SATELLITE IMAGERY ANALYSIS IN R

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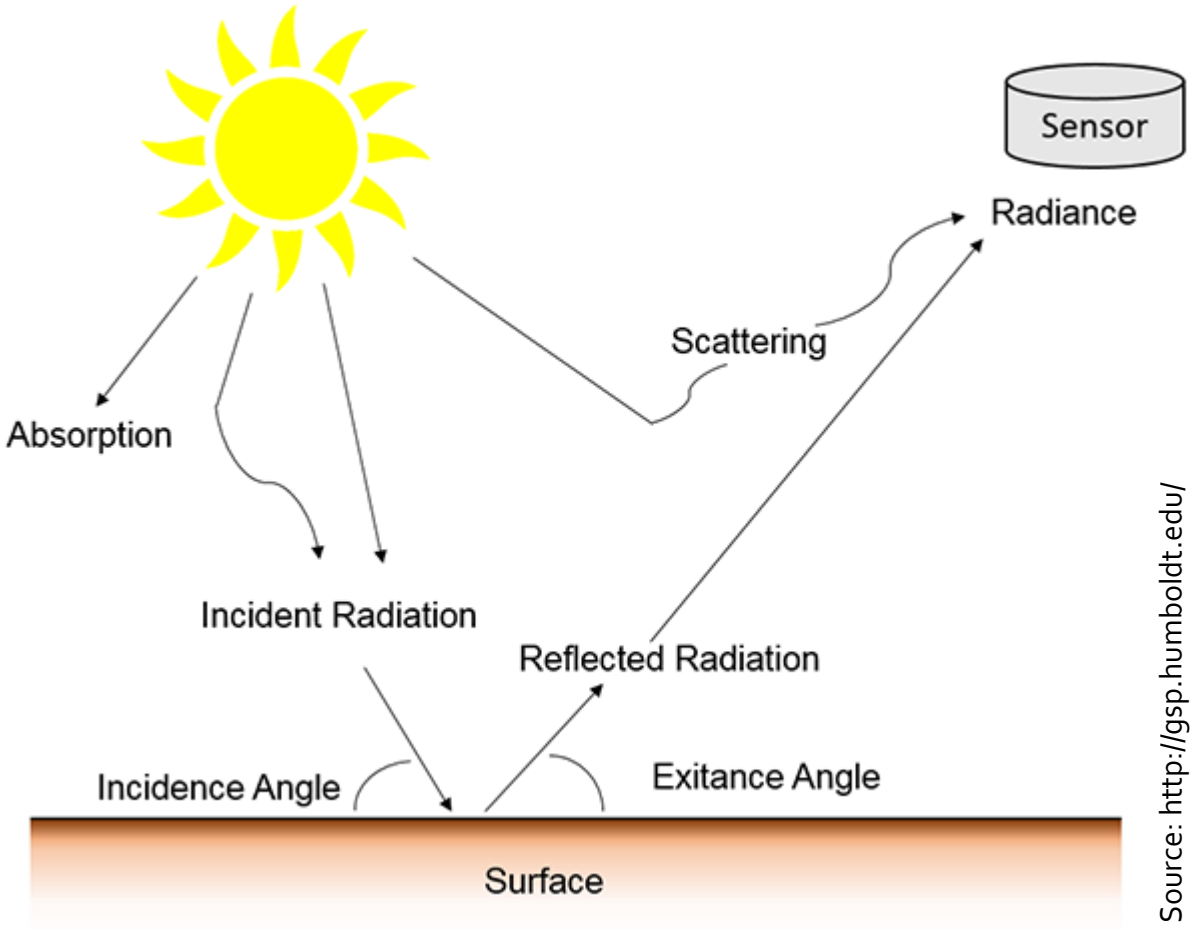
WHY R?

