

Instructions on Installing and Using the SentinelHub API

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This instruction provides steps for installing the required Python packages for SentinelHub Process API program. The Process API is the most commonly used API in Sentinel Hub as it provides images based on satellite data. Users can request raw satellite data, simple band combinations such as false colour composites, calculations of simple remote sensing indices like NDVI, or more advanced processing such as calculation of Leaf area index (LAI). (<https://docs.sentinel-hub.com/api/latest/api/process/>)

This instruction follows the procedure of

- (1) Installation of Anaconda Navigator and jupyter notebook
- (2) Install a conda environment with key packages for SentinelHub and ipkernel
- (3) Import the Python packages to test if the installation is successful
- (4) Register a Copernicus user account
- (5) Run a jupyter notebook program (Testing.ipynb) to obtain Sentinel-2 data and analysis.

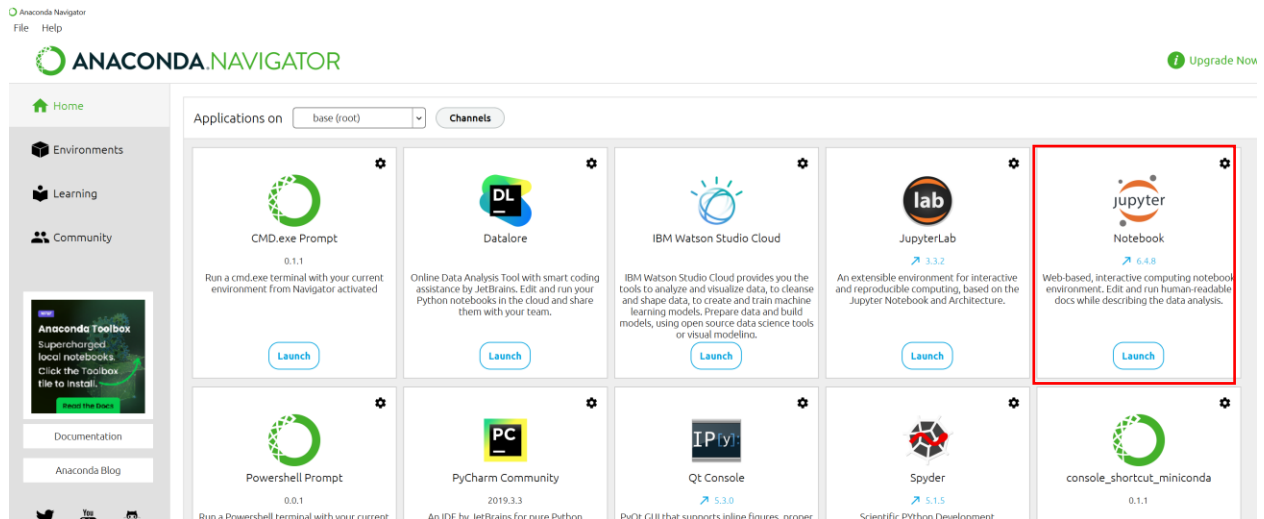
Step 1 – Installing Anaconda Navigator and Jupyter Notebook

<https://www.anaconda.com/download>

Please select the corresponding version for PC or Mac.

