The mapmisc package

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This document will be incomplete if `rgdal` is unavailable or there is on internet connection when this document is compiled. The full document is at `http://diseasemapping.r-forge.r-project.org/`.

1 Introduction

This package provides a few utilities for making nice maps in R, with an emphasis on enabling maps in short tidy code chunks which are suitable for Sweave and knitr documents. The package duplicates the capabilities of packages such as classInt, geonames, and OpenStreetMap, and the price of having tidier code is much of the flexibility from these other packages has been lost here.

The meuse data from the sp package

```
library('sp')
data('meuse')
coordinates(meuse) <- ~x+y
class(meuse)

## [1] "SpatialPointsDataFrame"
## attr(,"package")
## [1] "sp"
```

```
library('rgdal')
proj4string(meuse) <- CRS("+init=epsg:28992")
meuseLL = spTransform(meuse, CRS("+init=epsg:4326"))
```

Get elevation data with

```
library('raster')
nldElev = raster::getData("alt", lon=raster::xmin(meuseLL),
    lat=raster::ymin(meuseLL), path=tempdir() )
raster::getData("SRTM", lon=raster::xmin(meuseLL),
    lat=raster::ymin(meuseLL), path=tempdir() )
nldElev = raster(file.path(tempdir(), "srtm_38_02.tif"))
nldElev = crop(nldElev, extent(meuseLL))
nldElev = projectRaster(nldElev, crs=proj4string(meuse))
```

Or simply do

```
library('mapmisc')
data('netherlands')
```

The elevation data is a Raster.

```
class(nldElev)

## [1] "RasterLayer"
## attr(,"package")
## [1] "raster"

nldElev = crop(nldElev, extend(extent(meuse), 1000))
```

2 Downloading background maps and city locations

Get a background map covering the extent of the meuse data

```
library('mapmisc')
if(haveRgdal)
  nldTiles = openmap(meuse)

## Warning in spTransform(x, crsOut): NULL target CRS comment, falling back to
PROJ string
```

`nldTiles` is a Raster with the same projection as `meuse`

```
class(nldTiles)

## [1] "RasterLayer"
## attr(,"package")
## [1] "raster"

projection(nldTiles)

## [1] "+proj=sterea +lat_0=52.1561605555556 +lon_0=5.38763888888889 +k=0.9999079 +x_0=1

projection(meuse)

## [1] "+proj=sterea +lat_0=52.1561605555556 +lon_0=5.38763888888889 +k=0.9999079 +x_0=1
```

Maps which can be downloaded are shown at `http://diseasemapping.r-forge.r-project.org/openmap/`

`GNcities` is a wrapper for the function of the same name in the geonames package.

```
nldCities = GNcities(meuse, maxRows=6)
```

A SpatialPointsDataFrame, with same map projection.

```
class(nldCities)

## [1] "SpatialPointsDataFrame"
## attr(,"package")
## [1] "sp"

names(nldCities)

##  [1] "lng"         "geonameId"   "countrycode" "name"        "fclName"
##  [6] "toponymName" "fcodeName"   "wikipedia"   "lat"         "fcl"
## [11] "population"  "fcode"

projection(nldCities)

## [1] "+proj=sterea +lat_0=52.1561605555556 +lon_0=5.38763888888889 +k=0.9999079 +x_0=1
```

3 Making maps

The `map.new` function sets up a map in the current plot window with the correct limits and aspect ratio for the object supplied, and without margins or white space. `scaleBar` adds a scale and north arrow. It uses the map projection of the argument supplied to calculate distances and find north.

Some of the code in the following sections require the `rgdal` package to run.

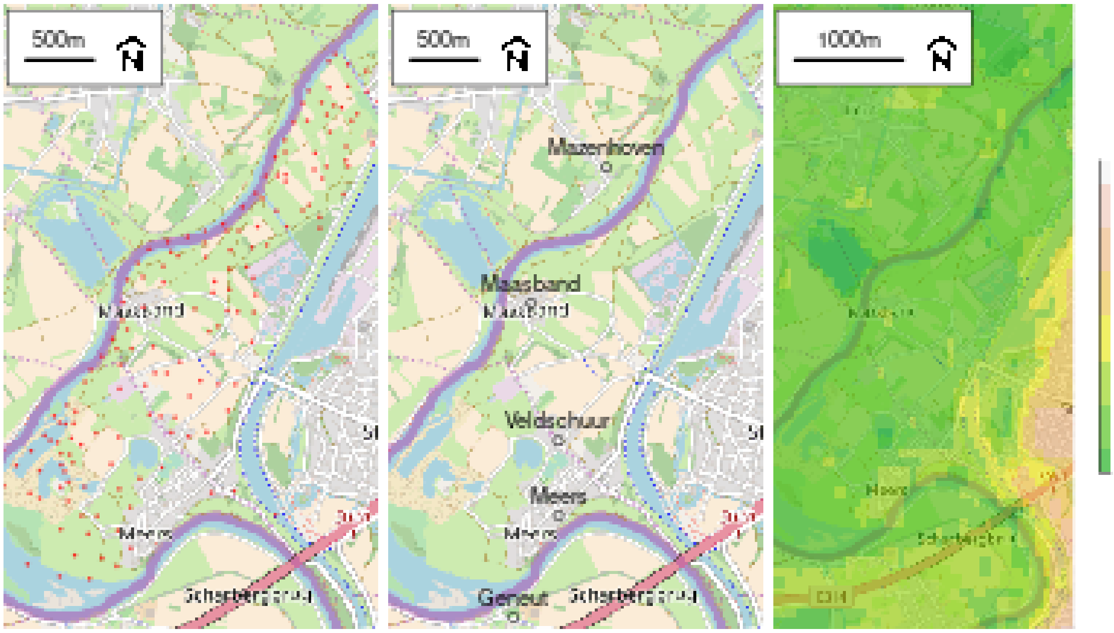
```
# plot the data locations
map.new(meuse)
plot(nldTiles, add=TRUE)
points(meuse,col="red", cex=0.3)
scaleBar(crs=proj4string(meuse),pos="topleft", bg="white")

## Warning in spTransform(xpoints, crsLL): NULL target CRS comment, falling back
to PROJ string
## Warning in spTransform(xpoints, crsLL): NULL target CRS comment, falling back
to PROJ string
```

```
# plot city names
map.new(meuse)
plot(nldTiles, add=TRUE)
points(nldCities)
text(nldCities, labels=nldCities$name, pos=3)
scaleBar(proj4string(meuse),pos="topleft", bg="white")
```

```
## Warning in spTransform(xpoints, crsLL): NULL target CRS comment, falling back
to PROJ string
## Warning in spTransform(xpoints, crsLL): NULL target CRS comment, falling back
to PROJ string
```

```
# plot elevation
map.new(meuse, legendRight=TRUE)
plot(nldTiles, add=TRUE)
plot(nldElev,add=TRUE,col=terrain.colors(8),alpha=0.6,legend.mar=2, legend.line=0,)
scaleBar(meuse,pos="topleft",bg="white")
```

```
## Warning in spTransform(xpoints, crsLL): NULL target CRS comment, falling back
to PROJ string
## Warning in spTransform(xpoints, crsLL): NULL target CRS comment, falling back
to PROJ string
```



(a) data locations (b) cities (c) elevation

Figure 1: simple map

4 Legends

Create a colour scale for plotting copper concentrations

```
cuScale = colourScale(meuse$copper, breaks=5, style='equal',
    opacity=0.8, dec=-1, firstBreak=0)
```

and elevation, with transparency decreasing as elevation increases.

```
elevScale = colourScale(nldElev, style='equal',
    breaks=6, col=terrain.colors,
    firstBreak=0, dec=-1,opacity=c(0.2, 0.9))
```

