MOHID Preprocessing Notebook

User Guide

V1.0

Mohid-Water-Modelling-System/

https://github.com/Mohid-Water-Modelling-System/MOHID_Jupyter-Notebooks/tree/master

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MOHID_Preprocessing	Update MOHID_Preprocessing.ipynb	30 minutes ago
MOHID_Water	Get river data	yesterday
README.md	Update README.md	4 minutes ago

README

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https://github.com/Mohid-Water-Modelling-System/MOHID_Jupyter-Notebooks/archive/refs/heads/master.zip

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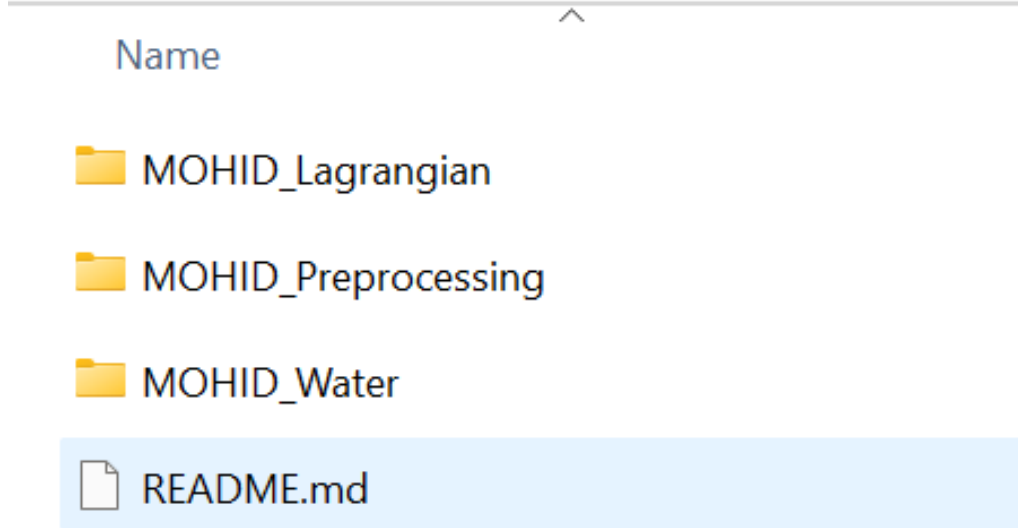

Name
MOHID_Lagrangian
MOHID_Preprocessing
MOHID_Water
README.md

README

Below is a step-by-step guide on how to set up and launch MOHID Jupyter Notebooks for interactive computing:

1. Download and Install Miniconda:

- Visit the Miniconda download page.
- Download the Miniconda installer for your operating system (Windows, macOS, or Linux).
- Follow the installation instructions to install Miniconda on your system.

2. Open the Terminal or Command Prompt:

- Windows: Open the Anaconda Prompt or Command Prompt.
- macOS/Linux: Open your preferred Terminal application.

3. Create a Conda Environment:

It's best practice to use a dedicated environment for each project. To create the MOHID environment, follow these steps:

- Download the YAML file:

README

- Download the YAML file:

  Obtain the .yaml (or .yml) file that lists all required packages.

- Create the environment:

  Run the following command (make sure you're in the directory where your yml file is located):

```
conda env create --file ENV_NAME
```

  Replace ENV_NAME with the name of the environment you wish to create.

4. Activate the environment:

To work within the new environment, activate it by running:

```
conda activate ENV_NAME
```

Replace ENV_NAME with the name of the environment you wish to activate.

5. Launch Jupyter Notebook:

README

5. Launch Jupyter Notebook:

Once the environment is activated and all necessary packages are installed, launch Jupyter Lab (or Notebook) by issuing:

```
jupyter lab
```

This command will open the Jupyter interface in your default web browser. Tip: If you prefer the classic Jupyter Notebook interface, use jupyter notebook instead.

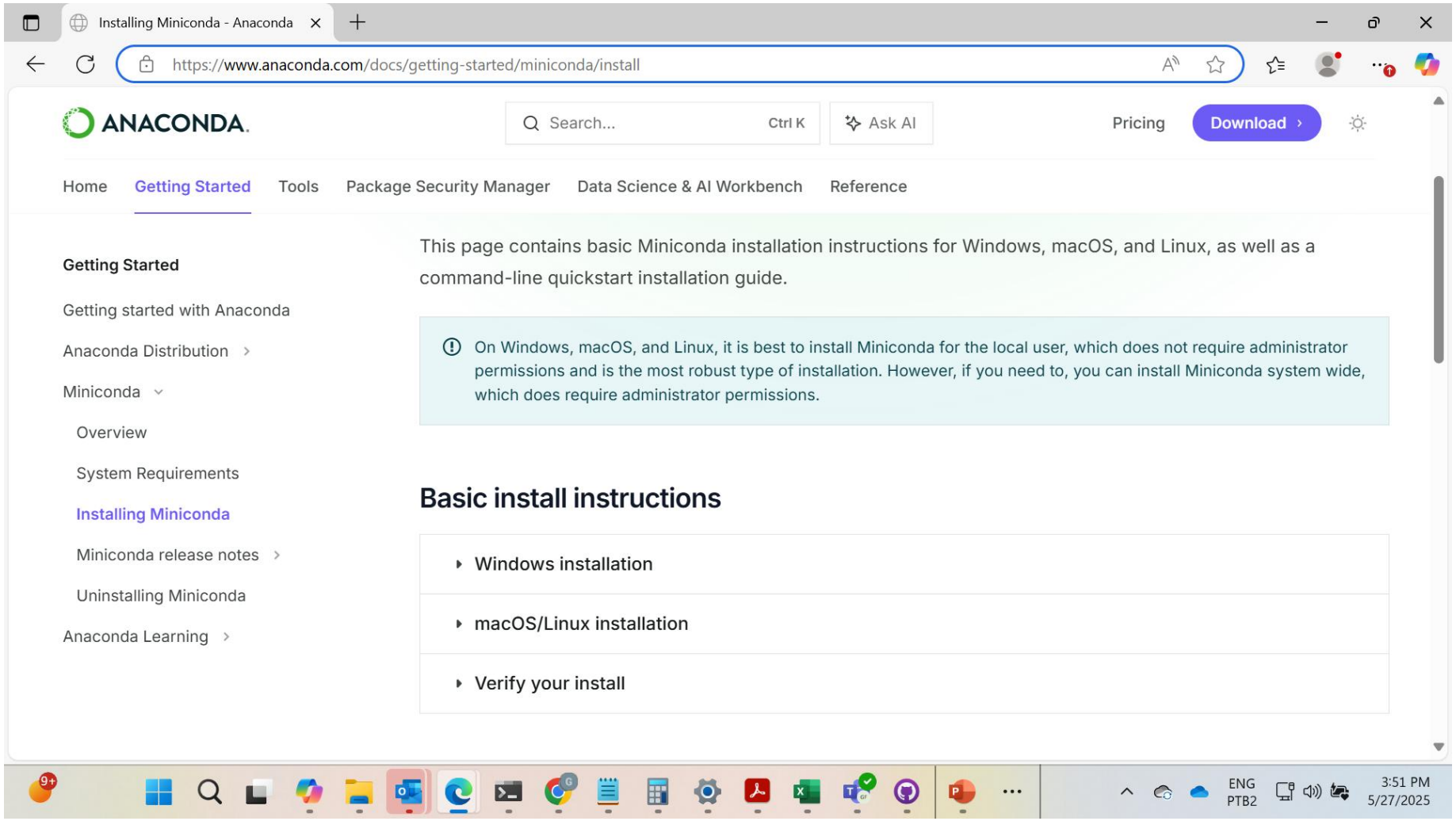
6. Open the Notebook

Within the Jupyter interface:

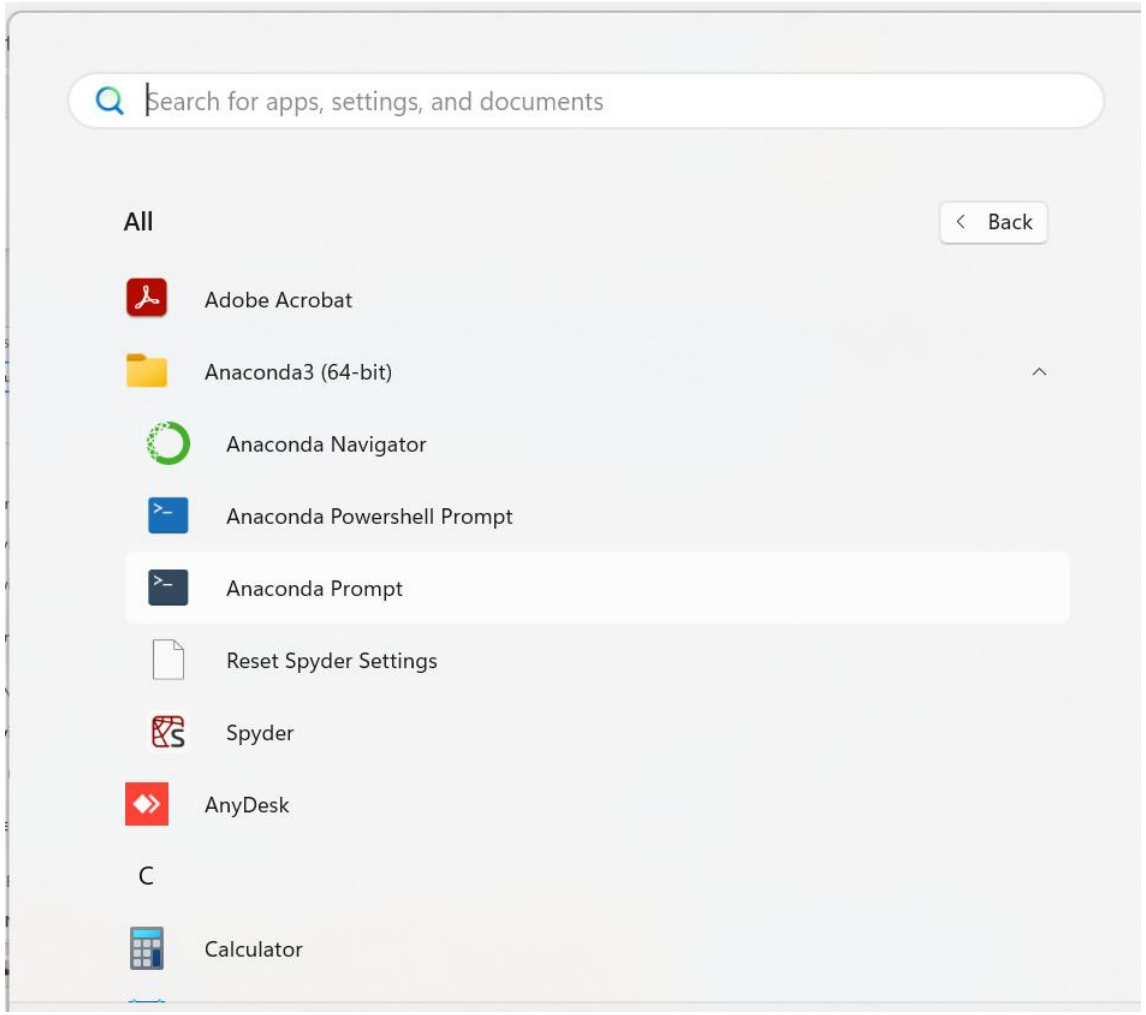
- Navigate to the directory where the notebook file (.ipynb) is located.
- Click on the the notebook file (.ipynb) to open it.

By following these steps, you´ll have a fully functional MOHID Jupyter Notebook environment for interactive computing.

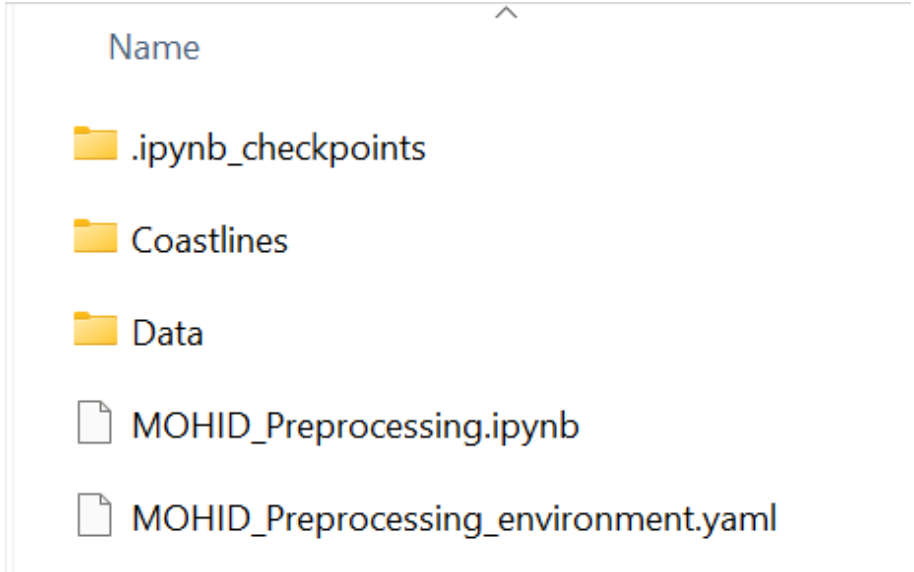
1. Download and Install Miniconda:



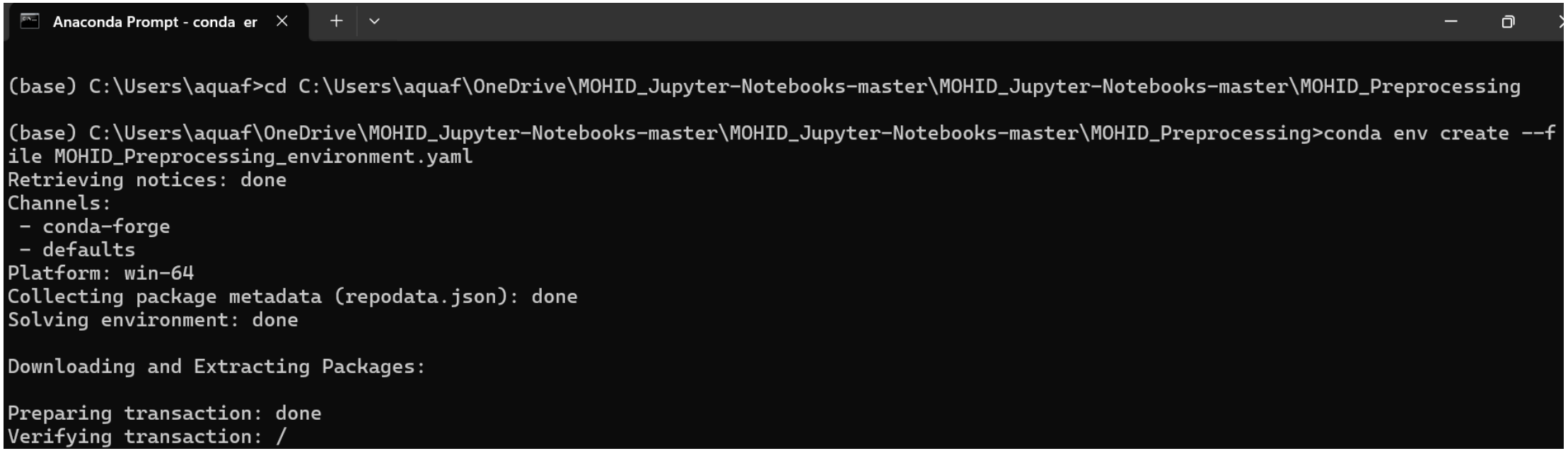
2. Open the Terminal or Command Prompt:



3. Create a Conda Environment:



3. Create a Conda Environment:



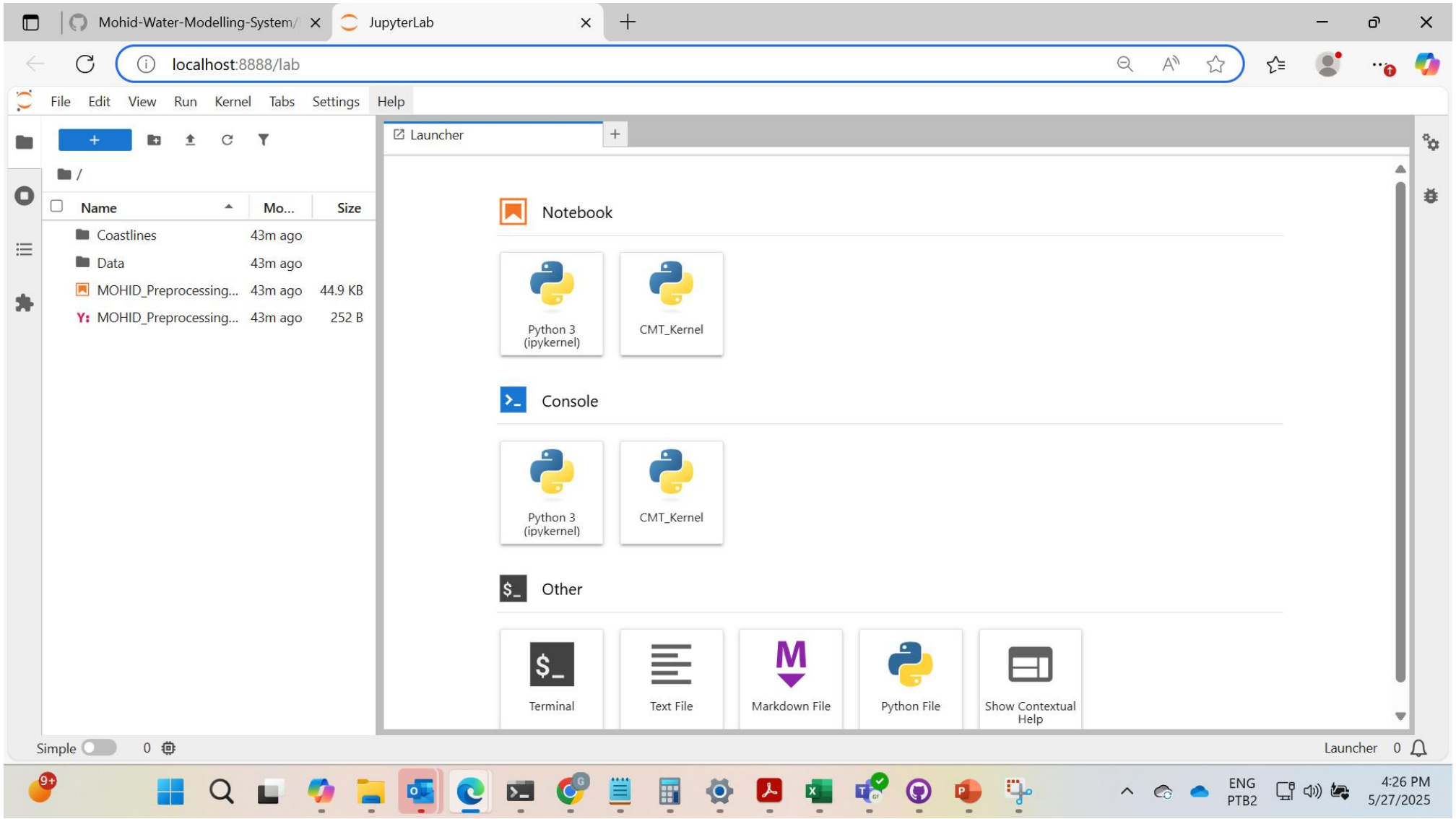
4. Activate the environment:

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


(base) C:\Users\aquaf\OneDrive\MOHID_Jupyter-Notebooks-master\MOHID_Jupyter-Notebooks-master\MOHID_Preprocessing>conda activate MOHID
_Preprocessing_environment

(MOHID_Preprocessing_environment) C:\Users\aquaf\OneDrive\MOHID_Jupyter-Notebooks-master\MOHID_Jupyter-Notebooks-master\MOHID_Preproc
essing>
```

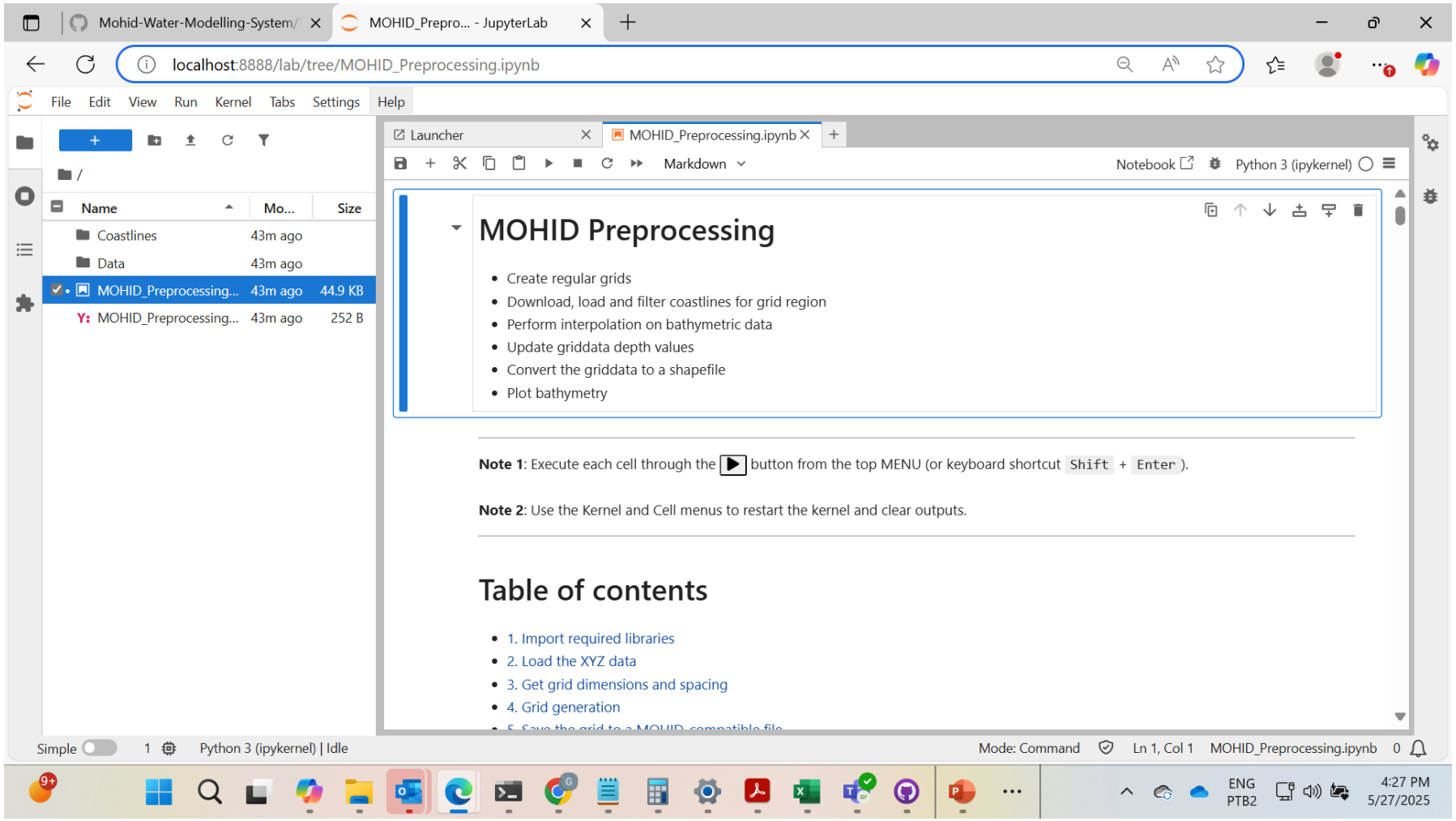
5. Launch Jupyter Notebook

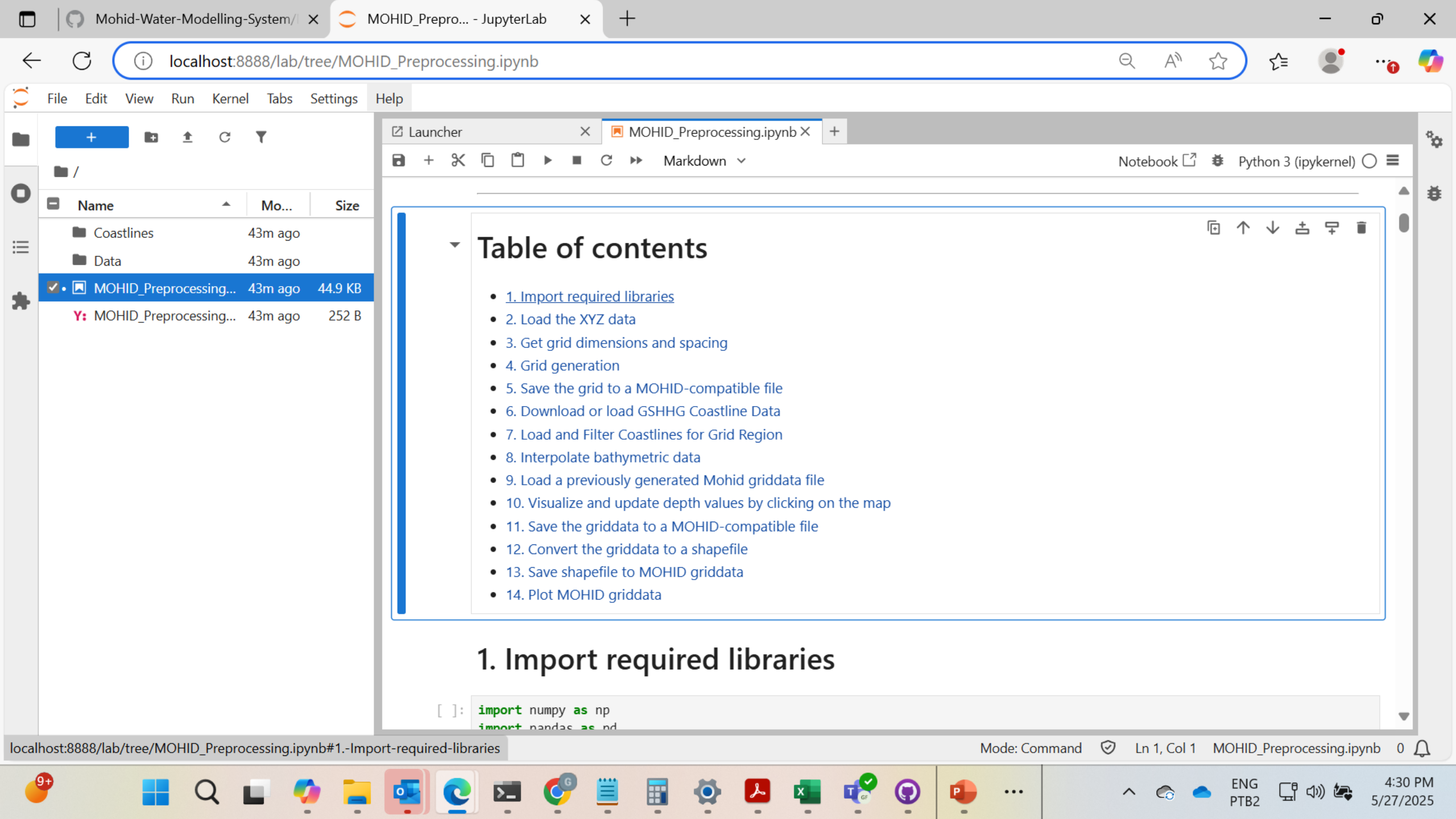
```
(MOHID_Preprocessing_environment) C:\Users\aquaf\OneDrive\MOHID_Jupyter-Notebooks-master\MOHID_Jupyter-Notebooks-master\MOHID_Preproc
essing>jupyter lab
[I 2025-05-27 16:24:20.761 ServerApp] jupyter_lsp | extension was successfully linked.
[I 2025-05-27 16:24:20.766 ServerApp] jupyter_server_terminals | extension was successfully linked.
[I 2025-05-27 16:24:20.770 ServerApp] jupyterlab | extension was successfully linked.
[I 2025-05-27 16:24:20.775 ServerApp] notebook | extension was successfully linked.
[W 2025-05-27 16:24:21.029 ServerApp] jupyter_nbextensions_configurator | error adding extension (enabled: True): The module 'jupyter
_nbextensions_configurator' could not be found (No module named 'jupyter_nbextensions_configurator'). Are you sure the extension is i
nstalled?
    Traceback (most recent call last):
      File "C:\Users\aquaf\anaconda3\envs\MOHID_Preprocessing_environment\Lib\site-packages\jupyter_server\extension\manager.py", lin
e 358, in add_extension
        extpkg = ExtensionPackage(name=extension_name, enabled=enabled)
      File "C:\Users\aquaf\anaconda3\envs\MOHID_Preprocessing_environment\Lib\site-packages\jupyter_server\extension\manager.py", lin
e 212, in __init__
        self._load_metadata()
        ~~~~~~~~~~~~~~~~~~~^^
      File "C:\Users\aquaf\anaconda3\envs\MOHID_Preprocessing_environment\Lib\site-packages\jupyter_server\extension\manager.py", lin
e 227, in _load_metadata
        raise ExtensionModuleNotFound(msg) from None
    jupyter_server.extension.utils.ExtensionModuleNotFound: The module 'jupyter_nbextensions_configurator' could not be found (No mod
ule named 'jupyter_nbextensions_configurator'). Are you sure the extension is installed?
[I 2025-05-27 16:24:21.030 ServerApp] notebook_shim | extension was successfully linked.
[I 2025-05-27 16:24:21.149 ServerApp] notebook_shim | extension was successfully loaded.
[I 2025-05-27 16:24:21.151 ServerApp] jupyter_lsp | extension was successfully loaded.
[I 2025-05-27 16:24:21.151 ServerApp] jupyter_server_terminals | extension was successfully loaded.
[I 2025-05-27 16:24:21.155 LabApp] JupyterLab extension loaded from C:\Users\aquaf\anaconda3\envs\MOHID_Preprocessing_environment\Lib
\site-packages\jupyterlab
[I 2025-05-27 16:24:21.156 LabApp] JupyterLab application directory is C:\Users\aquaf\anaconda3\envs\MOHID_Preprocessing_environment\
share\jupyter\lab
```

5. Launch Jupyter Notebook



5. Launch Jupyter Notebook




Mohid-Water-Modelling-System/
MOHID_Prepro... - JupyterLab
localhost:8888/lab/tree/MOHID_Preprocessing.ipynb
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Launcher
MOHID_Preprocessing.ipynb
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Notebook
Python 3 (ipykernel)
/
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8. Interpolate bathymetric data
9. Load a previously generated Mohid griddata file
10. Visualize and update depth values by clicking on the map
11. Save the griddata to a MOHID-compatible file
12. Convert the griddata to a shapefile
13. Save shapefile to MOHID griddata
14. Plot MOHID griddata
1. Import required libraries
[ ]:
import numpy as np
import pandas as pd
localhost:8888/lab/tree/MOHID_Preprocessing.ipynb#1.-Import-required-libraries
Mode: Command
Ln 1, Col 1
MOHID_Preprocessing.ipynb
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Mohid-Water-Modelling-System/ | MOHID_Prepro... - JupyterLab

localhost:8888/lab/tree/MOHID_Preprocessing.ipynb

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Name	Mo...	Size
Coastlines	43m ago	
Data	43m ago	
MOHID_Preprocessing...	43m ago	44.9 KB
MOHID_Preprocessing...	43m ago	252 B

Launcher | MOHID_Preprocessing.ipynb

Code | Notebook | Python 3 (ipykernel)

Run this cell and advance (Shift+Enter)

1. Import required libraries

[ ]:

```
import numpy as np
import pandas as pd
from IPython.display import clear_output, display
from ipyleaflet import Map, Marker, basemaps, Popup, Polyline, Circle, GeoData, Polygon, GeoJSON
from ipywidgets import HTML
from datetime import datetime
import matplotlib.pyplot as plt
from matplotlib import cm
import matplotlib.colors as mcolors
from matplotlib.colors import Normalize, to_hex
import random
from scipy.interpolate import griddata
from scipy.ndimage import gaussian_filter, label
import cartopy.crs as ccrs
import cartopy.io.img_tiles as cimgt
from urllib.request import urlopen, Request
import io
from PIL import Image
import geopandas as gpd
from shapely.geometry import Point, box
import requests
import zipfile
import os
from scipy.ndimage import label, find_objects, gaussian_filter
import matplotlib.colors as mcolors
import ipywidgets as widgets
```

Simple | 1 | Python 3 (ipykernel) | Idle | Mode: Edit | Ln 11, Col 14 | MOHID_Preprocessing.ipynb | 0

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Mohid-Water-Modelling-System/ | MOHID_Prepro... - JupyterLab

localhost:8888/lab/tree/MOHID_Preprocessing.ipynb

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Name	Mo...	Size
Coastlines	43m ago	
Data	43m ago	
MOHID_Preprocessing...	now	44.9 KB
MOHID_Preprocessing...	43m ago	252 B

Launcher | MOHID_Preprocessing.ipynb

Markdown | Notebook | Python 3 (ipykernel)

Kernel status: Busy
Executed 0/1 cells
Elapsed time: 3 seconds

```
from shapely.geometry import Point, box
import requests
import zipfile
import os
from scipy.ndimage import label, find_objects, gaussian_filter
import matplotlib.colors as mcolors
import ipywidgets as widgets
import shapefile
from shapely.vectorized import contains
from mpl_toolkits.axes_grid1 import make_axes_locatable
import time
```

2. Load the XYZ data

This step is optional (only perform if you already have an xyz file with bathymetry data).

+ 1 cell hidden

3. Get grid dimensions and spacing

[ ]:
```
nx = int(input("Enter the number of cells in the x-direction (nx): "))
ny = int(input("Enter the number of cells in the y-direction (ny): "))
```

[ ]:
```
dx = float(input("Enter the cell size in the x-direction (dx, in degrees): "))
dy = float(input("Enter the cell size in the y-direction (dy, in degrees): "))
```

Simple | 1 | Python 3 (ipykernel) | Busy | Mode: Command | Ln 1, Col 1 | MOHID_Preprocessing.ipynb | 0

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Mohid-Water-Modelling-System/ | MOHID_Prepro... - JupyterLab

localhost:8888/lab/tree/MOHID_Preprocessing.ipynb

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Name	Mo...	Size
Coastlines	43m ago	
Data	43m ago	
MOHID_Preprocessing...	now	44.9 KB
MOHID_Preprocessing...	43m ago	252 B

Launcher | MOHID_Preprocessing.ipynb

Markdown | Notebook | Python 3 (ipykernel)

Kernel status: Idle
Executed 1 cell
Elapsed time: 3 seconds

```
from shapely.geometry import Point, box
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import zipfile
import os
from scipy.ndimage import label, find_objects, gaussian_filter
import matplotlib.colors as mcolors
import ipywidgets as widgets
import shapefile
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from mpl_toolkits.axes_grid1 import make_axes_locatable
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```

[ ]:
```
dx = float(input("Enter the cell size in the x-direction (dx, in degrees): "))
dy = float(input("Enter the cell size in the y-direction (dy, in degrees): "))
```

Simple | 1 | Python 3 (ipykernel) | Idle | Mode: Command | Ln 1, Col 1 | MOHID_Preprocessing.ipynb | 0

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Coastlines	43m ago	
Data	43m ago	
MOHID_Preprocessing...	10s ago	44.9 KB
MOHID_Preprocessing...	43m ago	252 B

Launcher

MOHID_Preprocessing.ipynb

Code

Notebook

Python 3 (ipykernel)

2. Load the XYZ data

This step is optional (only perform if you already have an xyz file with bathymetry data).