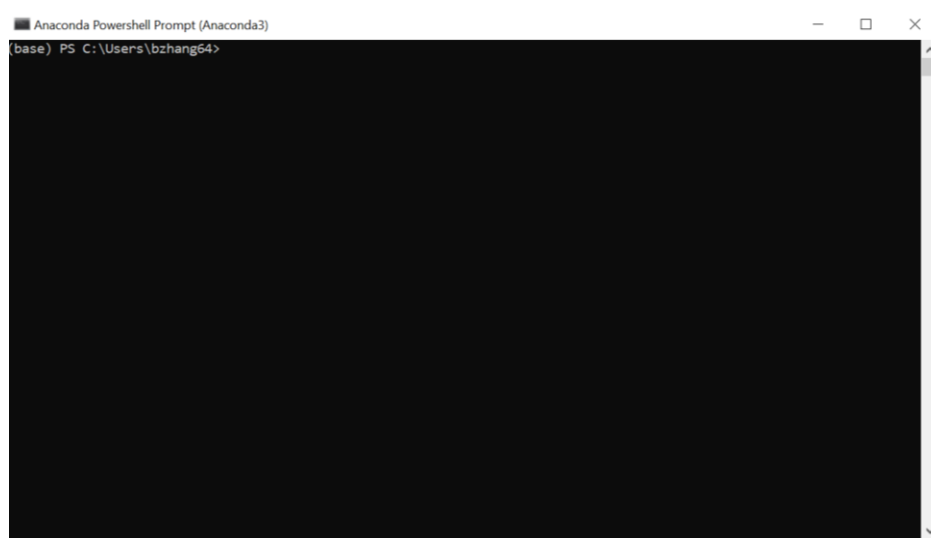
Then install jupyter notebook. You have two options.

- (1) Installation based on the navigator menu



(2) Installation based on Anaconda Powershell Prompt

For Windows PC, Search “Anaconda Powershell Prompt” and get this:



Then input this command:

```
conda install anaconda::jupyter
```

Then run this command to test if you successfully install jupyter notebook

```
jupyter notebook
```

For Mac, open your Terminal

Test your installation of conda by this command

```
conda --version
```

Then install jupyter notebook with

```
pip install notebook
```

run this to test the installation

```
jupyter notebook
```

Jupyter notebook uses your web browser and I recommend using Google Chrome.

For more information please visit <https://www.codecademy.com/article/setting-up-jupyter-notebook>

Step 2 Installation of conda environment

Conda (which is automatically installed when we installed Anaconda Navigator) is an efficient tool for organizing environments (e.g., Python or R environment). You may think of each environment represents a project, for which we need multiple Python packages. These packages may have compatibility issues (e.g., some Python packages have conflicts, or a package requires a certain version of another package to co-exist). That is why we separately create different environments, and for each environment, we have compatible Python packages. If you messed up an environment, and it does not work, you can simply remove this environment and build your environment all over again. For more information, please visit <https://carpentries-incubator.github.io/introduction-to-conda-for-data-scientists/02-working-with-environments/index.html>.

Now, let's build a conda environment called "sentinel" and install key Python packages for us to use Sentinel Hub Process API.

First, use your Anaconda Powershell Prompt (PC) or Mac (you can be at any directory – it does not matter), input this command to add conda-forge channel

```
conda config --add channels conda-forge
```

This channel is one of the most commonly used channel containing many useful packages.

Nest we create our environment "sentinel"

```
conda create -n sentinel sentinelhub numpy pandas matplotlib  
s2cloudless
```

“sentinelhub” is the python package for the Process API; numpy is a basic Python package for handling data; pandas is a useful package for handling csv files.

If successful, you see something like this:

The following packages will be downloaded:

package	build		
blosc-1.21.5	hdccc3a2_0	49 KB	conda-forge
boto3-1.34.67	pyhd8ed1ab_0	79 KB	conda-forge
botocore-1.34.67	pyge310_1234567_0	6.5 MB	conda-forge
brtoli-python-1.0.9	py311h12c1d0e_8	335 KB	conda-forge
bzip2-1.0.8	hcfcfb64_5	122 KB	conda-forge
cffi-1.16.0	py311ha68e1ae_0	290 KB	conda-forge
cryptography-42.0.5	py311h28e9c30_0	1.1 MB	conda-forge
david-1.2.1	hcfcfb64_0	604 KB	conda-forge
freetype-2.12.1	hdaf720e_2	498 KB	conda-forge
geos-3.12.1	h1537add_0	1.5 MB	conda-forge
giflib-5.2.1	h64bf75a_3	82 KB	conda-forge
hatchling-1.22.3	pyhd8ed1ab_0	62 KB	conda-forge
imagecodecs-2023.1.23	py311he6ff3c7_0	8.9 MB	
importlib-metadata-7.1.0	pyha770c72_0	26 KB	conda-forge
jpeg-9e	hcfcfb64_3	283 KB	conda-forge
krb5-1.21.2	heb0366b_0	694 KB	conda-forge
libaec-1.1.3	h63175ca_0	32 KB	conda-forge
libblas-3.9.0	21_win64_mkl	4.8 MB	conda-forge
libcblas-3.9.0	21_win64_mkl	4.8 MB	conda-forge
libcurl-8.6.0	hd5e4a3a_0	318 KB	conda-forge
libexpat-2.6.2	h63175ca_0	136 KB	conda-forge
libhwloc-2.9.3	default_haede6df_1009	2.5 MB	conda-forge
libiconv-1.17	hcfcfb64_2	621 KB	conda-forge
liblapack-3.9.0	21_win64_mkl	4.8 MB	conda-forge
libpng-1.6.43	h19919ed_0	339 KB	conda-forge
libsqlite-3.45.2	hcfcfb64_0	849 KB	conda-forge
libssh2-1.11.0	h7dfc565_0	261 KB	conda-forge
libwebp-base-1.3.2	hcfcfb64_0	263 KB	conda-forge
libxml2-2.12.6	hc3477c8_0	1.6 MB	conda-forge
mkl-2024.0.0	h66d3029_49657	103.5 MB	conda-forge
numpy-1.26.4	py311h0b4df5a_0	6.8 MB	conda-forge
openssl-3.2.1	hcfcfb64_1	7.8 MB	conda-forge
pandas-2.2.1	py311hf63dbb6_0	13.8 MB	conda-forge

The following NEW packages will be INSTALLED:

aenum	conda-forge/noarch::aenum-3.1.15-pyhd8ed1ab_0
aom	pkgs/main/win-64::aom-3.6.0-hd77b12b_0
blinker	conda-forge/noarch::blinker-1.7.0-pyhd8ed1ab_0
blosc	conda-forge/win-64::blosc-1.21.5-hdccc3a2_0
boto3	conda-forge/noarch::boto3-1.34.67-pyhd8ed1ab_0
botocore	conda-forge/noarch::botocore-1.34.67-pyge310_1234567_0
brtoli	pkgs/main/win-64::brtoli-1.0.9-h2bbff1b_7
brtoli-bin	pkgs/main/win-64::brtoli-bin-1.0.9-h2bbff1b_7
brtoli-python	conda-forge/win-64::brtoli-python-1.0.9-py311h12c1d0e_8
bzip2	conda-forge/win-64::bzip2-1.0.8-hcfcfb64_5
ca-certificates	conda-forge/win-64::ca-certificates-2024.2.2-h56e8100_0
certifi	conda-forge/noarch::certifi-2024.2.2-pyhd8ed1ab_0
cffi	conda-forge/win-64::cffi-1.16.0-py311ha68e1ae_0
cfitsio	pkgs/main/win-64::cfitsio-3.470-h2bbff1b_7
charls	pkgs/main/win-64::charls-2.2.0-h6c2663c_0
charset-normalizer	conda-forge/noarch::charset-normalizer-3.3.2-pyhd8ed1ab_0
click	conda-forge/noarch::click-8.1.7-win_pyh7428d3b_0
colorama	conda-forge/noarch::colorama-0.4.6-pyhd8ed1ab_0
cryptography	conda-forge/win-64::cryptography-42.0.5-py311h28e9c30_0
dataclasses-json	conda-forge/noarch::dataclasses-json-0.6.4-pyhd8ed1ab_0
david	conda-forge/win-64::david-1.2.1-hcfcfb64_0
editables	conda-forge/noarch::editables-0.5-pyhd8ed1ab_0
freetype	conda-forge/win-64::freetype-2.12.1-hdaf720e_2
geos	conda-forge/win-64::geos-3.12.1-h1537add_0
giflib	conda-forge/win-64::giflib-5.2.1-h64bf75a_3
hatchling	conda-forge/noarch::hatchling-1.22.3-pyhd8ed1ab_0
idna	conda-forge/noarch::idna-3.6-pyhd8ed1ab_0
imagecodecs	pkgs/main/win-64::imagecodecs-2023.1.23-py311he6ff3c7_0
importlib-metadata	conda-forge/noarch::importlib-metadata-7.1.0-pyha770c72_0
intel-openmp	conda-forge/win-64::intel-openmp-2024.0.0-h57928b3_49841
jmespath	conda-forge/noarch::jmespath-1.0.1-pyhd8ed1ab_0
jpeg	conda-forge/win-64::jpeg-9e-hcfcfb64_3
krb5	conda-forge/win-64::krb5-1.21.2-heb0366b_0
lcms2	pkgs/main/win-64::lcms2-2.12-h83e58a3_0
lerc	pkgs/main/win-64::lerc-3.0-hd77b12b_0
libaec	conda-forge/win-64::libaec-1.1.3-h63175ca_0
libavif	pkgs/main/win-64::libavif-0.11.1-h2bbff1b_0
libblas	conda-forge/win-64::libblas-3.9.0-21_win64_mkl
libbrtolicommon	pkgs/main/win-64::libbrtolicommon-1.0.9-h2bbff1b_7

