

# Sentinel 2 Bands and Combinations - GIS Geography

*GISGeography*

5–7 minutes



## Sentinel 2 Bands and Combinations

There are 13 Sentinel-2 bands in total. Each band is 10, 20, or 60 meters in pixel size.

Sentinel 2 consists of 2 satellites. First came Sentinel 2A which was launched in 2015. Next came Sentinel 2b in 2017.

Two additional satellites (Sentinel 2C and 2D) are planned to launch in 2024. This will make a total of four Sentinel-2 satellites.

Overall, these 2 additional satellites will cut the revisit time in half.

## Sentinel 2 Bands

Sentinel-2 carries the Multispectral Imager (MSI). This sensor delivers 13 spectral bands ranging from 10 to 60-meter pixel size.

- Its blue (B2), green (B3), red (B4), and near-infrared (B8) channels have a 10-meter resolution.
- Next, its red edge (B5), near-infrared NIR (B6, B7, and B8A), and short-wave infrared SWIR (B11 and B12) have a ground sampling distance of 20 meters.
- Finally, its coastal aerosol (B1) and cirrus band (B10) have a 60-meter pixel size.

<b>Band</b>	<b>Resolution</b>	<b>Central Wavelength</b>	<b>Description</b>
B1	60 m	443 nm	Ultra Blue (Coastal and Aerosol)
B2	10 m	490 nm	Blue
B3	10 m	560 nm	Green
B4	10 m	665 nm	Red
B5	20 m	705 nm	Visible and Near Infrared (VNIR)
B6	20 m	740 nm	Visible and Near Infrared (VNIR)
B7	20 m	783 nm	Visible and Near Infrared (VNIR)
B8	10 m	842 nm	Visible and Near Infrared (VNIR)
B8a	20 m	865 nm	Visible and Near Infrared (VNIR)
B9	60 m	940 nm	Short Wave Infrared (SWIR)
B10	60 m	1375 nm	Short Wave Infrared (SWIR)
B11	20 m	1610 nm	Short Wave Infrared (SWIR)
B12	20 m	2190 nm	Short Wave Infrared (SWIR)

## Sentinel Band Combinations

We use band combinations to better understand the features in imagery. The way we do this is by **rearranging the available channels** in creative ways.

By using band combinations, we can extract specific information from an image. For example, there are **band combinations** that highlight geologic, agricultural, or vegetation features in an image.

If you want to see Sentinel band combinations for yourself, you can check out the [Sentinel Playground](#). It visualizes the band combinations below, as well as several more.

### Natural Color (B4, B3, B2)



The natural color band combination uses the red (B4), green (B3), and blue (B2) channels. Its purpose is to display imagery the same way our eyes see the world. Just like how we see, healthy vegetation is green. Next, urban features often appear white and grey. Finally, water is a shade of dark blue depending on how clean it is.

### **Color Infrared (B8, B4, B3)**



The color infrared band combination is meant to emphasize healthy and unhealthy vegetation. By using the near-infrared (B8) band, it's especially good at reflecting chlorophyll. This is why in a color infrared image, denser vegetation is red. But urban areas are white.

### **Short-Wave Infrared (B12, B8A, B4)**



The short-wave infrared band combination uses SWIR (B12), NIR (B8A), and red (B4). This composite shows vegetation in various shades of green. In general, darker shades of green indicate denser vegetation. But brown is indicative of bare soil and built-up areas.

### **Agriculture (B11, B8, B2)**





The agriculture band combination uses SWIR-1 (B11), near-infrared (B8), and blue (B2). It's mostly used to monitor the health of crops because of how it uses short-wave and near-infrared. Both these bands are particularly good at highlighting dense vegetation that appears as dark green.

### Geology (B12, B11, B2)



The geology band combination is a neat application for finding geological features. This includes faults, lithology, and geological formations. By leveraging the SWIR-2 (B12), SWIR-1 (B11), and blue (B2) bands, geologists tend to use this Sentinel band combination for their analysis.

