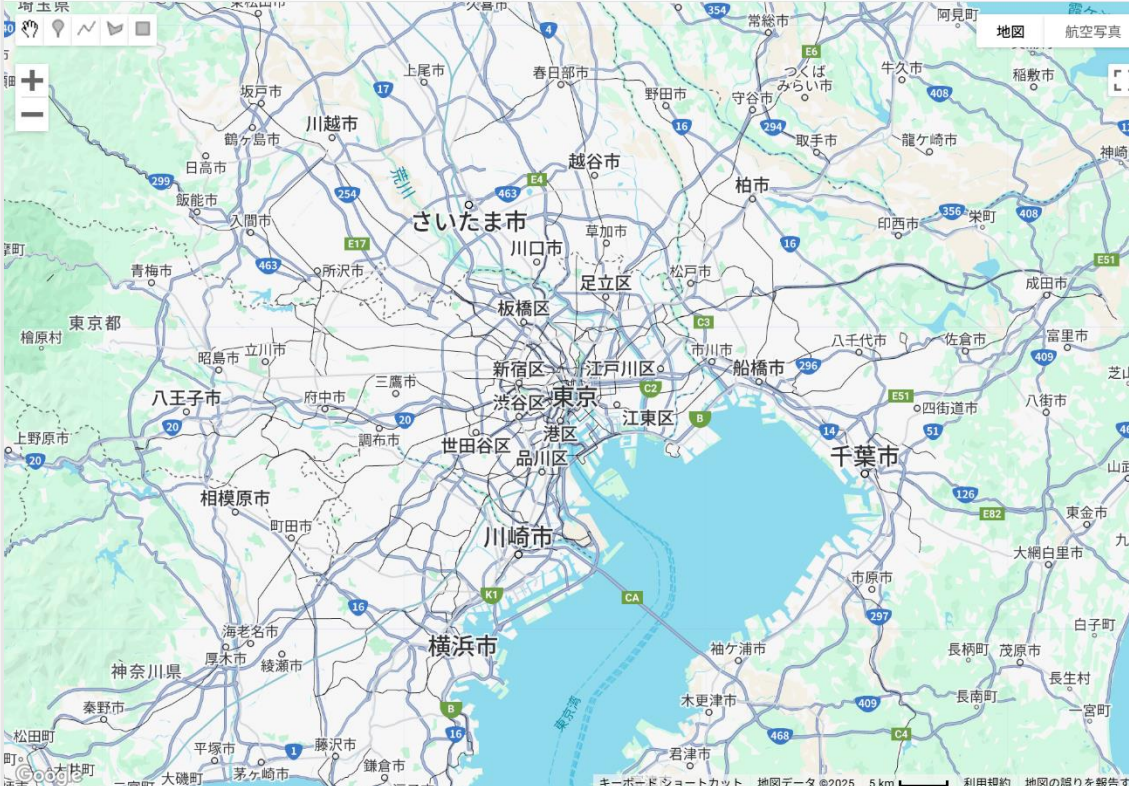# VEGA Step by Step Manual (1)

Visualizing Earth tool by Google Earth Engine Apps (VEGA) is a web-based application empowered by Google Earth Engine (GEE) which allows you to browse and visualize Landsat, Sentinel-2, Sentinel-1, and ALOS-2 archives without downloading the data or installing any software.

Users of GEE usually write JavaScript code, but VEGA doesn't require JavaScript knowledge. You can select options or input numbers on the control panel.

Control Panel

VEGA Step by Step Manual (2)

1: Please select the dataset (required).

To know about the available period of observation of each dataset click here!

Select a dataset ⇕

Select a dataset

Landsat 4, 5, and 7 Surface Reflectance Tier 1

Landsat 4, 5, and 7 Top-Of-Atmosphere Reflectance Tier 1

Landsat 8 and 9 Surface Reflectance Tier 1

Landsat 8 and 9 Top-Of-Atmosphere Reflectance Tier 1

Sentinel-2 Surface Reflectance

Sentinel-2 Top-Of-Atmosphere Reflectance

* Landsat 8 Raw Images Tier 2 (For Training Purpose Only)

Sentinel-1 C-band SAR

ALOS-2 ScanSAR L2.2 L-band SAR

1. Selecting one of the dataset from the pull down menu

Tips (Dataset availability)
- Landsat-4 SR: August 1982 – June 1993
- Landsat-5 SR: March 1984 – May 2012
- Landsat-7 SR: May 1999 – April 2022