Proceed ([y]/n)?

Type 'y' and press "enter" key

If successful, you see these:

```
Preparing transaction: done
Verifying transaction: done
Executing transaction: done
#
# To activate this environment, use
#
#     $ conda activate sentinel1
#
# To deactivate an active environment, use
#
#     $ conda deactivate
```

Now you successfully installed an environment called "sentinel"

We need to install another important python package called "ipykernel", a powerful package allows communication between your jupyter notebook (that we just installed) and your conda environments. Please note: we need to install ipykernel **WITHIN** the sentinel environment, which requires us to activate our sentinel environment.

Type:

```
conda activate sentinel
```

Then you should see this (**yours should be sentinel not sentinel1 like this**):

```
(base) PS C:\Users\bzhang64> conda activate sentinel
(sentinel) PS C:\Users\bzhang64>
```

Note the (sentinel) in the beginning, which means you are at sentinel environment now!

Then we install ipykernel by:

```
conda install ipykernel
```

```
python -m ipykernel install --user --name=sentinel
```

This command will make the IPython kernel for your conda environment available to Jupyter Notebook.

Last, let us test whether your jupyter notebook has successfully linked with sentinel environment. (If you opened an jupyter notebook please close the web and also exit from the prompt by Ctrl + "C")

We need to deactivate from sentinel environment to start jupyter notebook because the notebook was not installed within our environment.

```
(sentinel) PS C:\Users\bzhang64> conda deactivate  
(base) PS C:\Users\bzhang64>
```

Change directory to your working folder, where you download the Test_import_packages jupyter notebook using this “cd” command, **replace the directory with your own**

```
(base) PS C:\Users\bzhang64> cd D:\Paul\Groundwater\Code
```

Type (note that it is letter “l”, not number 1)

```
ls
```

to show your files, “Test_import_packages.ipynb” s

```
(base) PS D:\Paul\Groundwater\Code> ls
```

