

Nina: Tech Challenge

May 24-28 2019

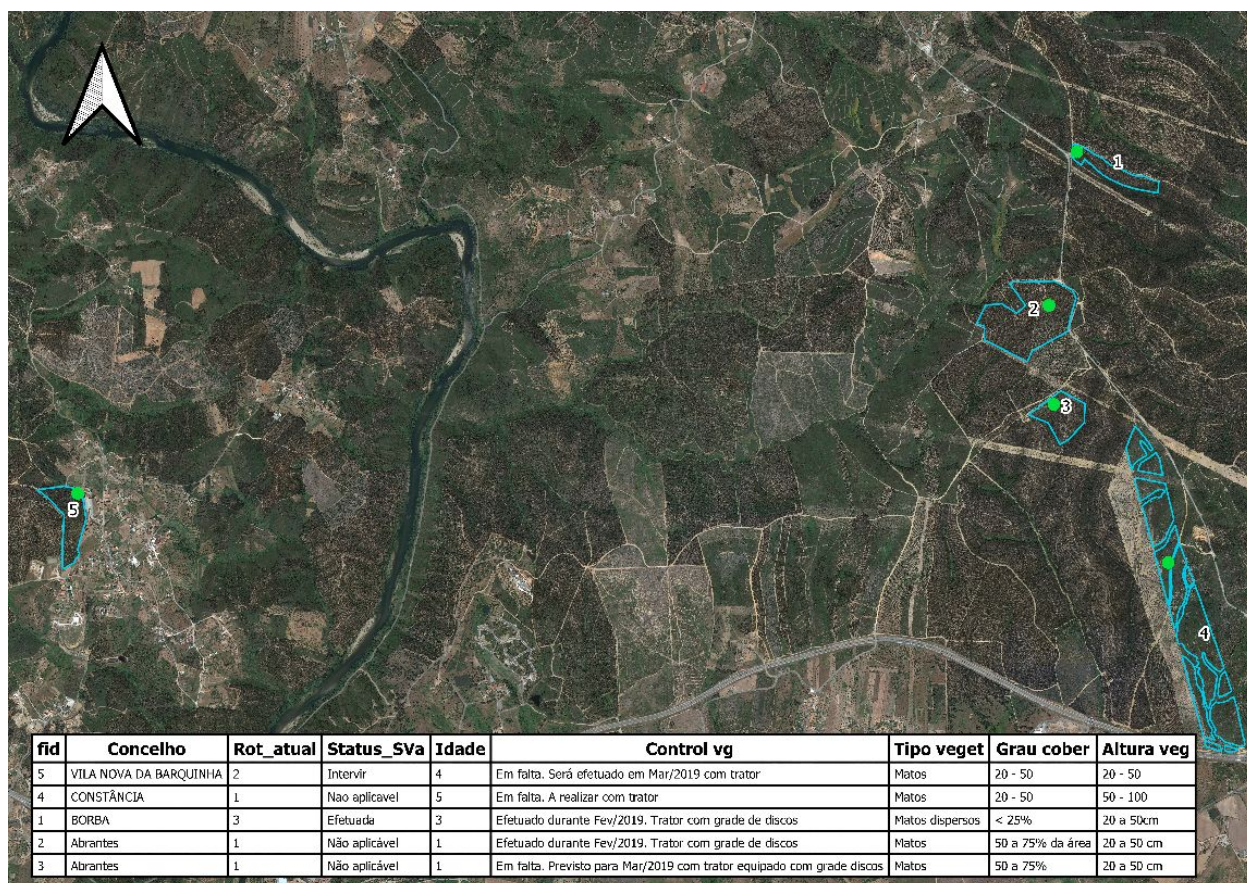
Welcome and happy reading!

Imagine that you are in a real situation at work, here in Portugal. Eucalyptus burns fast and because of this we are told that eucalyptus parcels need to have small bush vegetation removed from time to time to reduce wildfire risk. This vegetation cleaning happens when the trees are still small and young. A group of 5 eucalyptus parcel owners is at our office with the following problem: "We hire a third-party company to cut small bush in our parcels, and we need to verify that this cleaning has been done without us needing to go there on person". They give us the coordinates of the polygons of their parcels - in .kml file format - and asked us to help them.

