O02: Concepts of Remote Sensing

After a full day of R, today everything will be about remote sensing and earth observation. As broad as this field is nowadays, we want to give you an overview of important concepts of remote sensing along with some best practices to quickly get you to work with satellite imagery. There will be three parts to this: a

1. Video lecture along with some questions for you.
2. Reading task to solidify the concepts on your own.
3. R practical that applies the learned concepts.

Lectures

Please follow the links below to access the lectures:

1. Introduction to remote sensing and satellite imagery https://www.youtube.com/watch?v=Zo31paYaGrM&list=PL1MbwuMcC4yWw0UhPyJE-oJCfXLlYrBYM
2. Introduction to Unoccupied Aerial Systems https://www.youtube.com/watch?v=u9n3hkuwO2g

Lecture Questions

- What is the difference between active and passive remote sensing systems?
- Which wavelengths cover the visible spectrum?
- What is the red edge?
- Define the NDVI and give an example for what the NDVI can be used for.
- Different spatial resolutions can be used for different projects and research questions. Think of one idea for using multi-spectral satellite data of 250 m spatial resolution and of one idea for using aerial images of 0.2 m spatial resolution.
- Explore the Copernicus Data Hub where you can download data from the Sentinel Missions: https://browser.dataspace.copernicus.eu

Reading Task

Read the article Seeing the System from Above: The Use and Potential of Remote Sensing for Studying Ecosystem Dynamics by Cornelius Senf (2022). You can download the article here as it is published as open access.

First we start with some general questions for a better understanding of the article:

- How does the author define *remote sensing*?
- What are the three main considerations when choosing remote sensing data for a particular project?
- What costs can be expected when working with satellite remote sensing data?
- What are some potential errors when working with remote sensing data?

The author's background is in the field of ecosystem dynamics and the article is regarding the benefits and challenges of remote sensing with regards to ecosystem research. However, the concepts depicted in the article are transferable to all environmental science (and beyond). Try to answer the next questions for yourself by keeping your own field of research in mind.

- What information could be retrieved from (multiple) landcover classifications for your field of interest?
- In what way could your research benefit from Unmanned Aerial Vehicles?
- In what way could your research benefit from satellite imagery?

R Practice

Now we want to put the remote sensing concepts into practice. Please download the training resources here and you will find the files `TASK-satellite-imagery.R` along with `landsat_fogo.tif` and `fogo_plots.gpkg` in there. Open the .R file with RStudio. It will guide you through your first analysis of satellite data and their visualization.

You can download the example solution here.

Lecture References

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- USGS – Earth Explorer. <https://earthexplorer.usgs.gov/> (14.08.2020).

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