[ ]:

```
file_path = 'Data/data.xyz'  # Replace with your file path
data = pd.read_csv(file_path, header=None, names=['longitude', 'latitude', 'depth'], sep='\\s+')
# Convert to list of dictionaries
data_list = data.to_dict(orient='records')

# Define the maximum number of points to display
MAX_POINTS = 1000  # Adjust based on performance needs

# If the dataset is too large, randomly sample points
if len(data_list) > MAX_POINTS:
    data_sample = random.sample(data_list, MAX_POINTS)

# Calculate the mean latitude and longitude for centering the map
center_lat = np.mean([row['latitude'] for row in data_sample])
center_lon = np.mean([row['longitude'] for row in data_sample])
grid_map = Map(center=(center_lat, center_lon), zoom=10)

# Define colormap and normalization
cmap = cm.viridis  # Choose a colormap like 'viridis', 'plasma', etc.
norm = Normalize(vmin=min(row['depth'] for row in data_sample), vmax=max(row['depth'] for row in data_sample))

# Function to convert a value into a color
def value_to_color(value):
    return to_hex(cmap(norm(value)))  # Convert RGBA to hex
```

Simple 1 Python 3 (ipykernel) | Idle

Mode: Edit Ln 4, Col 43 MOHID_Preprocessing.ipynb 0

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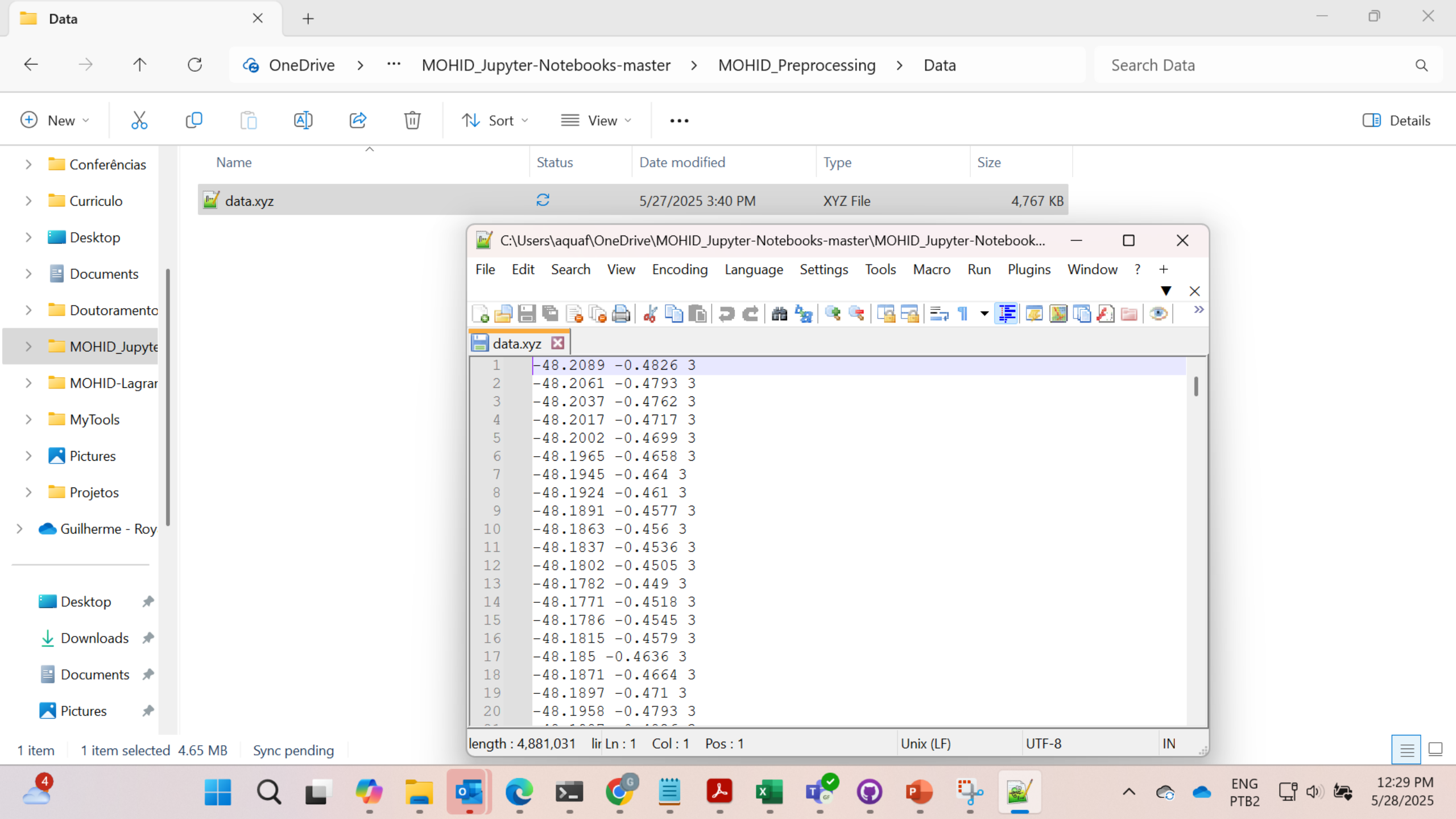
Data
OneDrive
MOHID_Jupyter-Notebooks-master
MOHID_Preprocessing
Data
Search Data
New
Sort
View
Details
Conferências
Curriculo
Desktop
Documents
Doutoramento
MOHID_Jupyte
MOHID-Lagrar
MyTools
Pictures
Projetos
Guilherme - Roy
Desktop
Downloads
Documents
Pictures
Name
Status
Date modified
Type
Size
data.xyz
5/27/2025 3:40 PM
XYZ File
4,767 KB
C:\Users\aquaf\OneDrive\MOHID_Jupyter-Notebooks-master\MOHID_Jupyter-Notebook...
File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ? +
data.xyz
1 -48.2089 -0.4826 3
2 -48.2061 -0.4793 3
3 -48.2037 -0.4762 3
4 -48.2017 -0.4717 3
5 -48.2002 -0.4699 3
6 -48.1965 -0.4658 3
7 -48.1945 -0.464 3
8 -48.1924 -0.461 3
9 -48.1891 -0.4577 3
10 -48.1863 -0.456 3
11 -48.1837 -0.4536 3
12 -48.1802 -0.4505 3
13 -48.1782 -0.449 3
14 -48.1771 -0.4518 3
15 -48.1786 -0.4545 3
16 -48.1815 -0.4579 3
17 -48.185 -0.4636 3
18 -48.1871 -0.4664 3
19 -48.1897 -0.471 3
20 -48.1958 -0.4793 3
length : 4,881,031 lir Ln : 1 Col : 1 Pos : 1
Unix (LF)
UTF-8
IN
1 item
1 item selected 4.65 MB
Sync pending
ENG
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MOHID_Preprocessing...	43m ago	252 B

Launcher | MOHID_Preprocessing.ipynb

Markdown | Notebook | Python 3 (ipykernel)

3. Get grid dimensions and spacing

[ ]:
```
nx = int(input("Enter the number of cells in the x-direction (nx): "))
ny = int(input("Enter the number of cells in the y-direction (ny): "))
```

[ ]:
```
dx = float(input("Enter the cell size in the x-direction (dx, in degrees): "))
dy = float(input("Enter the cell size in the y-direction (dy, in degrees): "))
```

4. Grid generation

Click on the map to create the grid

+ 1 cell hidden

5. Save the grid to a MOHID-compatible file

+ 1 cell hidden

6. Download or load GSHHG Coastline Data

+ 1 cell hidden

Simple | 1 | Python 3 (ipykernel) | Idle | Mode: Command | Ln 1, Col 1 | MOHID_Preprocessing.ipynb | 0

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Launcher | MOHID_Preprocessing.ipynb

Code | Notebook | Python 3 (ipykernel)

3. Get grid dimensions and spacing

```
[*]: nx = int(input("Enter the number of cells in the x-direction (nx): "))
     ny = int(input("Enter the number of cells in the y-direction (ny): "))
```

```
Enter the number of cells in the x-direction (nx):  100
Enter the number of cells in the y-direction (ny): 100
```

```
[ ]: dx = float(input("Enter the cell size in the x-direction (dx, in degrees): "))
     dy = float(input("Enter the cell size in the y-direction (dy, in degrees): "))
```

4. Grid generation

Click on the map to create the grid

+ 1 cell hidden

5. Save the grid to a MOHID-compatible file

+ 1 cell hidden

6. Download or load GSHHG Coastline Data

+ 1 cell hidden

Simple | 1 | Python 3 (ipykernel) | Busy | Mode: Command | Ln 1, Col 71 | MOHID_Preprocessing.ipynb | 0

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MOHID_Preprocessing...	now	45.6 KB
MOHID_Preprocessing...	43m ago	252 B

Launcher | MOHID_Preprocessing.ipynb

Code | Notebook | Python 3 (ipykernel)

3. Get grid dimensions and spacing

[3]:
```
nx = int(input("Enter the number of cells in the x-direction (nx): "))
ny = int(input("Enter the number of cells in the y-direction (ny): "))
```

```
Enter the number of cells in the x-direction (nx):  100
Enter the number of cells in the y-direction (ny):  100
```

[*]:
```
dx = float(input("Enter the cell size in the x-direction (dx, in degrees): "))
dy = float(input("Enter the cell size in the y-direction (dy, in degrees): "))
```

```
Enter the cell size in the x-direction (dx, in degrees):  0.01
Enter the cell size in the y-direction (dy, in degrees): 0.01
```

4. Grid generation

Click on the map to create the grid

+ 1 cell hidden

5. Save the grid to a MOHID-compatible file

+ 1 cell hidden

6. Download or load GSHHG Coastline Data

Simple | 1 | Python 3 (ipykernel) | Busy | Mode: Command | Ln 1, Col 79 | MOHID_Preprocessing.ipynb | 0

ENG PTB2 12:33 PM 5/28/2025

MOHID_Jupyter-Notebooks/MOH | MOHID_Prepro... - JupyterLab

localhost:8888/lab/tree/MOHID_Preprocessing.ipynb

File Edit View Run Kernel Tabs Settings Help

/

Name	Mo...	Size
Coastlines	43m ago	
Data	43m ago	
MOHID_Preprocessing...	now	45.6 KB
MOHID_Preprocessing...	43m ago	252 B

Launcher | MOHID_Preprocessing.ipynb

Markdown | Notebook | Python 3 (ipykernel)

4. Grid generation

Click on the map to create the grid

[ ]:

```
# Initialize the interactive map
try:
    grid_map
except NameError:
    grid_map = Map(center=(0.0, 0.0), zoom=2)


# Display the map
display(grid_map)


# Store polylines so they can be removed later
polylines = []
marker = []

# Display instructions
instructions = HTML(
    """
    <h4>Interactive Map for Grid Generation</h4>
    <ol>
        <li>Click anywhere on the map to find the origin coordinates (latitude and longitude).</li>
        <li>The grid will be visualized as a mesh directly on the map.</li>
```

Simple 1 Python 3 (ipykernel) | Idle Mode: Command Ln 1, Col 1 MOHID_Preprocessing.ipynb 0

ENG PTB2 12:33 PM 5/28/2025

MOHID_Jupyter-Notebooks/MOH

MOHID_Prepro... - JupyterLab

localhost:8888/lab/tree/MOHID_Preprocessing.ipynb

File Edit View Run Kernel Tabs Settings Help

/

Name	Mo...	Size
Coastlines	43m ago	
Data	43m ago	
MOHID_Preprocessing...	now	45.6 KB
MOHID_Preprocessing...	43m ago	252 B

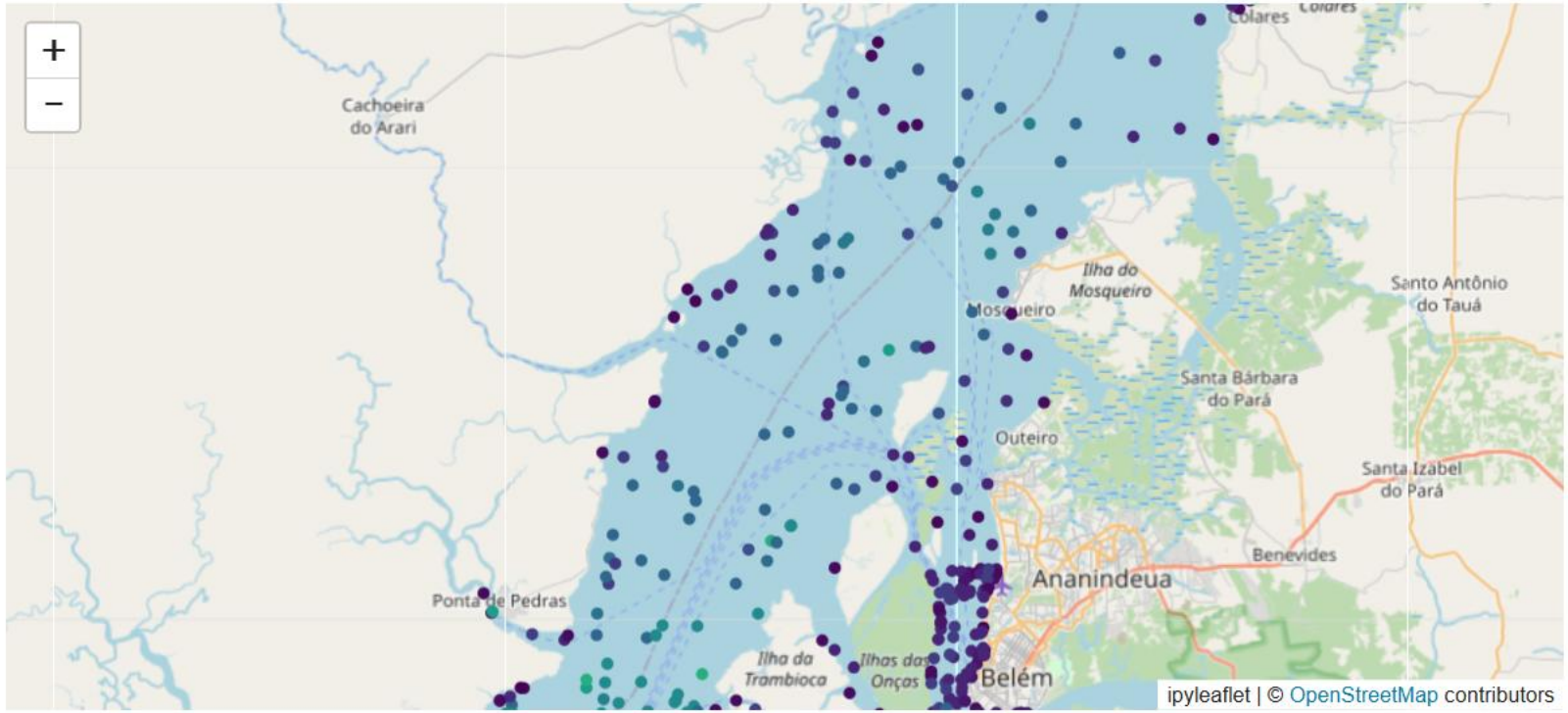
Launcher

MOHID_Preprocessing.ipynb

Markdown

Notebook

Python 3 (ipykernel)



Interactive Map for Grid Generation

1. Click anywhere on the map to find the origin coordinates (latitude and longitude).
2. The grid will be visualized as a mesh directly on the map.

Simple 1 Python 3 (ipykernel) | Idle

Mode: Command Ln 1, Col 1 MOHID_Preprocessing.ipynb 0

ENG PTB2 12:34 PM 5/28/2025

MOHID_Jupyter-Notebooks/MOH | MOHID_Prepro... - JupyterLab

localhost:8888/lab/tree/MOHID_Preprocessing.ipynb

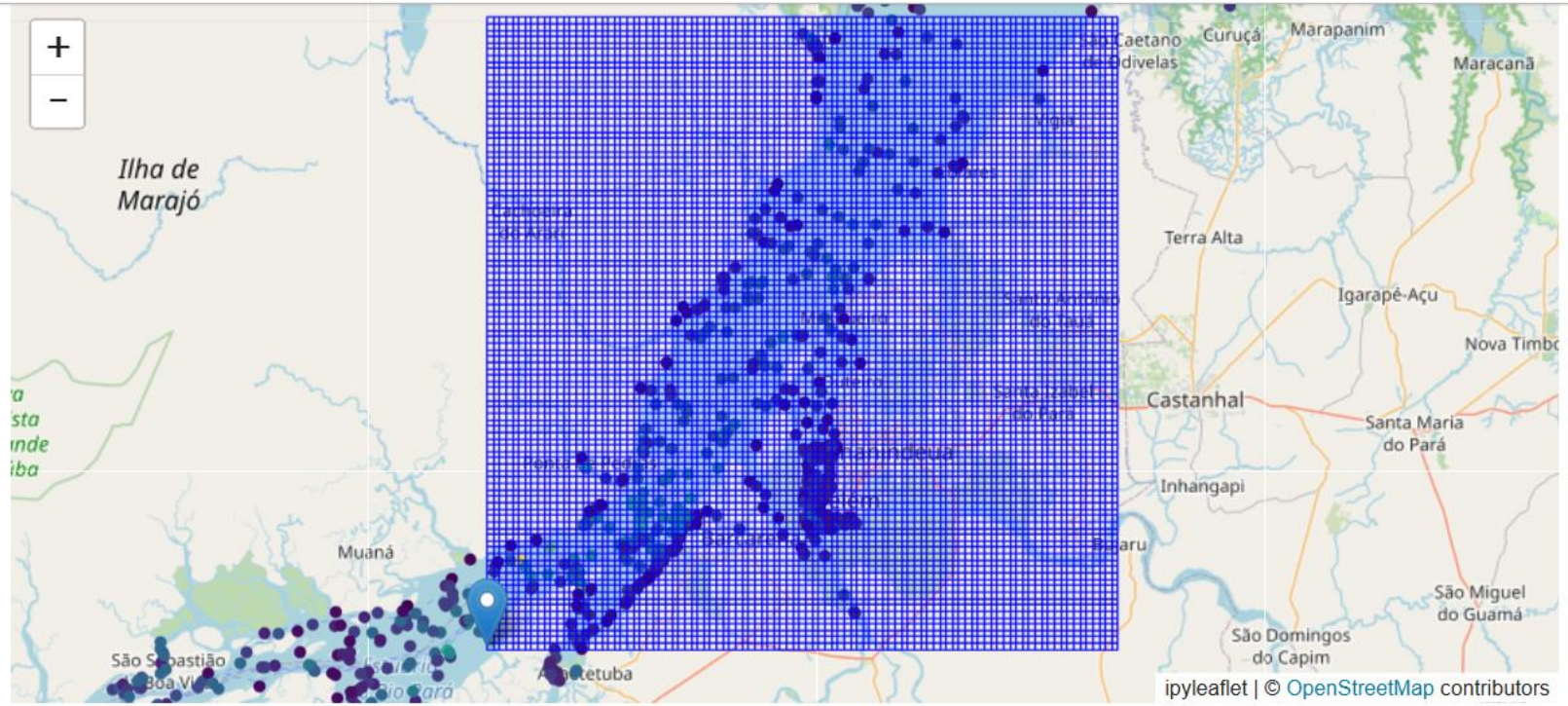
File Edit View Run Kernel Tabs Settings Help

/

Name	Mo...	Size
Coastlines	43m ago	
Data	43m ago	
MOHID_Preprocessing...	now	46.5 KB
MOHID_Preprocessing...	43m ago	252 B

Launcher | MOHID_Preprocessing.ipynb

Code | Notebook | Python 3 (ipykernel)



Interactive Map for Grid Generation

1. Click anywhere on the map to find the origin coordinates (latitude and longitude).
2. The grid will be visualized as a mesh directly on the map.