25-09-2020

Basic information

Remote sensing – acquisition of information about objects/phenomenon from the distance – e.g. from satellite, aircrafts, drones

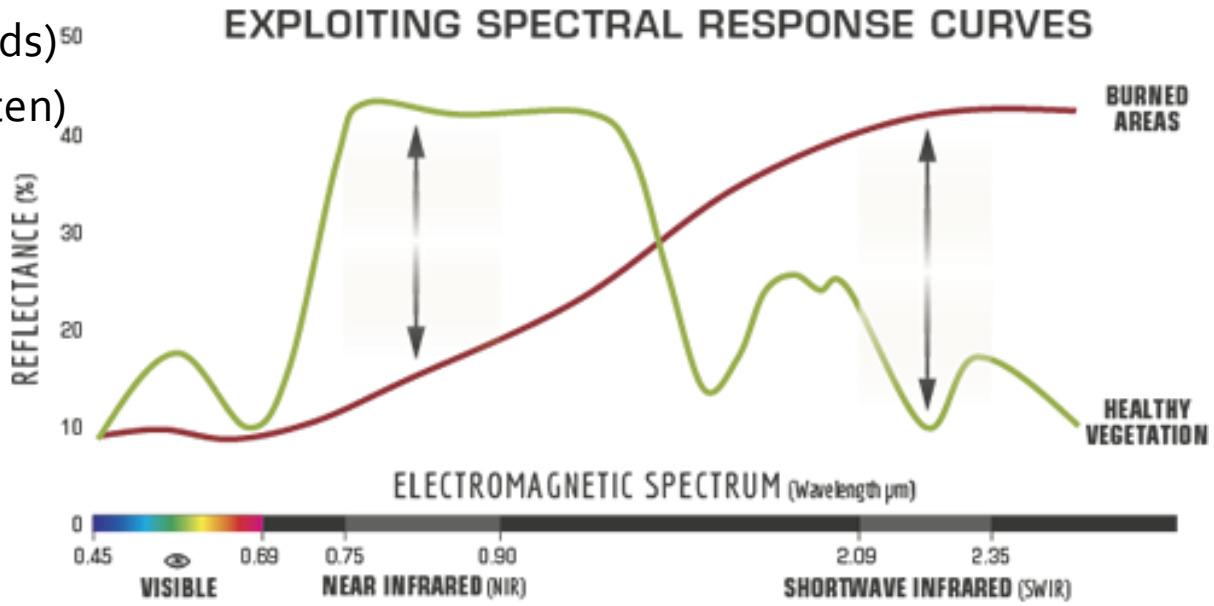
Optical remote sensing – use of visible and infrared waves



