Caroline Baumann - Jet Propulsion Laboratory, California Institute of Technology

CREATING MONTHLY COMPOSITES

ECOSTRESS TUTORIALS

This tutorial will show you how to create monthly composite images of ECOSTRESS data using a Python code. The code shows how to make composites of Land Surface Temperature (LST) products, but it can be modified for other ECOSTRESS products.

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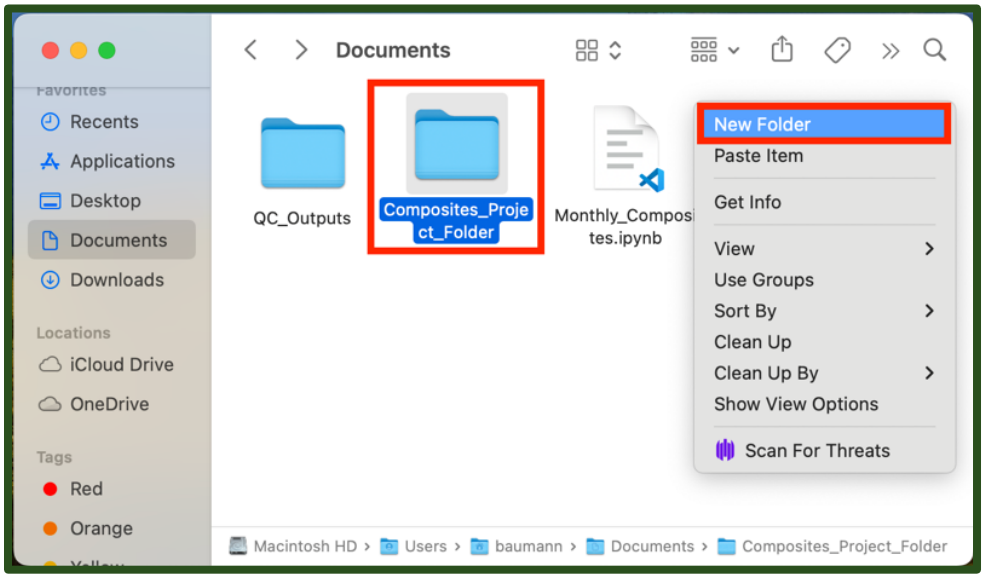
What is a Composite Image?

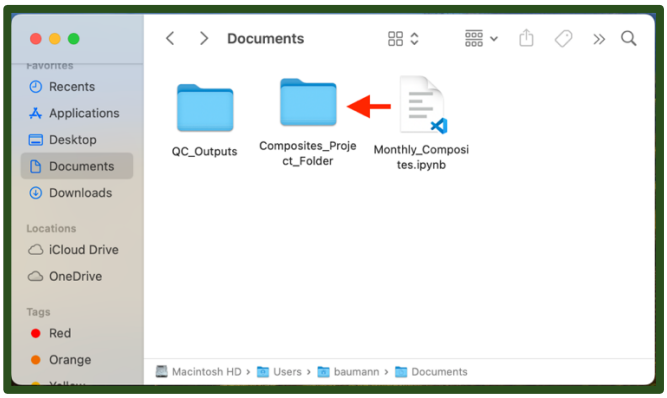
A composite image is an image made by combining multiple images into one. Composite images are commonly used in remote sensing to get the average or median of data for a certain time period. These images can also help compare changes over time.

CREATING MONTHLY COMPOSITES

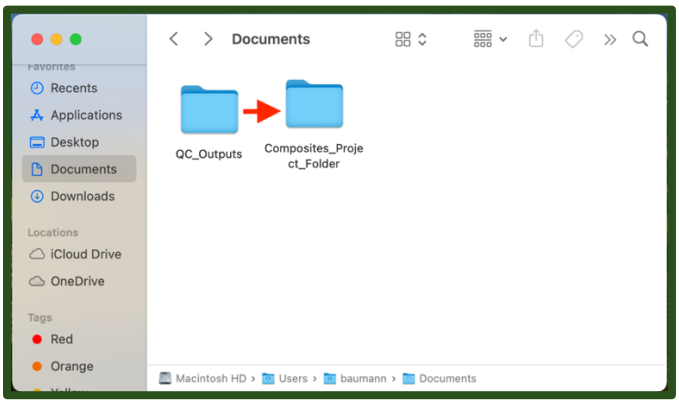
1. Download the **Monthly_Composites** code from https://github.com/ECOSTRESS-Tutorials/ECOSTRESS-Monthly-Composites.
2. Open your **finder**. Create a **project folder** to store all the files for this project by **right clicking** and selecting **New Folder**. Name your new folder so that you know it is the main project folder.



3. **Move** the **downloaded code** file into the project folder.

