Fifty ways to draw a volcano using package **plot3D** .

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Abstract

There must be more than 50 ways to .. draw the volcano data set from R, using R-package plot3D (Soetaert).

Keywords: volcano, persp3D, Image, plot3D, R .

1. Intro

To reduce the size of this vignette, I reduce the size of `volcano`:

```
# Reduce the resolution
Volcano <- volcano[seq(1, nrow(volcano), by = 3),
                   seq(1, ncol(volcano), by = 3)]
```

2. Images and contours

```
par(mfrow = c(3, 3), mar = c(3, 3, 3, 3))
contour(Volcano)
Contour(Volcano, lwd = 2)
image(Volcano)
image(Volcano, col = jet.col(100))
Image(Volcano, clab = "m")
Image(Volcano, facets = FALSE)
Image(Volcano, contour = TRUE)
Image(Volcano, contour = list(lwd = 2, col = jet.col(11)))
Image(Volcano, theta = 30, NAcol = "black")
```

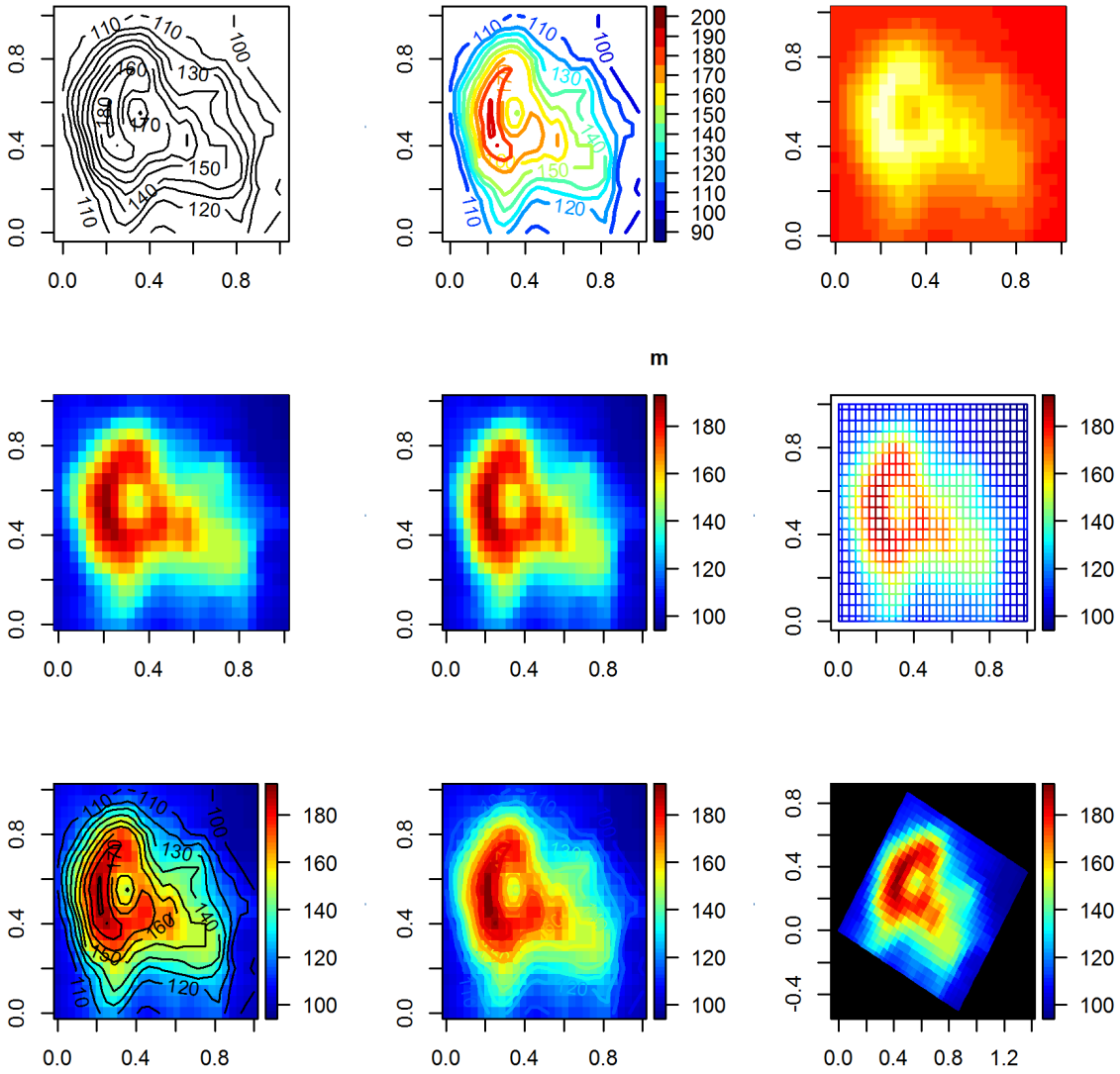

Figure 1: The Image and contour function

3. persp3D

```
par(mfrow = c(3, 3), mar = c(2, 2, 2, 2))
persp(Volcano)
persp(Volcano, theta = 40, phi = 40, col = "gold", border = NA, shade = 0.5)
persp3D(z = Volcano, clab = "m")
persp3D(z = Volcano, clab = "m", shade = 0.2)
persp3D(z = Volcano, facets = FALSE)
persp3D(z = Volcano, facets = FALSE, shade = 0.2)
persp3D(z = Volcano, col = "gold", border = "black", shade = 0.5)
persp3D(z = Volcano, col = ramp.col(c("grey", "black")))
persp3D(z = Volcano, facets = FALSE, col = "darkblue")
```