- Landsat-4 TOA: August 1982 – December 1993
- Landsat-5 TOA: April 1984 – November 2011
- Landsat-7 TOA: June 1999 – April 2022

- Landsat-8 SR+TOA: April 2013 – Present
- Landsat-9 SR+TOA: October 2021 – Present

- Sentinel-2 SR: March 2017 – Present
- Sentinel-2 TOA: June 2015 – Present

- Landsat-8 Raw: March 2013 – Present

- Sentinel-1: October 2014 – Present
- ALOS-2 L2.2: August 2014 – Present

2: Only in case of SAR data filter SAR data properties (optional).

2-1: Filter based on acquisition modes.

> Choose an acquisition mode

2-2: Filter based on Orbit pass direction.

> Choose Orbit pass

Choose acquisition mode
All acquisition modes
IW (Interferometric Wide Swath)
EW (Extra Wide Swath)
SM (Strip Map)

Choose Orbit pass
Both
ASCENDING
DESCENDING

2. Filter SAR data properties (optional)

- **Note: Please proceed with this step only in the case of Sentinel-1 selection, Otherwise skip to step 3.**

2-1 Filter based on the acquisition modes.
- Choose an acquisition mode from the drop-down menu.

2-2 Filter based on the Orbit pass direction
- Choose an orbit pass from the drop-down menu.

Tips (Acquisition mode of Sentinel-1)
- Sentinel-1 has 4 acquisition modes and VEGA enables you to visualize 3 of them. The spatial resolutions of the acquisition modes are resampled to 10m for IW and SM, and 40m for EW respectively. See the details at EU's website[1].
- Each acquisition mode selects single polarization (HH or VV) or dual polarization (HH+HV or VV+VH) for observation.

Tips (Acquisition mode of ALOS-2)
- In the case of the ALOS-2 dataset, this menu is NOT selectable, as the dataset has only available acquisition mode (ScanSAR mode).

[1] Reference: https://sentiwiki.copernicus.eu/web/s1-mission

3: Please choose a method for band(s) visualization (required).

3-1: To view a single band (grayscale) image, please select a band from the dropbox menu below.

> Select a value... ▲▼

3-2: To view a 3 bands (red-green-blue) color composite image, please write down the bands combination in red, green, and blue order as shown in the example.

> ex: B4-B3-B2

To reset the visualization method use the reset bottom.

> Reset visualization method

3. Selecting the visualization method and the band(s)

- To visualize black & white image by single band. →see 3-1 below
- To visualize color image by multiple bands. →see 3-2 below

3-1   Selecting a band to visualize black & white (grayscale) image

- Choose the band from the drop-down menu. (Leave 3-2 text box blank)

3-2   Selecting three bands for color composition visualization

- Write down respective composition in the "Red-Green-Blue" order, capital-scale letter, and separated by a hyphen(-) in the text box (ex: B4-B3-B2 or VH-HH-VH).

To reset and switch between visualization methods, press Reset button.

Tips (Band Information)

Information on the selectable bands for 3-2 is available at the reference slides, or you can also refer them if you press 3-1 "Choose a band" button (Make sure not to choose any of them) .

Tips (True Color image)

To make "True Color" image, input the following combination.

- Landsat 4, 5, and 7: B3-B2-B1
- Landsat 8 and 9: B4-B3-B2
- Sentinel-2: B4-B3-B2

4. Assigning minimum and maximum pixel value ranges

4: Please specify the minimum and maximum pixel value to be displayed in the text box (reflectance x 10000 for optical data, Negative backscattering values for SAR data)(required).

Min value(s) ex: 1band: 0; 3bands: 0,0,0

Max value(s) ex: 1band: 3000; 3bands: 3000,4000,5000

- Write down minimum value(s) in the upper text box, and maximum value(s) in the lower text box.
- If you chose "three bands for color composition visualization" at 3-2, you can input min and max values for respective bands separating the numbers with comma (,) (ex: 3000,2500,3000)
- If the min and max values ranges are the same for each band, one value can be assigned for each min. and max. values.

Tips (Pixel Values)
For those who use VEGA for the first time:
- In optical imageries, 0 for Min and 3000 for Max values are recommended.
- In SAR imagery, -30 for Min and -25 for Max values are recommended
Then, you can change the values and see how the image will look.

5. Specifying the period of observation

5: Please enter the observation period (start and end dates) as shown in the example (required).

Starting date ex: 2018-01-01

Ending date ex: 2020-01-01

- Write down the starting date of observation in the upper text box, and the ending date in the lower text box.
- The dates must be written in the YYYY-MM-DD format and must be separated only by hyphen (ex: 2018-11-25).

Tips (Dataset Availability)
See the tip on page 2 for availability (observation period) of each dataset.

VEGA Step by Step Manual (6)

6: Please select the data composition method (required).

Select a reducer ⇕

6. Selecting Data Composition Method

- You can choose reducer (function) to composite the collection as a single image. Available methods are:
  - ✓ Median
  - ✓ Mean
  - ✓ Minimum
  - ✓ Maximum
  - ✓ Latest observation (No reducer)
  - ✓ Earliest observation (No reducer)

7: For cloud masking, please check the box (optional).

☐ Cloud Masking

7. Specifying the cloud masking status.

- If you want to mask cloud cover to generate a cloud free image, check "Cloud Masking" box.

8: Please press the loading button to display the image (required).

Load image

8. Load the Image

- You can load the image according to specifications assigned in previous sections.

VEGA Step by Step Manual (7)
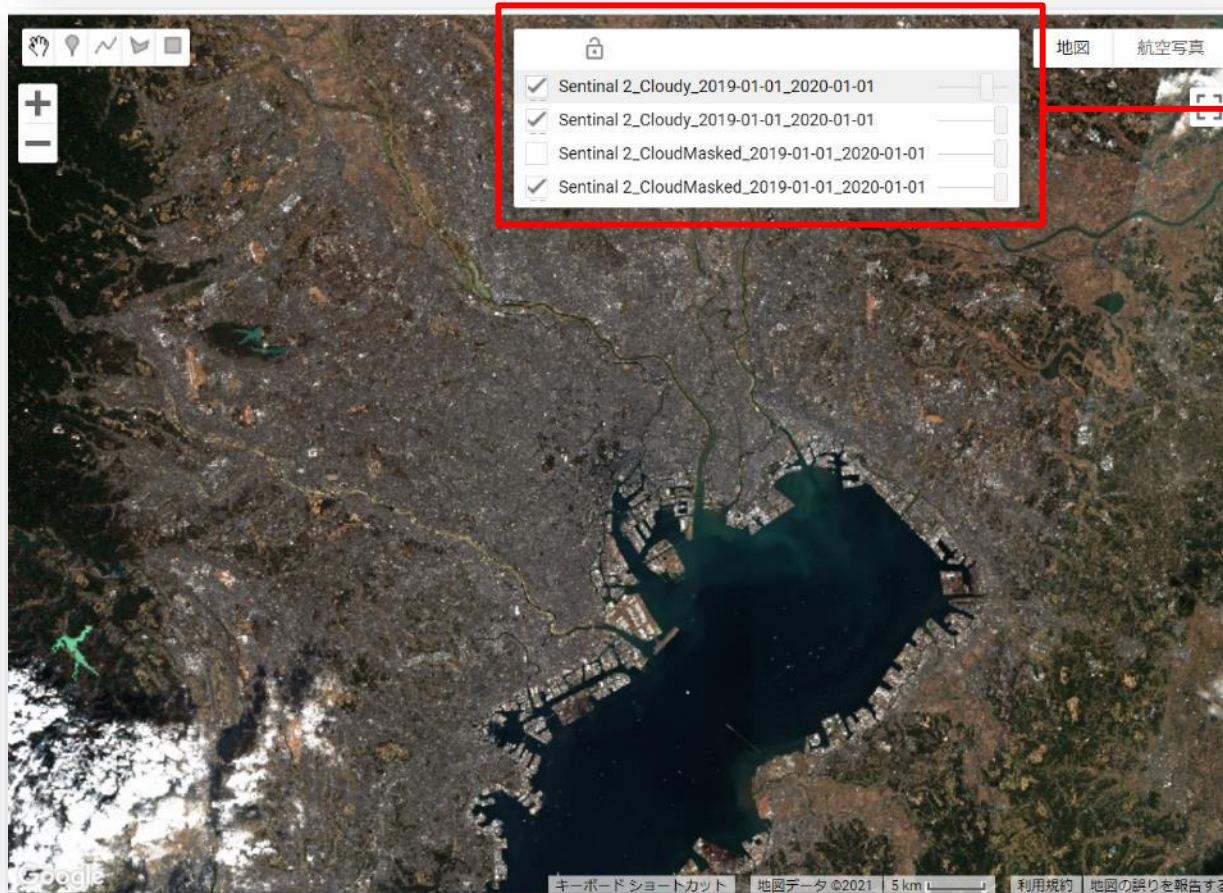
9. Comparison of Visualized Images