Directory: D:\Paul\Groundwater\Code

Mode	LastWriteTime	Length	Name
d----	3/21/2024 2:24 PM		.ipynb_checkpoints
d----	2/6/2024 2:32 PM		Server
-a----	3/19/2024 9:46 AM	8508	Mosaic_three_folders.ipynb
-a----	3/18/2024 10:17 AM	5361	Batch_masking.ipynb
-a----	3/18/2024 10:23 AM	5785	Batch_coregistration.ipynb
-a----	2/10/2024 12:30 PM	184740	Cropping and Collocating S1 to S2.ipynb
-a----	3/20/2024 11:34 AM	2795226	Extracting_AWEIsh-Copy1.ipynb
-a----	3/21/2024 11:54 AM	6038465	Extracting_AWEIsh.ipynb
-a----	1/23/2024 3:47 PM	14363	Mosaicking_Groundwater_Results.ipynb
-a----	2/6/2024 3:22 PM	488	Test_images_with_R.R
-a----	3/21/2024 2:26 PM	1849	Test_import_packages.ipynb
-a----	3/15/2024 2:42 PM	8771657	Token2018.ipynb
-a----	3/12/2024 3:28 PM	27766	Token2019.ipynb
-a----	3/12/2024 3:09 PM	14515	Token2020.ipynb
-a----	3/14/2024 4:08 PM	15983	Token2021.ipynb
-a----	3/14/2024 4:07 PM	850	try.zip
-a----	3/15/2024 2:18 PM	72	Untitled.ipynb
-a----	3/20/2024 4:09 PM	290274528	wateryear2018Lower.npy
-a----	3/20/2024 3:44 PM	288756960	wateryear2018Upper.npy
-a----	3/18/2024 1:37 PM	2277537728	wateryear2018_Lower.npy
-a----	3/18/2024 3:51 PM	2247904608	wateryear2018_Middle.npy

Then input

```
jupyter notebook
```

if you check the New button shown below, and see sentinel, which means you successfully linked sentinel environment to the notebook. In the next step, we will test whether our packages are successfully installed.

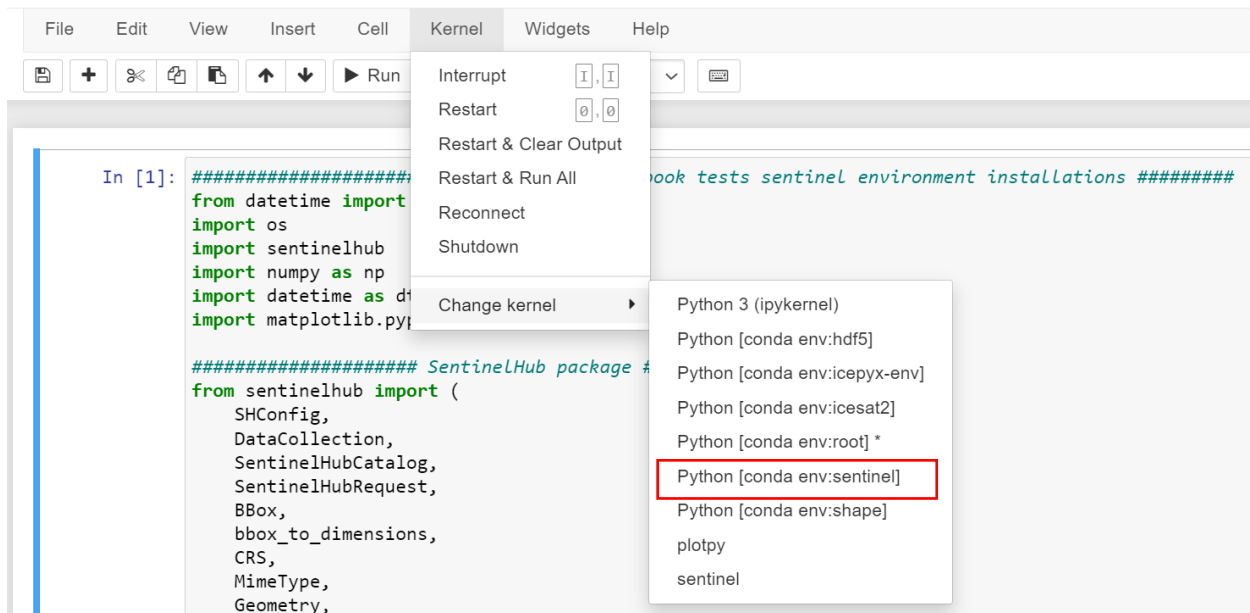


Step 3 Import python packages in jupyter notebook

Click the “Test_import_packages.ipynb”