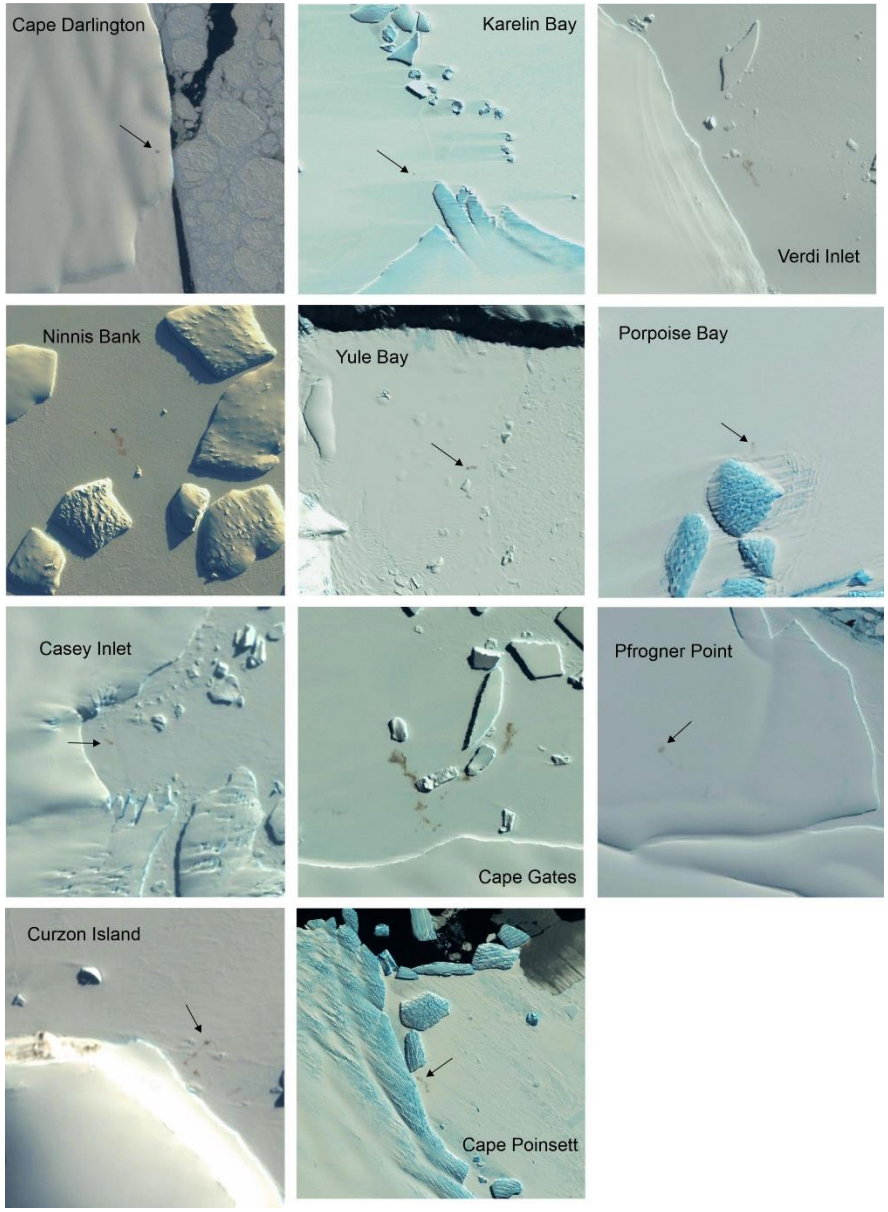
Source: http://gsp.humboldt.edu/

Basic information

- Optical imagery – for example Sentinel-2, Landsat, Google Earth high resolution images
- Resolutions:
  - Spatial (pixel size)
  - Spectral (n. of bands)
  - Temporal (how often)
  - Radiometric
- Applications…

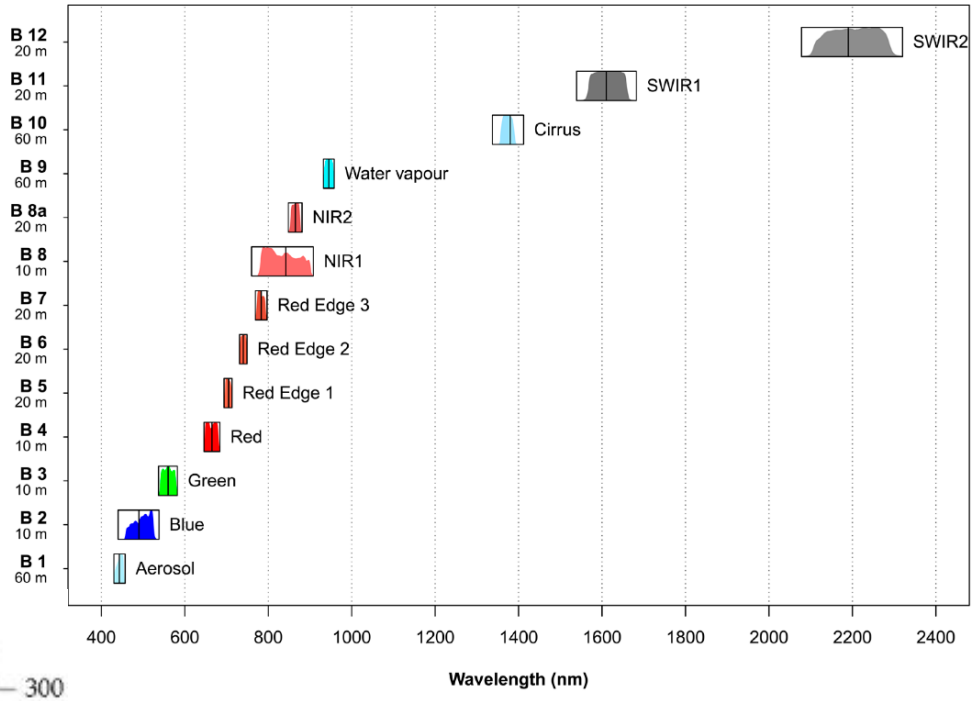


httphttp://gsp.humboldt.edu

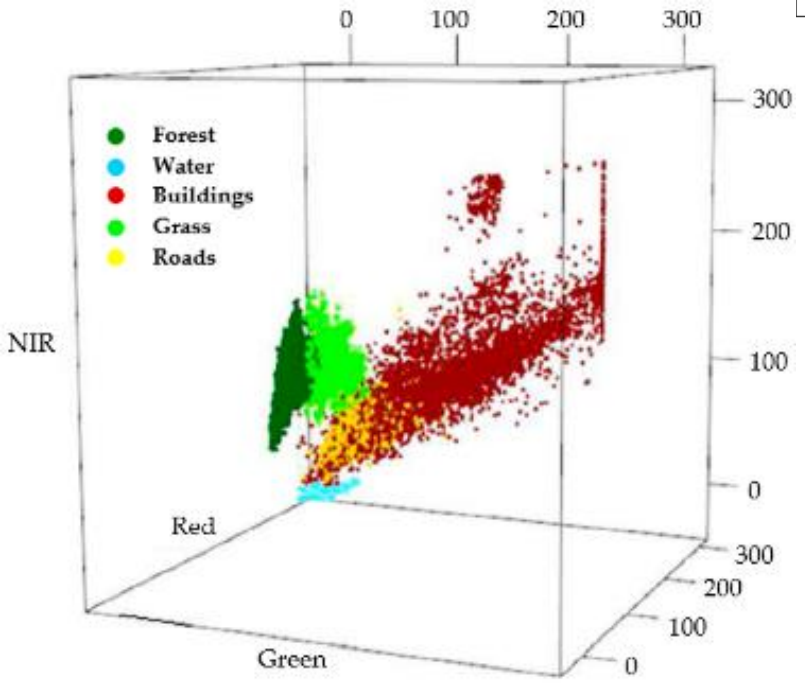


Fretwell & Trathan, 2020,
Discovery of new colonies by Sentinel2 reveals good and bad news for emperor penguins

