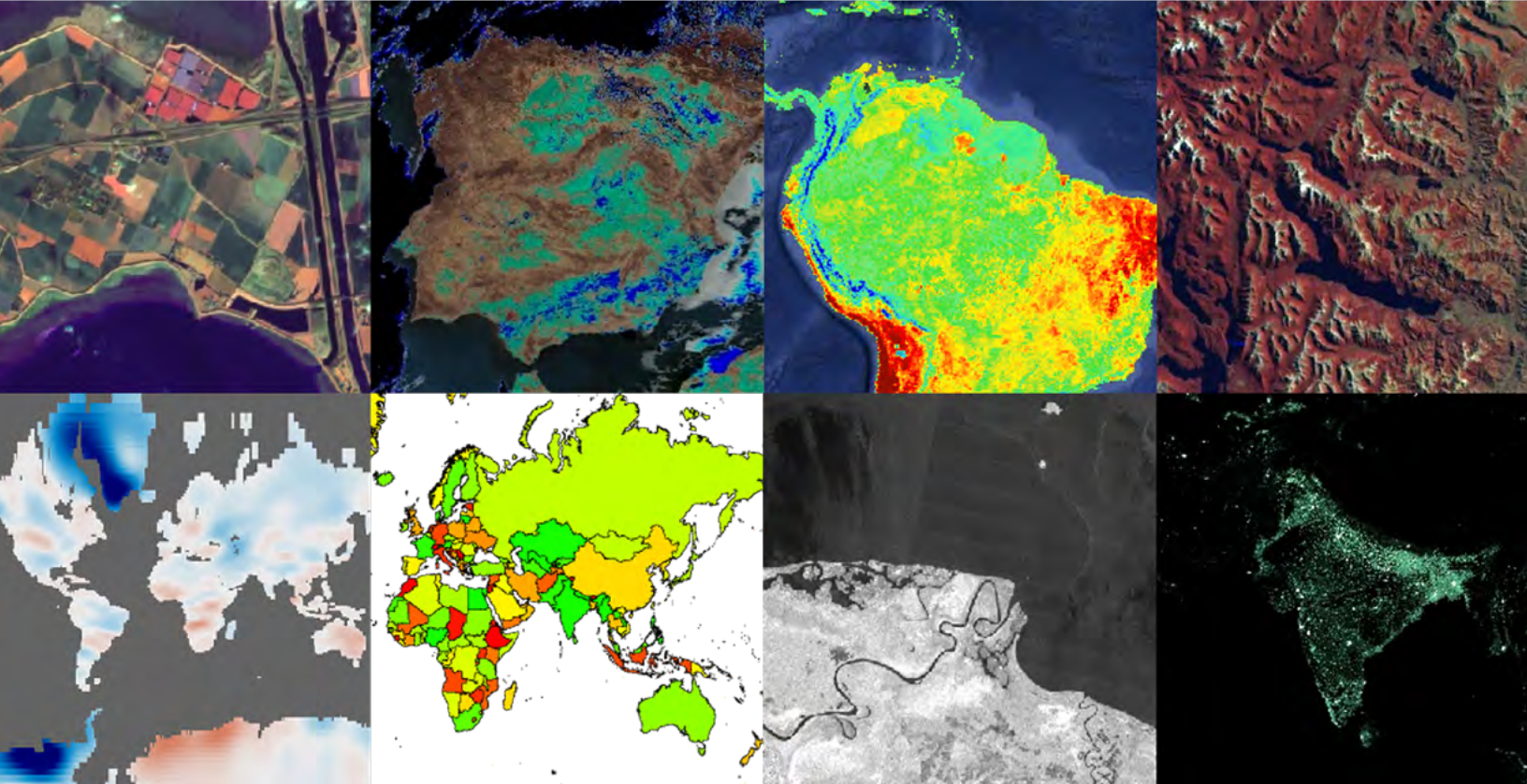




BROCHURE

# Spatial Modeler Livelihood for Google Earth Engine

Connecting the world's most widely used remote sensing software package to the world's largest repository of data and processing



Spatial Modeler Livelink for Google Earth Engine is a built-in feature that pairs the intuitive, easy-to-use graphical modeling environment of the editor with the vast data holdings and online processing capabilities of Google Earth Engine. This must be enabled by configuring a Google Earth Engine project account.

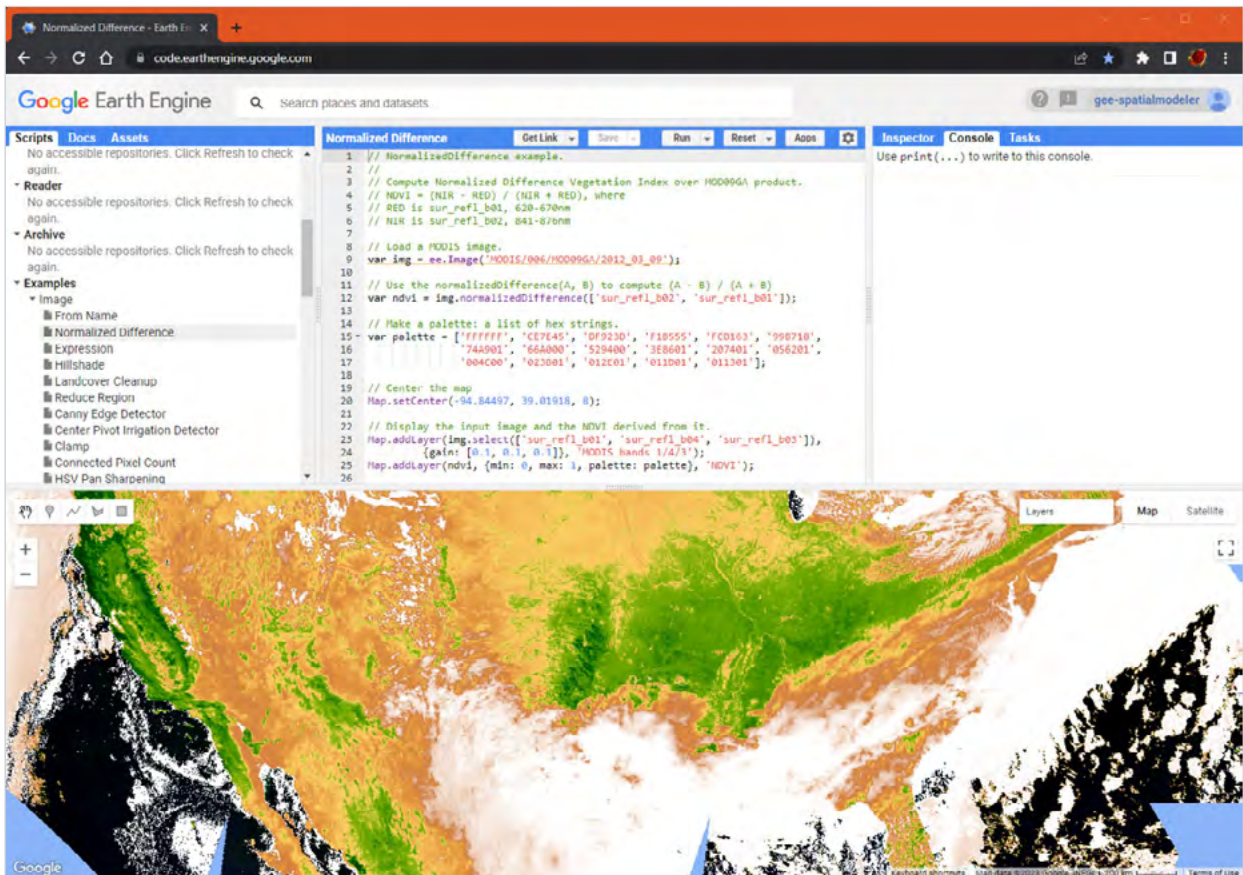
Spatial Modeler Livelink for Google Earth Engine is perfect for experienced Octave Imagine (formerly ERDAS IMAGINE) users who want to benefit from the massive amount of data and unparalleled processing power offered by Google Earth Engine. It is also ideal for new Imagine users who want to benefit from Google Earth Engine's capabilities without having to write a single line of code.