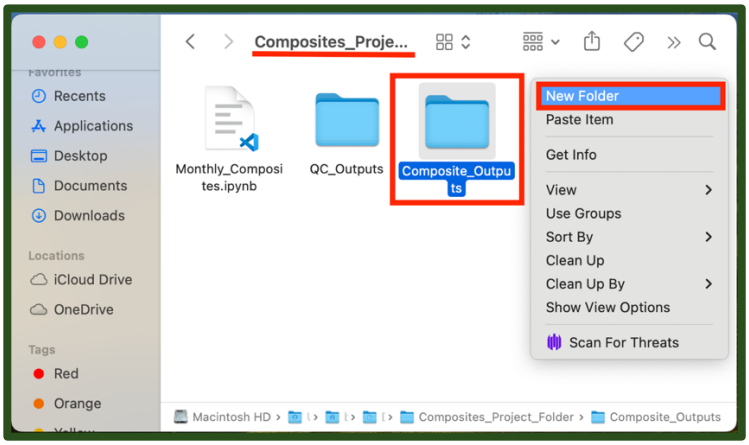


4. **Move** the folder with your QCed or cloud masked **ECOSTRESS data** into the project folder.

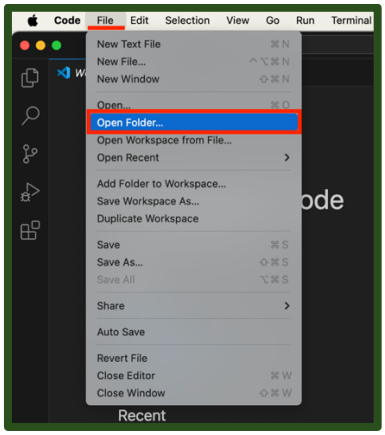


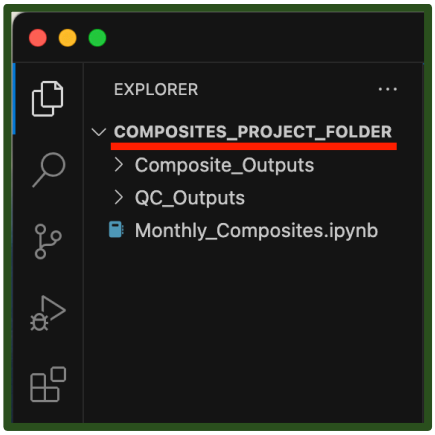
Tip: It is best practice to use input data that has already been **QCed** or **cloud masked** in order to improve accuracy. If your ECOSTRESS images are not QCed or cloud masked, follow the **Applying QC Flags** or **Cloud Masking ECOSTRESS Products** tutorial to set them up for this tutorial. If you used a different QC or cloud masking method, or chose to not to QC or cloud mask your images, you may need to **change the datetime extraction** parts of the code to match your input files' naming structure.

6. In the project folder, create a new **sub folder** to store the completed composite image.

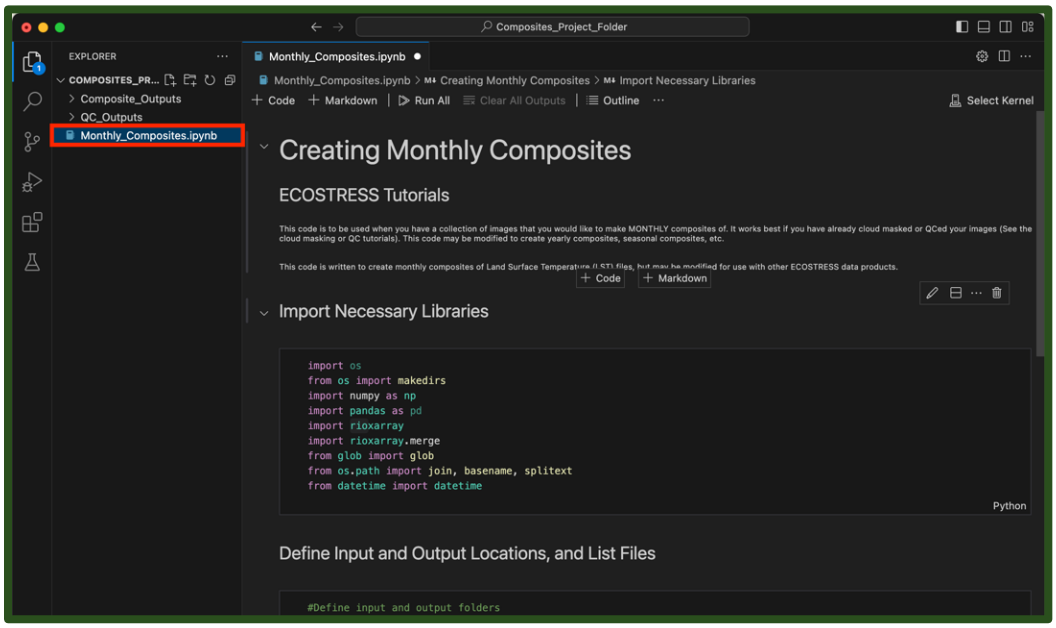


7. Open **Visual Studio Code** and use **File > Open Folder…** to get connected to the main folder that contains the QCed or cloud masked ECOSTRESS files, the Monthly_Composites code, and the output subfolder.