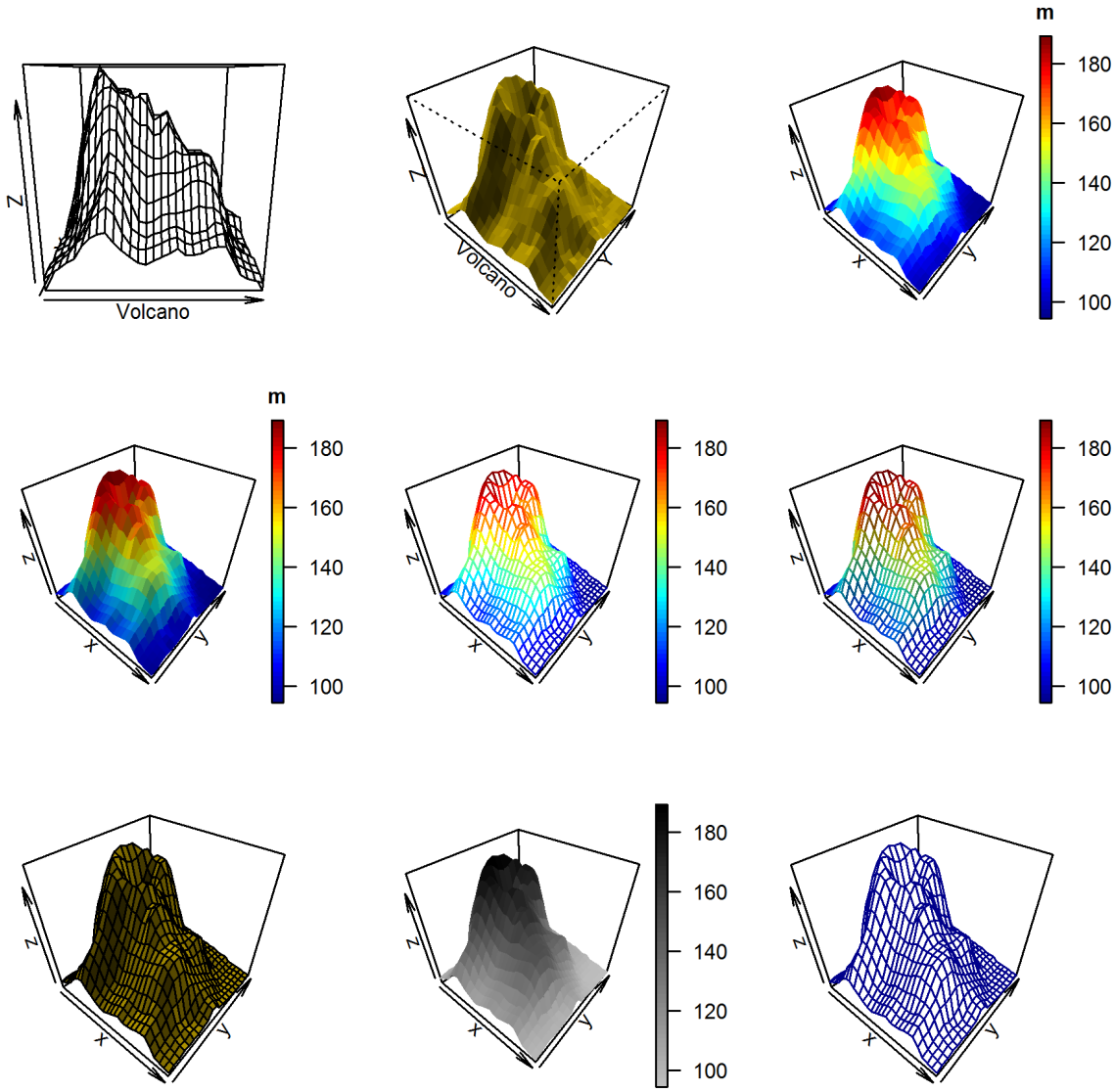

Figure 2: The persp3D function

4. Backgrounds and axes annotations

```
par(mfrow = c(3, 3), mar = c(1, 1, 1, 1))
persp3D(z = Volcano, col = "lightblue", shade = 0.5)
persp3D(z = Volcano, col = "lightblue", shade = 0.5, box = FALSE)
persp3D(z = Volcano, col = "lightblue", shade = 0.5, ticktype = "detailed")
persp3D(z = Volcano, col = "lightblue", shade = 0.5, bty = "f")
persp3D(z = Volcano, col = "lightblue", shade = 0.5, bty = "b2")
persp3D(z = Volcano, col = "lightblue", shade = 0.5, bty = "g")
persp3D(z = Volcano, col = "lightblue", shade = 0.5, bty = "bl")
persp3D(z = Volcano, col = "lightblue", shade = 0.5, bty = "u",
       col.panel = "yellow", col.grid = "grey")
persp3D(z = Volcano, col = "lightblue", shade = 0.5,
       ticktype = "detailed", bty = "b2")
```