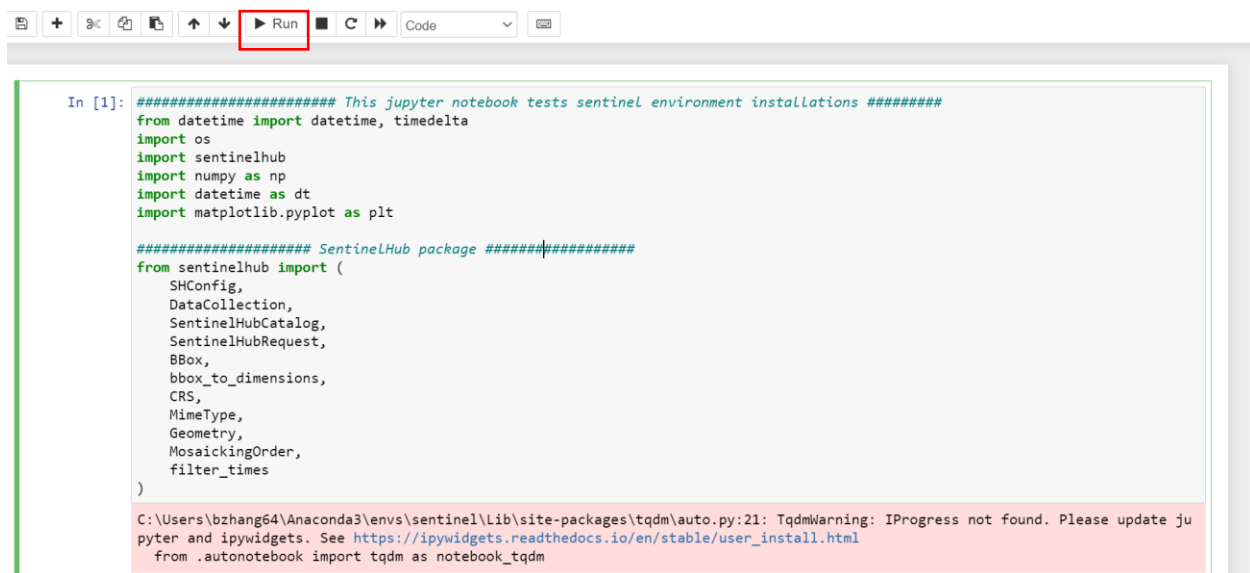


Then change the kernel to sentinel



Then run the first block, by first select this block and clicke Run button

Or select the block, and then press Ctrl + Shift at the same time.



If it shows [1] on the top left corner, you successfully installed all packages. The text at the bottom with a magenta background is a warning, so no worries.

If you have errors at the bottom, you did not successfully install at least one of the packages, and need to install it in the environment using your prompt or terminal.