## What is Google Earth Engine?

Google Earth Engine is a combination of a planetary scale collection of geospatial data and massive computing capabilities that can change the way people approach geospatial information analysis. The holdings include all the imagery from programs like LANDSAT, MODIS, Sentinel and others. This imagery spans the Earth in many cases and in some cases covers the last 40 years. Coupled with this data is a rich geoprocessing engine that puts the processing close to the data in the cloud. The combination of data and processing makes it possible to perform actions such as mapping change over time for the whole world in ways that were impractical in the past.

## Power for programmers

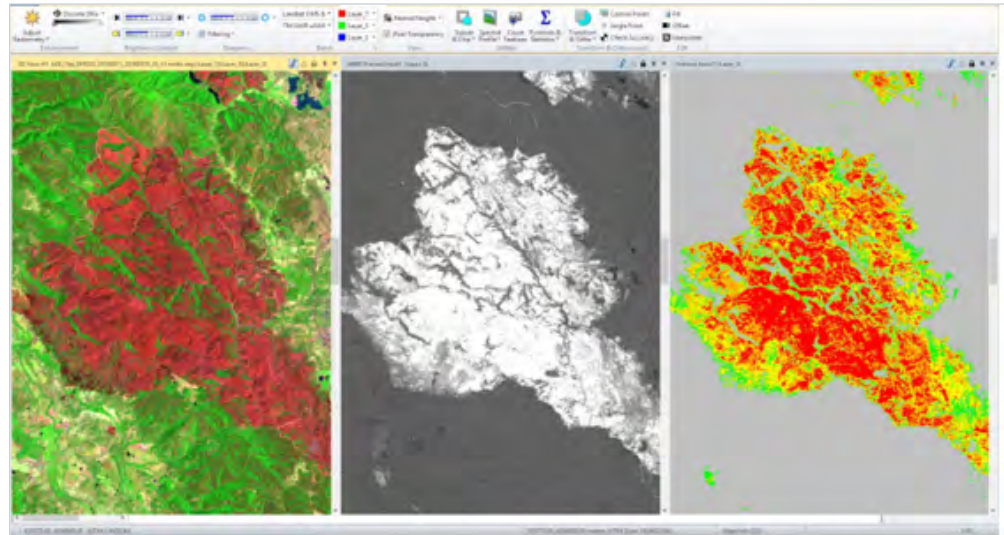
Google provides programmers several levels of access to the Google Earth Engine environment. The lowest level access is the REST API for use by serious software developers. A step up from this are the JavaScript and Python wrappers built on top of the REST API. Python is widely used by students and researchers who are comfortable with programming. There are countless tools available in the Python environment, so developers who already have a Python environment can be up and running in a matter of hours. The JavaScript API is a web-based environment complete with an Integrated Developer Environment (IDE) called the CodeEditor, which is available to any JavaScript programmer with access to a modern browser. In this environment the JavaScript programming is coupled with Google Maps to provide convenient visualization.



Google Earth Engine Code Editor

## Power for everyday users

Imagine has long provided a no-programming approach to building geospatial models. Spatial Modeler is a graphical environment that enables a user to develop new algorithms by dragging in operators (fundamental processing units) and simply connecting them together to build sophisticated new algorithms. Spatial Modeler provides hundreds of these operators that span the range of processing, from imagery to features to point clouds. This includes traditional remote sensing, photogrammetry, radargrammetry, grid processing and feature processing. GIS workers with an understanding of the domain and no programming background can build large, capable models in this drag-and-drop environment.