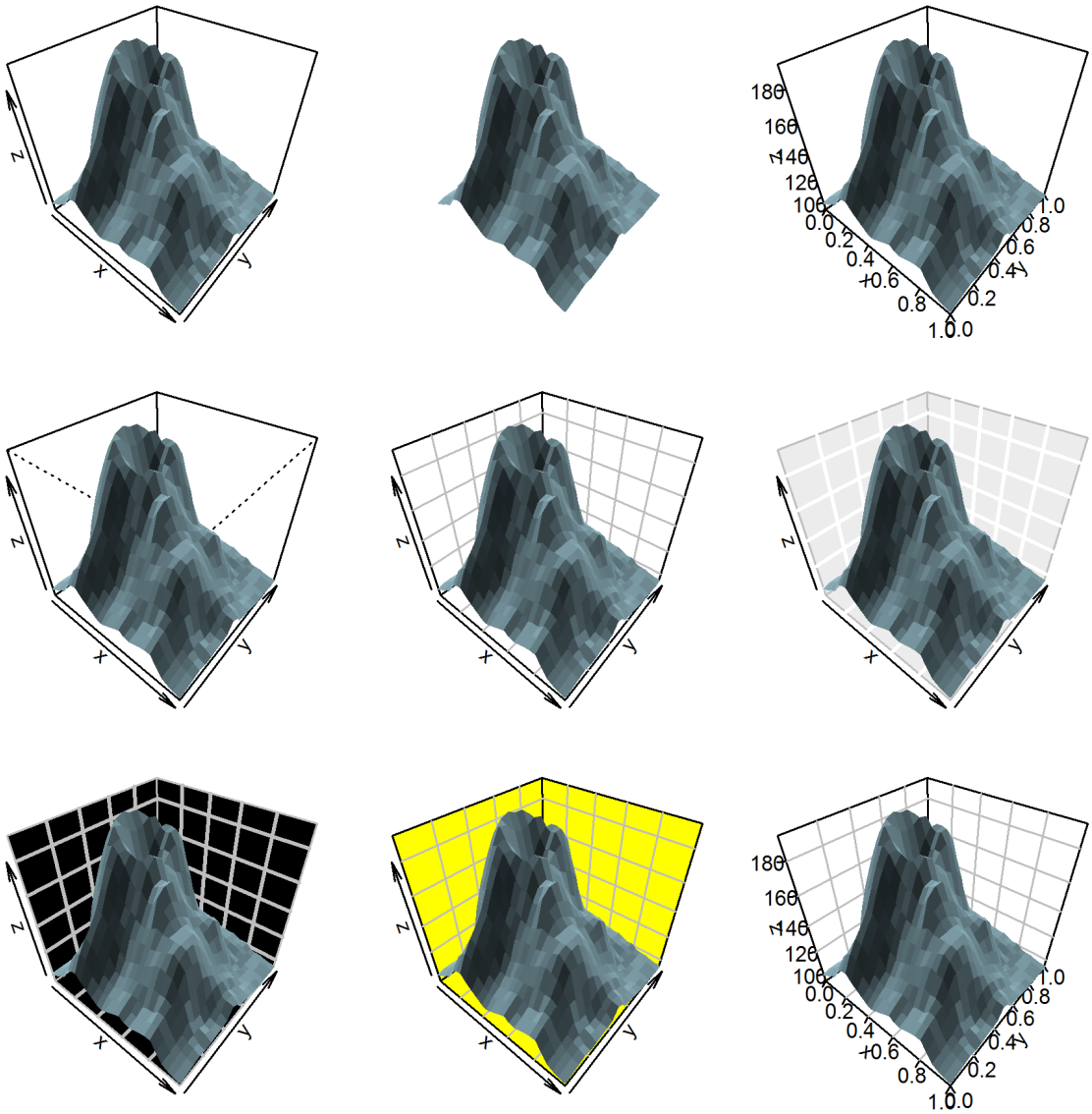

Figure 3: The box types

5. View and shading perspectives

```
par(mfrow = c(3, 3), mar = c(1, 1, 1, 1))
x <- 1:nrow(Volcano)
y <- 1:ncol(Volcano)
persp3D(x, y , z = Volcano, col = "lightblue", scale = FALSE,
       shade = 0.5, expand = 0.25)
persp3D(x, y , z = Volcano, col = "lightblue", scale = FALSE,
       shade = 0.5, expand = 0.25, d = 0.1)
persp3D(x, y , z = Volcano, col = "lightblue", scale = FALSE,
       shade = 0.5, expand = 0.25, d = 10)
persp3D(x, y , z = Volcano, col = "lightblue", scale = FALSE,
       shade = 0.5, expand = 0.25, r = 0)
persp3D(x, y , z = Volcano, col = "lightblue", scale = FALSE,
       shade = 0.5, expand = 0.25, r = 10)
persp3D(x, y , z = Volcano, col = "lightblue", scale = FALSE,
