

eLTER Science Conference - 2025 - Tampere,FI



Analyzing Remote Sensing Data with R

Getting Started

This [Github repository](#) lists the preparatory steps in advance of the workshop, and contains the practice exercises that will be covered.

Required Software

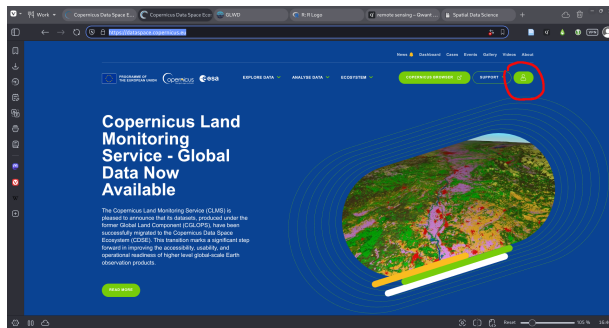
Each workshop participant should do the following on her laptop:

- Install a recent version of R, for your operating system from [CRAN](#)
- Windows users should add the Rtools toolchain;
 - from: [RTools](#)
 - matching the version of R that was installed
- Install RStudio™ from [Posit](#)
- Once R is installed, the following packages should also be added:
 - `terra`(Hijmans (2025)), `sf`, `remotes`, `CDSE`(Karaman (2025)), `rOPTRAM`(Silver, Beiden, and Karnieli (2023)), `leaflet`, `ggplot2`;
 - At the R command line, run:
 - `install.packages(c("terra", "sf", "remotes", "ggplot2", "leaflet"), dependencies = TRUE)`
 - `remotes::install_github("zivankaraman/CDSE")`
 - `remotes::install_github("ropensci/rOPTRAM")`

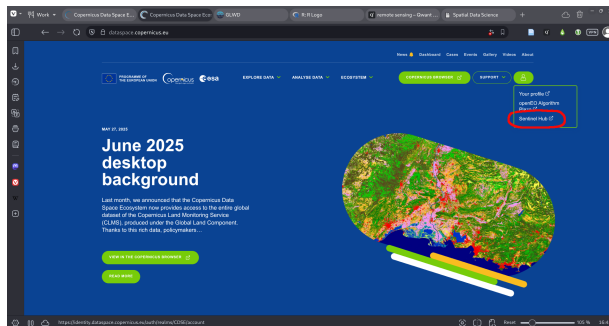
Authentication on Copernicus DataSpace (CDSE)

- Browse to CDSE [portal](#)
- Follow steps below to register on CDSE and prepare clientid and secret.
- Save both the clientid and secret to a `csv` text file.