Simple | 1 | Python 3 (ipykernel) | Idle | Mode: Command | Ln 7, Col 1 | MOHID_Preprocessing.ipynb | 0

ENG PTB2 12:35 PM 5/28/2025

MOHID_Jupyter-Notebooks/MOH | MOHID_Prepro... - JupyterLab

localhost:8888/lab/tree/MOHID_Preprocessing.ipynb

File Edit View Run Kernel Tabs Settings Help

/

Name	Mo...	Size
Coastlines	43m ago	
Data	43m ago	
MOHID_Preprocessing...	now	46.5 KB
MOHID_Preprocessing...	43m ago	252 B

Launcher | MOHID_Preprocessing.ipynb

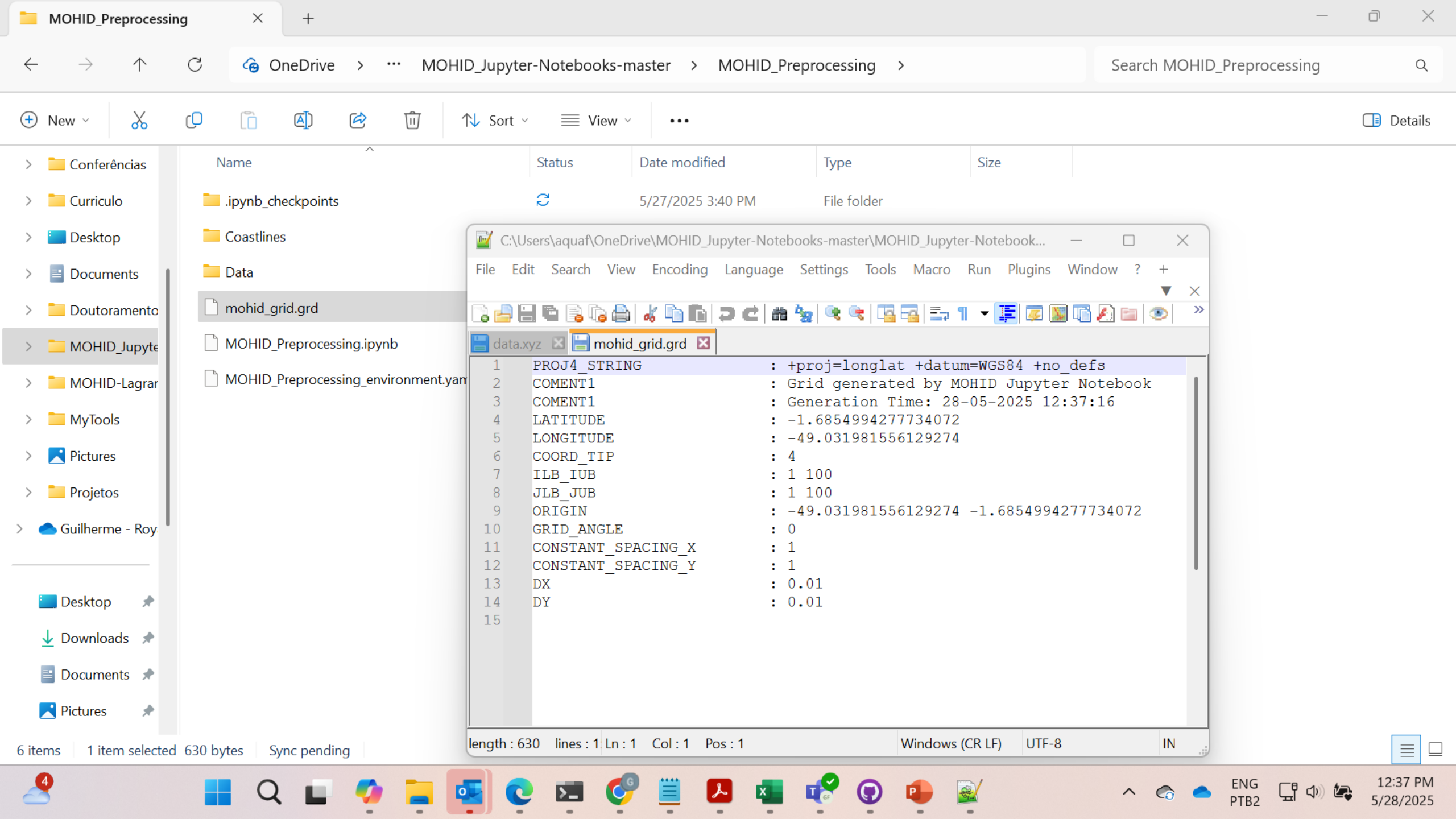
Markdown | Notebook | Python 3 (ipykernel)

5. Save the grid to a MOHID-compatible file

[ ]:
```
# Get current date and time
now = datetime.now()

# Format the date and time
formatted_date_time = now.strftime("%d-%m-%Y %H:%M:%S")

output_file = "mohid_grid.grd"
with open(output_file, "w") as f:
    f.write("PROJ4_STRING              : +proj=longlat +datum=WGS84 +no_defs\n")
    f.write("COMENT1                   : Grid generated by MOHID Jupyter Notebook\n")
    f.write("COMENT1                   : Generation Time: " + formatted_date_time + "\n")
    f.write("LATITUDE                  : " + str(y0) + "\n")
    f.write("LONGITUDE                 : " + str(x0) + "\n")
    f.write("COORD_TIP                 : 4\n")
    f.write("ILB_IUB                   : 1 " + str(ny) + "\n")
    f.write("JLB_JUB                   : 1 " + str(nx) + "\n")
    f.write("ORIGIN                    : " + str(x0) + " " + str(y0) + "\n")
    f.write("GRID_ANGLE                : 0\n")
    f.write("CONSTANT_SPACING_X        : 1\n")
    f.write("CONSTANT_SPACING_Y        : 1\n")
    f.write("DX                        : " + str(dx) + "\n")
    f.write("DY                        : " + str(dy) + "\n")

print(f"\nGrid saved to {output_file}")
```

Simple | 1 | Python 3 (ipykernel) | Idle | Mode: Command | Ln 1, Col 1 | MOHID_Preprocessing.ipynb | 0

ENG PTB2 12:36 PM 5/28/2025


MOHID_Preprocessing
OneDrive
MOHID_Jupyter-Notebooks-master
MOHID_Preprocessing
Search MOHID_Preprocessing
New
Sort
View
Details
Conferências
Curriculo
Desktop
Documents
Doutoramento
MOHID_Jupyte
MOHID-Lagrar
MyTools
Pictures
Projetos
Guilherme - Roy
Desktop
Downloads
Documents
Pictures
Name
Status
Date modified
Type
Size
.ipynb_checkpoints
5/27/2025 3:40 PM
File folder
Coastlines
Data
mohid_grid.grd
MOHID_Preprocessing.ipynb
MOHID_Preprocessing_environment.yan
C:\Users\aquaf\OneDrive\MOHID_Jupyter-Notebooks-master\MOHID_Jupyter-Notebook...
File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ? +
data.xyz
mohid_grid.grd
1 PROJ4_STRING : +proj=longlat +datum=WGS84 +no_defs
2 COMENT1 : Grid generated by MOHID Jupyter Notebook
3 COMENT1 : Generation Time: 28-05-2025 12:37:16
4 LATITUDE : -1.6854994277734072
5 LONGITUDE : -49.031981556129274
6 COORD_TIP : 4
7 ILB_IUB : 1 100
8 JLB_JUB : 1 100
9 ORIGIN : -49.031981556129274 -1.6854994277734072
10 GRID_ANGLE : 0
11 CONSTANT_SPACING_X : 1
12 CONSTANT_SPACING_Y : 1
13 DX : 0.01
14 DY : 0.01
15
length : 630 lines : 1 Ln : 1 Col : 1 Pos : 1 Windows (CR LF) UTF-8 IN
6 items 1 item selected 630 bytes Sync pending
ENG
PTB2
12:37 PM
5/28/2025

MOHID_Jupyter-Notebooks/MOH | MOHID_Prepro... - JupyterLab

localhost:8888/lab/tree/MOHID_Preprocessing.ipynb

File Edit View Run Kernel Tabs Settings Help

/

Name	Mo...	Size
Coastlines	43m ago	
Data	43m ago	
MOHID_Preprocessing...	now	46.4 KB
mohid_grid.grd	7s ago	630 B
MOHID_Preprocessing...	20h ago	252 B

Launcher | MOHID_Preprocessing.ipynb

Markdown | Notebook | Python 3 (ipykernel)

6. Download or load GSHHG Coastline Data

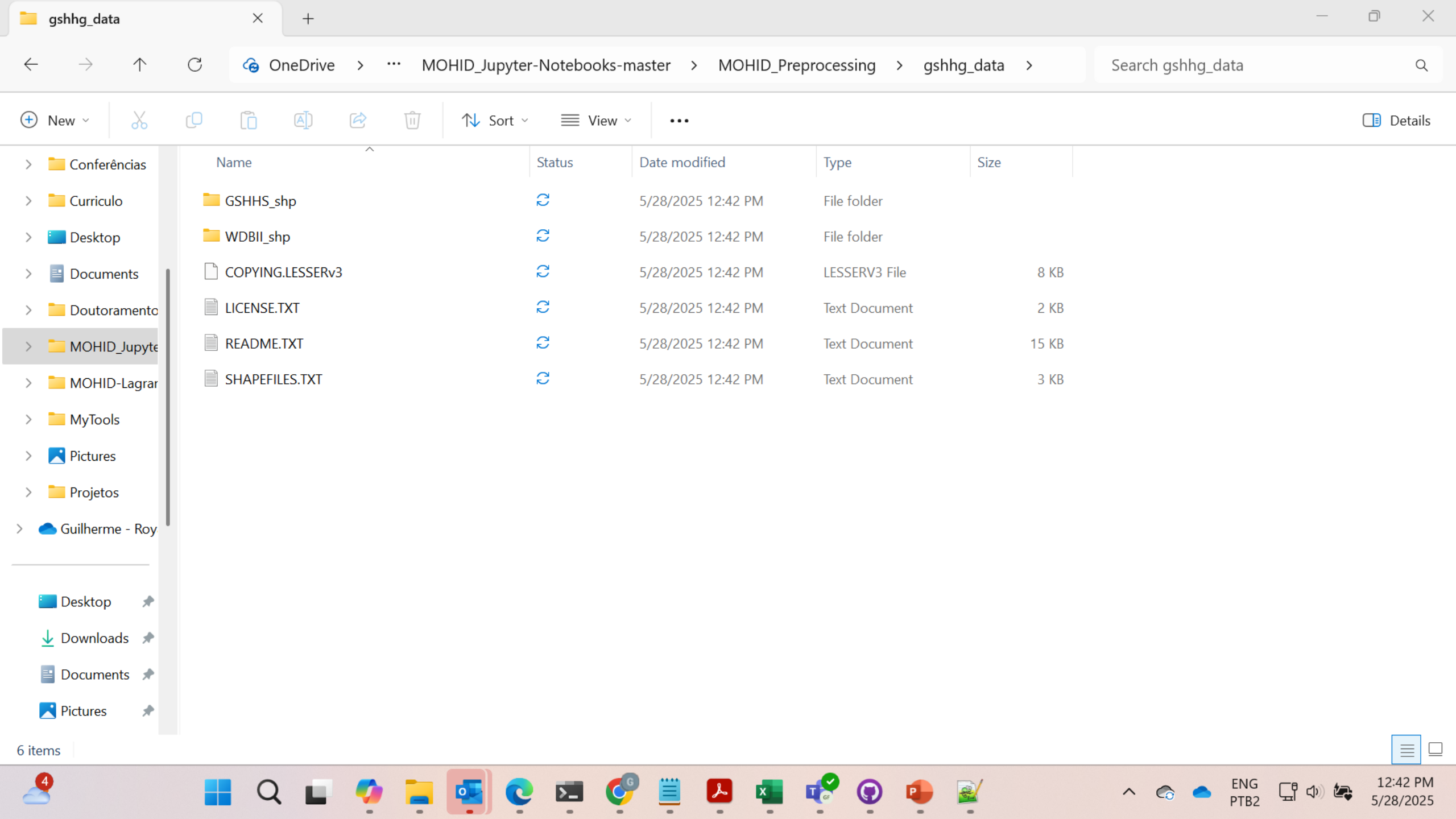
[ ]:
```
# Define URL and local paths
gshhg_url = "https://www.soest.hawaii.edu/pwessel/gshhg/gshhg-shp-2.3.7.zip"
zip_path = "gshhg_shapefiles.zip"
extract_path = "gshhg_data"

# Download the file if not exists
if not os.path.exists(zip_path):
    print("Downloading GSHHG data...")
    response = requests.get(gshhg_url)
    with open(zip_path, "wb") as f:
        f.write(response.content)

# Extract the files
if not os.path.exists(extract_path):
    print("Extracting GSHHG data...")
    with zipfile.ZipFile(zip_path, "r") as zip_ref:
        zip_ref.extractall(extract_path)

print("GSHHG data is ready.")
```

7. Load and Filter Coastlines for Grid Region

+ 1 cell hidden

Simple | 1 | Python 3 (ipykernel) | Idle | Mode: Command | Ln 1, Col 1 | MOHID_Preprocessing.ipynb | 0

ENG PTB2 12:38 PM 5/28/2025


gshhg_data
OneDrive
MOHID_Jupyter-Notebooks-master
MOHID_Preprocessing
gshhg_data
Search gshhg_data
New
Sort
View
Details
Conferências
Curriculo
Desktop
Documents
Doutoramento
MOHID_Jupyte
MOHID-Lagrar
MyTools
Pictures
Projetos
Guilherme - Roy
Desktop
Downloads
Documents
Pictures
Name
Status
Date modified
Type
Size
GSHHS_shp 5/28/2025 12:42 PM File folder
WDBII_shp 5/28/2025 12:42 PM File folder
COPYING.LESSERv3 5/28/2025 12:42 PM LESSERV3 File 8 KB
LICENSE.TXT 5/28/2025 12:42 PM Text Document 2 KB
README.TXT 5/28/2025 12:42 PM Text Document 15 KB
SHAPEFILES.TXT 5/28/2025 12:42 PM Text Document 3 KB
6 items
ENG
PTB2
12:42 PM
5/28/2025

Mohid-Water-Modelling-System/ | MOHID_Prepro... - JupyterLab

localhost:8888/lab/tree/MOHID_Preprocessing.ipynb

File Edit View Run Kernel Tabs Settings Help

/

Name	Mo...	Size
Coastlines	43m ago	
Data	43m ago	
gshhg_data	2s ago	
MOHID_Preprocessing...	now	46.4 KB
gshhg_shapefiles.zip	5s ago	142.2 MB
mohid_grid.grd	1s ago	628 B
MOHID_Preprocessing...	21h ago	252 B

Launcher | MOHID_Preprocessing.ipynb

Code | Notebook | Python 3 (ipykernel)

7. Load and Filter Coastlines for Grid Region

[ ]:

```
# Load the coastline shapefile
coastline_shapefile = os.path.join(extract_path, "GSHHS_shp", "f", "GSHHS_f_L1.shp") #if using downloaded GSHHG coastline d
#coastline_shapefile = "Coastlines/Para_3_completo.shp" #if using other coastline data

coastlines = gpd.read_file(coastline_shapefile)

# Define a bounding box
np_x = np.array(x_grid)
np_y = np.array(y_grid)

c = 3
x_min=np.min(np_x)-dx*c; y_min=np.min(np_y)-dy*c; x_max=np.max(np_x)+dx*c; y_max=np.max(np_y)+dy*c

bbox = [x_min, y_min, x_max, y_max] #[min_lon, min_lat, max_lon, max_lat]

# Create a bounding box geometry
bbox_geom = gpd.GeoDataFrame(geometry=[box(*bbox)], crs=coastlines.crs)

# Filter coastlines for the bounding box
filtered_coastlines = gpd.overlay(coastlines, bbox_geom, how='intersection')

# Convert to GeoJSON
coastline_geojson = filtered_coastlines.to_json()


# Convert to GeoJSON for ipyleaflet
```

Simple | 1 | Python 3 (ipykernel) | Idle | Mode: Command | Ln 3, Col 2 | MOHID_Preprocessing.ipynb | 0

ENG PTB2 2:03 PM 5/28/2025

Mohid-Water-Modelling-System/ | MOHID_Prepro... - JupyterLab

localhost:8888/lab/tree/MOHID_Preprocessing.ipynb

File Edit View Run Kernel Tabs Settings Help

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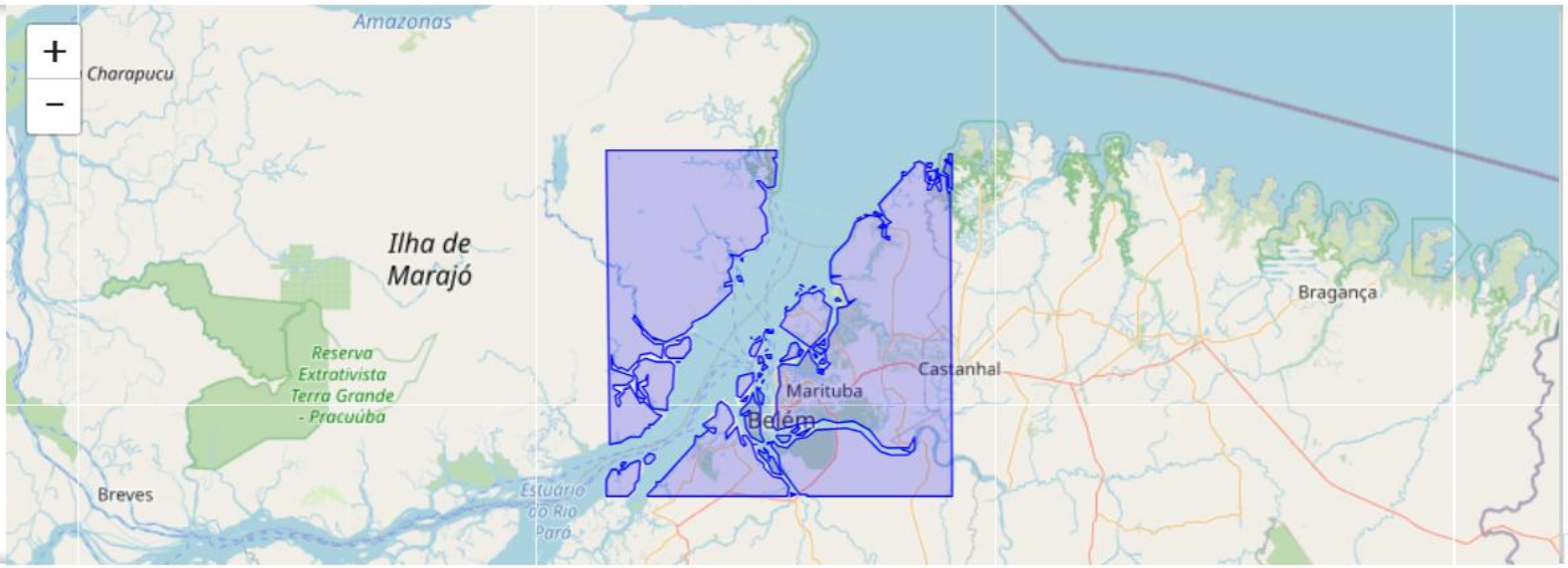
Name	Mo...	Size
Coastlines	43m ago	
Data	43m ago	
gshhg_data	2s ago	
MOHID_Preprocessing...	now	46.7 KB
gshhg_shapefiles.zip	5s ago	142.2 MB
mohid_grid.grd	1s ago	628 B
MOHID_Preprocessing...	21h ago	252 B

Launcher | MOHID_Preprocessing.ipynb

Code | Notebook | Python 3 (ipykernel)

[9]:



8. Interpolate bathymetric data

+ 1 cell hidden

9. Load a previously generated Mohid griddata file

Simple | 1 | Python 3 (ipykernel) | Idle | Mode: Command | Ln 9, Col 24 | MOHID_Preprocessing.ipynb | 0

ENG PTB2 2:05 PM 5/28/2025

Mohid-Water-Modelling-System/ | MOHID_Prepro... - JupyterLab

localhost:8888/lab/tree/MOHID_Preprocessing.ipynb

File Edit View Run Kernel Tabs Settings Help

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Name	Mo...	Size
Coastlines	43m ago	
Data	43m ago	
gshhg_data	2s ago	
MOHID_Preprocessing...	now	46.7 KB
gshhg_shapefiles.zip	5s ago	142.2 MB
mohid_grid.grd	1s ago	628 B
MOHID_Preprocessing...	21h ago	252 B

Launcher | MOHID_Preprocessing.ipynb

Markdown | Notebook | Python 3 (ipykernel)

8. Interpolate bathymetric data

[ ]:
```
# Remove NaN values from the dataset
mask = ~np.isnan(data['longitude']) & ~np.isnan(data['latitude']) & ~np.isnan(data['depth'])
lons, lats, depths = data['longitude'][mask], data['latitude'][mask], data['depth'][mask]

# Initialize the grid with -99
zi = np.full((x_grid.shape[0] - 1, x_grid.shape[1] - 1), -99, dtype=float)

# Convert coastline geometries to Shapely Polygons
coast_polygons = list(filtered_coastlines.geometry)

# Calculate the midpoints for interpolation
x_centers = (x_grid[:-1, :-1] + x_grid[1:, 1:]) / 2
y_centers = (y_grid[:-1, :-1] + y_grid[1:, 1:]) / 2

# Assume 'filtered_coastlines' is a GeoSeries containing the coastline polygons
water_mask = ~contains(filtered_coastlines.unary_union, x_centers, y_centers)

# Interpolate depth values only for water cells
zi[water_mask] = griddata(
    (lons, lats), depths,
    (x_centers[water_mask], y_centers[water_mask]),
    method="nearest"
)

# Apply depth constraints
```

Simple | 1 | Python 3 (ipykernel) | Idle | Mode: Command | Ln 1, Col 1 | MOHID_Preprocessing.ipynb | 0

ENG PTB2 2:05 PM 5/28/2025

Mohid-Water-Modelling-System/ | MOHID_Prepro... - JupyterLab

localhost:8888/lab/tree/MOHID_Preprocessing.ipynb#8.-Interpolate-bathymetric-data

File Edit View Run Kernel Tabs Settings Help

/

Name	Mo...	Size
Coastlines	43m ago	
Data	43m ago	
gshhg_data	2s ago	
MOHID_Preprocessing...	now	47.5 KB
gshhg_shapefiles.zip	5s ago	142.2 MB
mohid_grid.grd	1s ago	628 B
MOHID_Preprocessing...	21h ago	252 B

Launcher | MOHID_Preprocessing.ipynb

Markdown | Notebook | Python 3 (ipykernel)

10. Visualize and update depth values by clicking on the map

This code is currently efficient for not-so-large griddatas (e.g., 100 x 100 cells). To update large gridatas (e.g., 400 x 400 cells), convert first to shapefile, modify the cell depths in QGIS, and then convert the griddata to a MOHID-compatible file again. You can use this Jupyter Notebook to convert between formats.