       shade = 0.5, expand = 0.25, theta = -10)
persp3D(x, y, z = Volcano, col = "lightblue", scale = FALSE,
       shade = 0.5, expand = 0.25, phi = 10)
persp3D(x, y , z = Volcano, col = "lightblue", scale = FALSE,
       shade = 0.5, expand = 0.25, ltheta = 10)
persp3D(x, y , z = Volcano, col = "lightblue", scale = FALSE,
       shade = 0.5, expand = 0.25, lphi = 90)
```

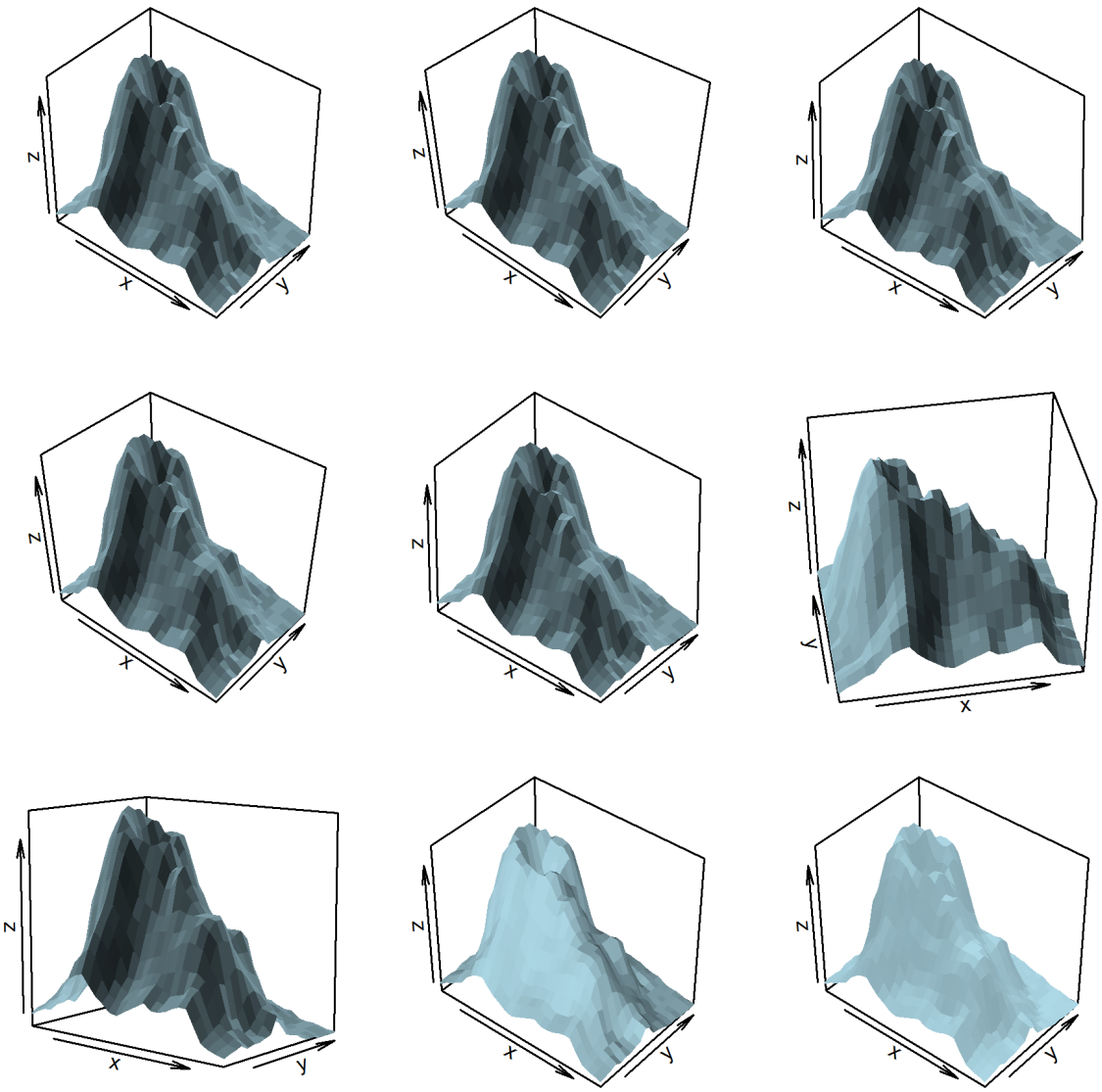

Figure 4: The views

6. Ribbons and histograms

```
par(mfrow = c(2, 2), mar = c(2, 2, 2, 2))
ix <- seq(1, nrow(Volcano), length.out = 20)
iy <- seq(1, ncol(Volcano), length.out = 20)
ribbon3D(z = Volcano[, iy])
ribbon3D(z = Volcano[ix, ], dir = "y")
ribbon3D(z = Volcano[ix, iy], dir = "xy")
hist3D(z = Volcano[ix,iy], shade = 0.5)
```

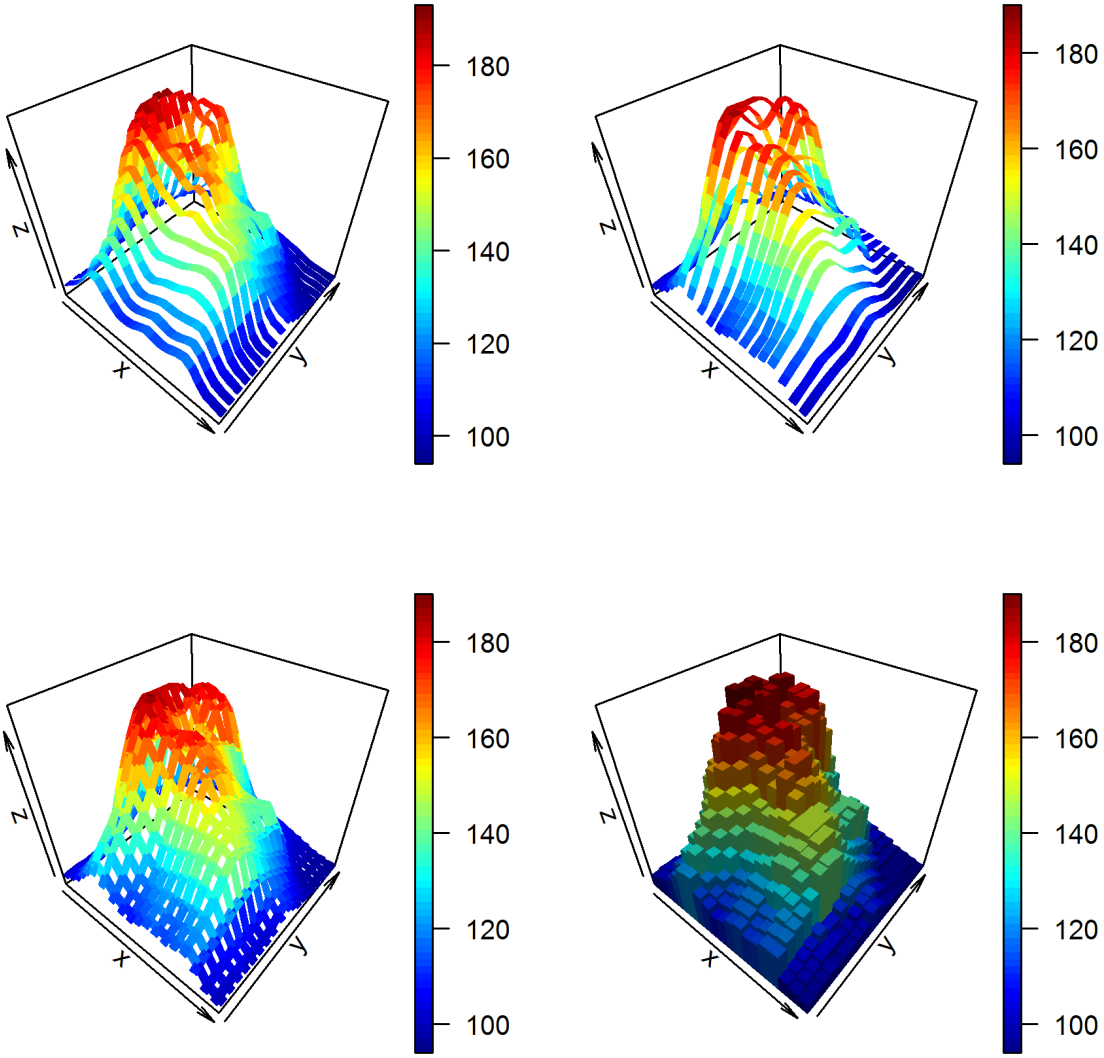

Figure 5: ribbons and histograms

7. Color keys

```
par(mfrow = c(2, 2), mar = c(2, 2, 2, 2))
persp3D(z = Volcano/1000, log = "c", clab = c("km (logscale)"))
persp3D(z = Volcano, clab = "m",
       colkey = list(side = 3, length = 0.5, width = 0.5, cex.axis = 0.8))
persp3D(z = Volcano, clab = c("height", "m"),
       colkey = list(length = 0.5, dist = -0.1, shift = -0.1))
par(mar = c(4, 4, 2, 2))
Image(z = Volcano, clab = "height, m",
       colkey = list(dist = -0.20, shift = 0.15,
       side = 3, length = 0.5, width = 0.5,
       cex.clab = 1.2, col.clab = "white", col.axis = "white",
       col.ticks = "white", cex.axis = 0.8))
```