This in the information we have for the 5 parcels:

ID	District	Rot_atual	Cleaning Status	Tree age	Vegetati on Cleaning	Vegetati on Type	Vegetati on coverage	Vegetati on height (cm)
5	Vila Nova da Barquinha	<i>ignore</i>	In the process of	4	03/2019	bushes	20 - 50 %	20 -100
4	Constanca	<i>ignore</i>	N/A	5	missing	bushes	20 - 50 %	50 - 100

1	Borba	ignore	done	3	02/2019	Disperse d bushes	< 25 %	20 - 50
2	Abrantes	ignore	N/A	1	02/2019	bushes	50 -75 %	20 - 50
3	Abrantes	ignore	N/A	1	03/2019	bushes	50 - 75 %	20 - 50



Click on the image to open it in higher resolution

[Here](#) is the file with kml coordinates of the parcels.

Important Notes:

We acknowledge that this challenge seems like a lot of work. What is expected of you is to present your work to us up until the stage you have reached.

We are extremely happy to be working with satellite images and the possibilities that they allow for. We hope that you enjoy it as much as we do!

Hint: Use the satellite images with low cloud coverage.

Finally, we would like to offer you up to 3 Jokers (Joker = help from our side). Asking for all of the 3 Jokers will NOT affect your evaluation. Do not hesitate to drop Katia (katia@nina.space) a message during the time you work on the challenge to ask for one or more Jokers. She will be happy to read you, assist you and guide you!

Code Delivery:

You received this challenge on Friday morning, May 24th 2019.

Please create a private repository on Github and put the code you have written for this challenge there - and add Katia as a collaborator (Github user name - estambolieva@gmail.com). The final commit should be made before 10 a.m. Monday morning, May 27th 2019. Jupyter notebooks accepted.

Presentation:

Please present your work on this challenge in 30 minutes. Include answers to the following questions too:

1. What definitely went wrong?
2. What was the most challenging part of it?
3. How did you overcome it?
4. What more do you suggest we do for this challenge?

How can we help?

1. Download ESA's (European Space Agency) satellite images (from [here](#))
 - a. no need to write code for this, please download the images manually. See section *Satellite Imagery* below.
 - b. *suggested Joker: ask Katia for help*
2. Load the satellite image/s/
 - a. *suggested Joker: ask Katia for help*
3. Find the coordinates of each pixel in these satellite images
 - a. *suggested Joker: ask Katia for help*
4. Find the pixels, which are part of at least 1 parcel (e.g based on the [kml](#) coordinates)
 - a. *suggested Joker: ask Katia for help*

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5. Compute vegetation indices:
 - a. start with [NDVI](#)
 - b. Experiment with other vegetation indices ([here](#), and for more detailed one: [here](#))
 - c. *suggested Joker: ask Katia for help*
 6. Visualise how the vegetation index looks like for at least 1 satellite image
 - a. *suggested Joker: ask Katia for help*
 7. **Most important task:** Detect slight vegetation change over time (based on the knowledge on when a parcel has been cleaned)
 - a. *suggested Joker: ask Katia for help*

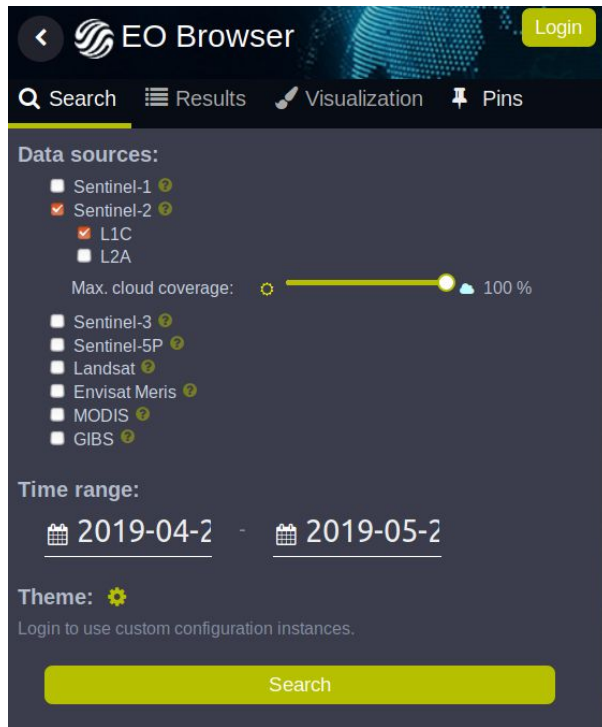
Another way to approach the problem:

If you can solve the owners' problem following different logic, feel free to present your solution.

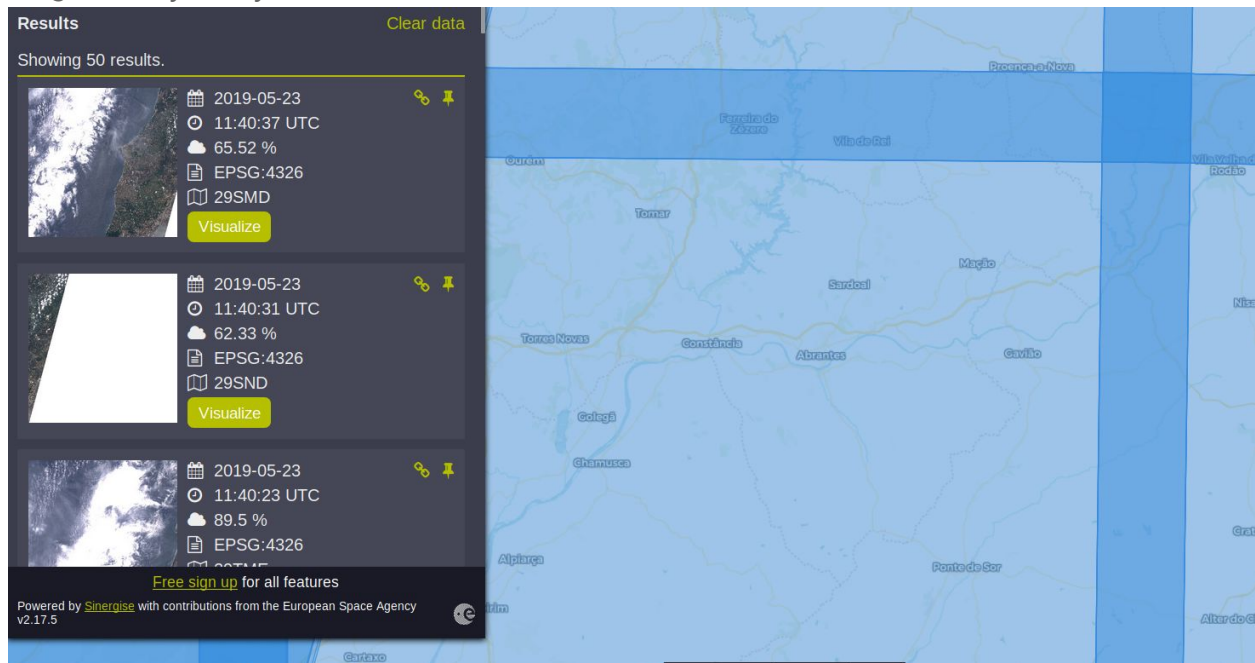
Satellite Imagery:

[How to download the satellite images:](#)

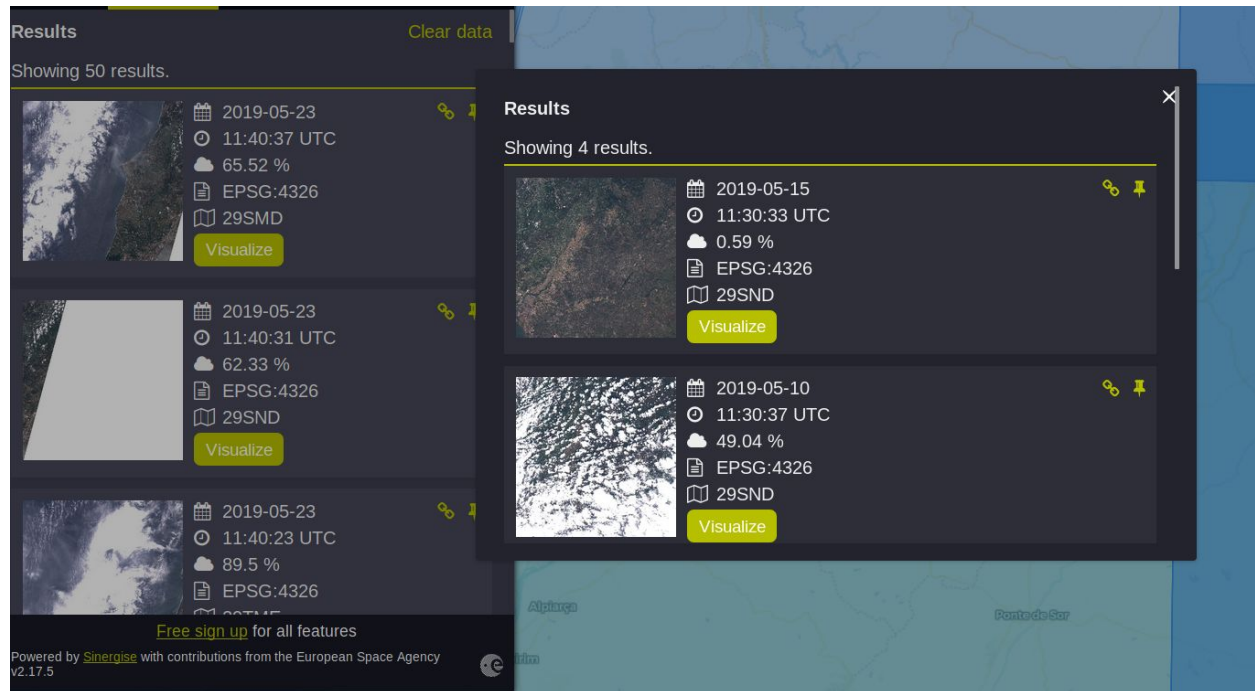
Sentinel-2 satellite images for Abrantes, Portugal, can be downloaded from [here](#)



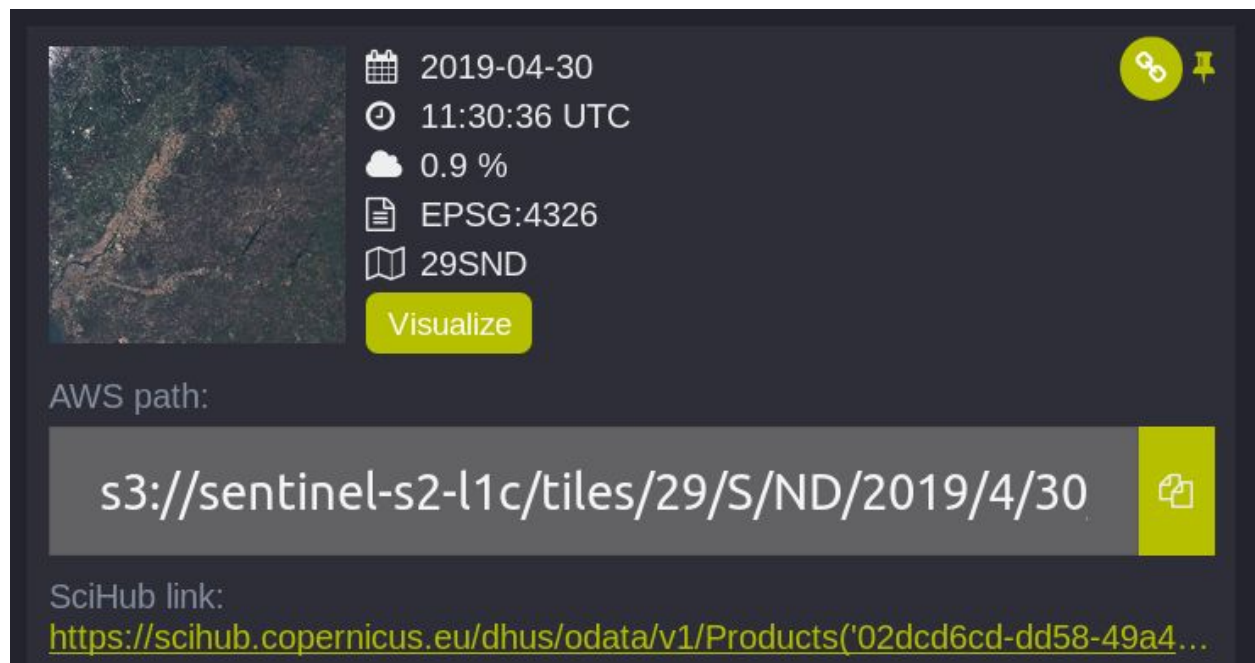
Select Sentinel-2, L1C, and choose the time range you want images from. Click search. You are going to be shown all results of images taken between the dates of the time range - every 5 days at a time.



Click on the images that include Abrantes, and see the results of the search:



Select a specific image you want to explore by clicking on the link green button on the top right corner for each image next to the green pin. Copy the scihub link and download from there for free.



Note: To download the images from scihub, a login is required. Registration is for free for all citizens of the world.

And voila - now you have the images you want to work with!