Step 4 Register a Copernicus user account

We need a user account to get access to Sentinel-2 data stored in Copernicus

Use this link <https://dataspace.copernicus.eu/> and click the “Register” button

Fill in this form

Register form
* Required fields

First name *

Last name *

Email *

Password *

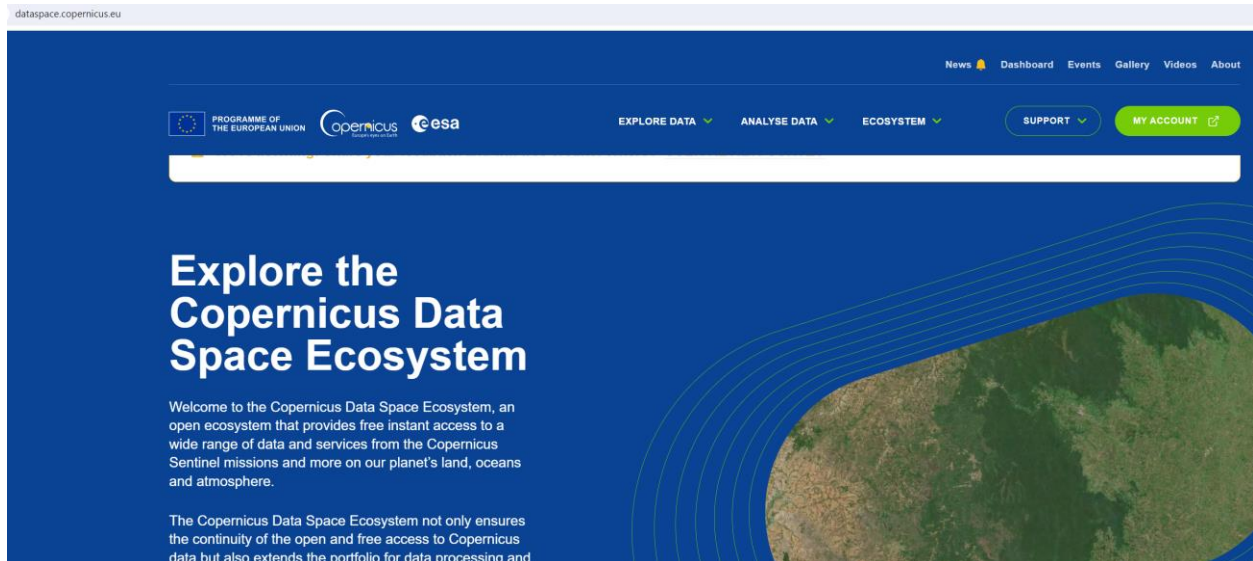
Confirm password *

Country *

Type of user (you are/your organisation is ?) *

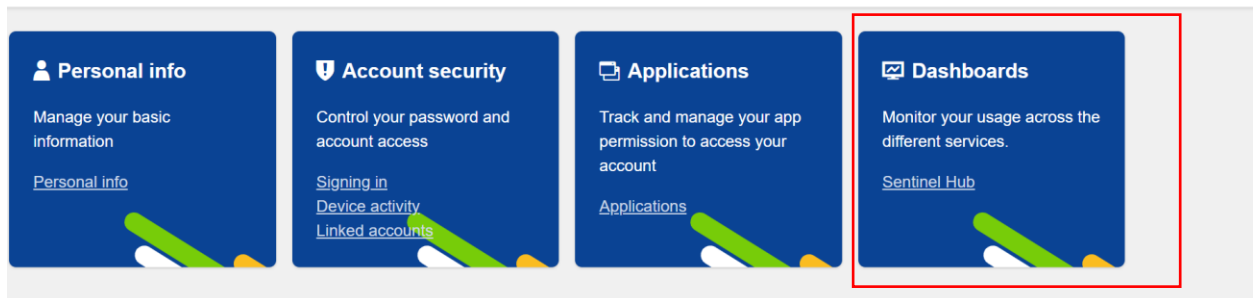
Verify your email through your registered email address