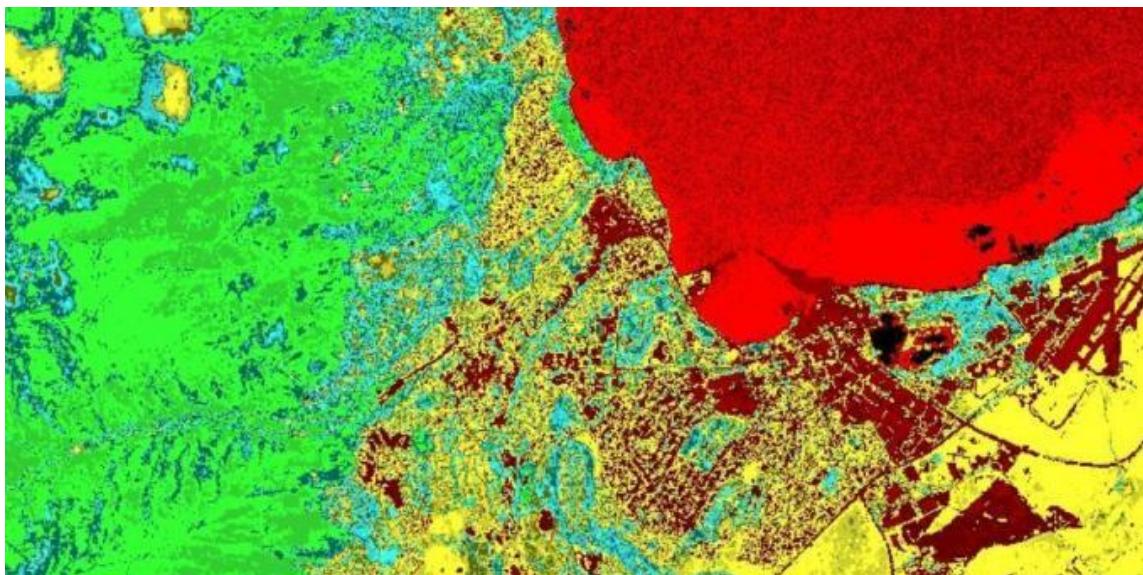
### Bathymetric (B4, B3, B1)





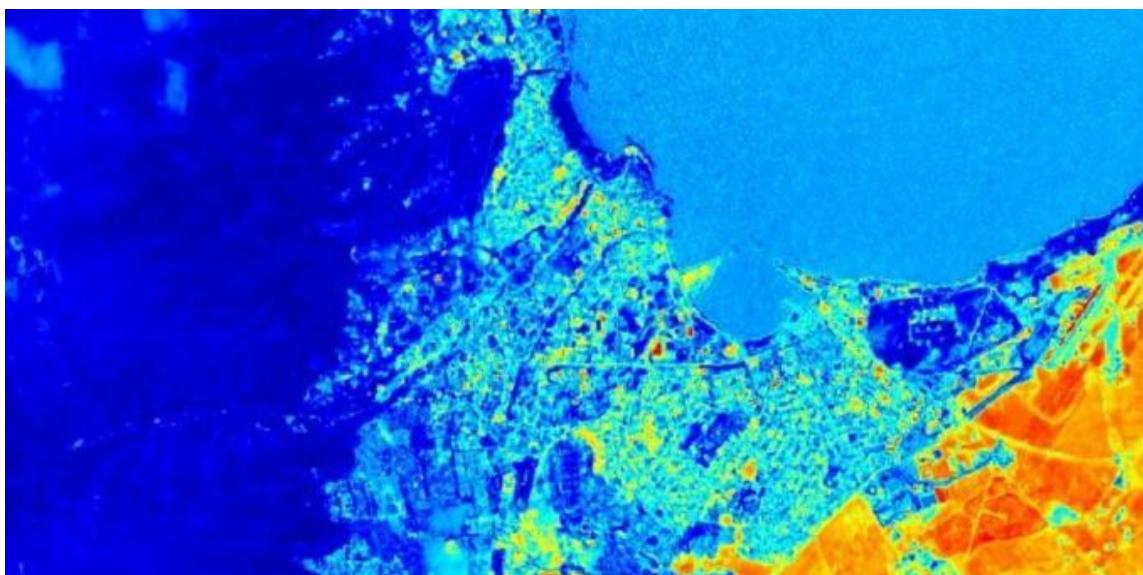
As the name implies, the bathymetric band combination is good for coastal studies. The bathymetric band combination uses the red (B4), green (B3), and coastal band (B1). Using the coastal aerosol band is good for estimating suspended sediment in the water.

#### **Vegetation Index $(B8-B4)/(B8+B4)$**



Because near-infrared (which vegetation strongly reflects) and red light (which vegetation absorbs), the vegetation index is good for quantifying the amount of vegetation. The formula for the normalized difference vegetation index is  $(B8-B4)/(B8+B4)$ . While high values suggest dense canopy, low or negative values indicate urban and water features.

#### **Moisture Index $(B8A-B11)/(B8A+B11)$**



The moisture index is ideal for finding water stress in plants. It uses the short-wave and near-infrared to generate an index of moisture content. In general, wetter vegetation has higher values. But lower moisture index values suggest plants are under stress from

insufficient moisture.

## Sentinel 2 Data Access and Software

If you're looking to download Sentinel 2 data, your best bet is the [Sentinel Copernicus Browser](#) (previously known as Sentinels Scientific Data Hub)

- This data portal is managed by the [European Space Agency \(ESA\)](#) and contains all the latest acquisitions from all the Sentinel satellites.
- If you want a step-by-step guide, then we've created a tutorial on [how to download Sentinel 2 imagery](#).
- Finally, if you're looking to analyze, manipulate, or just visualize the imagery, the [SNAP Toolbox](#) is completely free for everyone to use.

Well, that's it for today.

If you're interested in reading more on band combinations, make sure to check out our [spectral signatures cheatsheet](#).

Or if you're just looking at finding new and creative ways to use satellite imagery, read our article on [100 remote sensing applications](#).

Subscribe to our newsletter: