

Datos espaciales en R: aspectos básicos

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mayo de 2016

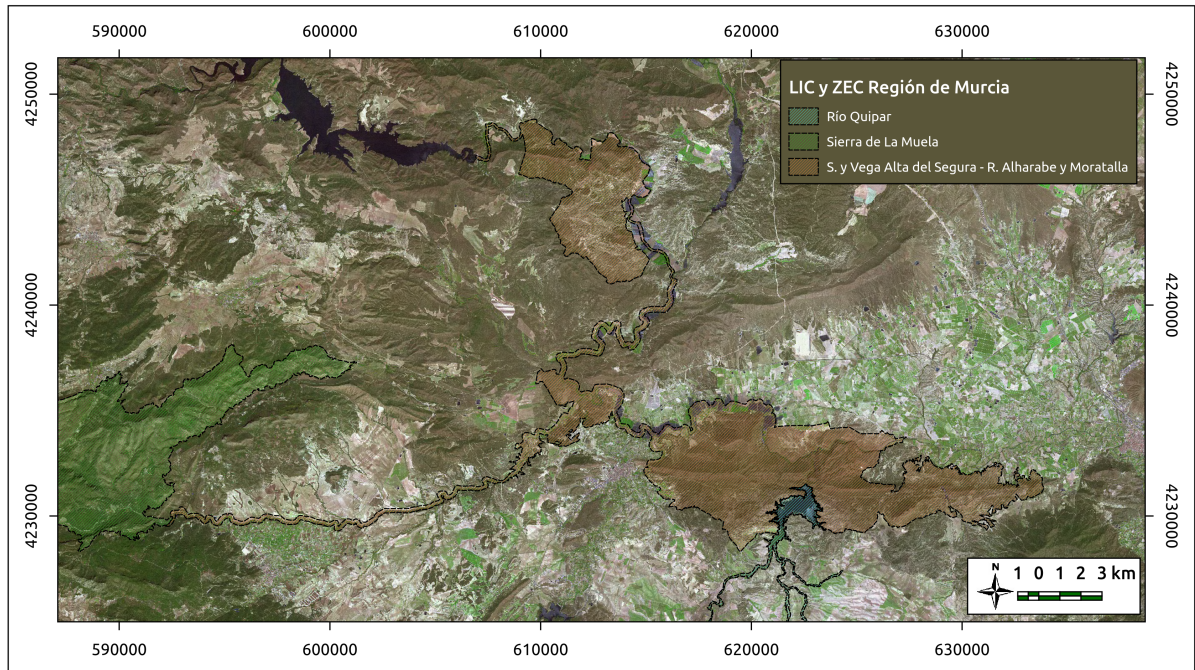
Contents

1	Continuando con QGIS	1
1.1	Dudas:	1
1.2	Nuestros datos. Fichero kml	2
2	Retomamos R	2
2.1	Librerías requeridas	2
2.2	Jugando con nuestros datos espaciales:	3
2.3	Objetos espaciales en R (I)	7
3	Información del proceso	14
4	Ampliación de la información	14

1 Continuando con QGIS

1.1 Dudas:

- wms
- diseñador de impresión
 - cuadrículas mapa
 - escala (redondear)
 - diseño



Ortofoto PNOA 2014 © Instituto Geográfico Nacional de España. Sistema de proyección: coordenadas UTM, Huso 30, ETRS89

PROYECTO O ESTUDIO: Tarea 2 curso EDE01 	DESCRIPCIÓN: Vista (zoom) a la ZEC de las Sierras y Vega Alta del Segura y Ríos Alharabe y Moratalla. Capa de base Ortofoto del PNOA del año 2014.	TÍTULO DEL MAPA: ZEC de las Sierras y Vega Alta del Segura y Ríos Alharabe y Moratalla.	ESCALA 1:200.000	
			Original A3	

1.2 Nuestros datos. Fichero kml

Vamos a cargar un track similar al que habéis grabado con la aplicación del móvil y exportarlo a shape en *QGIS*.

2 Retomamos R

2.1 Librerías requeridas

Cargamos en primer lugar la librerías necesarias.

```
library( rgdal ) # entrada/salida, reproyecciones
```

```
## Loading required package: sp
```

```
## rgdal: version: 1.1-10, (SVN revision 622)
## Geospatial Data Abstraction Library extensions to R successfully loaded
## Loaded GDAL runtime: GDAL 1.11.3, released 2015/09/16
## Path to GDAL shared files: /usr/share/gdal/1.11
## Loaded PROJ.4 runtime: Rel. 4.9.2, 08 September 2015, [PJ_VERSION: 492]
## Path to PROJ.4 shared files: (autodetected)
## Linking to sp version: 1.2-3
```

```
library( rgeos ) # opciones de geometria
```

```
## rgeos version: 0.3-19, (SVN revision 524)  
## GEOS runtime version: 3.5.0-CAPI-1.9.0 r4084  
## Linking to sp version: 1.2-3  
## Polygon checking: TRUE
```

```
library( raster ) # datos raster  
library( rgl )
```

```
##  
## Attaching package: 'rgl'  
  
## The following object is masked from 'package:rgeos':  
##  
## triangulate
```

```
library( sp ) # datos vectoriales  
library( rasterVis ) # plot 3D mapas
```

```
## Loading required package: lattice
```

```
## Loading required package: latticeExtra
```

```
## Loading required package: RColorBrewer
```

```
library( maptools ) # para trabajar con KML
```

```
## Checking rgeos availability: TRUE
```

```
library(spdep) # dependencias datos espaciales
```

```
## Loading required package: Matrix
```