[ ]:

```
# ----------------------
# Setup and timing
# ----------------------
start_time = time.time()

# Assume x_grid, y_grid, and zi are defined externally
LonGrid = np.array(x_grid)
LatGrid = np.array(y_grid)
min_lon, max_lon = LonGrid.min(), LonGrid.max()
min_lat, max_lat = LatGrid.min(), LatGrid.max()

# Create a dedicated output widget for displaying interactive controls.
output = widgets.Output()
display(output)

# ----------------------
# Create the Map
# ----------------------
m = Map(center=(LatGrid.mean(), LonGrid.mean()), zoom=8)
marker = None  # For interactive marker
```

Simple | 1 | Python 3 (ipykernel) | Idle | Mode: Command | Ln 1, Col 1 | MOHID_Preprocessing.ipynb | 0

ENG PTB2 3:26 PM 5/28/2025

Mohid-Water-Modelling-System/ | MOHID_Prepro... - JupyterLab

localhost:8888/lab/tree/MOHID_Preprocessing.ipynb#8.-Interpolate-bathymetric-data

File Edit View Run Kernel Tabs Settings Help

/

Name	Mo...	Size
Coastlines	43m ago	
Data	43m ago	
gshhg_data	2s ago	
MOHID_Preprocessing...	now	47.5 KB
gshhg_shapefiles.zip	5s ago	142.2 MB
mohid_grid.grd	1s ago	628 B
MOHID_Preprocessing...	21h ago	252 B

Launcher | MOHID_Preprocessing.ipynb

Markdown | Notebook | Python 3 (ipykernel)

```
m.on_interaction(update_depth)
```

```
Total time: 0.80 seconds
```

11. Save the griddata to a MOHID-compatible file

Simple | 1 | Python 3 (ipykernel) | Idle | Mode: Command | Ln 1, Col 1 | MOHID_Preprocessing.ipynb | 0

ENG PTB2 3:27 PM 5/28/2025

Mohid-Water-Modelling-System/ | MOHID_Prepro... - JupyterLab

localhost:8888/lab/tree/MOHID_Preprocessing.ipynb#8.-Interpolate-bathymetric-data

File Edit View Run Kernel Tabs Settings Help

/

Name	Mo...	Size
Coastlines	43m ago	
Data	43m ago	
gshhg_data	2s ago	
MOHID_Preprocessing...	now	47.5 KB
gshhg_shapefiles.zip	5s ago	142.2 MB
mohid_grid.grd	1s ago	628 B
MOHID_Preprocessing...	21h ago	252 B

Launcher | MOHID_Preprocessing.ipynb

Code | Notebook | Python 3 (ipykernel)

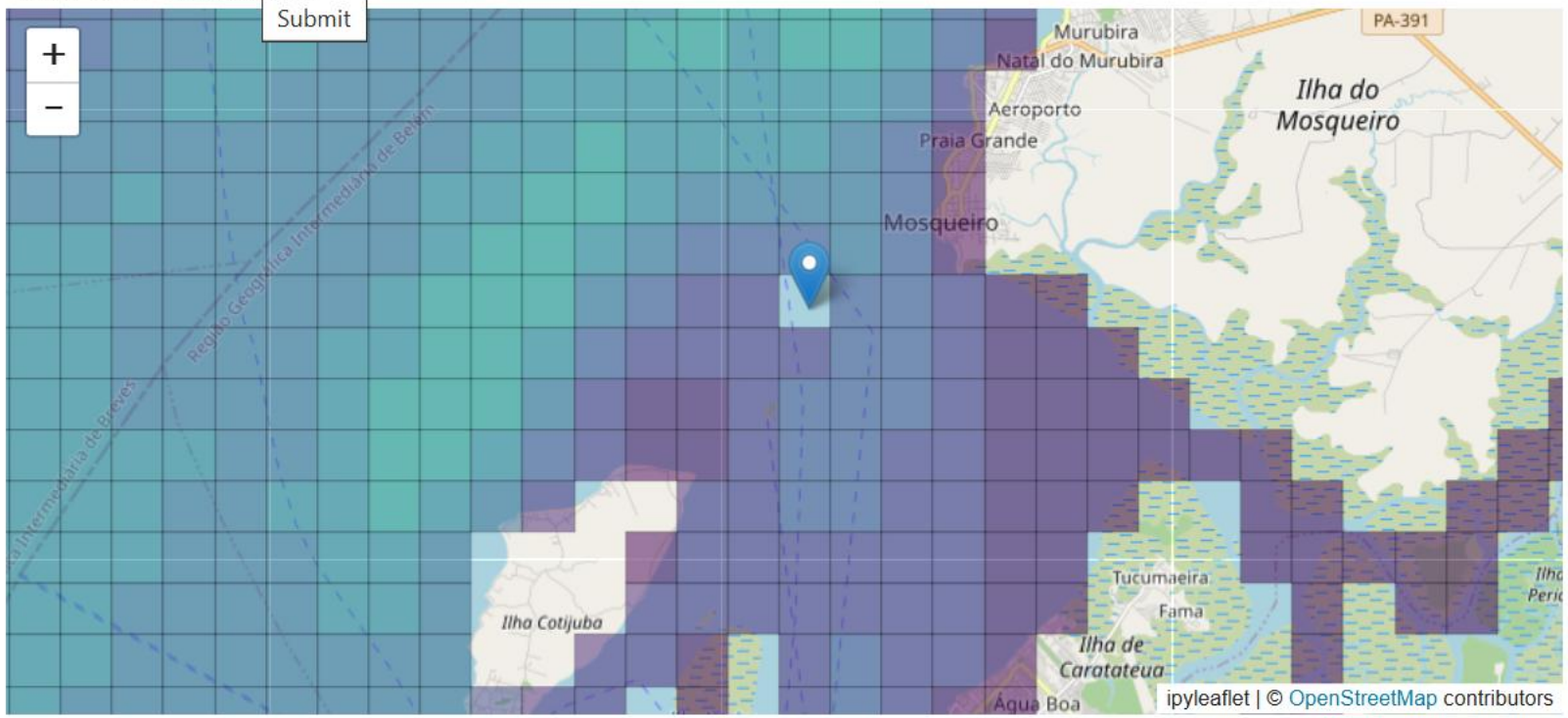
```
m.on_interaction(update_depth)
```

Cell (47, 47) Depth -99.0: 5

Submit

Total time: 0.80 seconds

Submit



Simple | 1 | Python 3 (ipykernel) | Idle

Mode: Command | Ln 17, Col 17 | MOHID_Preprocessing.ipynb | 0

ENG PTB2 3:28 PM 5/28/2025

Mohid-Water-Modelling-System/ | MOHID_Prepro... - JupyterLab

localhost:8888/lab/tree/MOHID_Preprocessing.ipynb#8.-Interpolate-bathymetric-data

File Edit View Run Kernel Tabs Settings Help

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Name	Mo...	Size
Coastlines	43m ago	
Data	43m ago	
gshhg_data	2s ago	
MOHID_Preprocessing...	now	47.5 KB
gshhg_shapefiles.zip	5s ago	142.2 MB
mohid_grid.grd	1s ago	628 B
MOHID_Preprocessing...	21h ago	252 B

Launcher | MOHID_Preprocessing.ipynb

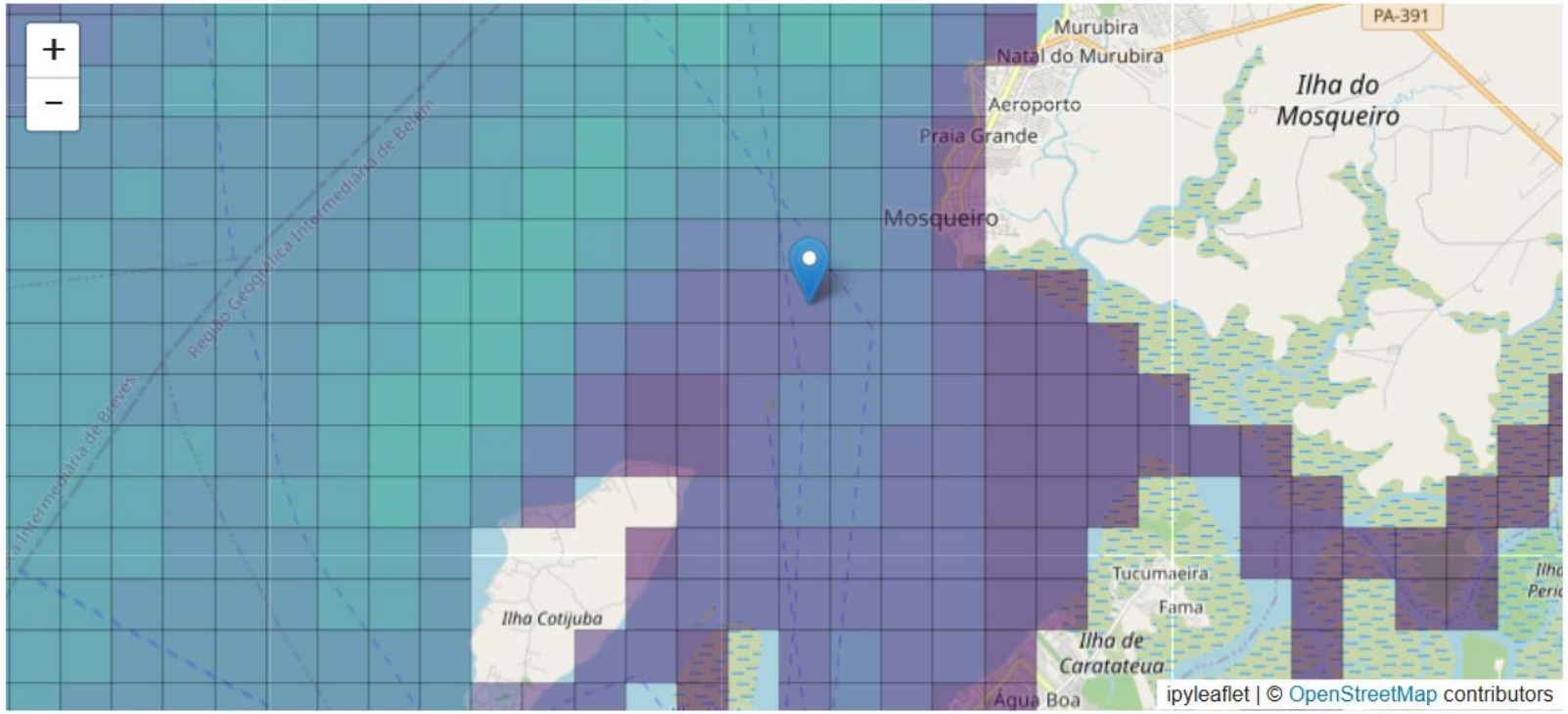
Code | Notebook | Python 3 (ipykernel)

```
m.on_interaction(update_depth)
```

Cell (47, 47) Depth -99.0: 5

Submit

```
Total time: 0.80 seconds
```



Simple | 1 | Python 3 (ipykernel) | Idle | Mode: Command | Ln 17, Col 17 | MOHID_Preprocessing.ipynb | 0

ENG PTB2 3:28 PM 5/28/2025

Mohid-Water-Modelling-System/ | MOHID_Prepro... - JupyterLab

localhost:8888/lab/tree/MOHID_Preprocessing.ipynb#8.-Interpolate-bathymetric-data

File Edit View Run Kernel Tabs Settings Help

/

Name	Mo...	Size
Coastlines	43m ago	
Data	43m ago	
gshhg_data	2s ago	
MOHID_Preprocessing...	now	48.3 KB
gshhg_shapefiles.zip	5s ago	142.2 MB
mohid_grid.grd	1s ago	628 B
MOHID_Preprocessing...	21h ago	252 B

Launcher | MOHID_Preprocessing.ipynb

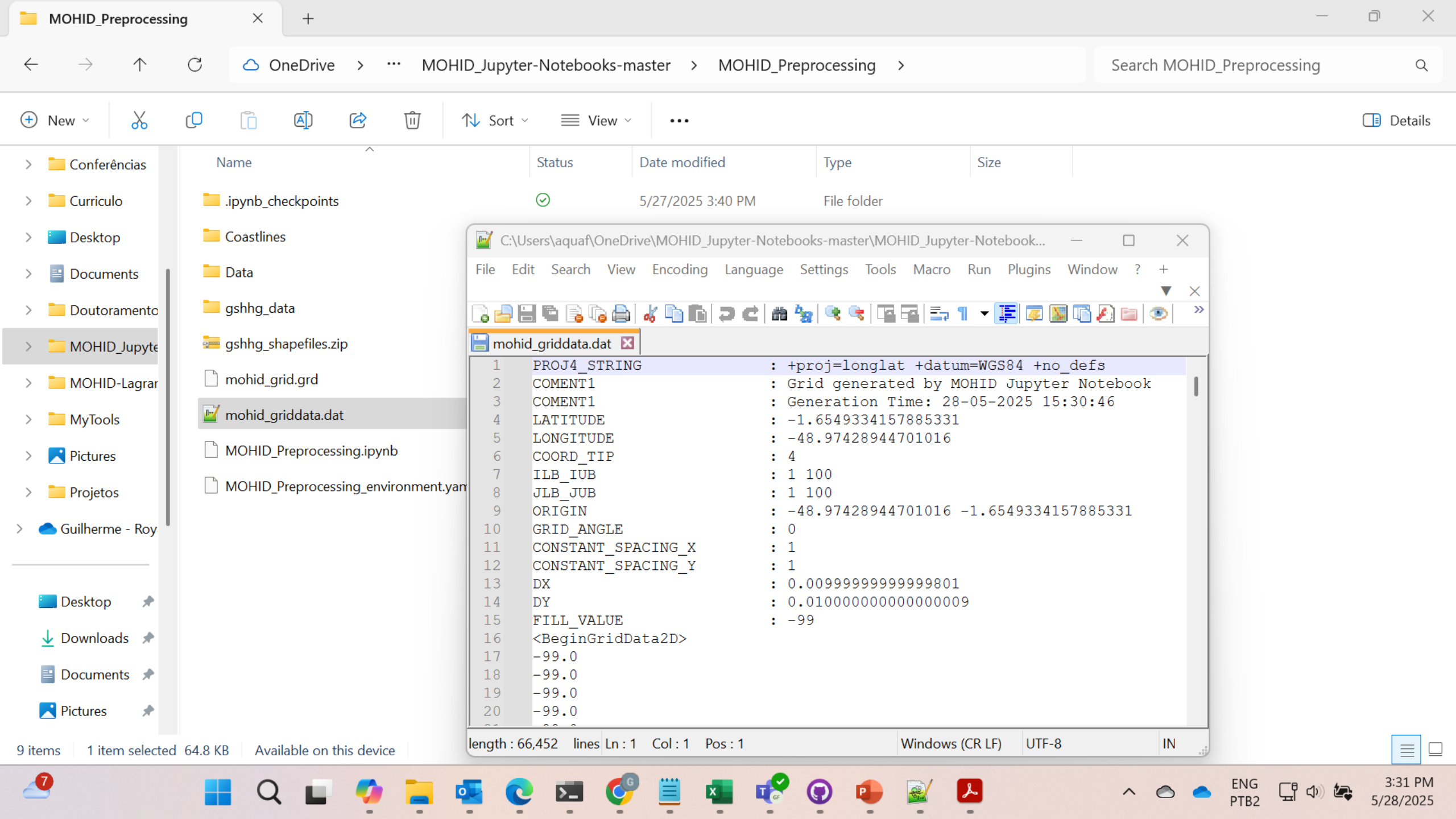
Code | Notebook | Python 3 (ipykernel)

11. Save the griddata to a MOHID-compatible file

[ ]:
```
rows, cols = zi.shape

np_x = np.array(x_grid)
np_y = np.array(y_grid)

# Calculate the cell spacing
dx = np.abs(np_x[0][1] - np_x[0][0])
dy = np.abs(np_y[1][0] - np_y[0][0])

# Get current date and time
now = datetime.now()

# Format the date and time
formatted_date_time = now.strftime("%d-%m-%Y %H:%M:%S")

output_file = "mohid_griddata.dat"
with open(output_file, "w") as f:
    f.write("PROJ4_STRING              : +proj=longlat +datum=WGS84 +no_defs\n")
    f.write("COMENT1                   : Grid generated by MOHID Jupyter Notebook\n")
    f.write("COMENT1                   : Generation Time: " + formatted_date_time + "\n")
    f.write("LATITUDE                  : " + str(y0) + "\n")
    f.write("LONGITUDE                 : " + str(x0) + "\n")
    f.write("COORD_TIP                 : 4\n")
    f.write("ILB_IUB                   : 1 " + str(int(rows)) + "\n")
    f.write("JLB_JUB                   : 1 " + str(int(cols)) + "\n")
```

Simple | 1 | Python 3 (ipykernel) | Idle | Mode: Command | Ln 17, Col 17 | MOHID_Preprocessing.ipynb | 0

ENG PTB2 3:29 PM 5/28/2025


MOHID_Preprocessing
OneDrive
MOHID_Jupyter-Notebooks-master
MOHID_Preprocessing
Search MOHID_Preprocessing
New
Sort
View
Details
Conferências
Curriculo
Desktop
Documents
Doutoramento
MOHID_Jupyte
MOHID-Lagrar
MyTools
Pictures
Projetos
Guilherme - Roy
Desktop
Downloads
Documents
Pictures
Name
Status
Date modified
Type
Size
.ipynb_checkpoints
5/27/2025 3:40 PM
File folder
Coastlines
Data
gshhg_data
gshhg_shapefiles.zip
mohid_grid.grd
mohid_griddata.dat
MOHID_Preprocessing.ipynb
MOHID_Preprocessing_environment.yan
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mohid_griddata.dat
1 PROJ4_STRING : +proj=longlat +datum=WGS84 +no_defs
2 COMENT1 : Grid generated by MOHID Jupyter Notebook
3 COMENT1 : Generation Time: 28-05-2025 15:30:46
4 LATITUDE : -1.6549334157885331
5 LONGITUDE : -48.97428944701016
6 COORD_TIP : 4
7 ILB_IUB : 1 100
8 JLB_JUB : 1 100
9 ORIGIN : -48.97428944701016 -1.6549334157885331
10 GRID_ANGLE : 0
11 CONSTANT_SPACING_X : 1
12 CONSTANT_SPACING_Y : 1
13 DX : 0.00999999999999801
14 DY : 0.010000000000000009
15 FILL_VALUE : -99
16 <BeginGridData2D>
17 -99.0
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Mohid-Water-Modelling-System/ | MOHID_Prepro... - JupyterLab

localhost:8888/lab/tree/MOHID_Preprocessing.ipynb#8.-Interpolate-bathymetric-data

