Universität Hamburg

KlimaCampus

Wissenschaftliches Arbeiten

Sommersemester 2011

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http://wiki.zmaw.de/lehre

Übersicht

- Verantwortung der Wissenschaft
- Datenanalyse und Visualisierung
- Gutachten

Verantwortung?

In Italien sind sieben Wissenschaftler wegen Totschlags angeklagt, weil sie vor dem katastrophalen Erdbeben von L'Aquila am 6. April 2009 nicht gewarnt haben sollen (...) Den Wissenschaftlern werde vorgeworfen, "unexakte, unvollständige und widersprüchliche Informationen" über die Erdbebengefahr in L'Aquila gegeben zu haben (...)

Spiegel Online, 27.05.2011

Datenanalyse und Visualisierung

- Datenanalyse dient dem Erkennen von Zusammenhängen und dem Testen von Hypothesen
  - Explorative Datenanalyse
  - Modellbasierte Datenanalyse
- Datenvisualisierung ist wichtiges Werkzeug der Datenanalyse
  - Abhängigkeit
  - Verteilung
  - Zusammensetzung
  - Vergleich

Verarbeitungsschritte der Datenanalyse

- Präprozessierung - Bearbeiten von Rohdaten
  - Selektion, Kalibration, Anbringen von Korrekturen, Transformation der Observablen in die gesuchte Größe (z.B. Laufzeit in Höhe), Fehlerbestimmung
- Prozessierung
  - Filtern, Normierung, Tests der Abhängigkeiten einzelner Variablen, zeitliche Variabilität
  - Komponentenzerlegung (z.B. Frequenz, Hauptkomponenten)
  - Clusterbildung, Klassifikation
  - Daten als Initial- oder Randbedingung, oder zur Assimilation in Modellen
- “Analyse” im Eigentlichen Sinn
  - Visualisierung
  - Verstehen der Ergebnisse des Prozessierens

Software für Prozessierung und Visualisierung

Kommerzielle Software

- MATLAB
- IDL
- Avzio
-
-

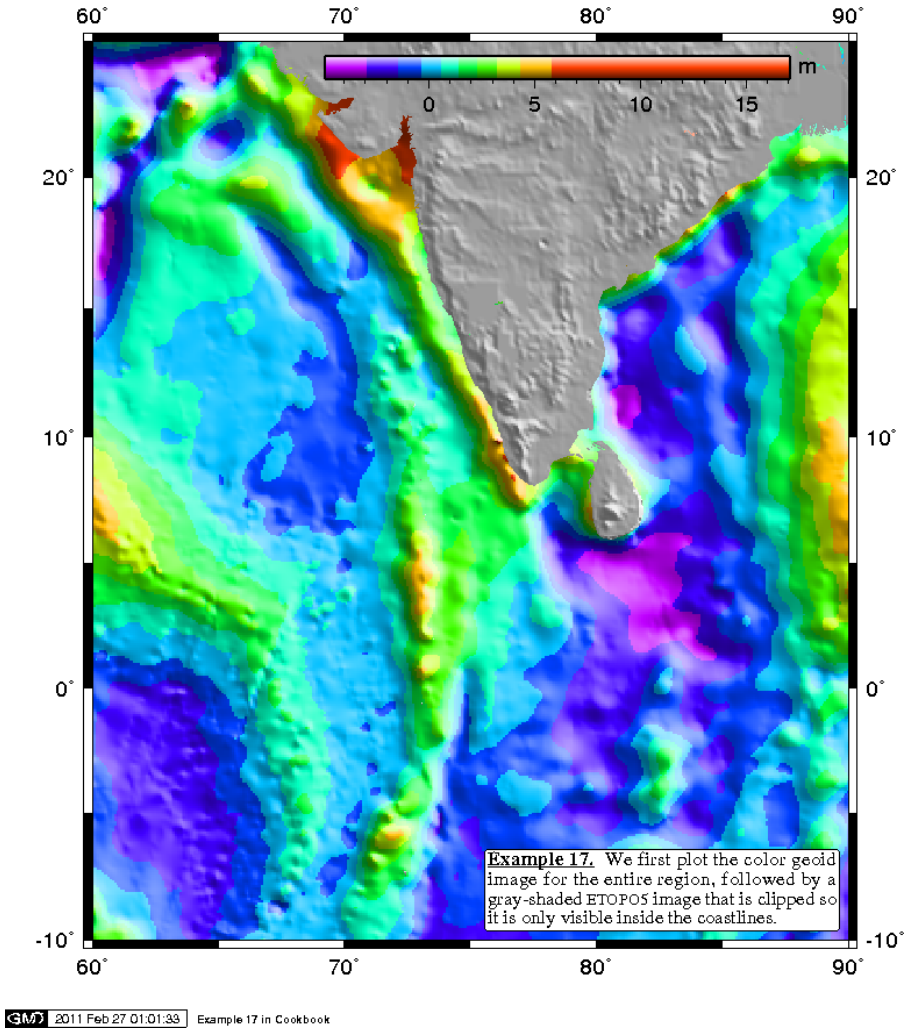
Freie und Open Source Software:

- Scientific Tools for Python
  - SciPy (pronounced SSigh Pie") is open-source software for mathematics, science, and engineering. It is also the name of a very popular conference on scientific programming with Python. The SciPy library depends on NumPy, which provides convenient and fast N-dimensional array manipulation. The SciPy library is built to work with NumPy arrays, and provides many user-friendly and efficient numerical routines such as routines for numerical integration and optimization. Together, they run on all popular operating systems, are quick to install, and are free of charge. NumPy and SciPy are easy to use, but powerful enough to be depended upon by some of the world's leading scientists and engineers.
- `http://www.scipy.org`
  `http://www.pythonxy.com/`

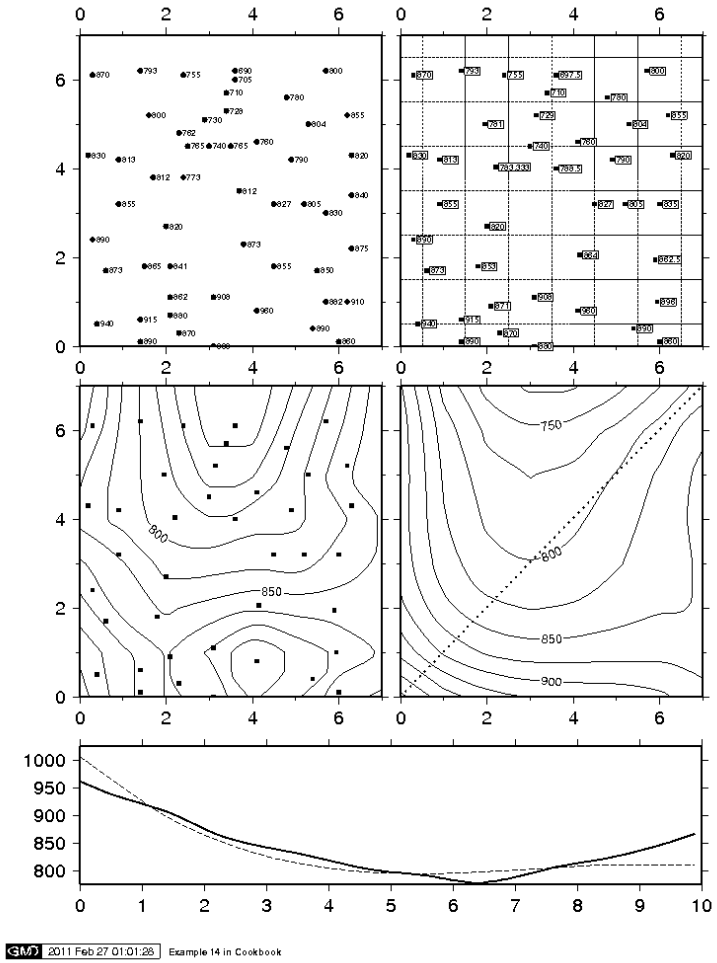
Freie und Open Source Software

- The Generic Mapping Tools
  - GMT is an open source collection of 60 tools for manipulating geographic and Cartesian data sets (including filtering, trend fitting, gridding, projecting, etc.) and producing Encapsulated PostScript File (EPS) illustrations ranging from simple x-y plots via contour maps to artificially illuminated surfaces and 3-D perspective views.
- `http://www.soest.hawaii.edu/gmt/`