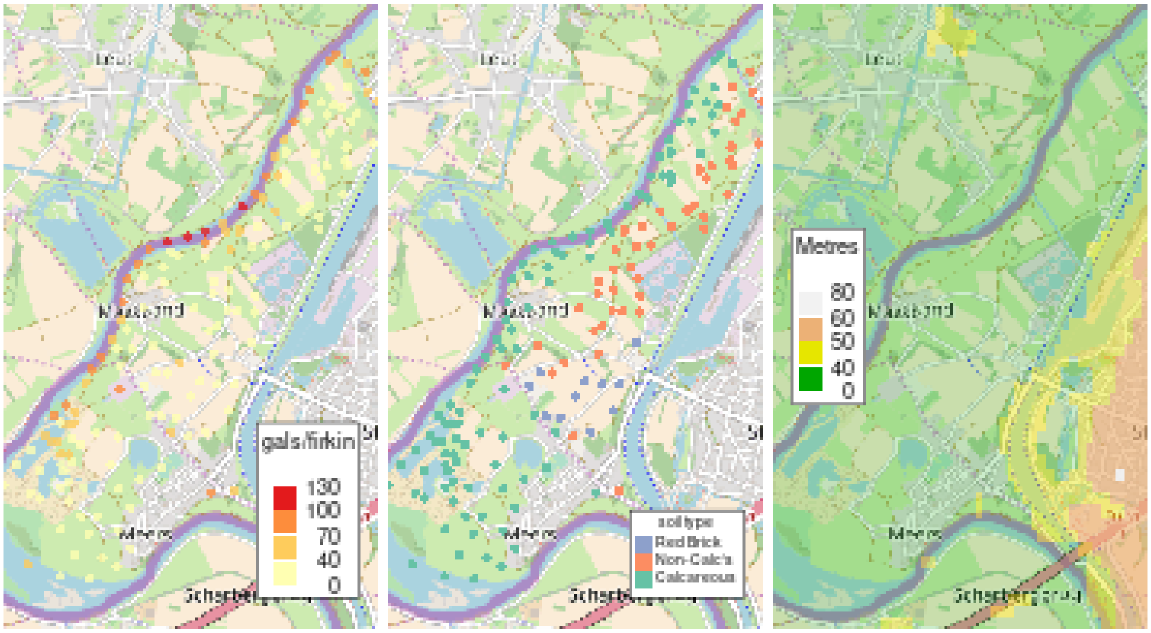
Soil type is a categorical variable, create a factor and create a colour scale of unique values

```
meuse$soilFac = factor(meuse$soil, levels=c(1,2,3),
    labels=c("Calcareous","Non-Calc's","Red Brick"))
soilScale = colourScale(meuse$soilFac, col="Set2")
```

```
map.new(meuse)
plot(nldTiles, add=TRUE)
plot(meuse, col=cuScale$plot,add=TRUE,pch=16)
legendBreaks("bottomright",  breaks=cuScale,
    title="gals/firkin")


map.new(meuse)
plot(nldTiles, add=TRUE)
plot(meuse, col=soilScale$plot,add=TRUE,pch=16)
legendBreaks("bottomright", breaks=soilScale,
    title="soil type", cex=0.7,bg="white")

map.new(meuse)
plot(nldTiles, add=TRUE)
image(nldElev, breaks=elevScale$breaks, col=elevScale$colOpacity,
    legend=FALSE,add=TRUE)
legendBreaks("left", breaks=elevScale, title='Metres',bg="white")
```

5 More plots

Rotate the data 50 degrees clockwise with an oblique mercator projection.



(a) Copper (b) soil (c) elevation

Figure 2: Meuse data again

```
if(requireNamespace('rgdal', quietly=TRUE)){
  meuseRot = spTransform(meuse, omerc(meuse, -50))
  tilesRot = openmap(meuseRot, fact=2)
  elevRot = projectRaster(nldElev, crs=projection(meuseRot))
  nldCitiesRot = spTransform(nldCities, CRS(projection(meuseRot)))
}

## Warning in spTransform(theCentre, crsLL): NULL target CRS comment, falling
back to PROJ string
## Warning in spTransform(theCentreSp, qq): NULL source CRS comment, falling
back to PROJ string
## Warning in spTransform(x, crsOut): NULL target CRS comment, falling back to
PROJ string
```

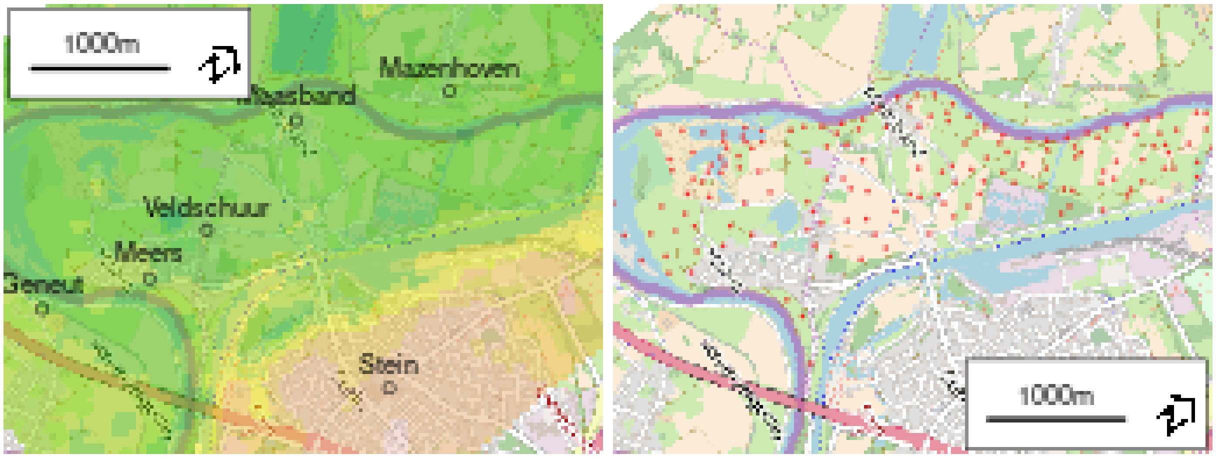
And create new plots

```
# first elevation
map.new(meuseRot)
plot(tilesRot, add=TRUE)
plot(elevRot,add=TRUE,alpha=0.5,col=terrain.colors(8), legend=FALSE)
points(nldCitiesRot)
text(nldCitiesRot, labels=nldCitiesRot$name, pos=3)

scaleBar(meuseRot,pos="topleft", bg="white")
```

```
## Warning in spTransform(xpoints, crsLL): NULL target CRS comment, falling back
to PROJ string
## Warning in spTransform(xpoints, crsLL): NULL target CRS comment, falling back
to PROJ string
```

```
# then data locations
map.new(meuseRot)
plot(tilesRot, add=TRUE)
points(meuseRot,col="red", cex=0.3)

scaleBar(proj4string(meuseRot), bg="white")
```

```
## Warning in spTransform(xpoints, crsLL): NULL target CRS comment, falling back
to PROJ string
## Warning in spTransform(xpoints, crsLL): NULL target CRS comment, falling back
to PROJ string
```