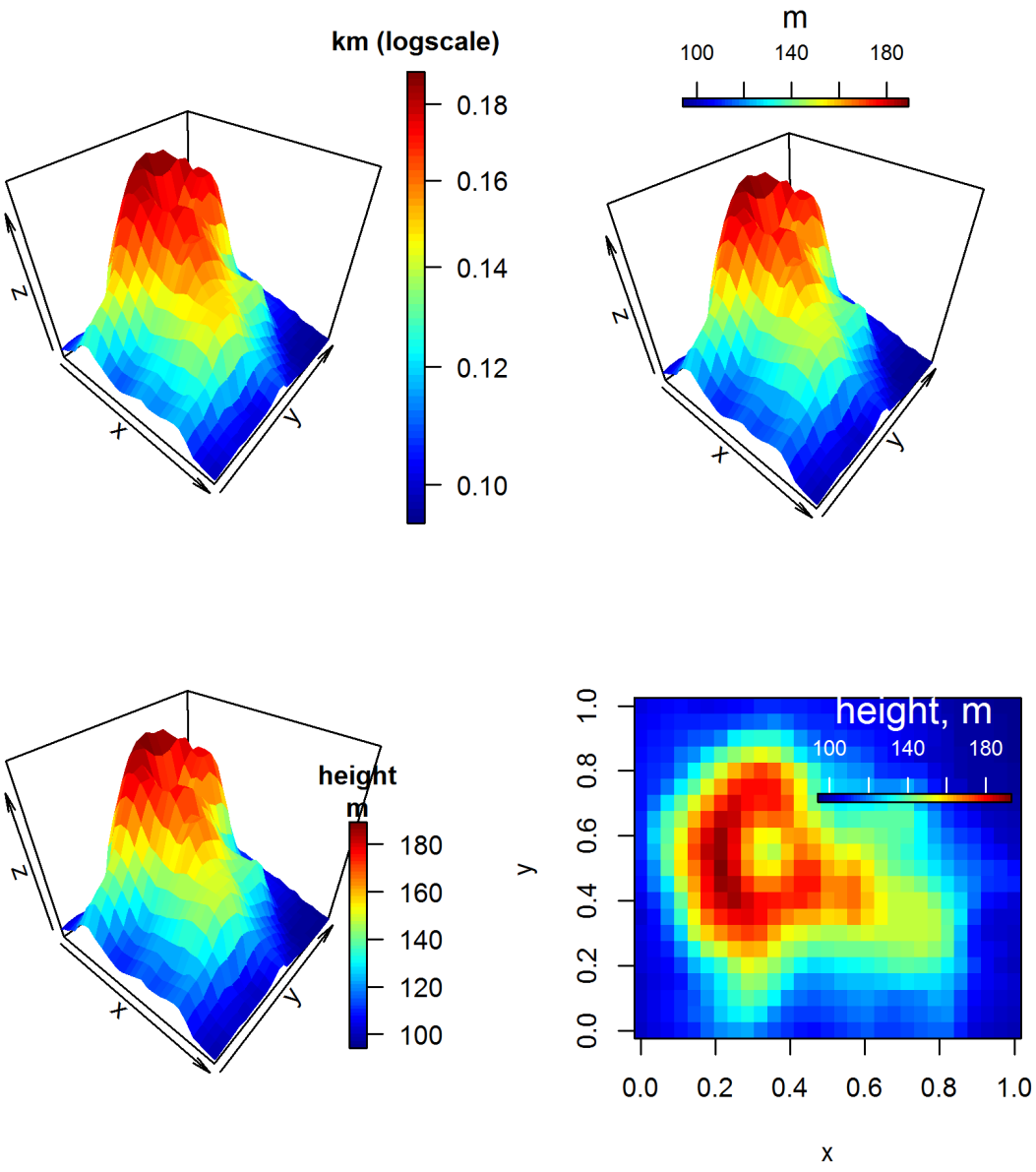

Figure 6: colorkeys

8. Combined persp3D and Image or contour

```
par(mfrow = c(2, 2), mar = c(2, 2, 2, 2))
ribbon3D(z = Volcano, zlim = c(-100, 200), image = TRUE)
persp3D(z = Volcano, zlim = c(-100, 200), contour = TRUE)
persp3D(z = Volcano, zlim= c(-200, 200), phi = 30,
       contour = list(nlevels = 20, col = "red"),
       image = list(col = grey (seq(0, 1, length.out = 100))))
persp3D(z = Volcano, contour = list(side = c("zmax", "z")), zlim= c(90, 300),
       phi = 30, theta = 20, d = 10, box = FALSE)
```