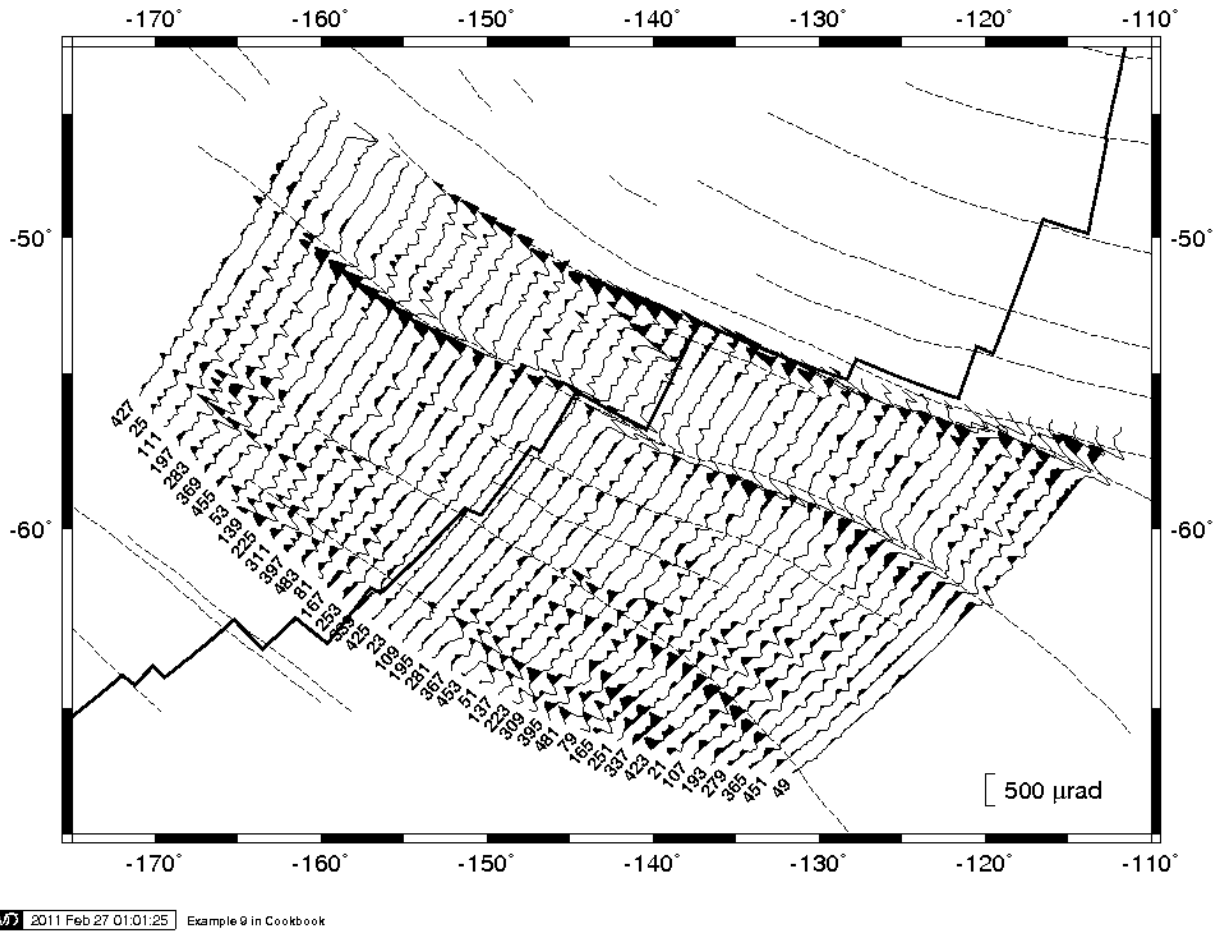
Clipping of Images



The Generic Mapping Tools



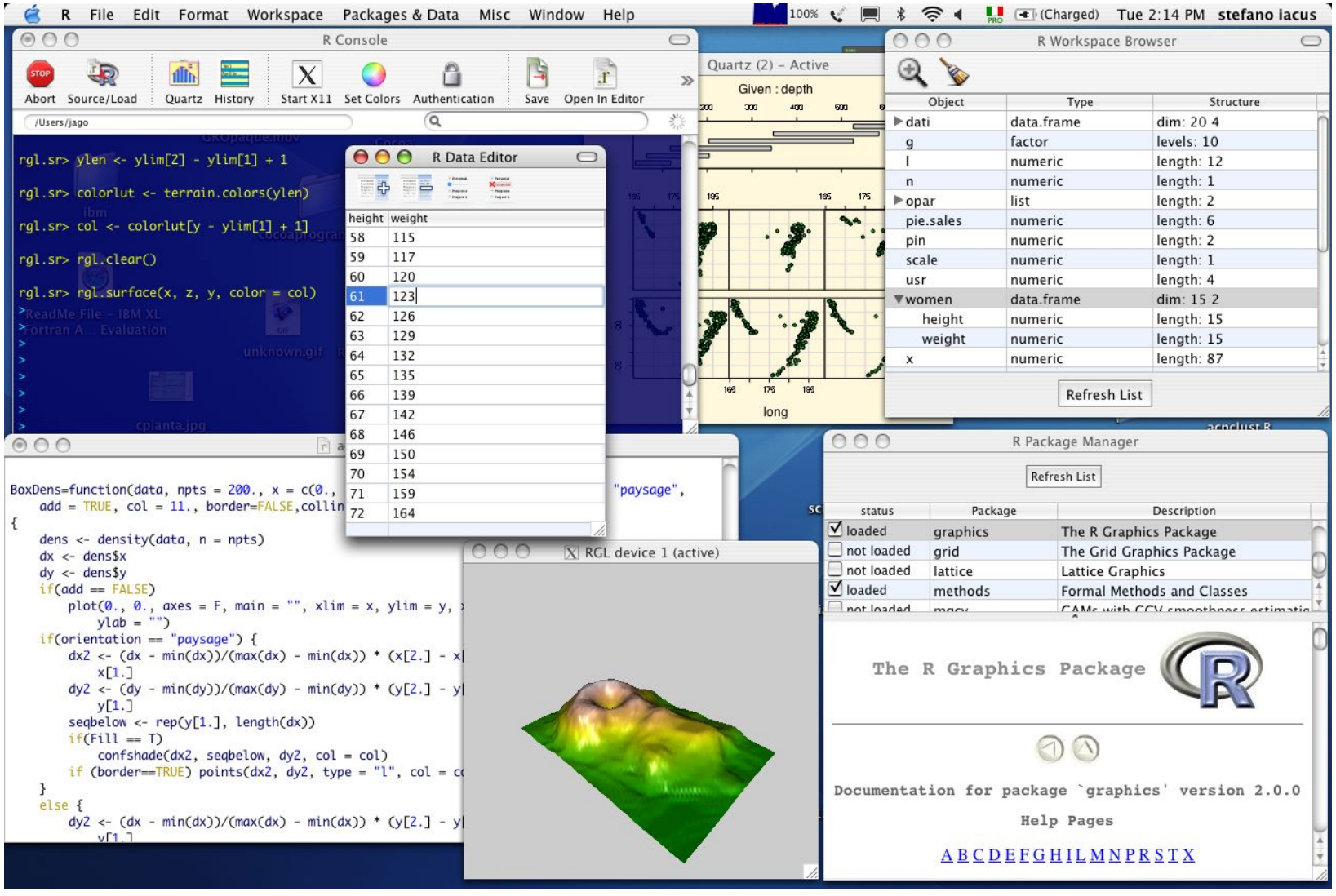
The Generic Mapping Tools



Freie und Open Source Software

- R
  - R is a language and environment for statistical computing and graphics. R provides a wide variety of statistical (linear and nonlinear modelling, classical statistical tests, time-series analysis, classification, clustering, ...) and graphical techniques, and is highly extensible.
    One of R's strengths is the ease with which well-designed publication-quality plots can be produced, including mathematical symbols and formulae where needed. Great care has been taken over the defaults for the minor design choices in graphics, but the user retains full control.
- `http://www.r-project.org/`

R


R File Edit Format Workspace Packages & Data Misc Window Help
R Console
Abort Source/Load Quartz History Start X11 Set Colors Authentication Save Open In Editor