Bands

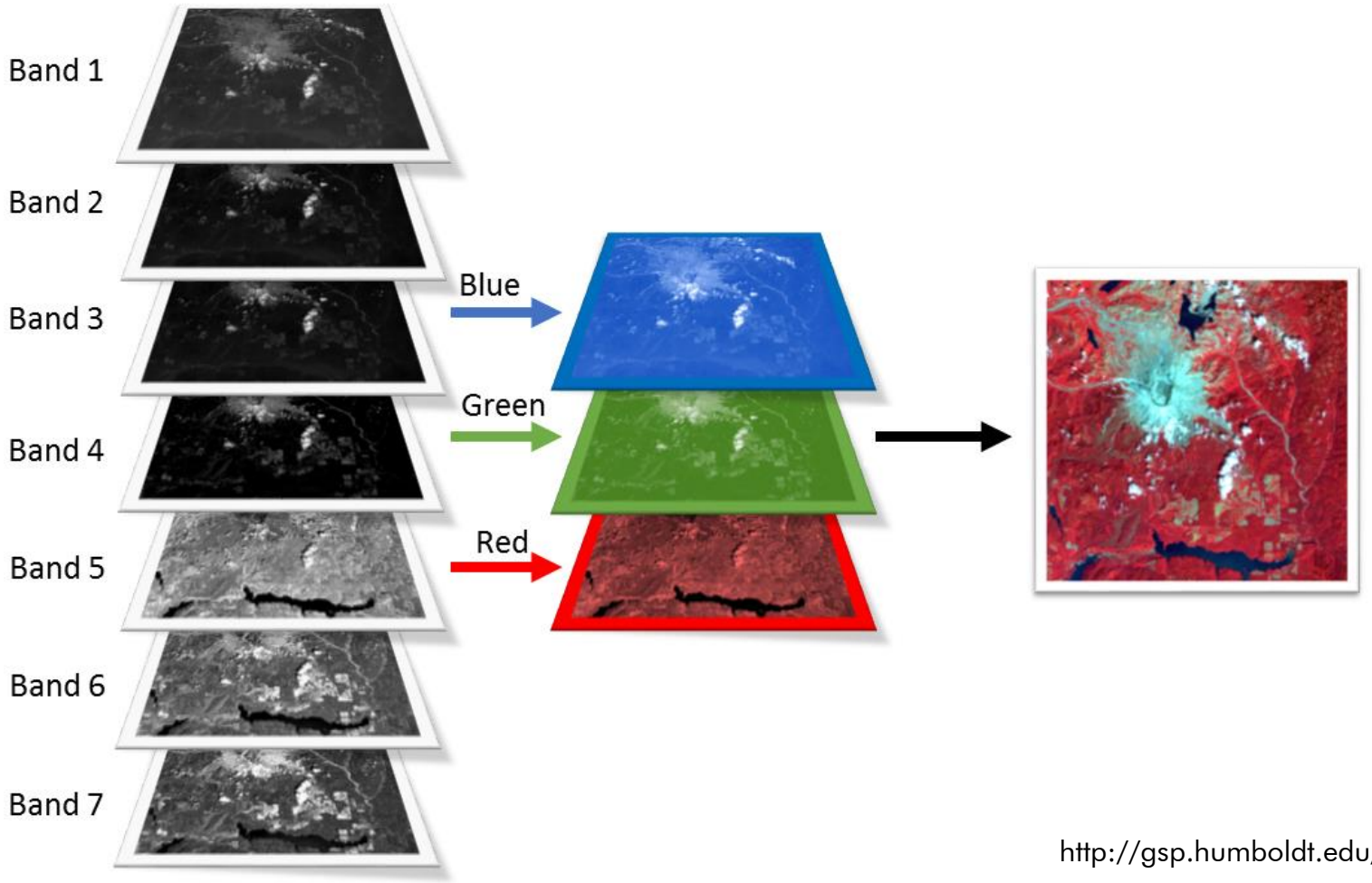


Źródło: Immitzer et al. 2016



Źródło: Hsiao, Cheng, 2016

Band composition



http://gsp.humboldt.edu/

We will work with:

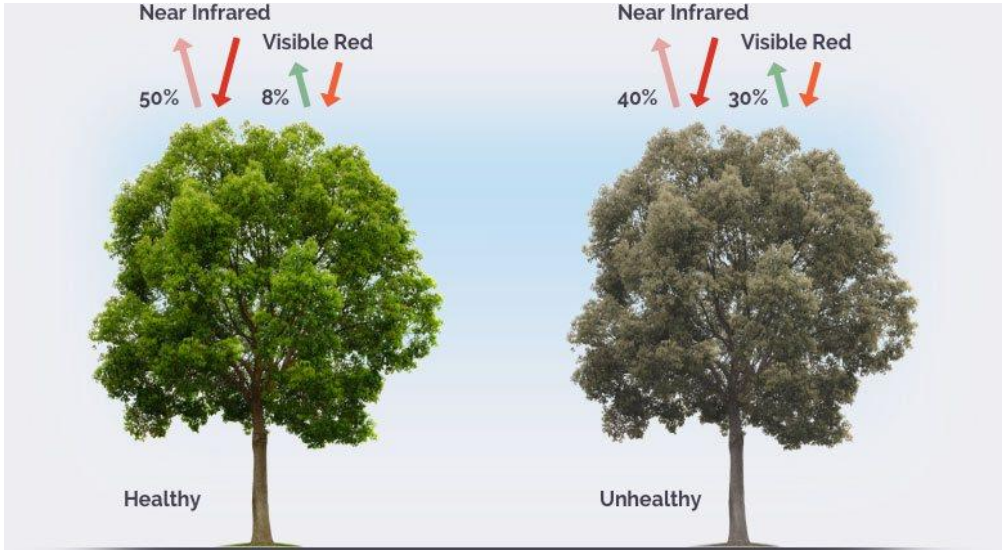
- Sentinel-2
  - Freely available
  - One image each 2-3 days
  - 10- and 20- meter resolution
  - Raster data
    - Raster = matrix of pixels
    - Spatial data

What we will do during workshop:

- Pre-processing
- Simple operations on bands, e.g. indices
- Classification using ML
- Feature selection/variable importance assessment

- NDVI (*Normalized Difference Vegetation Index*)

$$\frac{NIR - VIS\ R}{NIR + VIS\ R}$$



Classification of satellite imagery

Źródło: http://www.landinfo.com

Satellite imagery analysis in R

- Plenty of packages
- Download & pre-processing: **getSpatialdata, sen2r**
- Basic analysis: **raster**
- Processing: **RSToolbox**
- Machine learning algorithms from **caret**
- Others: ggplot2, dplyr …