Atmospheric correction

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Perform an atmospheric correction on a Landsat 8 scene

Set your working directory. You can use the function 'ReadClipboard()' to paste the path string with the correct syntaxis.

```
wd <- setwd("your\\path\\here")
getwd()
```

Install and load packages

```
# Define the multiple mutiple packages in a vector
PkgToLoad <- c("raster", "rgdal", "ggplot2", "devtools", "sf")
```

```
# Install mutiple packages if needed
install.packages(PkgToLoad)
```

```
# Load the packages
lapply(PkgToLoad, library, character.only = TRUE)
```

```
# The package 'devtools' is important in order to be able to import packages directly from the G
ithub repository
# While installing the last version of 'RStoolbox', please select option Nr:3 or 'None'. This wa
y no package will be updated
install_github("bleutner/RStoolbox")
```

```
library("RStoolbox")
```

Perform the radiometric correction. More information on: https://bleutner.github.io/RStoolbox/rstbx-docu/radCor.html (https://bleutner.github.io/RStoolbox/rstbx-docu/radCor.html)

In this exercise we are using the raster data of last week (basic raster) so please adjust your path accordingly

```
# Import meta-data and bands based on MTL file
metaData <- readMeta("data\\LC08_L1TP_174037_20180904_20180912_01_T1\\LC08_L1TP_174037_20180904_
20180912_01_T1_MTL.txt")

# Stack the metadata bands
lsMeta <- stackMeta(metaData)

# Correct DN to at-surface-reflecatance with DOS (Chavez decay model)
l8_boa_ref <- radCor(lsMeta, metaData, method = "dos")

# Export raster to folder
writeRaster(l8_boa_ref, datatype="FLT4S", filename = "data\\wk2_results\\l8_boa_ref.tif", format
= "GTiff", overwrite=TRUE)
```

Afterwards, load the image in QGis. Compare the file 'l8_boa_ref' and the file 'l8_radiance' in terms of quality.
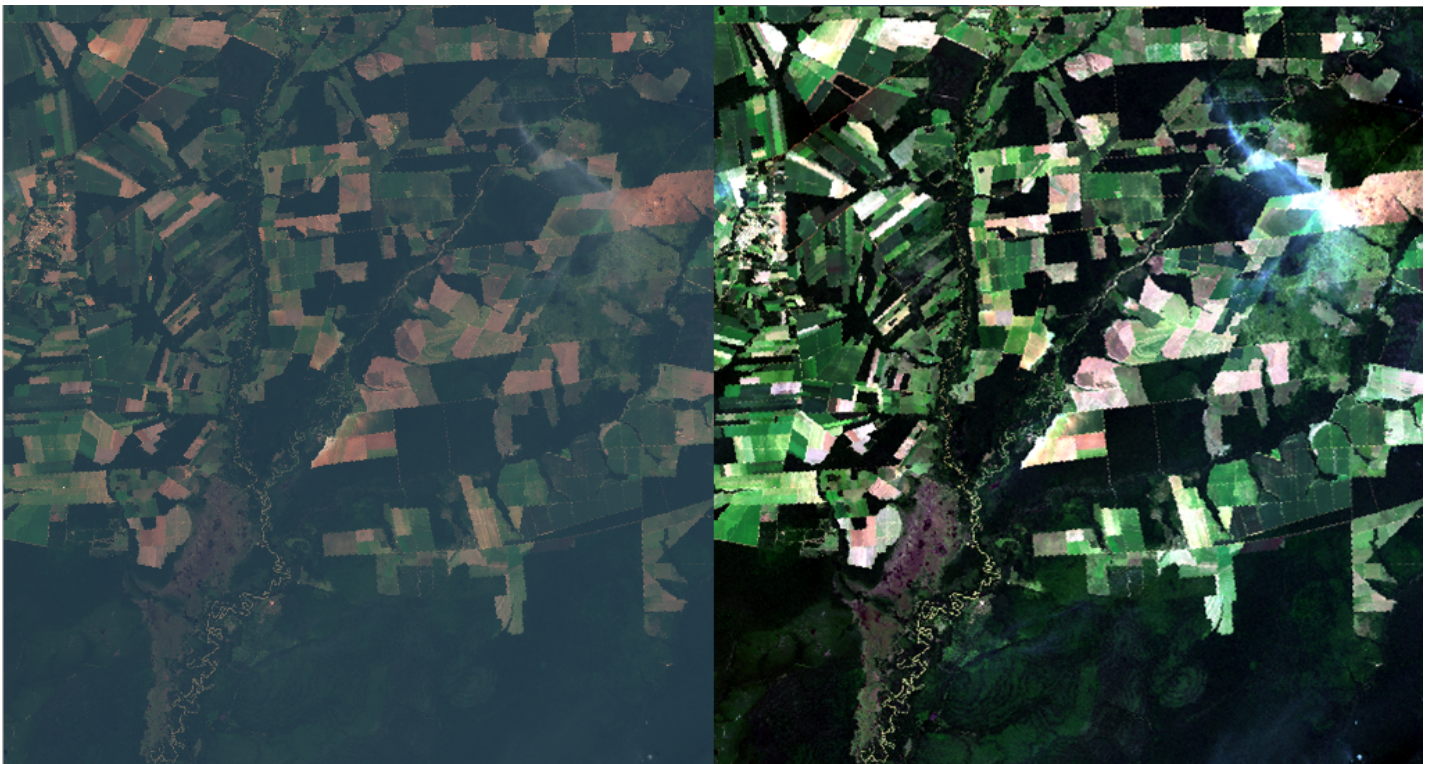

Figure 1. Left: Bottom of Atmosphere scene. Right: Radiance values scene. Landsat 8.

Load the BOA-Landsat8 image as a 'rasterBrick'.

```
# import the corrected boa image
l8_boa_br <- brick("data/wk2_results/l8_boa_ref.tif")
```

Load the vector file that shows a subset of the AOI and crop the Landsat corrected image.

```
# Load vector shapefile
aoi <- readOGR("data\\vector", "aoi_beirut")
```

```
## OGR data source with driver: ESRI Shapefile
## Source: "C:\Users\ulloa-to\git\Advanced_Remote_sensing_HM\data\vector", layer: "aoi_beirut"
## with 1 features
## It has 1 fields
## Integer64 fields read as strings:  id
```

In case the Projection of the vector and the raster do not coincide, reproject the vector file before cropping.

```r
# Check the projection of the vector
crs(aoi)

# Check the projection of your raster
crs(l8_boa_br)

# Reproject aoi if needed
aoi <- spTransform(aoi, crs(l8_boa_br))

# Crop all rasters to the extent of the aoi
l8_boa_cr <- crop(l8_boa_br, aoi)

# Export raster to folder
writeRaster(l8_boa_cr, datatype="FLT4S", filename = "data\\wk2_results\\l8_boa_cr.tif", format =
"GTiff", overwrite=TRUE)
```

```r
# Plot
plotRGB(l8_boa_cr, r=4, g=3, b=2, axes=TRUE, stretch="lin", main =
          "Bottom of Atmosphere Reflectance. Landsat 8")
```

Bottom of Atmosphere Reflectance. Landsat 8