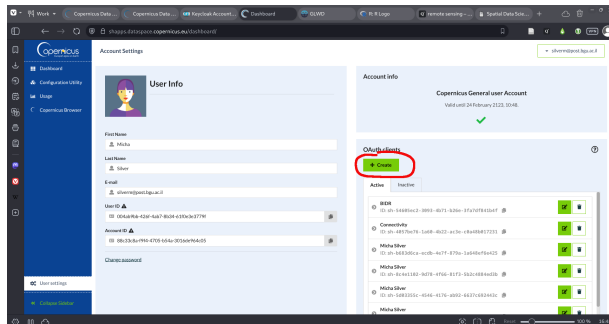
CDSE Authentication



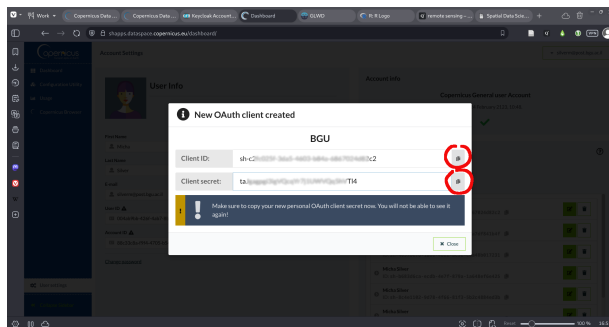
Browse to portal



Go to Sentinel Hub

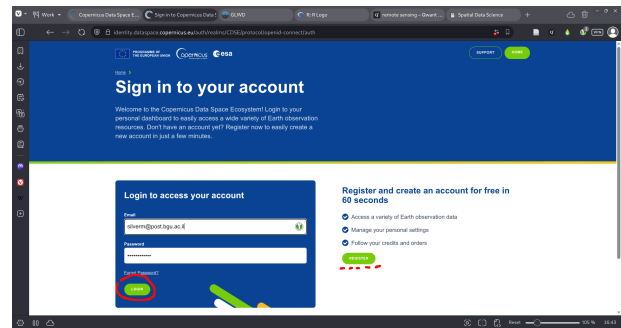


Create a new OAuth client

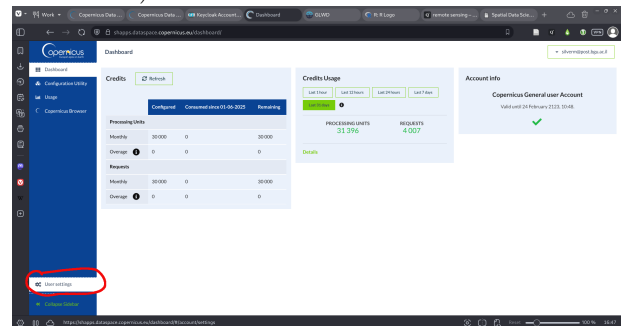


Copy both the clientid and the secret...

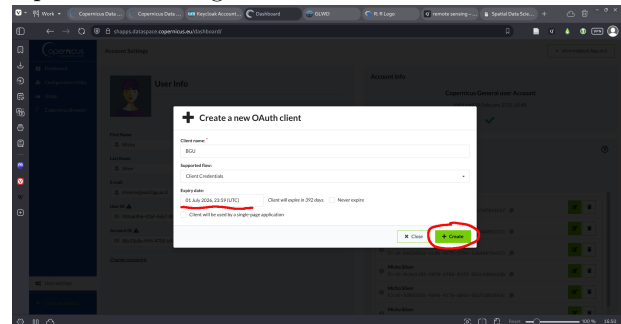
Steps



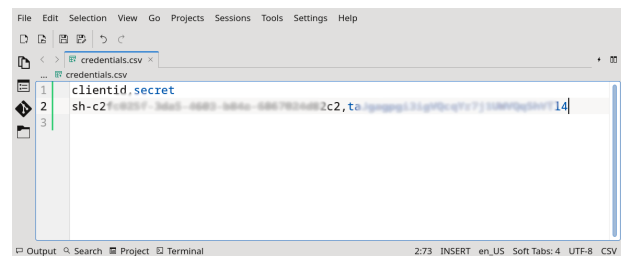
Register for an account (of Login if you already have an account)



Open User settings



Set expiration date and click Create



... and save to credentials.csv file

Workshop Exercise

Code and data

The exercise focuses on Doñana Park in Spain. (Green et al. (2024)).

Each participant can download the exercises and data in advance in one of three ways:

- Participants who are familiar with `git` can clone the repository:

```
git clone https://github.com/micha-silver/elter-2025-R-workshop.git
```

- The same result can be achieved within RStudio™ by starting a new Version Control based project, pointing to the same repository;
- Otherwise, the workshop material can be downloaded as a zip archive from [here](#);

Put your `credentials.csv` file into the same directory as the exercise.

Start RStudio™ and load the project “elter-2025-R-workshop”.

Exercises

- Load packages, set parameters;
- Query CDSE catalog for available images;
- Filter for low cloud cover, and only a single Copernicus tileId;
- Loop over list of available image dates;
- Derive MNDWI index for each image;
- Threshold MNDWI to obtain open water surfaces;
- Plot time series of MNDWI values;
- Prepare OPTRAM model from list of available dates;
- Derive soil moisture for one date using model coefficients.

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eLTER Workshop-Analyzing Remote Sensing Data in R

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References

- Green, Andy J., Carolina Guardiola-Albert, Miguel Ángel Bravo-Utrera, Javier Bustamante, Antonio Camacho, Carlos Camacho, Eva Contreras-Arribas, et al. 2024. “Groundwater Abstraction Has Caused Extensive Ecological Damage to the Doñana World Heritage Site, Spain.” *Wetlands* 44 (2): 20. <https://doi.org/10.1007/s13157-023-01769-1>.
- Hijmans, Robert J. 2025. *Terra: Spatial Data Analysis*. <https://CRAN.R-project.org/package=terra>.
- Karaman, Zivan. 2025. *CDSE: Copernicus Data Space Ecosystem API Wrapper* (version 0.2.1). <https://doi.org/10.32614/CRAN.package.CDSE>.
- Silver, Micha, Ron Beiden, and Arnon Karnieli. 2023. “rOPTRAM: An r Package for Preparing Soil Moisture Grids Based on the OPTRAM Model.” Ben Gurion University. <https://doi.org/https://doi.org/10.5281/zenodo.13257767>.