- VEGA shows and overlays the last four assigned images (the new image will be the top layer) and earlier images will not be shown.

- If you want to hide layers, uncheck its check box.

- You can change the transparency of each layer by moving its slider.

- After loading the image, by checking on any part of the image, you can check the latitude, longitude and pixel values of the top layer.

Ref: Bands Specifications for <u>Optical Datasets</u> (Landsat series and Sentinel-2)

List of Landsat 4,5, and 7 bands available on VEGA

Band Name	Wavelength	Description
B1	0.45-0.52 µm	Blue
B2	0.52-0.60 µm	Green
B3	0.63-0.69 µm	Red
B4	0.77-0.90 µm	Near infrared
B5	1.55-1.75 µm	Shortwave infrared 1
B7	2.08-2.35 µm	Shortwave infrared 2
B6	10.40-12.50 µm	Surface temperature

List of Landsat 8 and 9 bands available on VEGA

Band Name	Wavelength	Description
B1	0.435-0.451 µm	Ultra blue
B2	0.452-0.512 µm	Blue
B3	0.533-0.590 µm	Green
B4	0.636-0.673 µm	Red
B5	0.851-0.879 µm	Near infrared
B6	1.566-1.651 µm	Shortwave infrared 1
B7	2.107-2.294 µm	Shortwave infrared 2
B10	10.60-11.19 µm	Surface temperature

List of Landsat 8 Raw Images bands available on VEGA

Band Name	Wavelength	Description
B1	0.435-0.451 µm	Ultra blue
B2	0.452-0.512 µm	Blue
B3	0.533-0.590 µm	Green
B4	0.636-0.673 µm	Red
B5	0.851-0.879 µm	Near infrared
B6	1.566-1.651 µm	Shortwave infrared 1
B7	2.107-2.294 µm	Shortwave infrared 2
B10	10.60-11.19 µm	Thermal infrared 1
B11	11.50 - 12.51 µm	Thermal infrared 2

List of Sentinel-2 bands available on VEGA

Band Name	Wavelength	Description
B1	443.9nm (S2A) / 442.3nm (S2B)	Aerosols
B2	496.6nm (S2A) / 492.1nm (S2B)	Blue
B3	560nm (S2A) / 559nm (S2B)	Green
B4	664.5nm (S2A) / 665nm (S2B)	Red
B5	703.9nm (S2A) / 703.8nm (S2B)	Red Edge 1
B6	740.2nm (S2A) / 739.1nm (S2B)	Red Edge 2
B7	782.5nm (S2A) / 779.7nm (S2B)	Red Edge 3
B8	835.1nm (S2A) / 833nm (S2B)	Near infrared
B8A	864.8nm (S2A) / 864nm (S2B)	Red Edge 4
B9	945nm (S2A) / 943.2nm (S2B)	Water vapor
B11	1613.7nm (S2A) / 1610.4nm (S2B)	Shortwave infrared 1
B12	2202.4nm (S2A) / 2185.7nm (S2B)	Shortwave infrared 2

Ref: Bands Specifications for <u>SAR Datasets</u> (Sentinel-1 and ALOS-2)

List of Sentinel-1 polarizations available on VEGA

Polarization Name	Description
HH	Single co-polarization, horizontal transmit/horizontal receive
HV	Dual-band cross-polarization, horizontal transmit/vertical receive
VV	Single co-polarization, vertical transmit/vertical receive
VH	Dual-band cross-polarization, vertical transmit/horizontal receive

List of ALOS-2 polarizations available on VEGA

Polarization Name	Description
HH	Single co-polarization, horizontal transmit/horizontal receive
HV	Dual-band cross-polarization, horizontal transmit/vertical receive

For more information on VEGA
and the related training courses,
visit our website at
https://rs-training.jp/ or contact RESTEC