

## Slide 1 – Title Slide

Hello and welcome to Week 10, part 6 of EGM310: Where to find satellite data. In this lesson, we'll learn about where you can go to download satellite data for free, for any area that you might be interested in.

## Slide 2 – USGS EarthExplorer

We'll start with the US Geological Survey's Earth Explorer, shown here, and located at [earthexplorer.usgs.gov](http://earthexplorer.usgs.gov). Earth Explorer provides access to all Landsat data, as well as Sentinel-2 data and terrain-corrected ASTER data. It requires you to register for a free EROS account in order to download or order data. If you are downloading a lot of images, it also provides a separate tool to manage downloading in bulk. And, in order to find images, you can search using location, time, percent cloud cover, and a number of additional search criteria.

## Slide 3 – USGS EarthExplorer

For example, let's say I wanted to search for images over Northern Ireland, from anytime this year before the end of October when I did this exercise. I can zoom/pan on the map to find my area of interest, and begin clicking on the map to create a polygon. I then select my dataset – in this case, I want to select Landsat 8 Level-1 images. Level-1 images have been geometrically corrected, but they have not been radiometrically corrected – they are still measuring the at-sensor or top-of-atmosphere radiance. You can order Level-2 data, which have been radiometrically corrected, but these can take a little bit of time to process. After that, I want to look for an image with less than 20% cloud cover, and you can see some of the other filtering criteria that you can use here – if you want to know what these are, you can just click on the little “i” button here. For each of the images, you can also display the image footprint/outline, or a browse image, on the map, or look at the metadata. If you're logged in, which I wasn't here, you can also click to download the image directly or add it to an order.

## Slide 4 – NASA EarthData

The next site we'll talk about is NASA EarthData, which you can find at [search.earthdata.nasa.gov](http://search.earthdata.nasa.gov). This site provides access to ASTER products, including the images, either raw, radiometrically-corrected, or terrain-corrected images; you can also download individual digital elevation models, or DEMs, produced from a single ASTER scene. Here, you can also download the ASTER Global DEM version 3, the most up-to-date global elevation dataset produced from ASTER images. There's also a water bodies database, with masks for water bodies on a global scale; you can also access MODIS data here, though there are far more datasets available than the ones I've listed here. Like Earth Explorer, you can do a spatial or temporal search, or filter based on cloud cover. You can also use this to download large numbers of images – earthdata provides script-based tools to help download in bulk.

## **Slide 5 – NASA EarthData**

The setup for Earthdata is rather similar to EarthExplorer. First, you can add the different datasets that you want to search for; then, you can draw your polygon to search for images, filter based on cloud cover, time, whether the images are acquired during the day or night, and so on. Finally, you can look at the browse images for the results, and add them to an order. You will need a login to search for and download data, which is something that you can sign up for for free.

## **Slide 6 – Sentinel Open Access Hub**

One of the main ways to download Sentinel-2 data is the Sentinel Open Access Hub, which works in a similar fashion to the other examples we've been over, and it's located at [scihub.copernicus.eu](https://scihub.copernicus.eu).

## **Slide 7 – Sentinel Playground**

This next one is a little different. Sentinel Playground doesn't actually allow you to download the original image data. But, if you're more interested in doing some exploration to see what imagery is available, this is the place to go. You can browse through time to see images available close to a given date, and it shows you the cloud cover for the images. You can also choose how to display the data with built-in band combinations. For example, this image is made using the SWIR, NIR, and visible blue band, which is great for picking out/studying agriculture. There are presets for natural color images, a false color combination that's great for highlighting urban areas, and so on. You can also export high-quality images using this website, so it can be great for presentations or for making images to print off and decorate with.

## **Slide 8 – Norway's International Climate and Forests Initiative Imagery**

Next up, we have a relatively new one – the International Climate and Forests Initiative imagery, paid for by the Norwegian government. In Fall 2020, the government of Norway announced that it was going to make available high-resolution monthly mosaics of tropical forests, in an effort to help people understand and fight deforestation. The images are acquired by and hosted by Planet, a satellite imaging company. The images are made available as both RGB images and Visible/NIR mosaics – all you have to do is sign up for a free account at the website listed here.

## **Slide 9 – Google Earth Engine**

Finally, we have Google Earth Engine. Rather than a place to go to order and download image data, earth engine is a web-based processing service. With earth engine, you can search the entire Landsat archive, all Sentinel-2 images, all MODIS images, a selection of high-resolution imagery, plus a lot more datasets, including temperature, emissivity, elevation – it's a huge data catalogue. Earth engine also provides a code-based interface to search, manipulate, and process images. Because it's an online

processing server, you avoid having to download and store the images yourself; plus, all of the processing is being done online, so you can process global imagery from a laptop.

## **Slide 10 – Google Earth Engine**

The interface looks like this – you can see the script editor here in the middle, where you write the code to do the processing. You can also export datasets, make plots, and do some basic analysis all through the code editor. If you're interested in this, you can sign up at [earthengine.google.com](https://earthengine.google.com). If this is something that might interest you for your dissertation work, you can also send me an e-mail, and I'd be happy to talk about different project ideas.

## **Slide 11 – Summary**

In this lesson, we've learned that corresponding to the large amount of satellite data now available, there are numerous platforms that can be used to access the data, including downloading full-resolution data for processing and analysis, visualizing imagery, and also cloud-based processing and analysis.

## **Slide 12 – Additional Resources**

For most of the websites discussed here, I recommend heading to those websites and trying them out yourself. If you're interested in working with EarthEngine, I've include a link to a series of tutorials that provide an introduction to the platform, as well as a video that provides more step-by-step examples – though be warned, the video is rather long. That's all for this lesson – I hope you found it interesting, and if you have any questions, please don't hesitate to e-mail me or post in the discussion forum on blackboard. Bye!