2.2 Jugando con nuestros datos espaciales:

Primero cargamos capas base:

```
rm <- shapefile( "../capasSIG/rm.shp" )  
tm <- shapefile( "../capasSIG/terminosMun.shp" )  
zec <- shapefile( "../capasSIG/LIC_ZEC_ETRS89.shp" )  
crs( rm )
```

```
## CRS arguments:  
## +proj=utm +zone=30 +ellps=GRS80 +units=m +no_defs
```

Cargamos el track:

```
system( "file datos/estrechoBolvonegro.kml" )  
ebk <- getKMLcoordinates( "datos/estrechoBolvonegro.kml" )
```

```
## Warning in readLines(kmlfile, encoding = "UTF-8"): incomplete final line  
## found on 'datos/estrechoBolvonegro.kml'
```

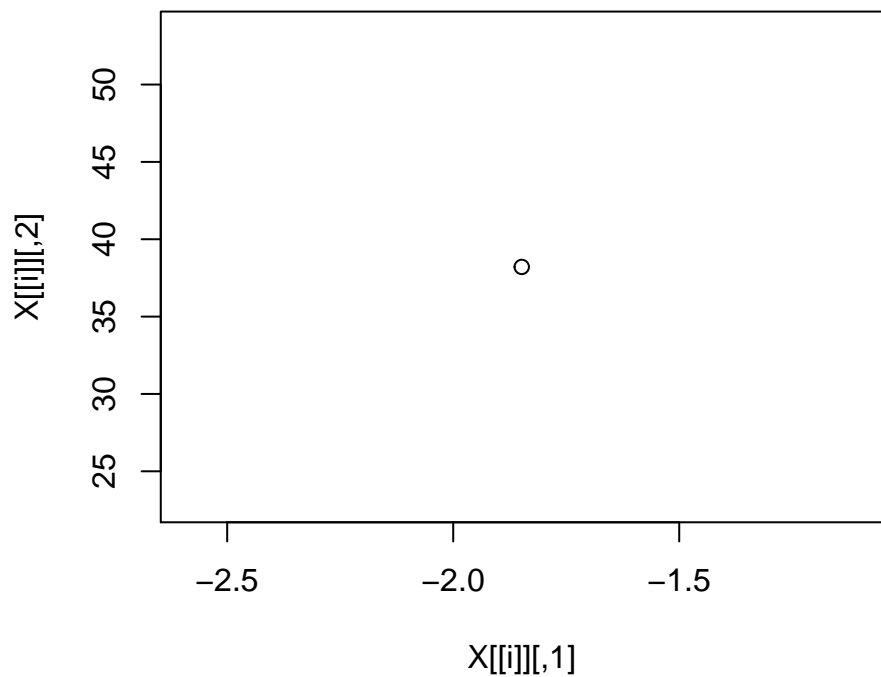
```
str( ebk ) # elementos del `track`
```

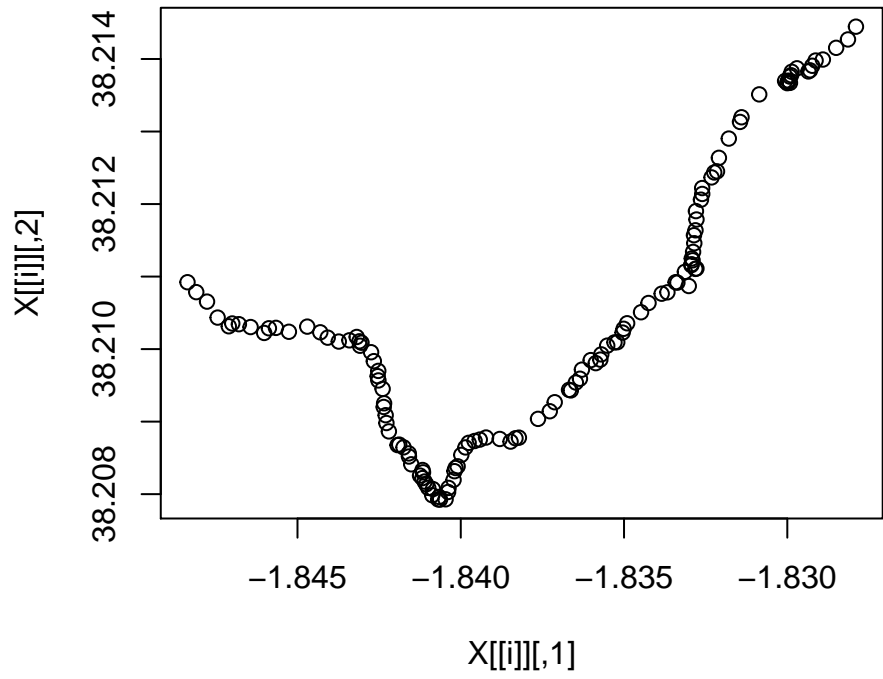
```
## List of 2  
## $ : num [1, 1:3] -1.85 38.21 455.32  
## $ : num [1:133, 1:3] -1.85 -1.85 -1.85 -1.85 -1.85 ...
```

```
crs( ebk )
```

```
## [1] NA
```