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depth_grid_cells.shp	now	1.3 MB
depth_grid_cells.shx	now	78.2 KB
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mohid_grid.grd	1h ago	628 B
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Launcher | MOHID_Preprocessing.ipynb

Code | Notebook | Python 3 (ipykernel)

12. Convert the griddata to a shapefile

[20]:

```
# Create a shapefile writer object
w = shapefile.Writer('depth_grid_cells', shapefile.POLYGON)
w.field('i', 'N')       # Row index (i)
w.field('j', 'N')       # Column index (j)
w.field('Depth', 'F', decimal=2)  # Depth value (float)

# Loop through the grid and create polygon cells
for i in range(len(zi)):
    for j in range(len(zi[i])):
        depth = zi[i, j]  # Get depth value

        if depth <= -99:
            depth = float('nan')

        # Define the 4 corner points of the grid cell with double precision
        lon1, lat1 = round(x_grid[i, j], 15), round(y_grid[i, j], 15)         # Bottom-left
        lon2, lat2 = round(x_grid[i, j+1], 15), round(y_grid[i, j+1], 15)     # Bottom-right
        lon3, lat3 = round(x_grid[i+1, j+1], 15), round(y_grid[i+1, j+1], 15) # Top-right
        lon4, lat4 = round(x_grid[i+1, j], 15), round(y_grid[i+1, j], 15) # Top-left

        # Create a polygon for the grid cell
        w.poly([[ (lon1, lat1), (lon2, lat2), (lon3, lat3), (lon4, lat4), (lon1, lat1) ]])

        # Add attributes (Row, Col, Depth)
        w.record(i+1, j+1, depth)
```

Simple | 1 | Python 3 (ipykernel) | Idle | Mode: Edit | Ln 14, Col 9 | MOHID_Preprocessing.ipynb | 0

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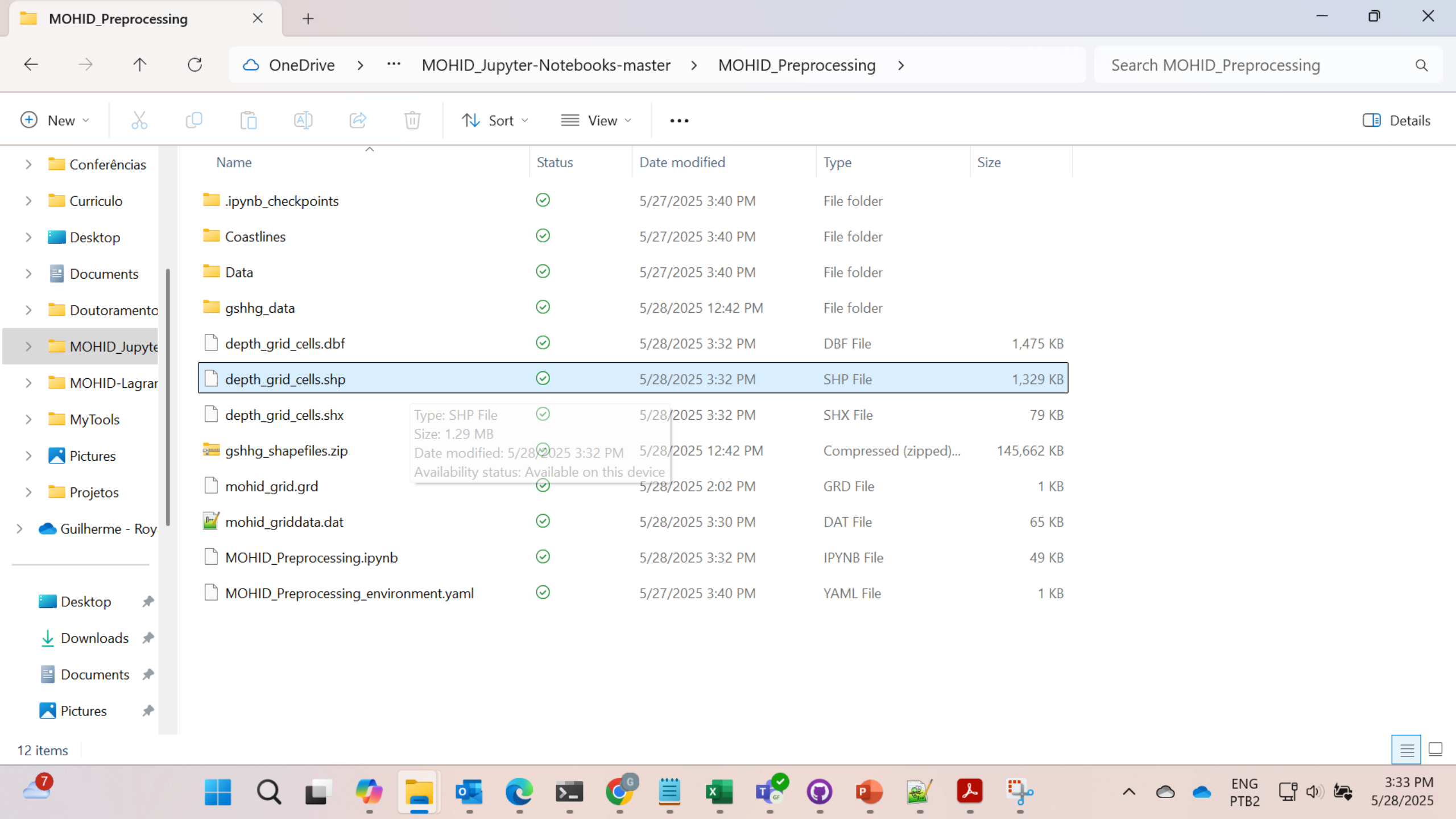
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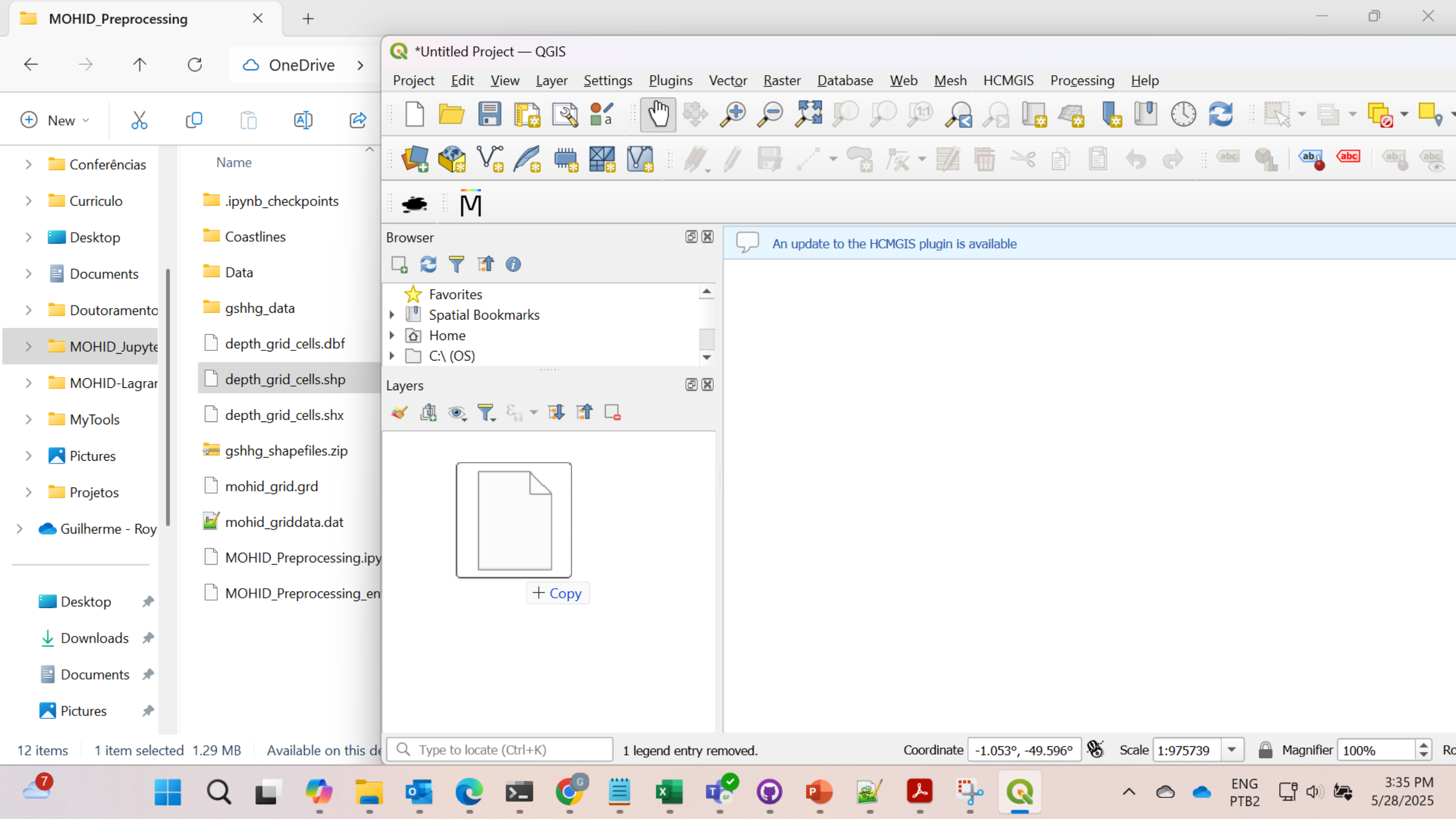
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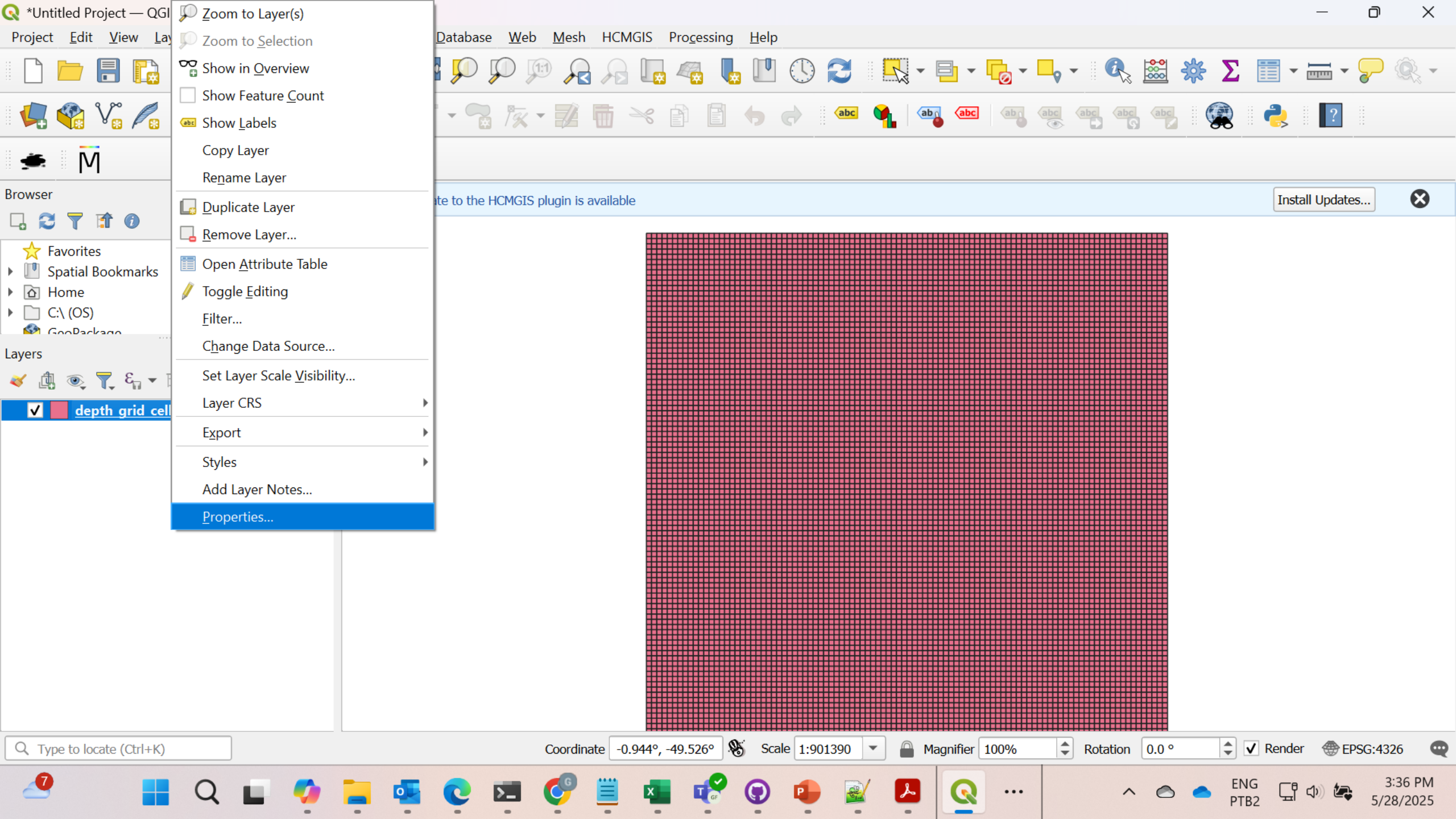
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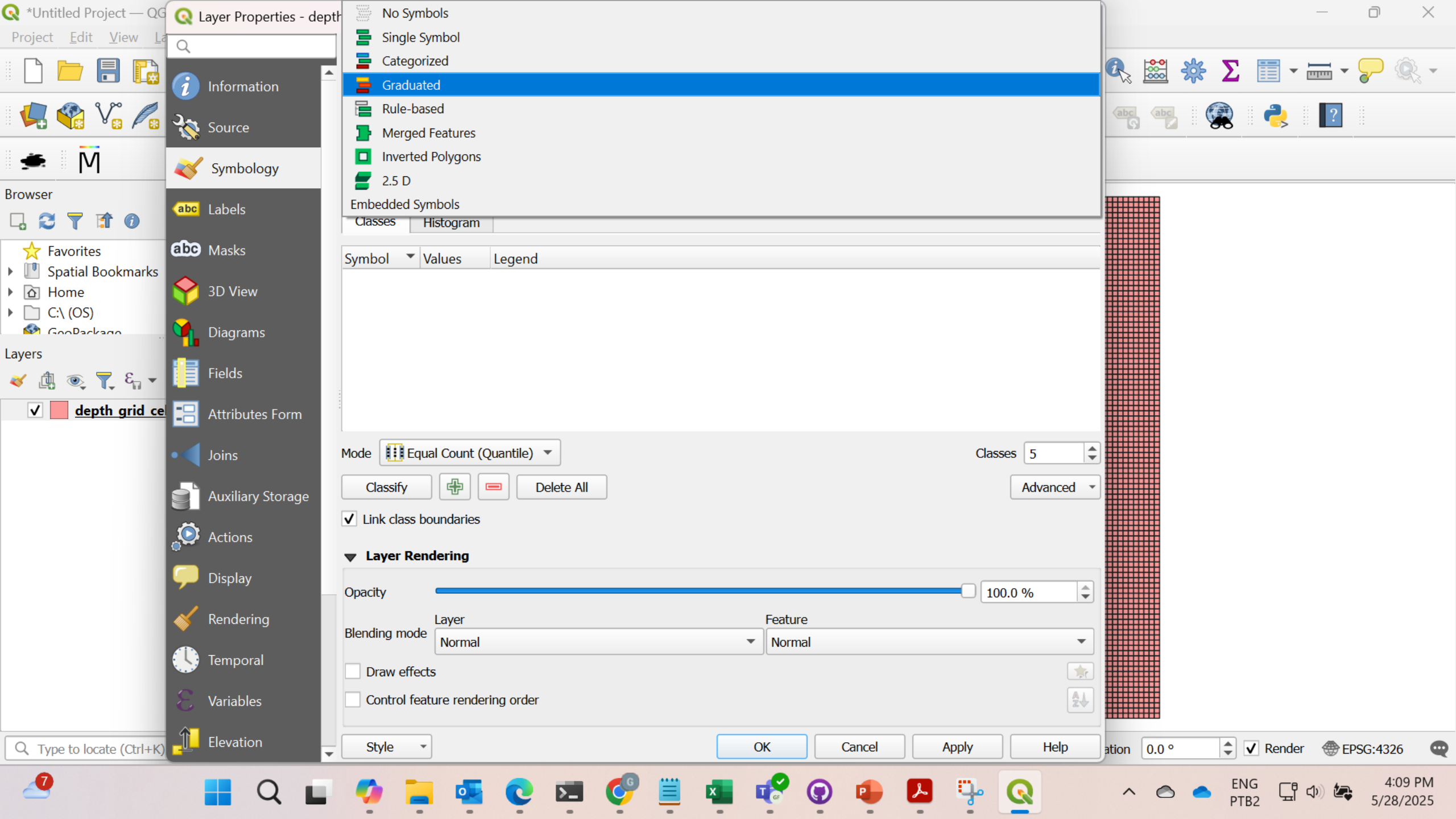
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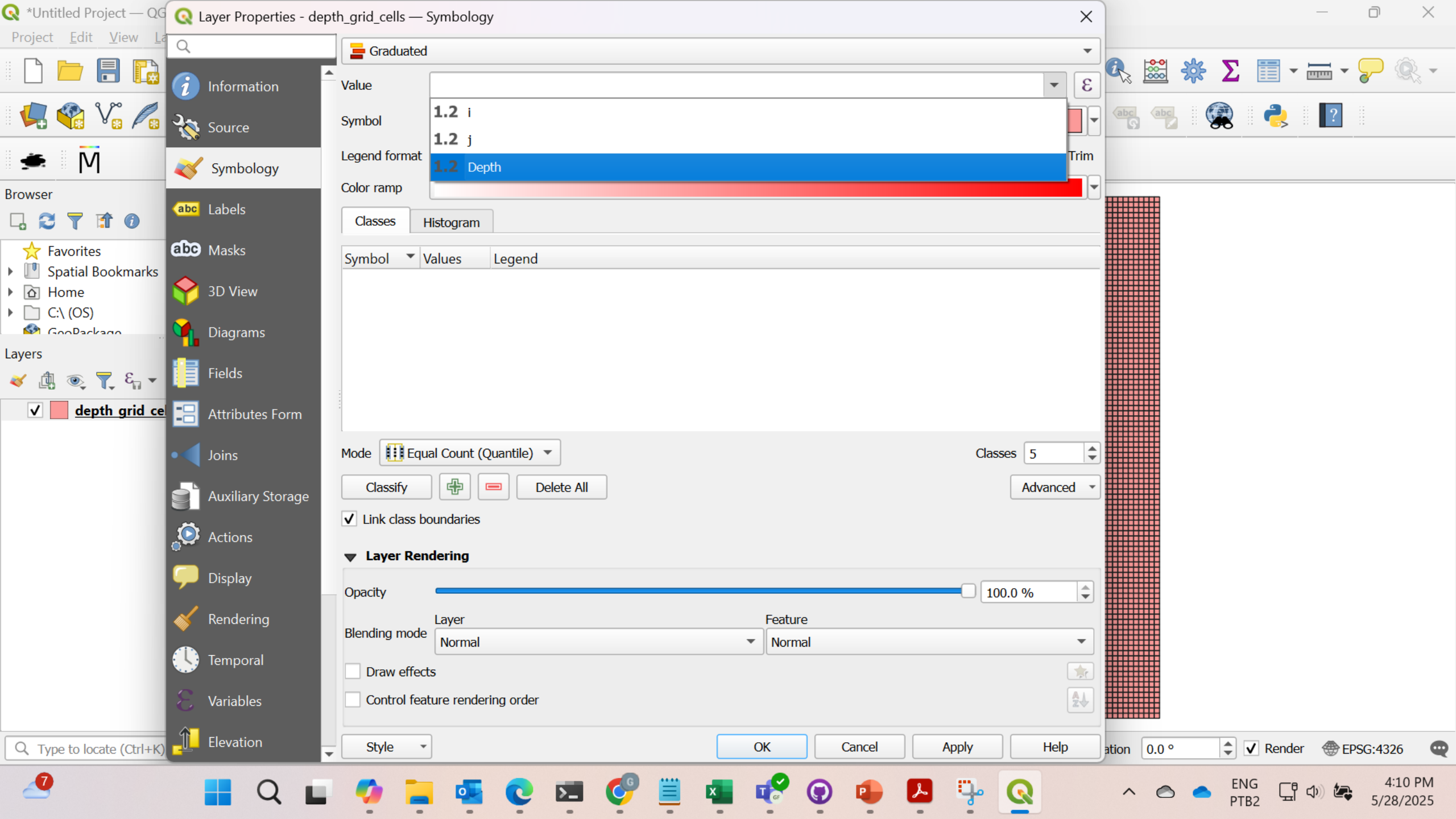
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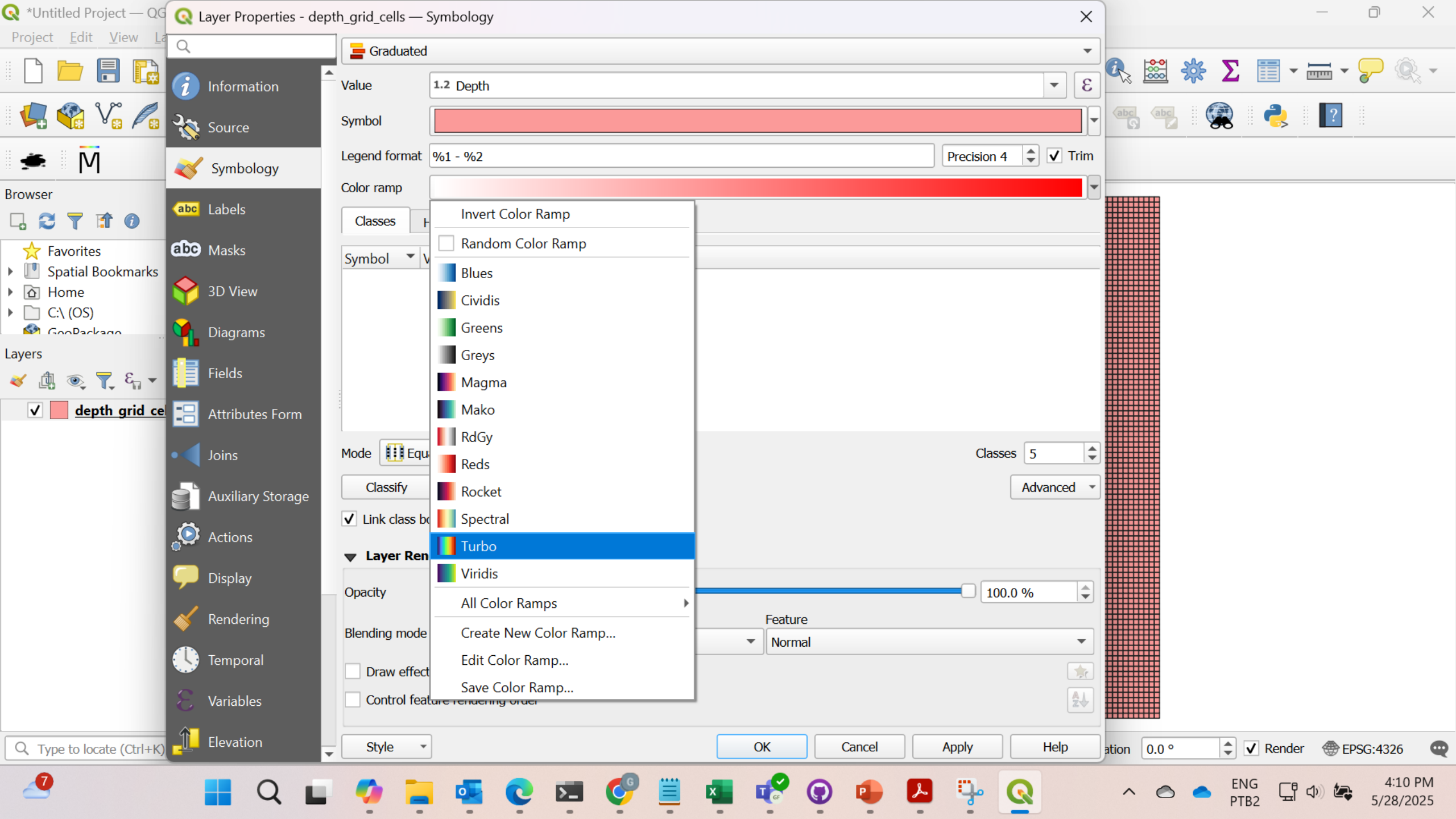
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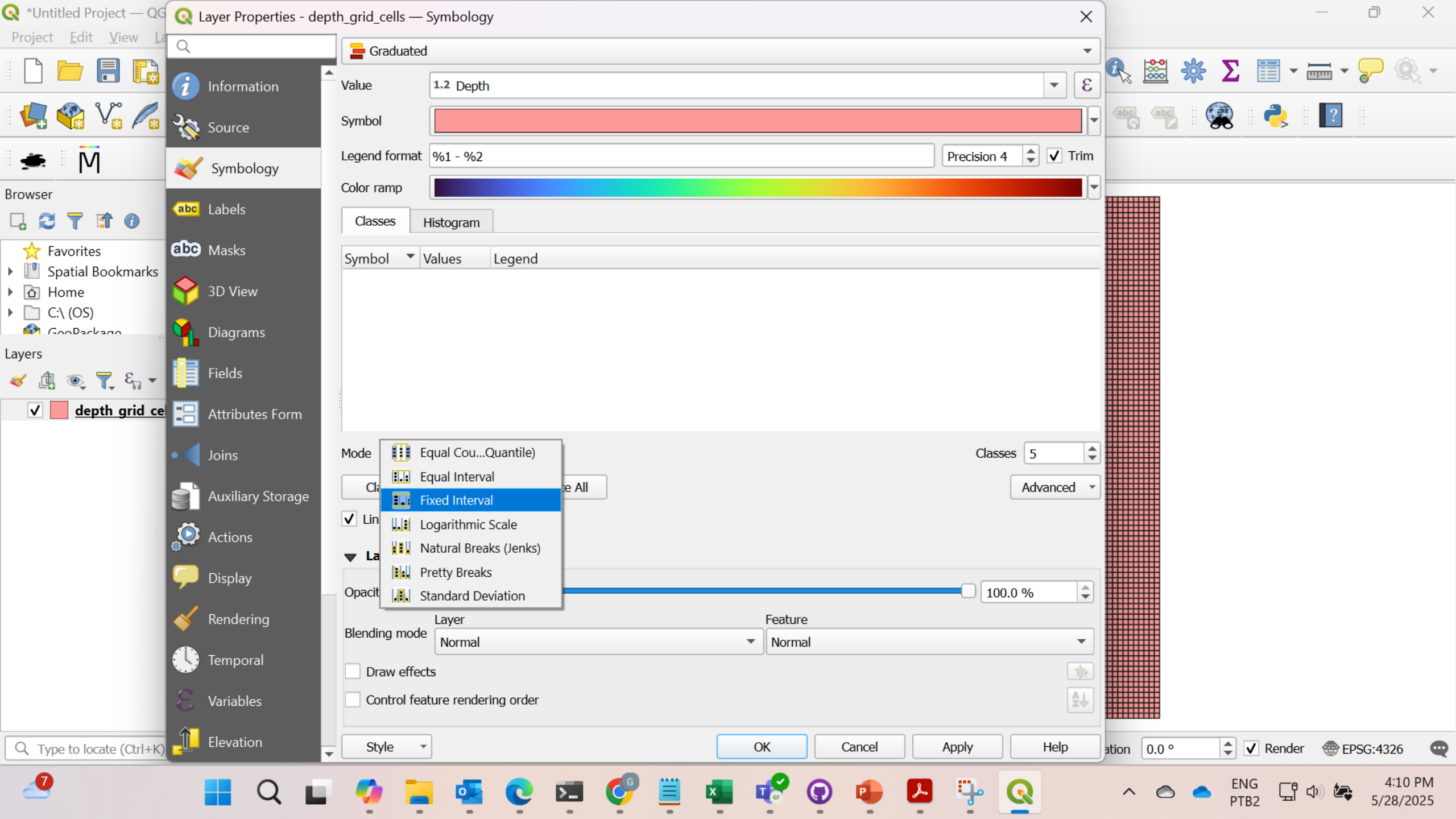
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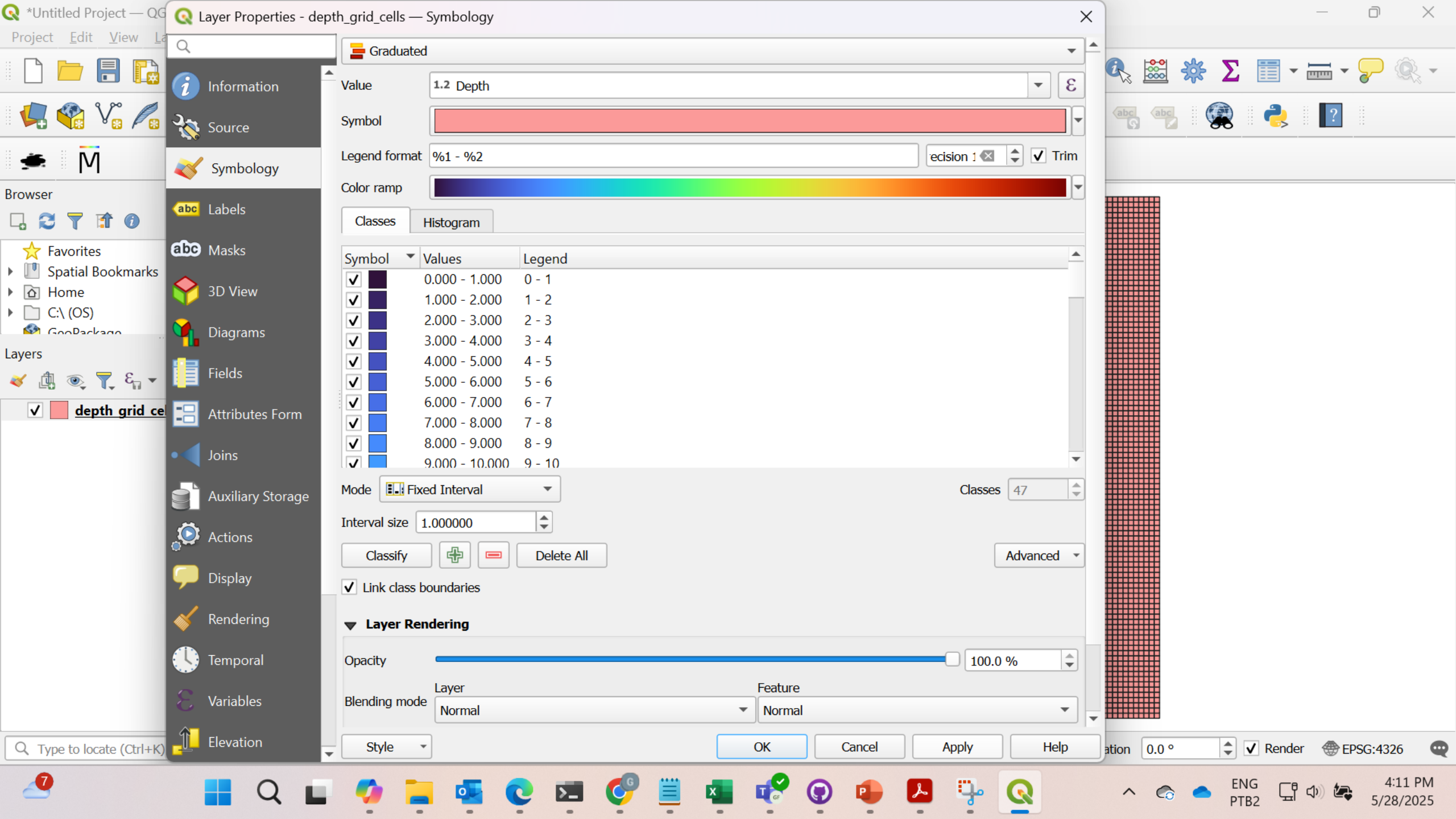
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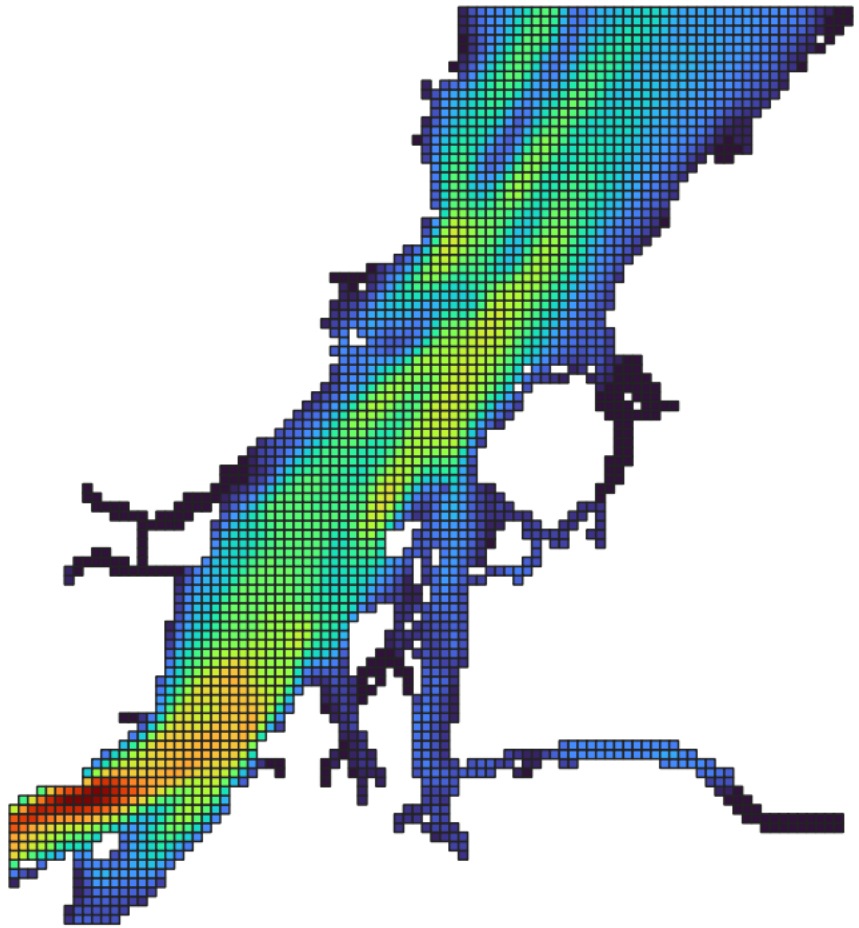

