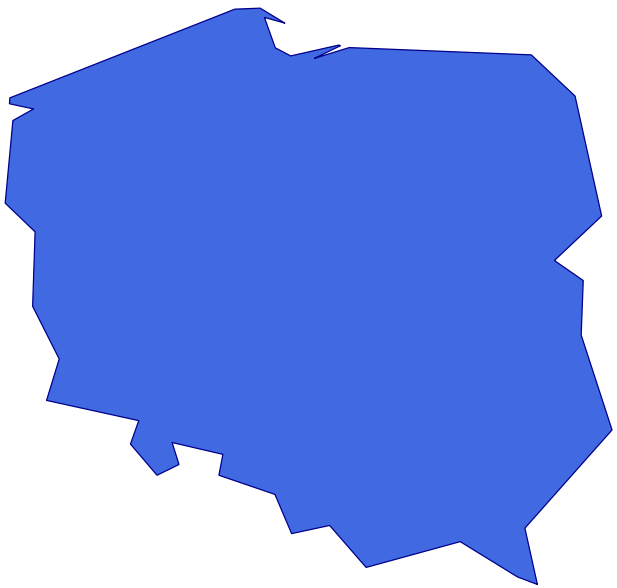
```
Pol <- wrld_simpl@data$NAME=="Poland"
table(Pol)
```

With table() we get the following result:

```
Pol
FALSE  TRUE
  245     1
```

R-package maptools - Poland

```
Poland <- wrld_simpl[Pol==T,]
plot(Poland,col="royalblue",border="darkblue")
```



R-package maptools - Europe

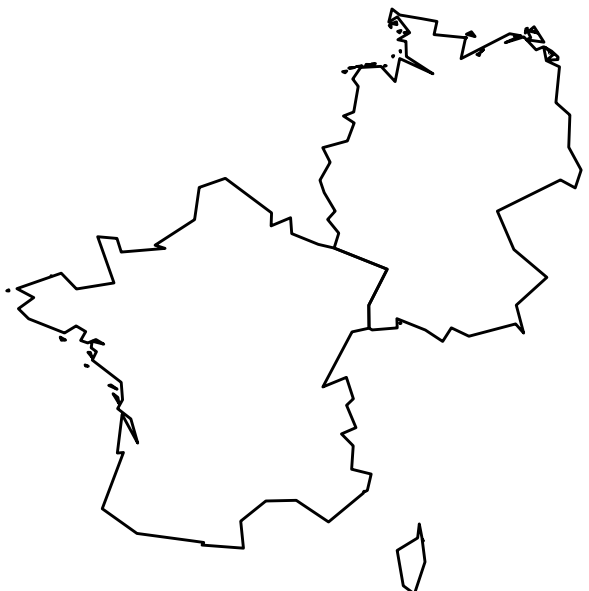
Create a map with the European Countries:

```
EuropeList <- c('Germany', 'France')
my_map <- wrld_simpl[wrld_simpl$NAME %in% EuropeList, ]
```

R-package maptools - Parts of the world

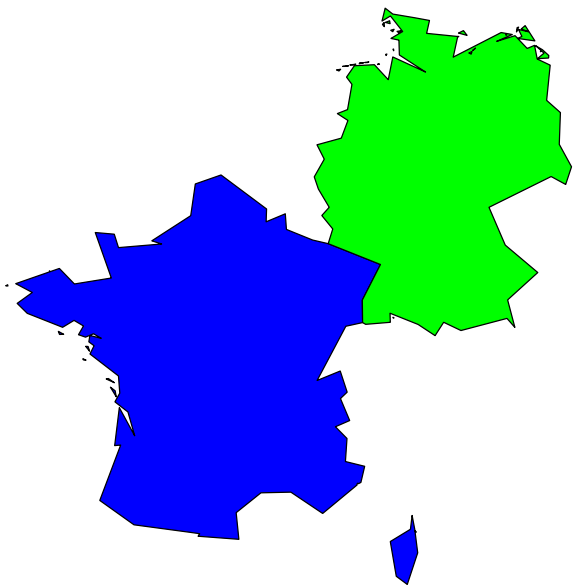
Draw only parts of the world

```
my_map <- wrld_simpl[wrld_simpl$NAME %in% c('Germany',
'France'),]
plot(my_map)
```