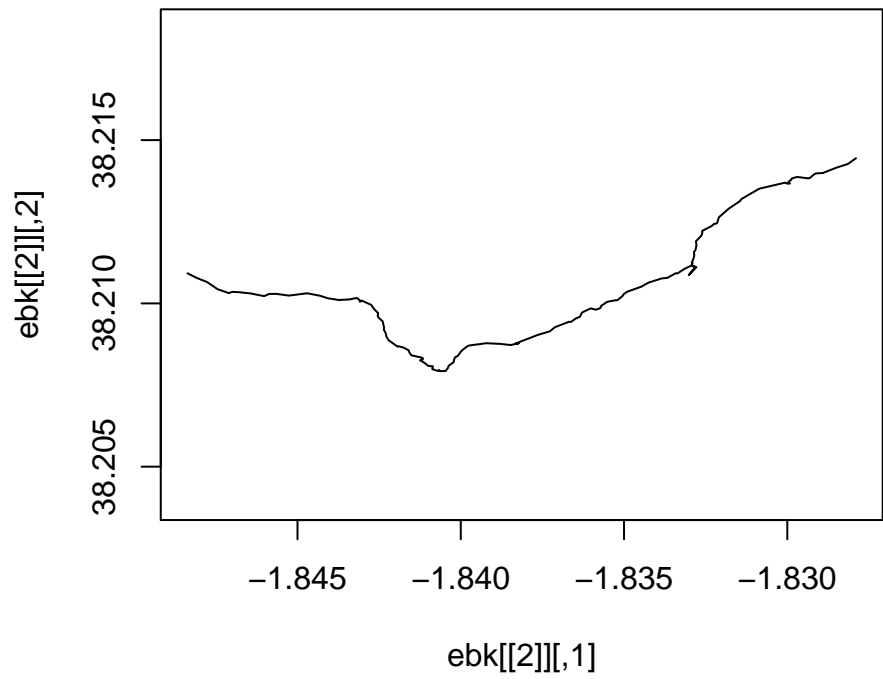
```
lapply(ebk, plot ) # representación de los elementos del track
```



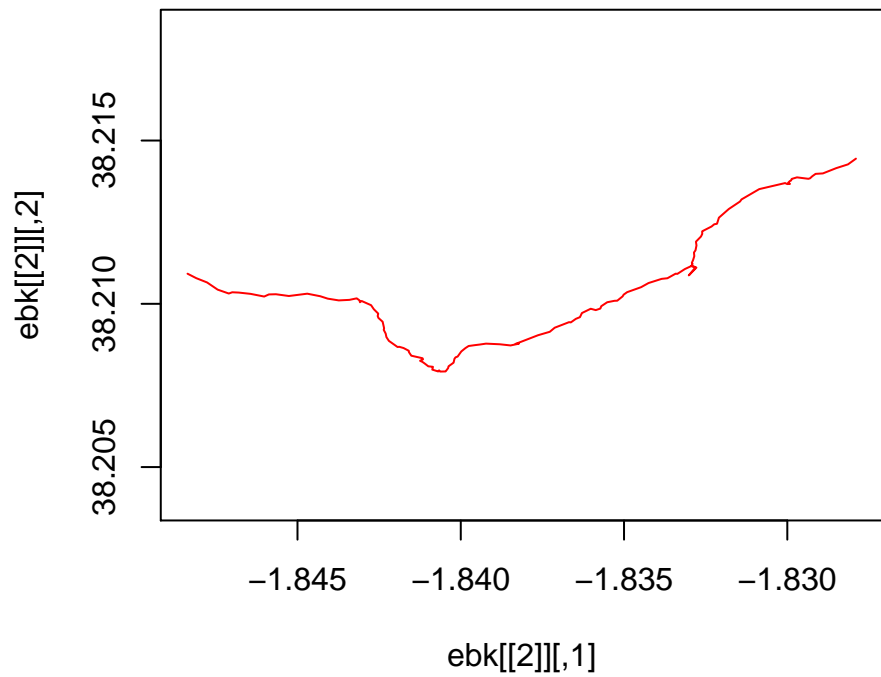


```
## [[1]]
## NULL
##
## [[2]]
## NULL
```

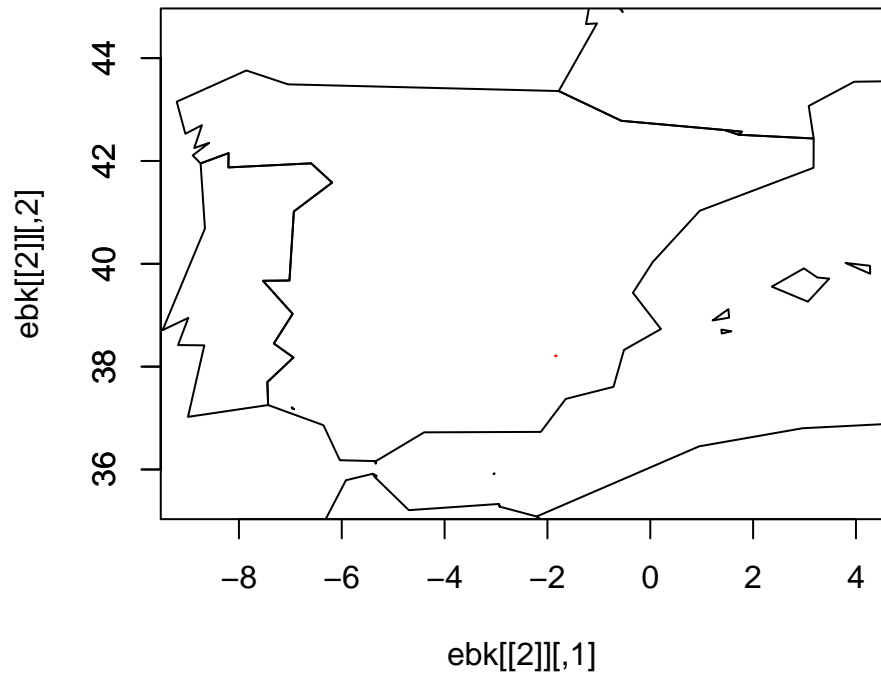
```
plot( ebk[[2]], asp = TRUE, type = "l" ) # representación del recorrido y modo lineal
```



```
data(wrld_simpl)
plot( ebk[[2]], asp = TRUE, type = "l",col="red")
```



```
plot( ebk[[2]], asp = TRUE, type = "l", xlim = c( -9, 4 ), ylim = c( 37, 43 ), col="red")
plot( wrld_simpl, xlim = c( -9, 4 ), ylim = c( 37, 43 ), add=T )
axis(2)
```