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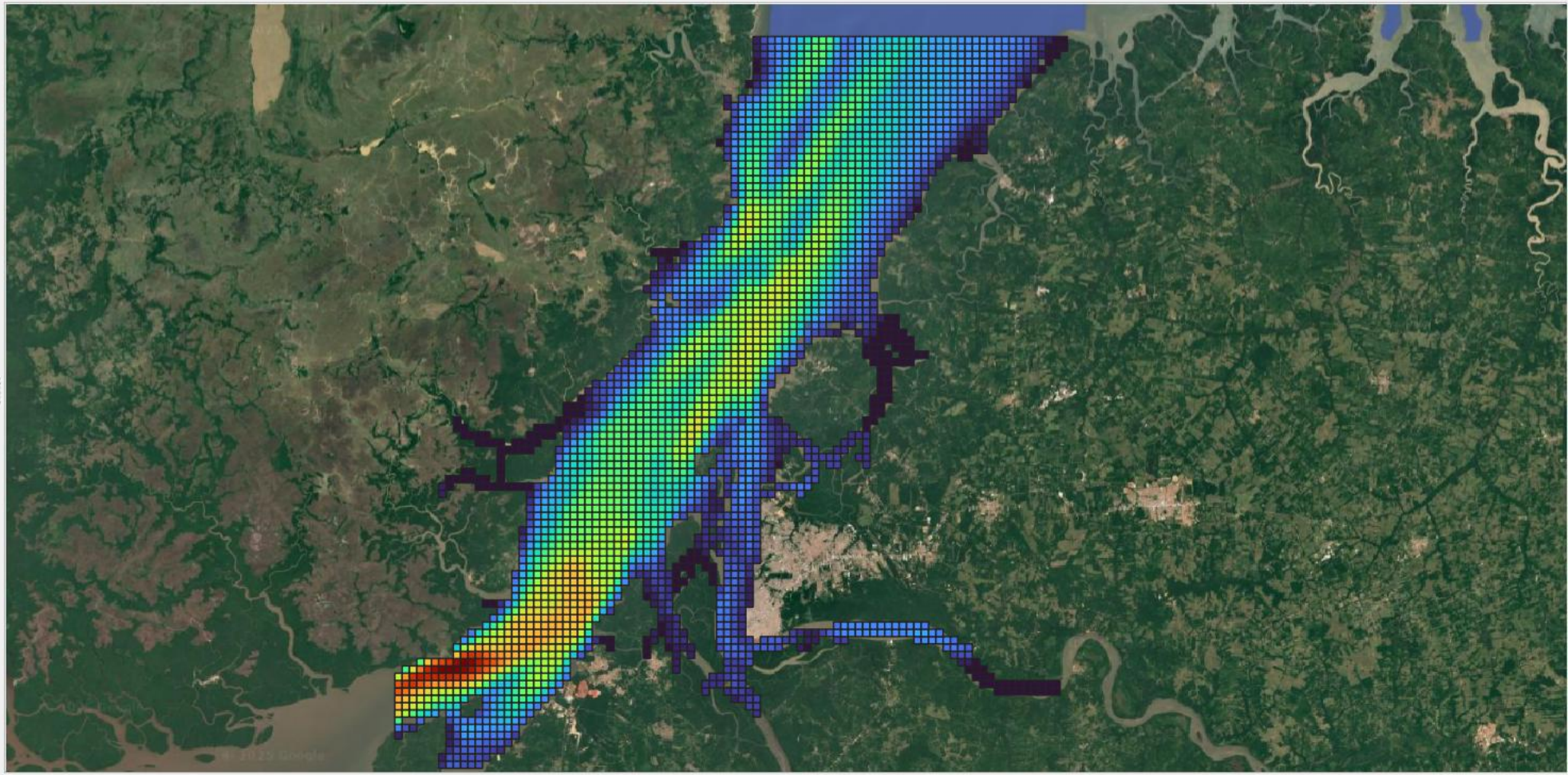

