

Afterword

Both parts of this book have quite consciously tried not to give authoritative advice on choices of methods or techniques.¹ The handling and analysis of spatial data with R continues to evolve – this is implicit in open source software development. It is also an important component attempting to offer applied researchers access to accepted and innovative alternatives for data analysis, and applied statisticians with representations of spatial data that make it easier to test and develop new analytical tools.

A further goal has been to provide opportunities for bringing together the various camps and traditions analysing spatial data, to make it somewhat easier to see that their ways of conducting their work are not so different from one another in practise. It has always been worrying that fields like disease mapping or spatial econometrics, with very similar data scenarios, make different choices with regard to methods, and treatments of the assumptions underlying those methods, in their research practice. Research practice evolves, and learning from a broader spread of disciplines must offer the chance to avoid choices that others have found less satisfactory, to follow choices from which others have benefited and to participate in innovation in methods.

This makes participation in the R community, posting questions or suggestions, reporting apparent bugs not only a practical activity, but also an affirmation that science is fostered more by openness than the unwarranted restriction of findings. In the context of this book, and as we said in the preface, we would be grateful for messages pointing out errors; errata will be posted on the book website (<http://www.asdar-book.org>).

¹ An illustration from an email exchange between the authors: “I think we are trying to enable people to do what they want, even if they shoot themselves in the feet (but in a reproducible way)!”

R and Package Versions Used

- R version 3.0.0 (2013-04-03), `x86_64-unknown-linux-gnu`
- Base packages: `base`, `datasets`, `graphics`, `grDevices`, `grid`, `methods`, `splines`, `stats`, `stats4`, `utils`
- Other packages: `akima` 0.5-10, `BayesX` 0.2-6, `BayesXsrc` 2.1-1, `bdsmatrix` 1.3, `bitops` 1.0-5, `boot` 1.3-9, `CARBayes` 1.3, `class` 7.3-7, `classInt` 0.1-19, `coda` 0.16-1, `colorspace` 1.2-1, `cubature` 1.1-2, `DCluster` 0.2-6, `deldir` 0.0-21, `e1071` 1.6-1, `epitools` 0.5-7, `evd` 2.3-0, `fields` 6.7, `foreign` 0.8-53, `Formula` 1.1-0, `geoR` 1.7-4, `geosphere` 1.2-28, `ggplot2` 0.9.3.1, `graph` 1.37.7, `gstat` 1.0-16, `gtools` 2.7.0, `INLA` 0.0, `lattice` 0.20-14, `latticeExtra` 0.6-24, `lmtest` 0.9-30, `locfit` 1.5-8, `maps` 2.3-2, `maptools` 0.8-23, `MASS` 7.3-26, `Matrix` 1.0-11, `MCMCpack` 1.2-4, `McSpatial` 1.1.1, `mgcv` 1.7-22, `nlme` 3.1-109, `osmar` 1.1-5, `pgirmess` 1.5.6, `pixmap` 0.4-11, `pkgDepTools` 1.25.0, `plm` 1.3-1, `quantreg` 4.96, `R2BayesX` 0.1-2, `R2WinBUGS` 2.1-18, `RandomFields` 2.0.66, `RANN` 2.2.1, `raster` 2.1-16, `RBGL` 1.35.0, `RColorBrewer` 1.0-5, `RCurl` 1.95-4.1, `rgdal` 0.8-5, `rgeos` 0.2-13, `sandwich` 2.2-9, `shapefiles` 0.7, `sp` 1.0-6, `spacetime` 1.0-4, `spam` 0.29-2, `SparseM` 0.96, `spatstat` 1.31-1, `spdep` 0.5-56, `spgrass6` 0.7-15, `sphet` 1.2-00, `splanCS` 2.01-32, `truncdist` 1.0-1, `XML` 3.96-0.1, `xtable` 1.7-1, `xts` 0.9-3, `zoo` 1.7-9
- Loaded via a namespace (and not attached): `BiocGenerics` 0.5.6, `dichromat` 2.0-0, `digest` 0.6.3, `gtable` 0.1.2, `intervals` 0.14.0, `labeling` 0.1, `LearnBayes` 2.12, `munsell` 0.4, `parallel` 3.0.0, `plyr` 1.8, `proto` 0.3-10, `reshape2` 1.2.2, `scales` 0.2.3, `stringr` 0.6.2, `tools` 3.0.0

Data Sets Used

- Auckland 90 m Shuttle Radar Topography Mission: downloaded on 26 September 2006 from the US Geological Survey, National Map Seamless Server <http://seamless.usgs.gov/>, now <http://earthexplorer.usgs.gov/>, GeoTiff file, 3 arcsec ‘Finished’ (90 m) data; file 70042108.zip on book website.
- Auckland shoreline: downloaded on 7 November 2005 from the National Geophysical Data Center coastline extractor <http://www.ngdc.noaa.gov/mgg/shorelines/shorelines.html>; file `auckland_mapgen.dat` on book website.
- Biological cell centres: available as `data(cells)` from `spatstat`, documented in Ripley (1977).
- Broad Street cholera mortalities: original files provided by Jim Detwiler, who had collated them for David O’Sullivan for use on the cover of O’Sullivan and Unwin (2003), based on earlier work by Waldo Tobler and others; this version is available as a compressed archive of a GRASS

location in file `snow_location.tgz`, and a collection of GeoTiff and shapefiles exported from this location in file `snow_files.zip` on the book website.

- California redwood trees: available as `data(redwoodfull)` from **spatstat**, documented in [Strauss \(1975\)](#).
- Cars: available as `data(cars)` from **datasets**.
- CRAN mirrors: locations of CRAN mirrors 1 October 2005; file on book website `CRAN051001a.txt`.
- Eurasian Collared Dove, *Streptopelia decaocto*, for the years 1986–2003, data used were originally obtained from the North American Breeding Bird Survey, published by [Cressie and Wikle \(2011\)](#); downloaded from the book web site, ftp://ftp.wiley.com/public/sci_tech_med/spatio_temporal_data/.
- Japan shoreline: available in the ‘world’ database provided by **maps**.
- Japanese black pine saplings: available as `data(japanesepines)` from **spatstat**, documented in [Numata \(1961\)](#).
- Lansing Woods maple trees: available as `data(lansing)` from **spatstat**, documented in [Gerard \(1969\)](#).
- Loggerhead turtle: downloaded on 2 November 2005 with permission from SEAMAP, ([Read et al., 2003](#)), data set 105; data described in [Nichols et al. \(2000\)](#); file `seamap105_mod.csv` on book website.
- Manitoulin Island: created using `Rgshhs` in **maptools** from the GSHHS high resolution file `gshhs_h.b`, version 1.5, of 3 April 2007, downloaded from <ftp://ftp.soest.hawaii.edu/pwessel/gshhs>.
- Maunga Whau volcano: available as `data(volcano)` from **datasets**.
- Meuse bank: available as `data(meuse)` from **sp**, supplemented by `data(meuse.grid)` and `data(meuse.riv)`, and documented in [Rikken and Van Rijn \(1993\)](#) and [Burrough and McDonnell \(1998\)](#).
- New Mexico brain cancer: The original data set for 1973–1991 has been downloaded from the SatScan™ web site (<http://www.satscan.org>) and it has been completed with county boundaries obtained from the U.S. Census Bureau web site (<http://www.census.gov/geo/www/cob/cs2000.html>).
- New York leukemia: used and documented extensively in [Waller and Gotway \(2004\)](#) and with data made available in Chap.9 of <http://www.sph.emory.edu/~lwaller/WGindex.htm>; the data import process is described in the help file of `NY_data` in **spdep**; geometries downloaded from the CIESIN server at <ftp://ftp.ciesin.columbia.edu>, file `/pub/census/usa/tiger/ny/bna_st/t8_36.zip`, and extensively edited; a zip archive `NY_data.zip` of shapefiles and a GAL format neighbours list is on the book website.
- North Carolina SIDS: shapefile `sids.shp` (based on geometries downloaded from <http://sal.agecon.uiuc.edu/datasets/sids.zip>; currently at <http://geodacenter.org/downloads/data-files/sids.zip>) and GAL format neighbour lists `ncCC89.gal` and `ncCR85.gal` distributed with **spdep**, data from [Cressie \(1993\)](#), neighbour lists from [Cressie and](#)

Chan (1989) and Cressie and Read (1985), documented in the `nc.sids` help page.

- North Derbyshire asthma study: the data has been studied by Diggle and Rowlingson (1994), Singleton et al. (1995), and Diggle (2003); the data are made available in anonymised form by permission from Peter Diggle as shapefiles in a zip archive `north_derby_asthma.zip` on the book website.
- Olinda 2010 population census, enumeration districts and remotely sensed data: Shapefile, raster files and data modified from downloads from <http://censo2010.ibge.gov.br/en/resultados>, <http://www.ibge.gov.br/home/estatistica/populacao/censo2010>, <http://www.dgi.inpe.br/CDSR/>, <http://earthexplorer.usgs.gov/>, ftp://geoftp.ibge.gov.br/malhas_digitais/censo_2010/setores_censitarios/shape/pe_v1.2.zip and ftp://ftp.ibge.gov.br/Censos/Censo_Demografico_2010/Sinopse/Agregados_por_Setores_Censitarios/Base_informacoes_setores2010_sinopse_PE.zip; the two latter are now: ftp://geoftp.ibge.gov.br/malhas_digitais/censo_2010/setores_censitarios/pe.zip and ftp://ftp.ibge.gov.br/Censos/Censo_Demografico_2010/Resultados_do_Universo/Agregados_por_Setores_Censitarios/Base_informacoes_setores2010_universo_PE.zip. These are stored in a zip archive `Olinda_data.zip` on the book website.
- Produc data in `plm`: A panel of 48 observations (one for each US state) from 1970 to 1986; online complement to Baltagi (2001), <http://www.wiley.com/legacy/wileychi/baltagi/>, <http://www.wiley.com/legacy/wileychi/baltagi/supp/PRODUC.prn>
- Scottish lip cancer: Shapefile and data file downloaded from the book website of Waller and Gotway (2004), <http://www.sph.emory.edu/~lwaller/WGindex.htm>, Chaps. 2 and 9.
- Spearfish: downloaded as GRASS location from http://grass.itc.it/sampledata/spearfish_grass60data-0.3.tar.gz, now http://grass.osgeo.org/sampledata/spearfish_grass60data.tar.gz; this data set has been the standard GRASS location for tutorials and is documented in Neteler and Mitasova (2004).
- US 1999 SAT scores: state boundaries available in the ‘state’ database provided by `maps`, original attribute data downloaded on 2 November 2005 from <http://www.biostat.umn.edu/~melanie/Data/> and supplemented with variable names and state names; the data set is also available from the website of Banerjee et al. (2004), <http://www.biostat.umn.edu/~brad/data/state-sat.dat>, and the modified version as file `state.sat.data_mod.txt` from the book website.
- World volcano locations: downloaded from the National Geophysical Data Center <http://www.ngdc.noaa.gov/hazard/volcano.shtml>, available as file `data1964a1.xy` from book website.

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