Reproyectamos un shapefile

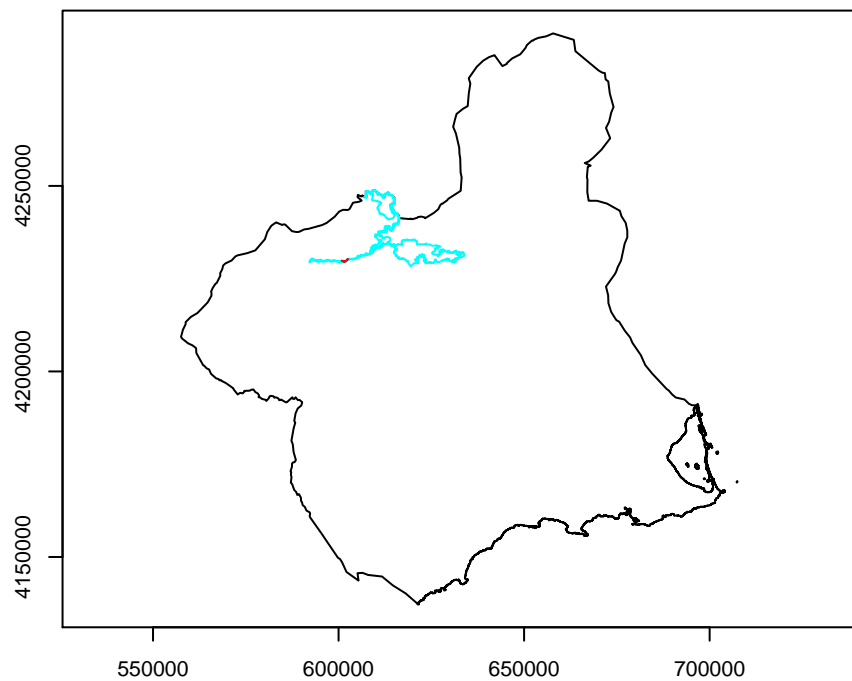
```
ebs <- shapefile("datos/estrecho_bolvonegro.shp")
crs( ebs )
```

```
## CRS arguments: +proj=longlat +ellps=GRS80 +no_defs
```

```
ebs_utm <- spTransform (ebs, crs ( rm ) )
crs( ebs_utm )
```

```
## CRS arguments:
## +proj=utm +zone=30 +ellps=GRS80 +units=m +no_defs
```

```
par( cex = 0.7 )
plot( rm, axes=T )
plot( zec[ 47, ], border=5, add=TRUE ) # Sierras y Vega Alta del Segura y
# Rios Alharabe y Moratalalla
plot(ebs_utm, add=T, col="red")
```



Ahora vamos a trabajar con vuestro track.

- importar el kml
- importar el shape

2.3 Objetos espaciales en R (I)

2.3.1 Puntos. SpatialPoints

```
ptos <- as.table(ebk[[2]]) coords <- cbind ( ptos[,1], ptos[,2] ) colnames (coords) <- c("lon", "lat") spt <-
SpatialPoints( coords ) z <- seq(1:nrow ( coords )) df <- data.frame(z)
spdf <- SpatialPointsDataFrame(coords, df) spdf@data
bbox(spdf) plot ( spdf )
```

2.3.2 Líneas. SpatialLines

```
l1 <- cbind ( ptos[,1], ptos[,2] ) L1 <- Line(l1) SL1 <- Lines( list (L1),ID = "a") SPL1 <- SpatialLines(list(SL1))  
plot ( SPL1 )
```

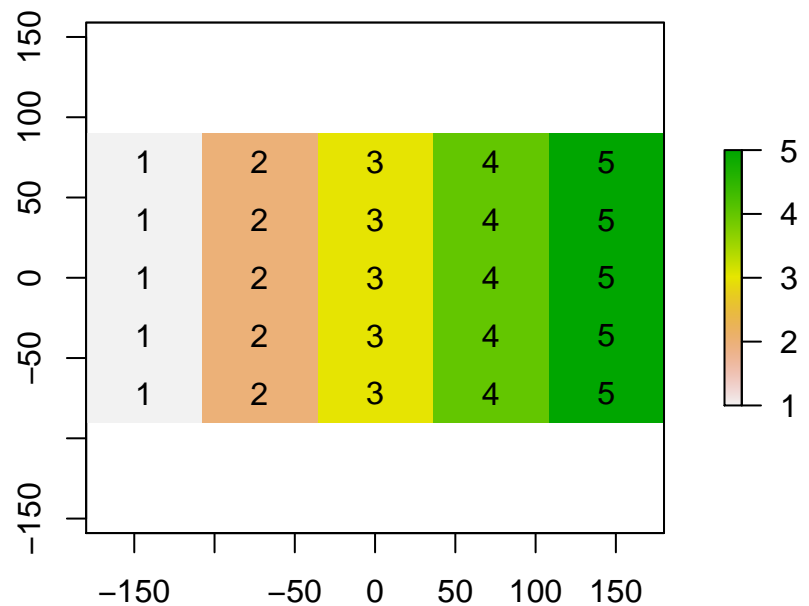
```
SPL1df<- SpatialLinesDataFrame(SPL1, data.frame(Z = c("Rio"), row.names = c("a")))
```

```
SPL1df as.data.frame(SPL1df)
```