/Users/jago
rgl.sr> ylen <- ylim[2] - ylim[1] + 1
rgl.sr> colorlut <- terrain.colors(ylen)
rgl.sr> col <- colorlut[y - ylim[1] + 1]
rgl.sr> rgl.clear()
rgl.sr> rgl.surface(x, z, y, color = col)
R Data Editor
height weight
58 115
59 117
60 120
61 123
62 126
63 129
64 132
65 135
66 139
67 142
68 146
69 150
70 154
71 159
72 164
Quartz (2) - Active
Given : depth
long
R Workspace Browser
Object Type Structure
dati data.frame dim: 20 4
g factor levels: 10
l numeric length: 12
n numeric length: 1
opar list length: 2
pie.sales numeric length: 6
pin numeric length: 2
scale numeric length: 1
usr numeric length: 4
women data.frame dim: 15 2
height numeric length: 15
weight numeric length: 15
x numeric length: 87
Refresh List
BoxDens=function(data, npts = 200., x = c(0.,
add = TRUE, col = 11., border=FALSE,collin
"paysage",
{
dens <- density(data, n = npts)
dx <- dens$x
dy <- dens$y
if(add == FALSE)
plot(0., 0., axes = F, main = "", xlim = x, ylim = y,
ylab = "")
if(orientation == "paysage") {
dx2 <- (dx - min(dx))/(max(dx) - min(dx)) * (x[2.] - x
x[1.]
dy2 <- (dy - min(dy))/(max(dy) - min(dy)) * (y[2.] - y
y[1.]
seqbelow <- rep(y[1.], length(dx))
if(Fill == T)
confshade(dx2, seqbelow, dy2, col = col)
if (border==TRUE) points(dx2, dy2, type = "l", col = c
}
else {
dy2 <- (dx - min(dx))/(max(dx) - min(dx)) * (y[2.] - y
RGL device 1 (active)
R Package Manager
Refresh List
status Package Description
loaded graphics The R Graphics Package
not loaded grid The Grid Graphics Package
not loaded lattice Lattice Graphics
loaded methods Formal Methods and Classes
The R Graphics Package
Documentation for package `graphics' version 2.0.0
Help Pages
A B C D E F G H I L M N P R S T X

Gutachten

1. Titel
2. Abstract
3. Einleitung
4. Wissenschaftliche Fragestellung
5. Methodik
6. Daten
7. Diskussion
8. Schlussfolgerungen
9. Abbildungen und Tabellen
10. Quellenangaben
11. Form

Entwickeln Sie Kriterien zur Begutachtung!