8. In the **EXPLORER** tab, find the **Monthly_Composites** code and **click** on it to open it.

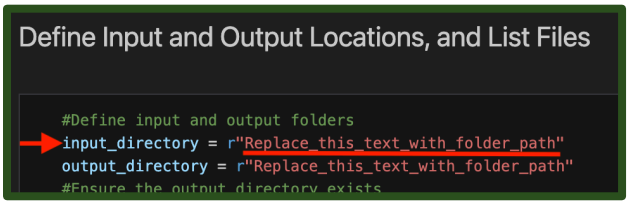


Tip: If you want to know more about what each line of the code does, read the **comments** in the code. Comments in the code are identified by **#**. These comments do not actually change how the code runs, but they can be helpful to put notes on how the code works for yourself or other users. This can also be helpful if you want to customize the code because it will guide you to which parts you may want to change!

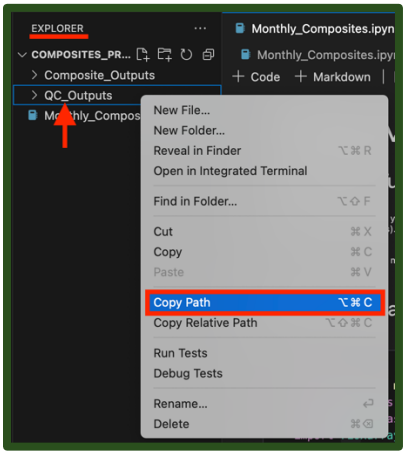
Examples of comments (**green text following the #):**

```
    #Make sure the date format matches your input images.
    #If you used our batch cloud mask code or QC code, this date format should be correct.
#Format the datetime object to get a string of the month and year
```

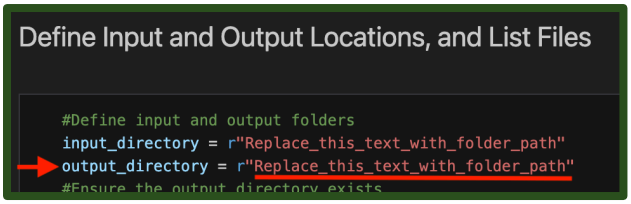
9. Find the section of the code titled **Define Input and Output Locations, and List Files**. Find the variable called **input_directory**. Change the text that says **"Replace_this_text_with_folder_path"** to the path of the folder where your QCed or cloud masked ECOSTRESS files are.



   a. To **copy the folder path**, use the **EXPLORER** panel on the left side of Visual Studio Code to find the folder you are interested in. Once you have found it, **right click** on it and select **Copy Path**. Now you can paste the path into your code. Make sure it is still **wrapped in quotes** and has **r** outside the first quote.



10. Next, find the variable called **output_directory**. Change the text that says **"Replace_this_text_with_folder_path"** to the path of the folder where you want the output file to be stored. Make sure it is still **wrapped in quotes** and has **r** outside the first quote.



Example Directory Set-Up:

```
#Define input and output folders
input_directory = r"/Users/baumann/Documents/Composites_Project_Folder/QC_Outputs"
output_directory = r"/Users/baumann/Documents/Composites_Project_Folder/Composite_Outputs"
#Ensure the output directory exists
```

11. Then, find the section of the code titled **Create Median Composites for Every Month Group**. Find the variable titled **output_file_path** and look for where it says **File_name_**. You can replace that part of the text with a more specific description of the image you will be saving.

```
#Create an output file path by combining the output folder location with a file name
output_file_path = join(output_directory, f"File_name_{month_year}_Median.tif") #Can rename if needed!
#Save the Composite Raster
ST_composite.rio.to_raster(output_file_path)
```

    a. For **example**, I am going to change mine to the **location** where my images are from:

```
#Create an output file path by combining the output folder location with a file name
output_file_path = join(output_directory, f"Salton_Sea_{month_year}_Median.tif") #Can rename if needed!
#Save the Composite Raster
ST_composite.rio.to_raster(output_file_path)
```

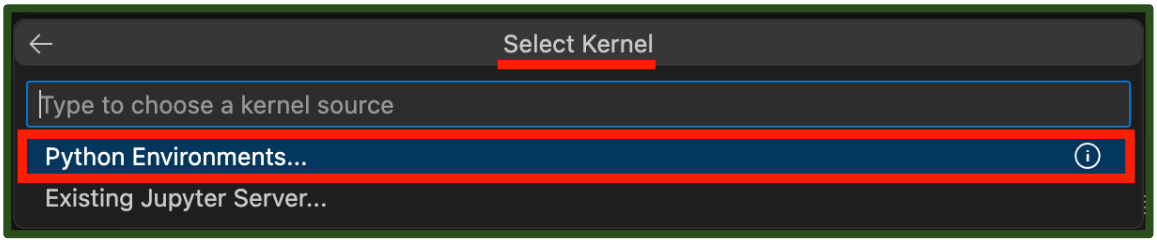
12. Now the code should be set up to be run with your desired images. Scroll back to the top to the section titled **Import Necessary Libraries**. This is the first block of code we want to run. Click into the box with the library importing code and press **Shift+Return** to run it.

Import Necessary Libraries

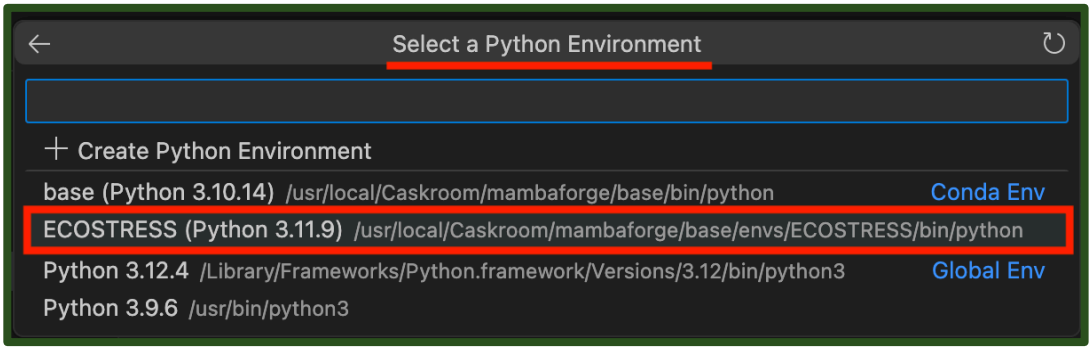
```
import os
from os import makedirs
import numpy as np
import pandas as pd
import rioxarray
import rioxarray.merge
from glob import glob
from os.path import join, basename, splitext
from datetime import datetime
```

Python

13. At the top of the window, a pop up will appear prompting you to **select a kernel** to run your code with. Click on **Python Environments ...**

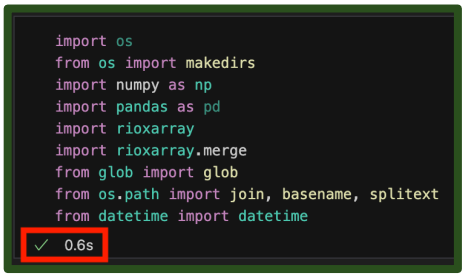


14. Select the **ECOSTRESS** environment that you created, or another one if you have a different one you want to use.

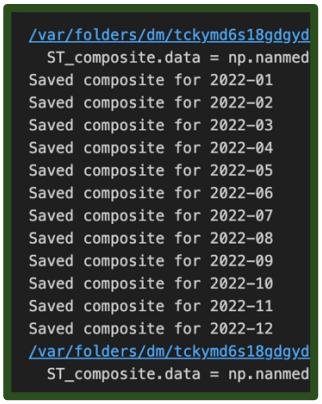


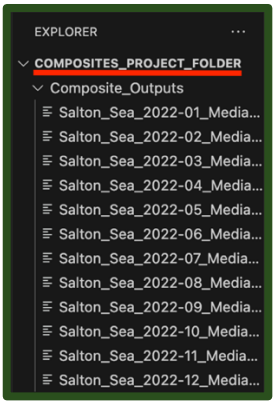
Tip: If you do not have an ECOSTRESS environment set up, follow the **Creating an Environment** tutorial to make one.

15. Let the code run for a few seconds. You will see the **seconds counting up** in the bottom left of the cell. You will know it is done when a **green check mark** appears.



16. Continue this process of running each block of code, in order from top to bottom, by clicking into the module with the code and pressing **Shift+Return**.
    a. The final block of code will **save** the composites to your output folder. It will print a message saying **Saved composite for year-month**. Check the folder to make sure they were saved correctly.





You now have monthly composites of all your ECOSTRESS images!