2.3.3 Raster

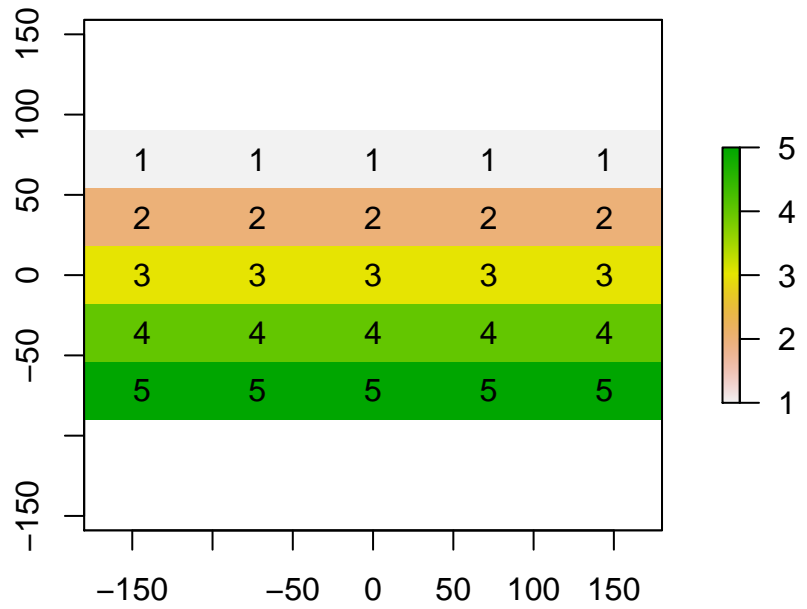
Crear objetos raster (una única capa)

```
r <- raster(ncol=5, nrow=5)  
r[] <- c( rep (1:5, 5))  
plot ( r )  
text ( r )
```



#¿Y por filas?

```
r1 <- raster(ncol=5, nrow=5)  
r1[] <- sort ( c( rep (1:5, 5 )))  
plot ( r1 )  
text ( r1 )
```

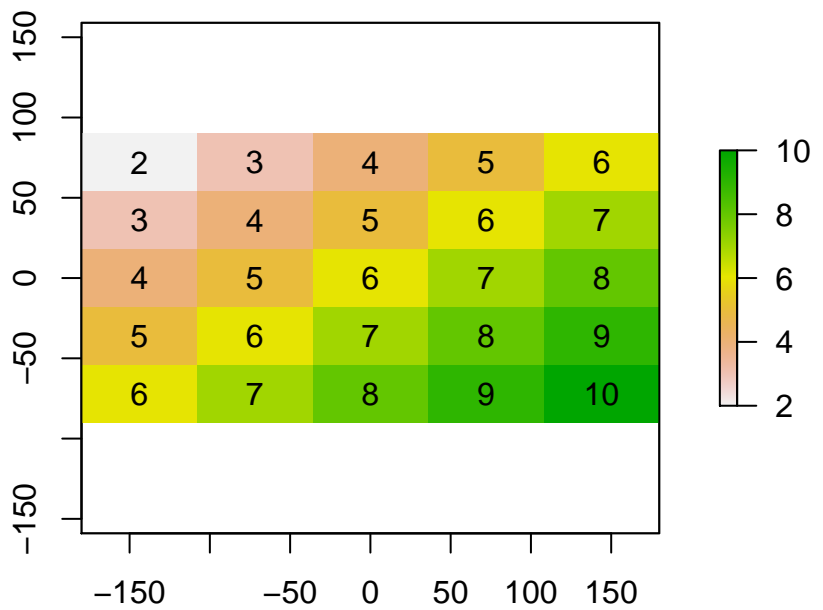



2.3.3.1 Iniciando el álgebra de mapas

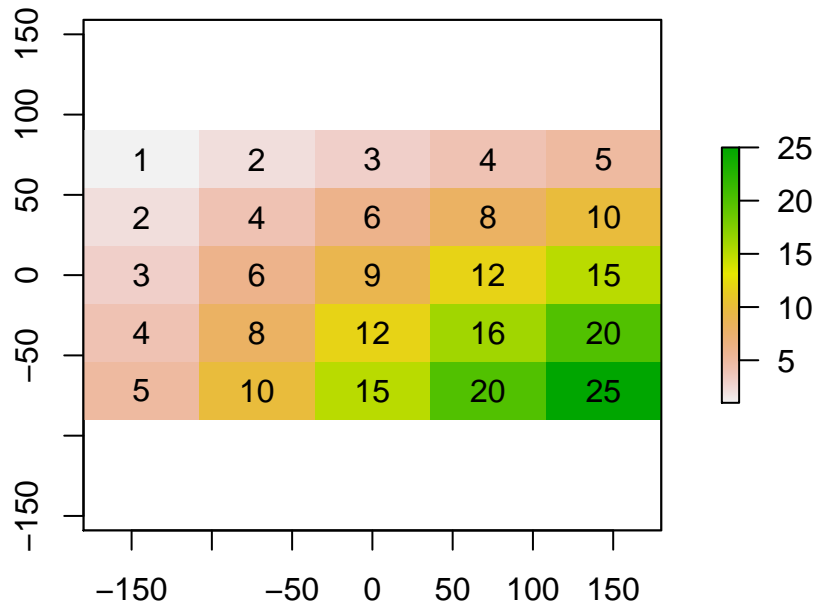
A los objetos espaciales raster en R se les puede aplicar funciones aritméticas, matemáticas, lógicas y estadísticas.

- Funciones aritméticas: +, -, *, ^, /, ...

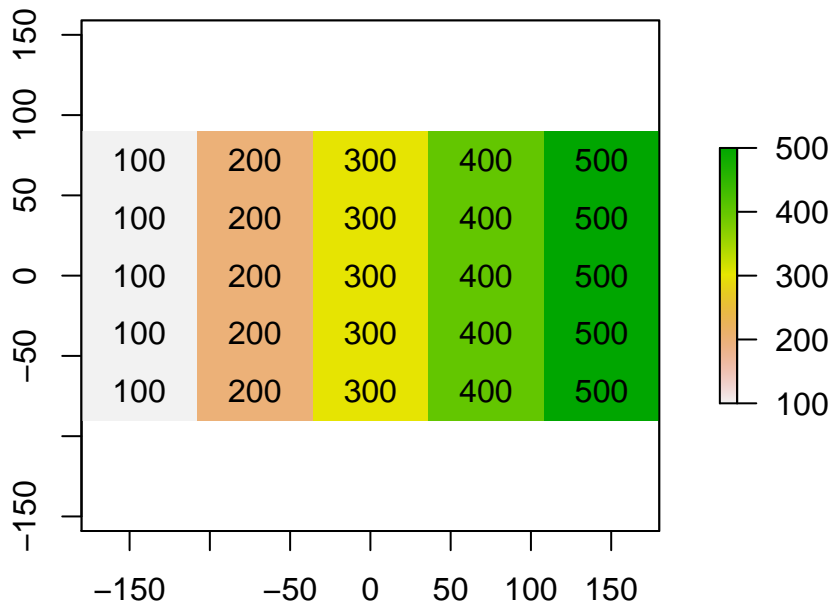
```
rsuma <- r + r1
plot (rsuma )
text ( rsuma )
```



```
rpro <- r * r1
plot (rpro )
text ( rpro )
```

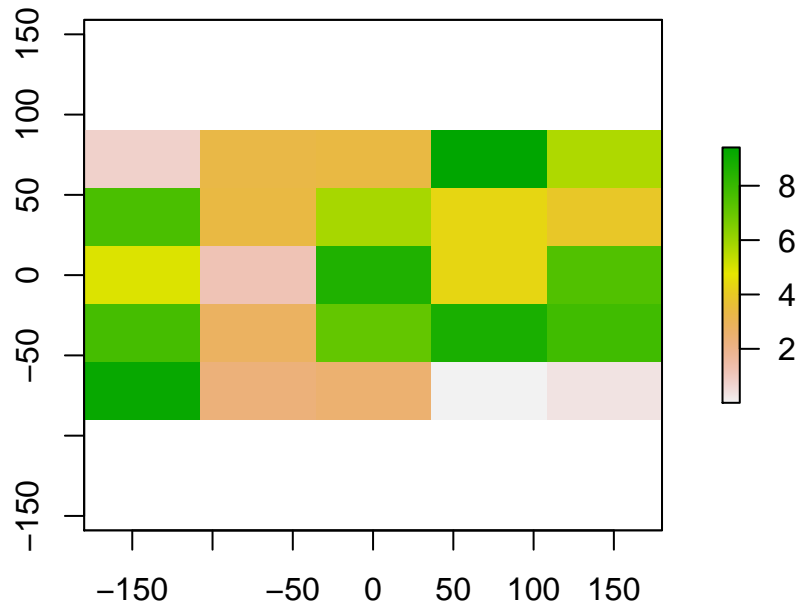


```
r100 <- r * 100
plot (r100)
text ( r100 )
```