(a) elevation (b) data

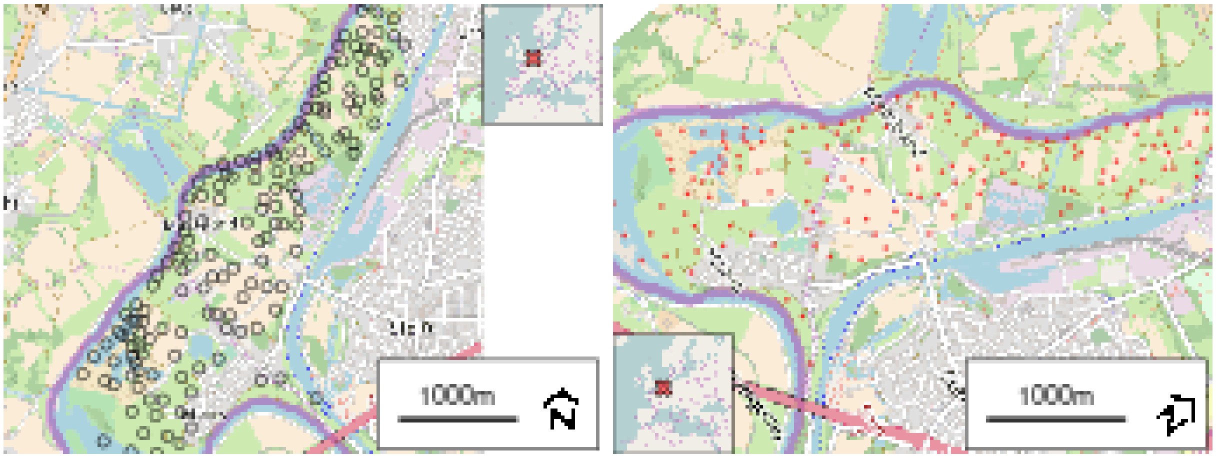
Figure 3: Rotated map

6 Inset maps

```
world = openmap(
    extent(-10,30,40,60),
    path="osm-no-labels")
```

```
## Warning in spTransform(x, crsOut): NULL source CRS comment, falling back to
PROJ string
## Warning in spTransform(x, crsOut): NULL target CRS comment, falling back to
PROJ string
```

```
# not rotated
map.new(meuse,legendRight=TRUE)
plot(nldTiles, add=TRUE)
points(meuse)

if(requireNamespace('rgdal', quietly=TRUE)) {
  scaleBar(proj4string(meuse),pos="bottomright", bg="white")
  insetMap(crs=meuse, pos="topright",map=world)
}

## Warning in spTransform(xpoints, crsLL): NULL target CRS comment, falling back
to PROJ string
## Warning in spTransform(xpoints, crsLL): NULL target CRS comment, falling back
to PROJ string
## Warning in spTransform(xsp, CRSobj = crs(mapOrig)): NULL target CRS comment,
falling back to PROJ string

# rotated
map.new(meuseRot)
plot(tilesRot, add=TRUE)
points(meuseRot,col="red", cex=0.3)

if(requireNamespace('rgdal', quietly=TRUE)) {
  scaleBar(proj4string(meuseRot), bg="white")
  insetMap(meuseRot, "bottomleft",map=world)
}

## Warning in spTransform(xpoints, crsLL): NULL target CRS comment, falling back
to PROJ string
## Warning in spTransform(xpoints, crsLL): NULL target CRS comment, falling back
to PROJ string
## Warning in spTransform(xsp, CRSobj = crs(mapOrig)): NULL target CRS comment,
falling back to PROJ string
```



(a) elevation

(b) rotated

Figure 4: Inset map