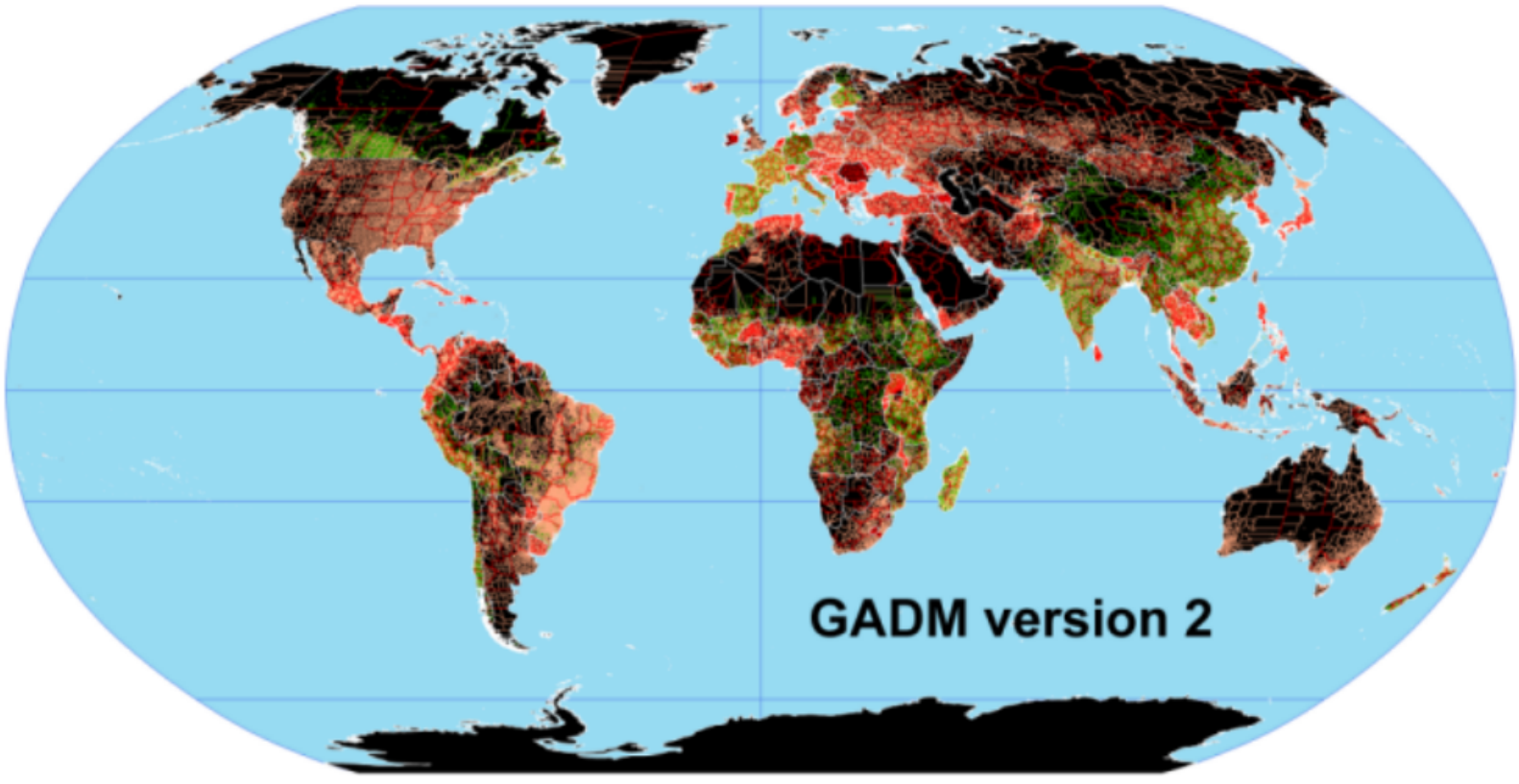


R-package maptools - More info

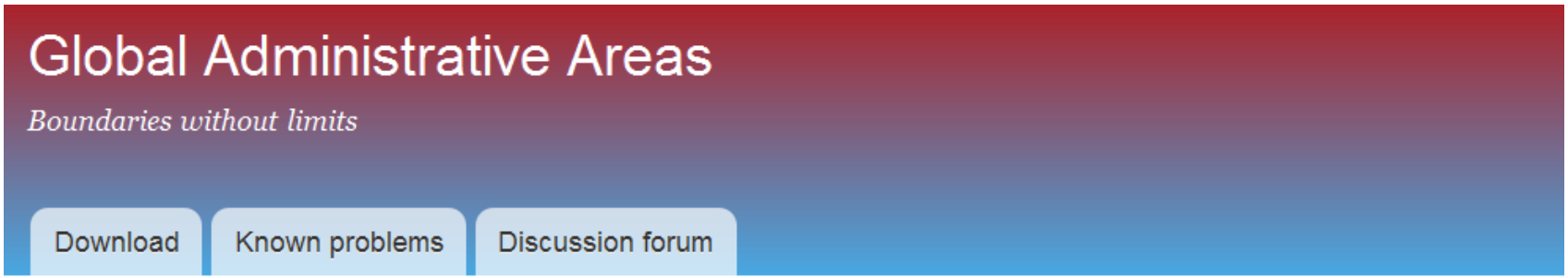
```
my_map@data$color <- c("blue","green")
plot(my_map,col=my_map@data$color)
```



GADM database of Global Administrative Areas



GADM database of Global Administrative Areas



GADM database of Global Administrative Areas

GADM is a spatial database of the location of the world's administrative areas (or adminstrative boundaries) for use in GIS and similar software. Administrative areas in this database are countries and lower level subdivisions such as provinces, departments, bibhag, bundeslander, daerah istimewa, fivondronana, krong, landsvæðun, opština, sous-préfectures, counties, and thana. GADM describes where these administrative areas are (the "spatial features"), and for each area it provides some attributes, such as the name and variant names.

Example - Usage of GADM

sp is a package that provides classes and methods for spatial data.

```
library(sp)
```

Downlaod information from gadm.org:

```
con <- url("http://gadm.org/data/rda/CHE_adm1.RData")
print(load(con))
close(con)
```

Example - Usage of GADM

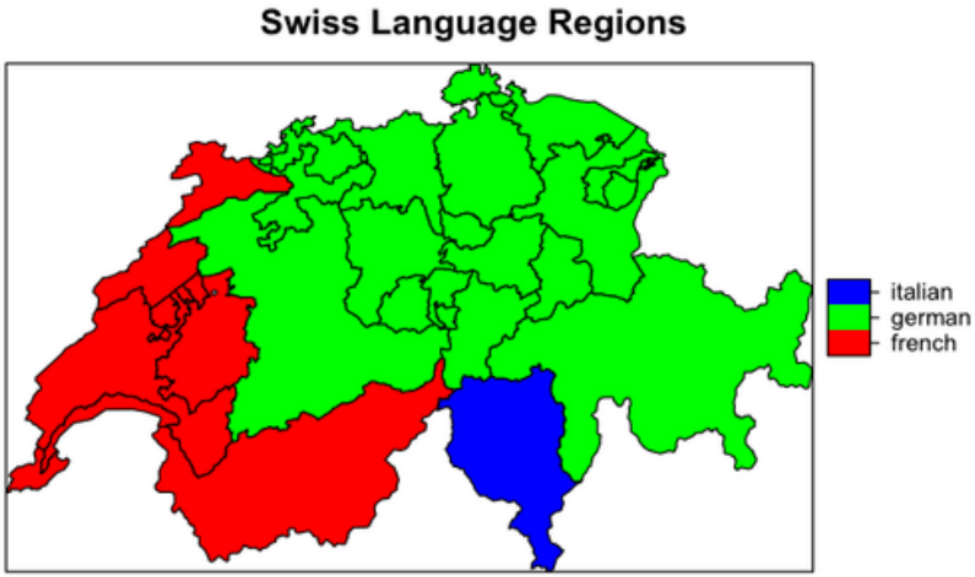
```
language <- c(rep("german",6),rep("french",2),
rep("german",2),rep("french",2),"german","french",
rep("german",7),
"italian","german","french","french","german","german")
gadm$language <- as.factor(language)
```

Define colours and plot the map with spplot

```
col = rainbow(length(levels(gadm$language)))
spplot(gadm, "language", col.regions=col, main="Swiss
Language Regions")
```

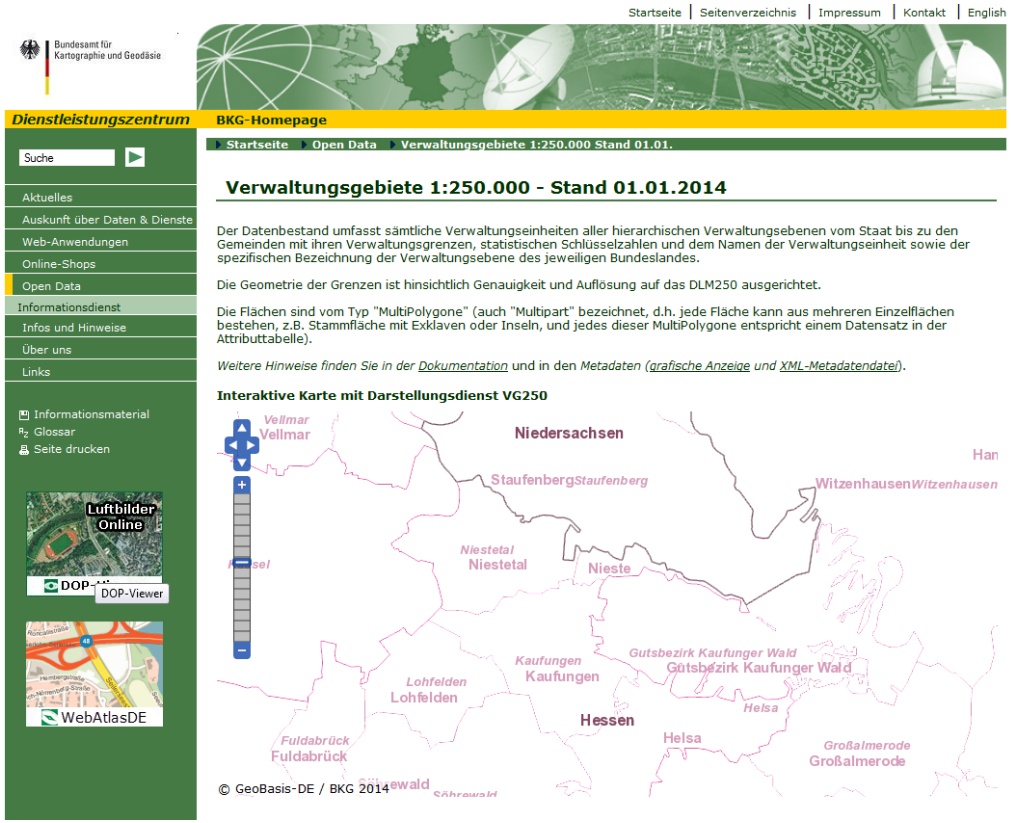
http://blog.revolutionanalytics.com/2009/10/geographic-maps-in-r.html

Example - Usage of GADM



Source GeoData Germany

geodatenzentrum.de



`http://www.geodatenzentrum.de/geodaten/gdz_rahmen.gdz_div?gdz_spr=deu&gdz_akt_zeile=5&gdz_anz_zeile=1&gdz_unt_zeile=14&gdz_user_id=0`

Package maptools

```
D.KRS    <- readShapePoly("vg2500_krs.shp")
BLA <- substr(D.KRS@data$RS,1,2)
plot(D.KRS[BLA=="07",],col="royalblue")
```