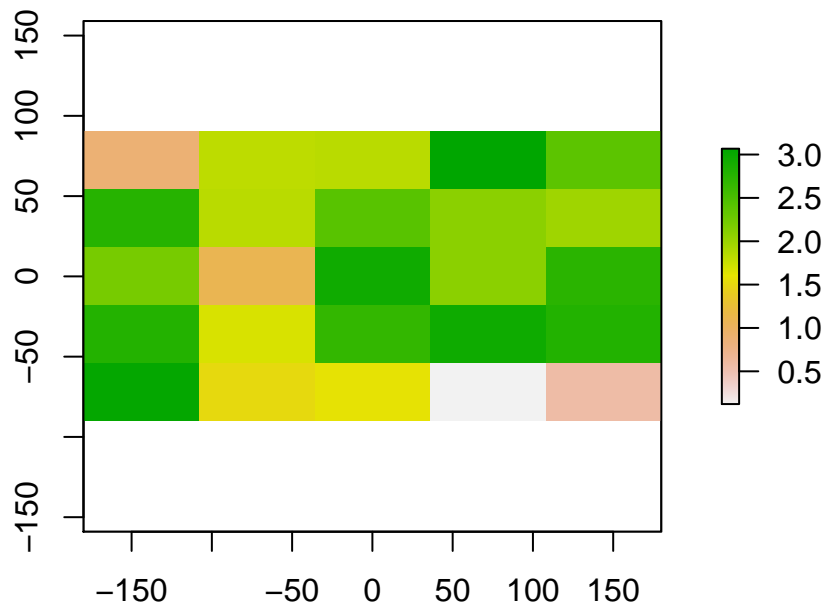


- Funciones matemáticas: abs, sprt, log10, log, exp, round, ...

```
r3 <- raster(nrow=10, ncol=10)
r3 <- setValues(r1, runif(ncell(r1)) * 10) # otra forma de asignar valores
r4 <- sqrt (r3)
plot (r3)
```



```
plot (r4)
```



- Summary

```
summary( r1)
```

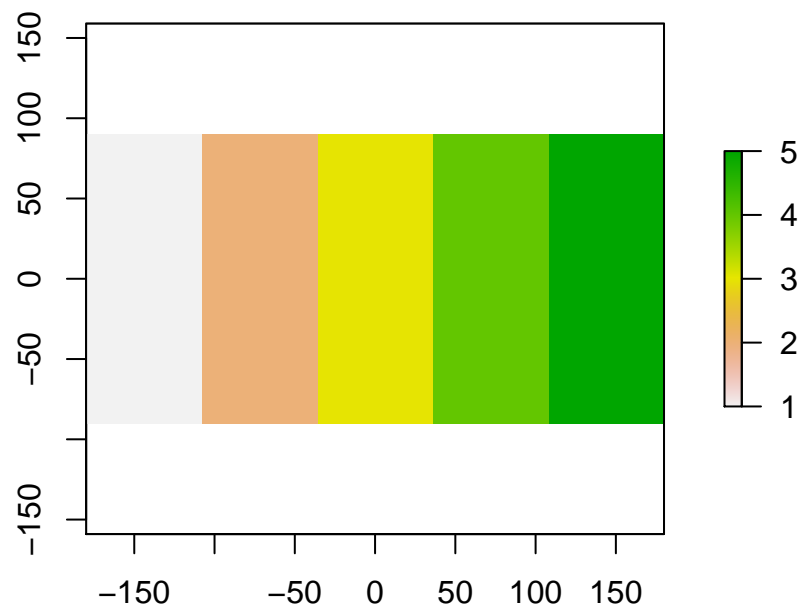
```
##          layer
## Min.      1
## 1st Qu.   2
## Median    3
## 3rd Qu.   4
## Max.      5
## NA's      0
```

```
summary( r4)
```

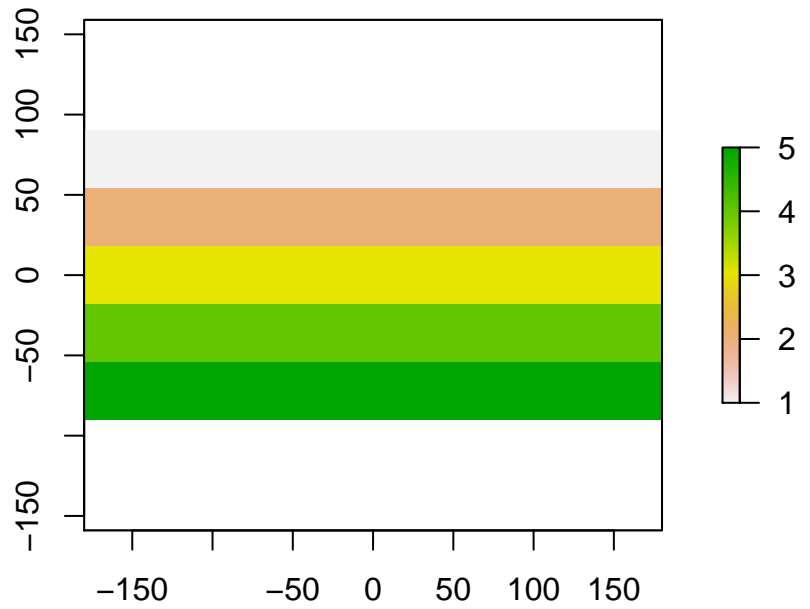
```
##           layer
## Min.      0.1222667
## 1st Qu.   1.6735484
## Median    2.0949925
## 3rd Qu.   2.7562256
## Max.      3.0673724
## NA's      0.0000000
```