Click “My Account” as shown below

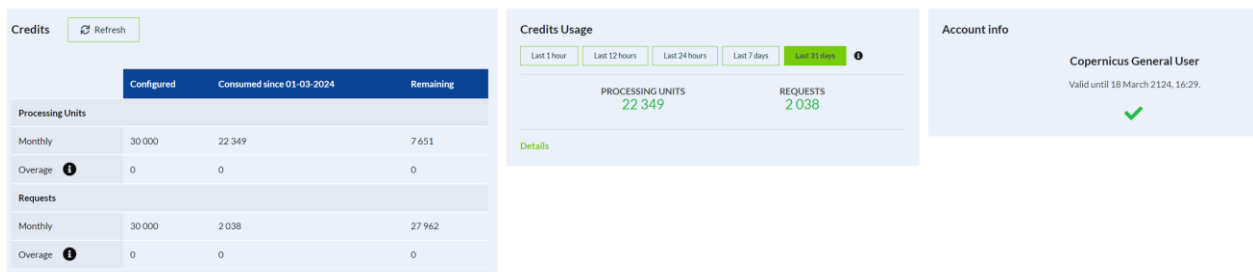


Click Dashboard


Welcome to the Copernicus Data Space Ecosystem account management



This shows the monthly quota you have – 30,000 request per month. If you can register with another email account(s) to get more quota.



Click **User Settings** at the left bottom



Dashboard

Configuration Utility

Usage



User settings

Collapse Sidebar

Dashboard

Credits

Refresh

	Configured	Consumed since 01-03-2024	Remaining
Processing Units			
Monthly	30 000	22 349	7 651
Overage 	0	0	0
Requests			
Monthly	30 000	2 038	27 962
Overage 	0	0	0

Click Create button



Auth clients

+ Create

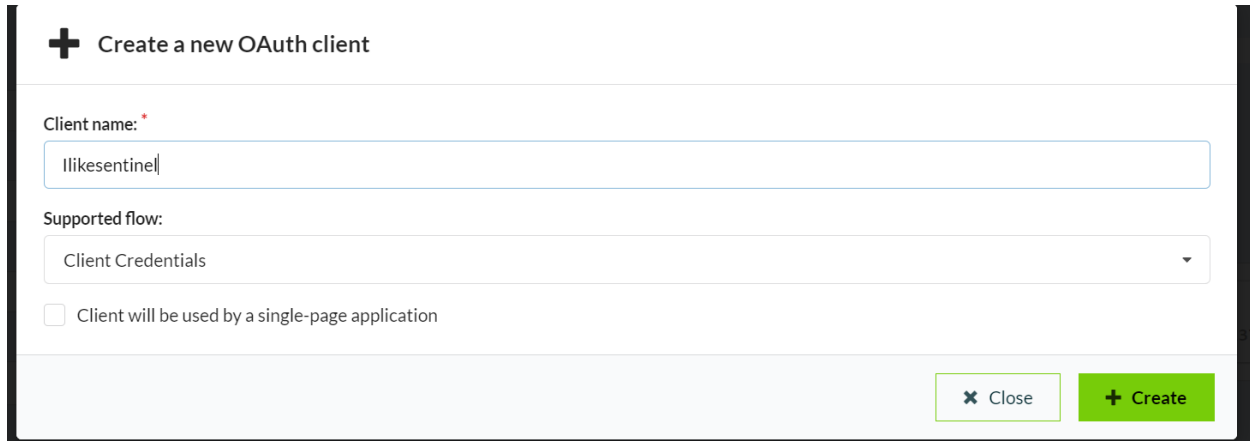
ActiveInactive

zhangpaul

ID: sh-1bce56db-6b8f-47b3-bc9f-e070c4a1370e



Input a user name (whatever you like)



Copy the client_id and client_secret! These are very important info.

We will paste these information in another jupyter notebook I am going to send to you soon.

Step 5 Run jupyter notebook sentinelhub.ipynb

1. Run Block 1 to import all python packages and define functions
2. Run Block 2 for configuration. **Please replace client_id and client_secret with yours!**

Note on Mac computer!

If you use a Macbook, you might get errors from this command `config = SHConfig()` from Block 2, and the error is about Permissions on `\Users\{your user name}\.config`

`.config` is a hidden folder, and what you need to do is to use your terminal, change directory (cd) to full permission

```
chmod 777 \Users\{your user name}\.config
```

Then try again with command `config = SHConfig()`

3. The rest of the blocks are self-explanatory.

Enjoy getting Sentinel-2 data!!