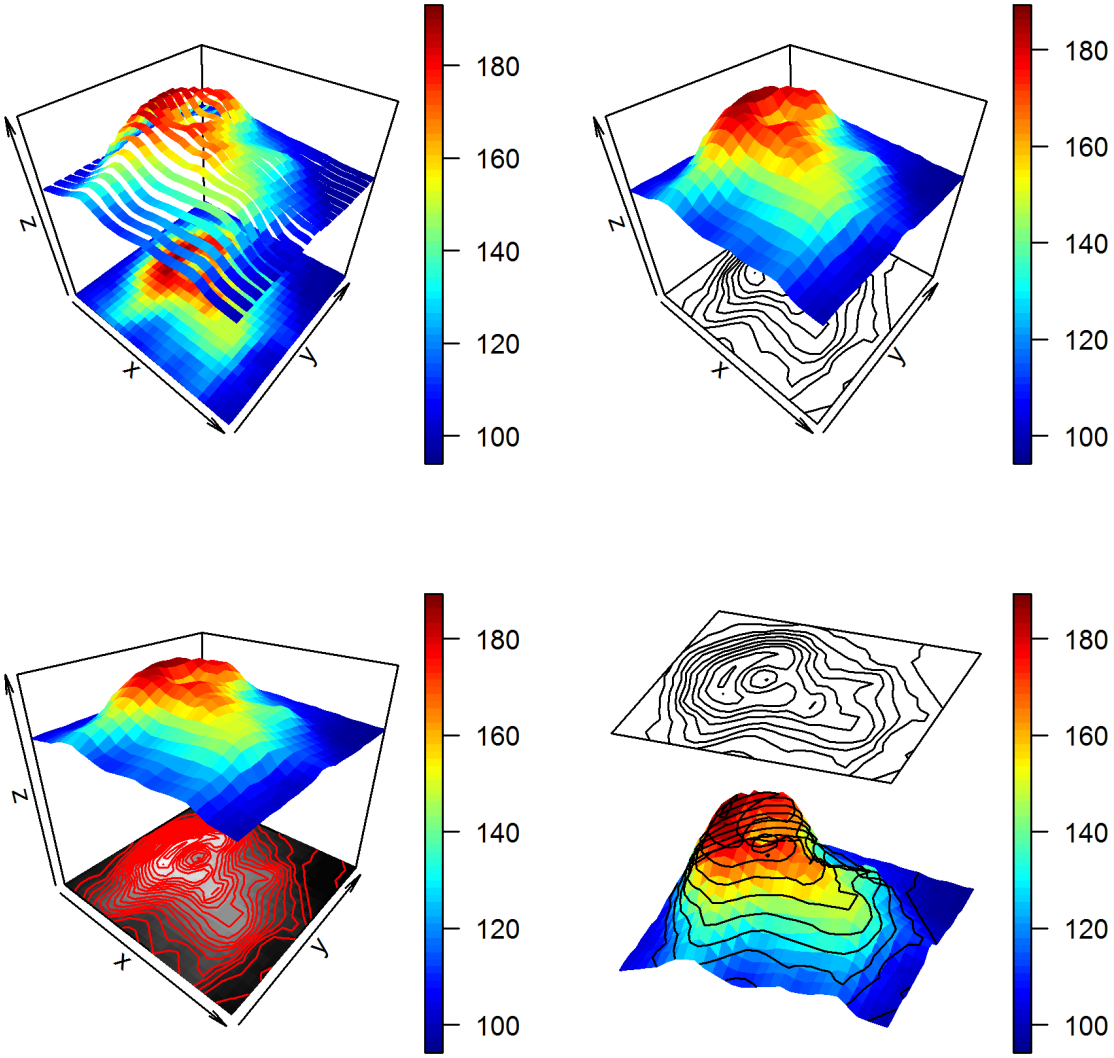

Figure 7: combined persp3D and Image

9. Two more to go

9.1. A composite complex one

```
par(mfrow = c(2, 1), mar = c(2, 2, 2, 2))
## ============================================================================
##  A composite one
## ============================================================================
# The volcano
 x <- 1:nrow(volcano)
 y <- 1:ncol(volcano)
# create the perspective box
 persp3D (x, y, z = volcano, theta = 10, phi = 20,
          box = FALSE, scale = FALSE, expand = 0.3)
# define a plane at z = 170
 Nz <- 50
 M <- mesh(x, y)
 z <- matrix(nrow = length(x), ncol = length(y), data = 170)
# add polygon; jetcolored, transparant: only border
 persp3D (x = x, y = y, z = z, add = TRUE,
          colvar = volcano, facets = NA)
## ============================================================================
## Drawing on panels
## ============================================================================
x <- 1 : nrow(Volcano)
y <- 1 : ncol(Volcano)
# A function that is called after the axes were drawn
panelfirst <- function(pmat) {
   XY <- trans3D(x = rep(1, ncol(Volcano)), y = y,
                 z = Volcano[10,], pmat = pmat)
   scatter(XY$x, XY$y, colvar = Volcano[10,],
           type = "l", lwd = 3, add = TRUE, colkey = FALSE)

   XY <- trans3D(x = x, y = rep(ncol(Volcano), nrow(Volcano)),
                 z = Volcano[,10], pmat = pmat)
   scatter(XY$x, XY$y, colvar = Volcano[,10],
           type = "l", lwd = 3, add = TRUE, colkey = FALSE)
 }
pmat <- persp3D(z = Volcano, x = x, y = y, scale = FALSE, theta = 30,
       expand = 0.1, panel.first = panelfirst, colkey = FALSE)
XY <- trans3D(x = rep(10, ncol(Volcano)), y = y, z = Volcano[10,],
   pmat = pmat)
lines(XY, lwd = 2, lty = 3)
XY <- trans3D(x = x, y = rep(10, nrow(Volcano)), z = Volcano[,10],
   pmat = pmat)
lines(XY, lwd = 2, lty = 3)
```

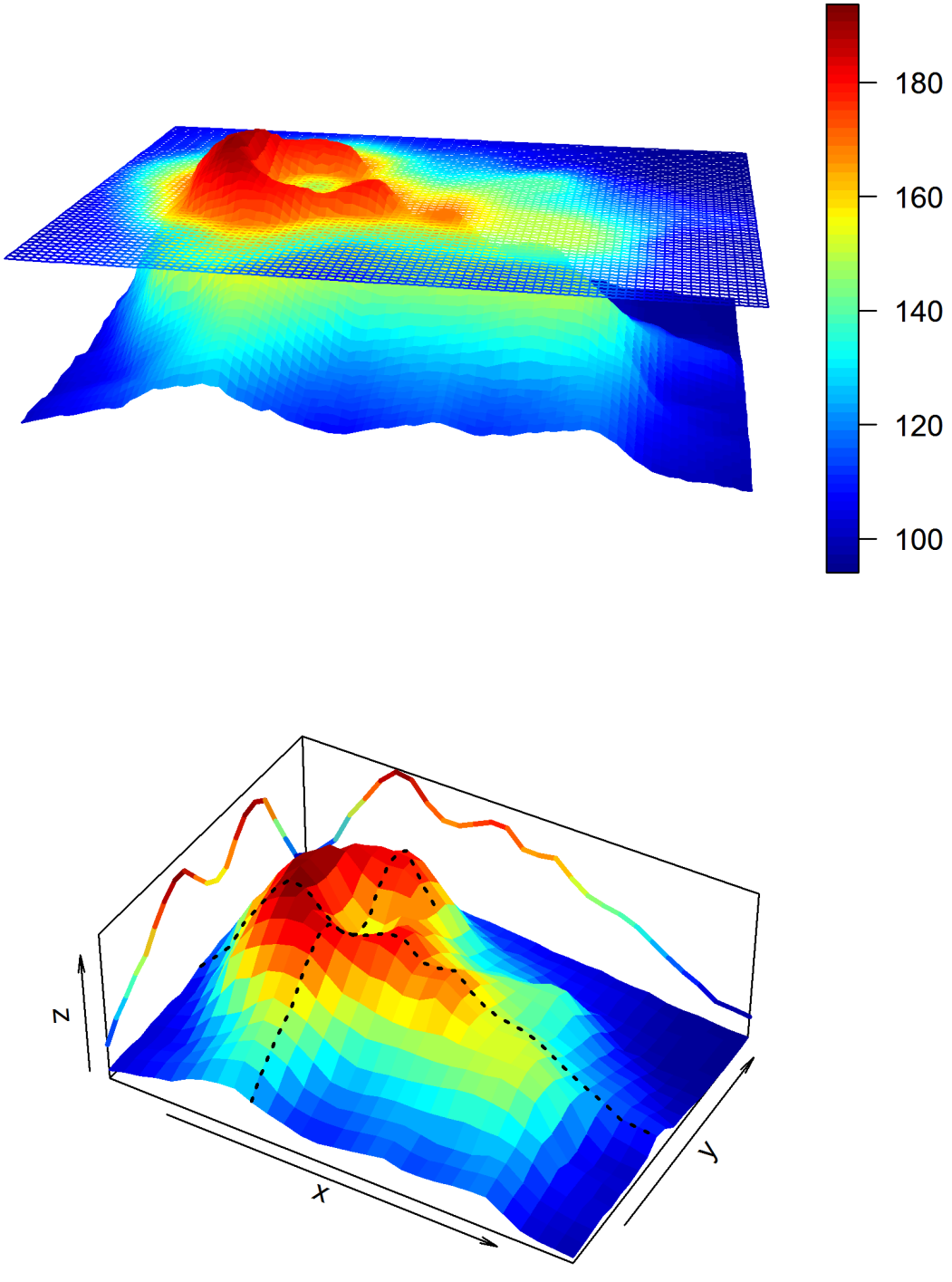

Figure 8:

References

Soetaert K (????). *plot3d: Plotting multi-dimensional data.* R package version 1.0.

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