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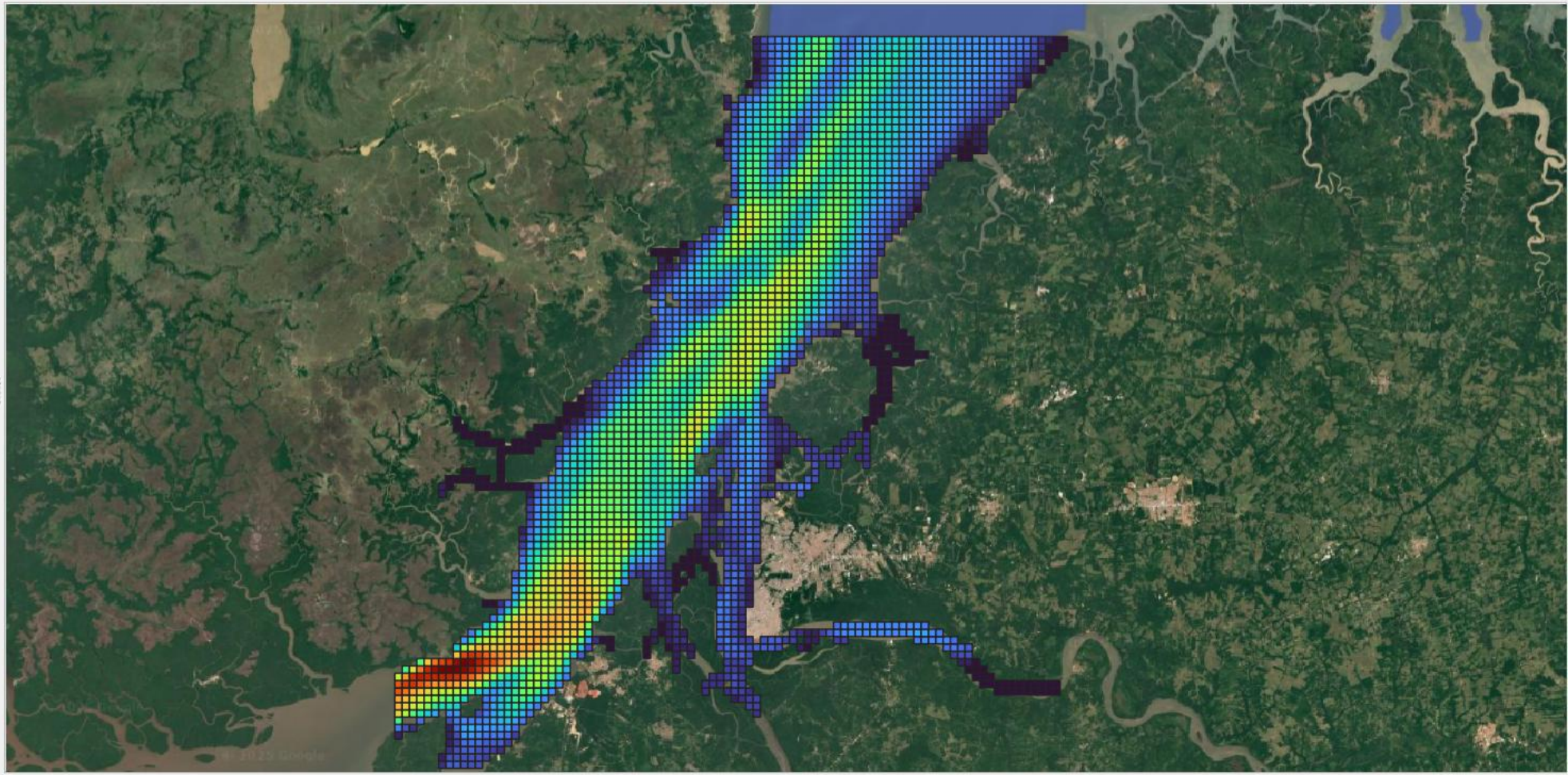

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Mohid-Water-Modelling-System/ | MOHID_Prepro... - JupyterLab

localhost:8888/lab/tree/MOHID_Preprocessing.ipynb#8.-Interpolate-bathymetric-data

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Launcher | MOHID_Preprocessing.ipynb

Code | Notebook | Python 3 (ipykernel)

13. Save shapefile to MOHID griddata

[24]:

```
# Load the shapefile
shapefile_path = 'depth_grid_cells.shp'
gdf = gpd.read_file(shapefile_path)

# Get the bounds of the shapefile
bounds = gdf.total_bounds  # [minx, miny, maxx, maxy]
minx, miny, maxx, maxy = bounds
origin_coordinates = (minx, miny)

def calculate_spacing(gdf):
    # Ensure the GeoDataFrame has geometries
    if gdf.empty or gdf.geometry.iloc[0] is None:
        raise ValueError("GeoDataFrame is empty or has no valid geometries.")

    # Get the first polygon's coordinates
    first_polygon = gdf.geometry.iloc[0]

    # Validate that the geometry is a valid polygon
    if not first_polygon.is_valid or first_polygon.geom_type != 'Polygon':
        raise ValueError("The first geometry is not a valid Polygon.")

    # Extract unique x and y coordinates
    x_coords = sorted(set(pt[0] for pt in first_polygon.exterior.coords))
    y_coords = sorted(set(pt[1] for pt in first_polygon.exterior.coords))

    # Ensure there are enough points to calculate spacing
    if len(x_coords) < 2 or len(y_coords) < 2:
```

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Mohid-Water-Modelling-System/ | MOHID_Prepro... - JupyterLab

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Launcher | MOHID_Preprocessing.ipynb

Markdown | Notebook | Python 3 (ipykernel)

```
Grid saved to mohid_griddata_from_shapefile.dat
```

14. Plot MOHID griddata

[ ]:

```
np_x = np.array(x_grid)
np_y = np.array(y_grid)

x_min = np.min(np_x)
y_min = np.min(np_y)
x_max = np.max(np_x)
y_max = np.max(np_y)

#extent = [x_max, x_min, y_max, y_min]

# Calculate the cell spacing
dx = np.abs(np_x[0][1] - np_x[0][0])
dy = np.abs(np_y[1][0] - np_y[0][0])

# Expand the extent by n cells in all directions
n = 5

lon_min = x_min - n * dx
lon_max = x_max + n * dx
lat_min = y_min - n * dy
lat_max = y_max + n * dy

extent = [
    lon_min,  # Left
```

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Mohid-Water-Modelling-System/ | MOHID_Prepro... - JupyterLab

localhost:8888/lab/tree/MOHID_Preprocessing.ipynb#8.-Interpolate-bathymetric-data

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Launcher | MOHID_Preprocessing.ipynb

Code | Notebook | Python 3 (ipykernel)

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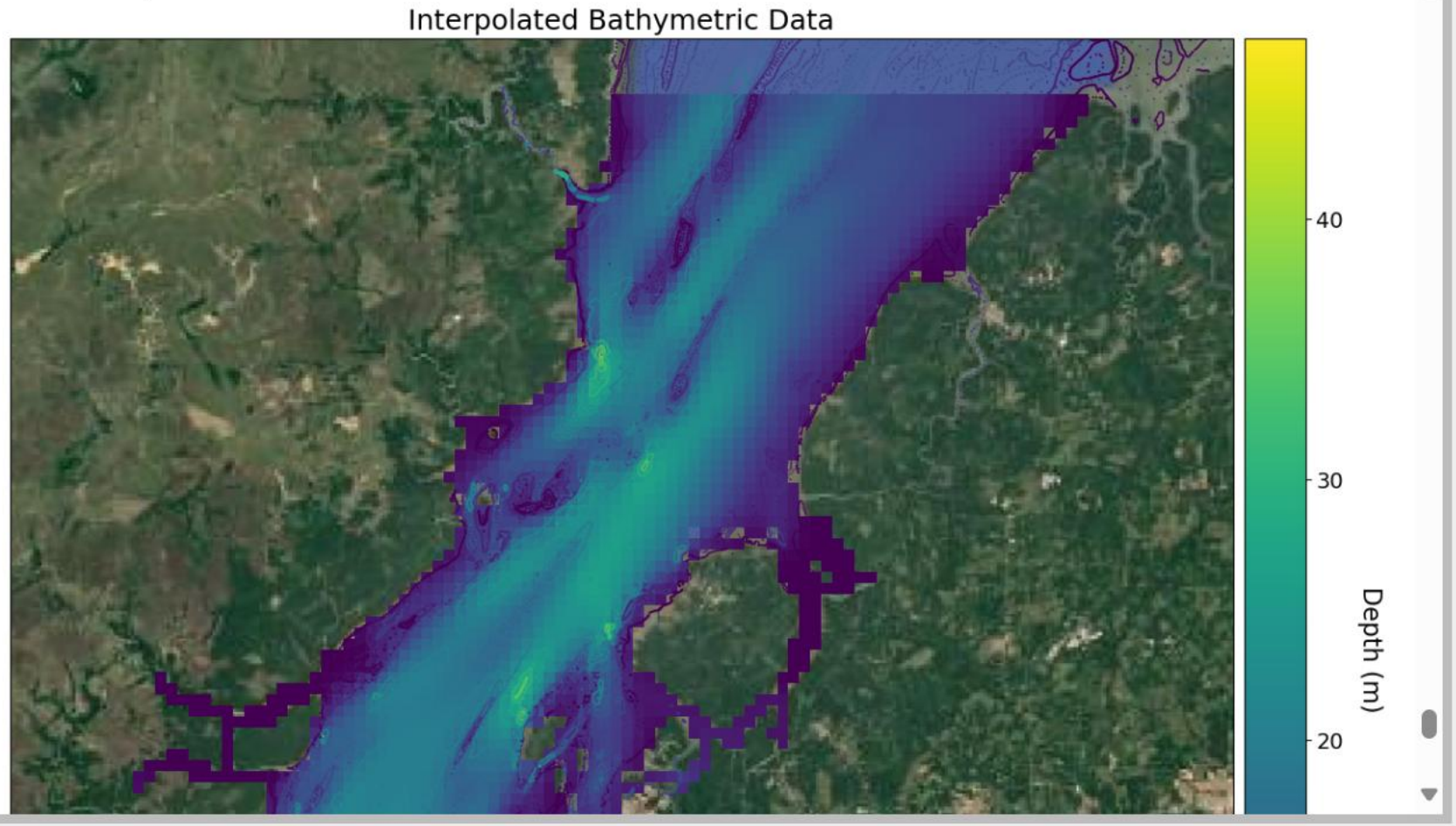

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MOHID_Preprocessing

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gshhg_shapefiles.zip
mohid_grid.grd
mohid_griddata.dat
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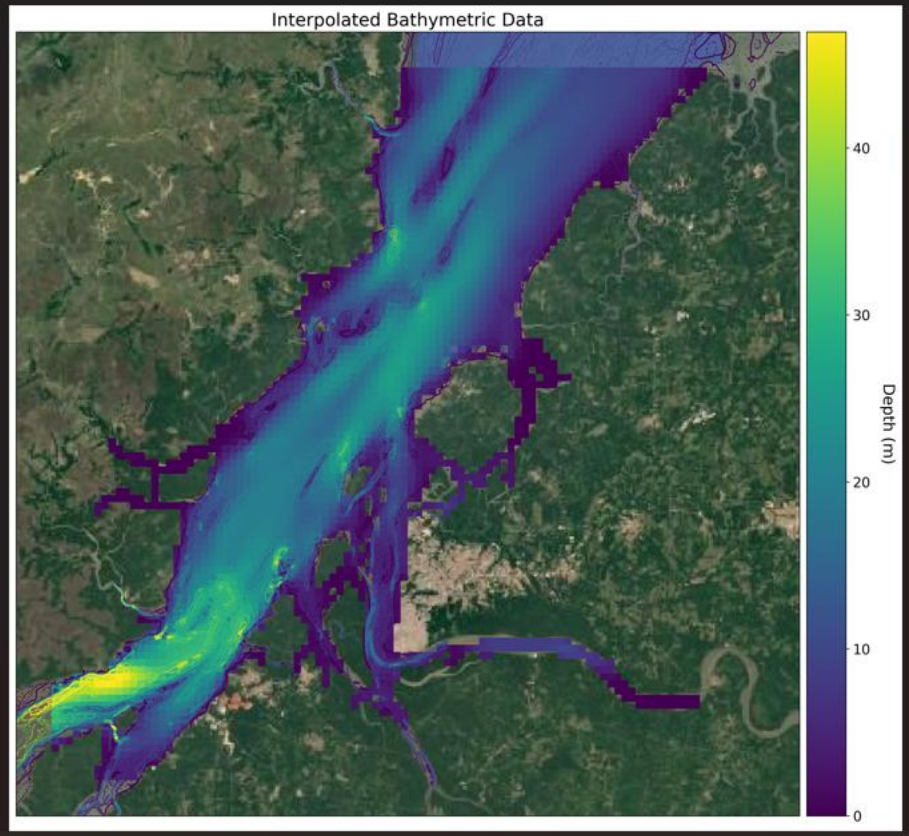
MOHID_Preprocessi
MOHID_Preprocessi

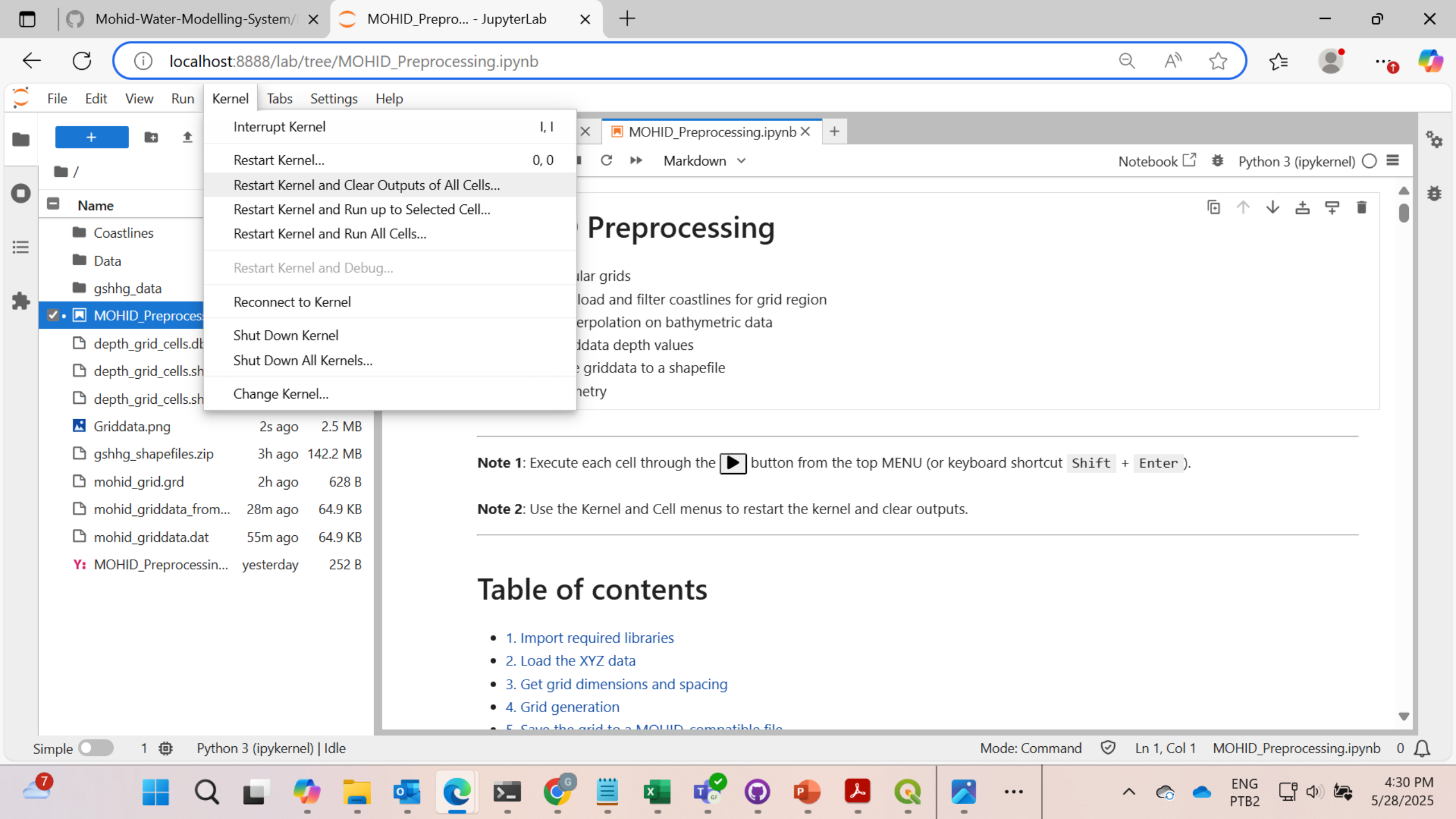
Edit | Griddata.png



3755 x 3469 | 2.5 MB | 18%

14 items | 1 item selected 2.54 MB | Available on this device

ENG
PTB2
4:27 PM
5/28/2025


Mohid-Water-Modelling-System/
MOHID_Prepro... - JupyterLab
localhost:8888/lab/tree/MOHID_Preprocessing.ipynb
File Edit View Run Kernel Tabs Settings Help
Interrupt Kernel I, I
Restart Kernel... 0, 0
Restart Kernel and Clear Outputs of All Cells...
Restart Kernel and Run up to Selected Cell...
Restart Kernel and Run All Cells...
Restart Kernel and Debug...
Reconnect to Kernel
Shut Down Kernel
Shut Down All Kernels...
Change Kernel...
MOHID_Preprocessing.ipynb
Markdown
Notebook
Python 3 (ipykernel)
Preprocessing
Note 1: Execute each cell through the button from the top MENU (or keyboard shortcut Shift + Enter).
Note 2: Use the Kernel and Cell menus to restart the kernel and clear outputs.
Table of contents
1. Import required libraries
2. Load the XYZ data
3. Get grid dimensions and spacing
4. Grid generation
Name
Coastlines
Data
gshhg_data
depth_grid_cells.sh
depth_grid_cells.sh
Griddata.png 2s ago 2.5 MB
gshhg_shapefiles.zip 3h ago 142.2 MB
mohid_grid.grd 2h ago 628 B
mohid_griddata_from... 28m ago 64.9 KB
mohid_griddata.dat 55m ago 64.9 KB
MOHID_Preprocessin... yesterday 252 B
Simple
Python 3 (ipykernel) | Idle
Mode: Command
Ln 1, Col 1
MOHID_Preprocessing.ipynb
ENG PTB2
4:30 PM 5/28/2025