- Comparar mapas

```
plot (r)
```

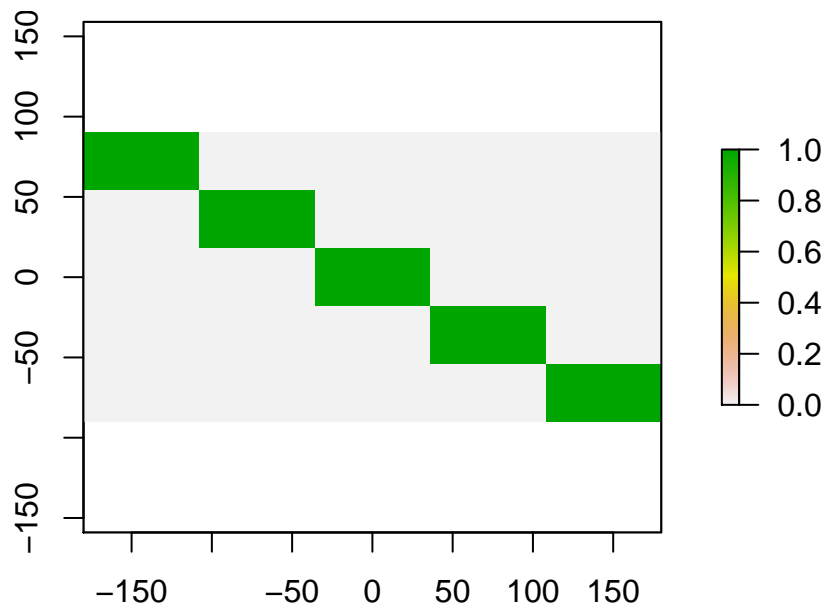


```
plot ( r1 )
```



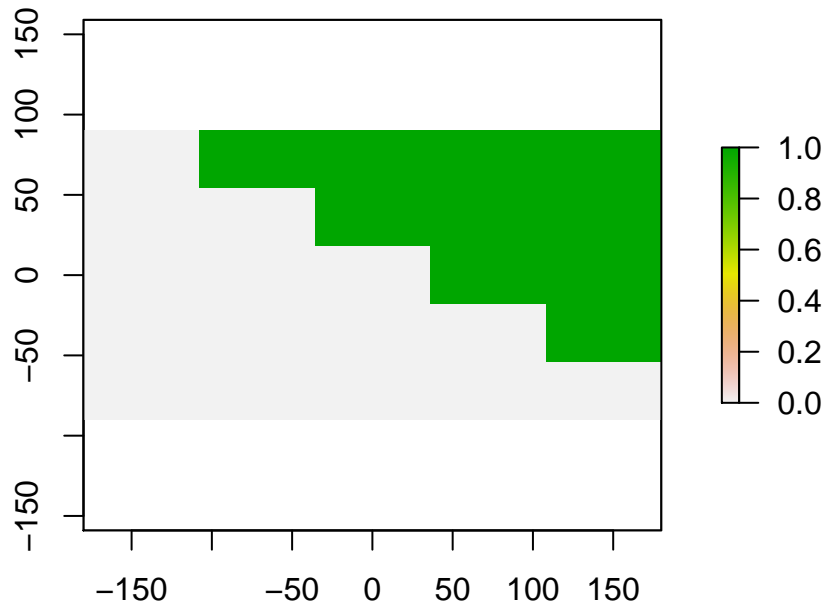
```
rc <- r == r1
```

```
plot( rc )
```



```
rma <- r > r1
```

```
plot (rma)
```



3 Información del proceso

Inicio del proceso: martes, 31 de mayo de 2016, a las 16:32:35
 Fin del proceso: martes, 31 de mayo de 2016, a las 16:32:54
 Duración total: 0.317 minutos

4 Ampliación de la información

Más información sobre ficheros KML

Más información [objetos espaciales] (<http://www.maths.lancs.ac.uk/~rowlings/Teaching/UseR2012/cheatsheet.html>)

```
Sys.info()
```

```
##                sysname
##                "Linux"
##                release
##                "4.4.0-22-generic"
##                version
## "#40-Ubuntu SMP Thu May 12 22:03:46 UTC 2016"
##                nodename
##                "ecomed01"
##                machine
##                "x86_64"
##                login
##                "unknown"
##                user
##                "paquicf"
## effective_user
##                "paquicf"
```

sessionInfo()

```
## R version 3.3.0 (2016-05-03)
## Platform: x86_64-pc-linux-gnu (64-bit)
## Running under: Ubuntu 16.04 LTS
##
## locale:
## [1] LC_CTYPE=es_ES.UTF-8      LC_NUMERIC=C
## [3] LC_TIME=es_ES.UTF-8      LC_COLLATE=es_ES.UTF-8
## [5] LC_MONETARY=es_ES.UTF-8  LC_MESSAGES=es_ES.UTF-8
## [7] LC_PAPER=es_ES.UTF-8     LC_NAME=C
## [9] LC_ADDRESS=C             LC_TELEPHONE=C
## [11] LC_MEASUREMENT=es_ES.UTF-8 LC_IDENTIFICATION=C
##
## attached base packages:
## [1] stats      graphics  grDevices  utils      datasets  methods   base
##
## other attached packages:
## [1] spdep_0.6-4      Matrix_1.2-6      maptools_0.8-39
## [4] rasterVis_0.40   latticeExtra_0.6-28 RColorBrewer_1.1-2
## [7] lattice_0.20-33  rgl_0.95.1441     raster_2.5-2
## [10] rgeos_0.3-19     rgdal_1.1-10      sp_1.2-3
##
## loaded via a namespace (and not attached):
## [1] Rcpp_0.12.3      knitr_1.13        magrittr_1.5
## [4] gmodels_2.16.2   splines_3.3.0     MASS_7.3-45
## [7] viridisLite_0.1.3 stringr_1.0.0     tools_3.3.0
## [10] parallel_3.3.0  grid_3.3.0       nlme_3.1-128
## [13] coda_0.18-1     deldir_0.1-12    gtools_3.5.0
## [16] htmltools_0.3.5  yaml_2.1.13      digest_0.6.9
## [19] formatR_1.4      evaluate_0.9      rmarkdown_0.9.6
## [22] gdata_2.17.0    stringi_1.0-1     LearnBayes_2.15
## [25] boot_1.3-18     foreign_0.8-66   hexbin_1.27.1
## [28] zoo_1.7-12
```