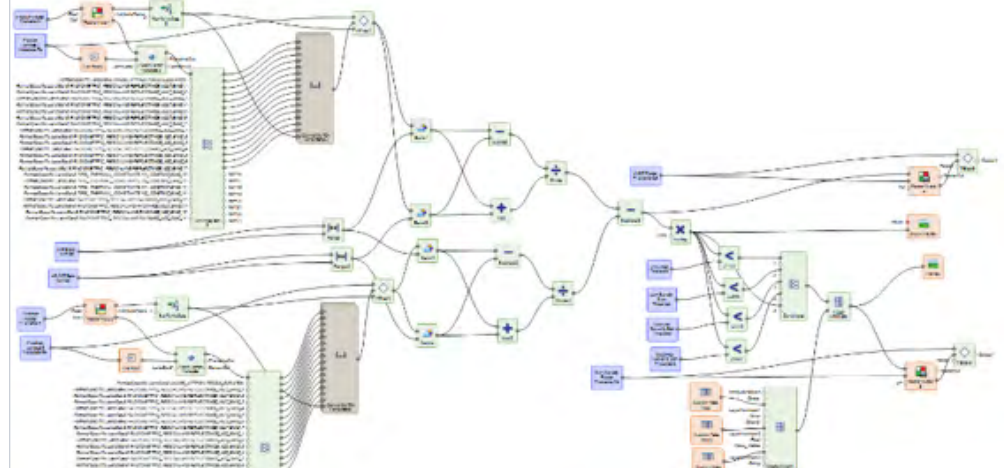


any fire severity mapping applications to date have subtracted a post-fire NBR image from a pre-fire NBR image in an absolute change detection methodology to derive the "differenced NBR" (dNBR) as follows:

$$dNBR = \text{prefireNBR} - \text{postfireNBR}$$

One advantage of the dNBR technique is that higher values indicate higher severity of burn.

dNBR\_thresholds\_reflectance\_v\_1E\_5\_0.gmxd



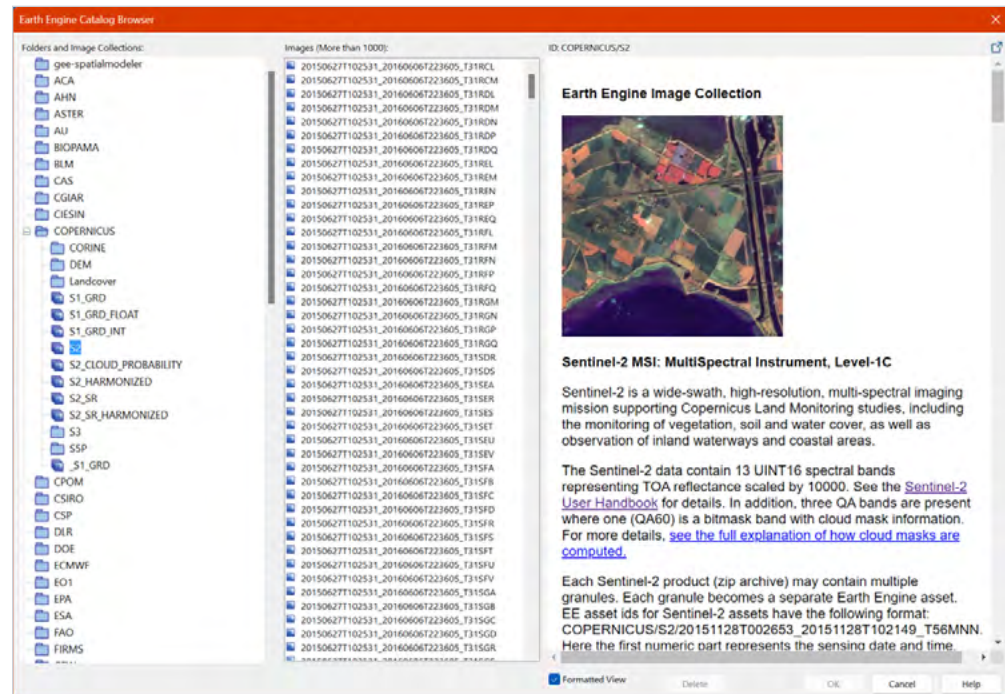
Example of Spatial Modeler solution

## Flexible and extensible architecture

Spatial Modeler was built to be able to be extended in different ways. Operators are added to the system in a modular fashion allowing new capabilities to be developed and added dynamically. Similarly, the very types of data operated on can be added using the same modular mechanism. This allows, for example, one team to develop feature operators, while a different team develops remote sensing capabilities and yet another develops photogrammetry. Spatial Modeler's core is an environment for organizing and orchestrating processing.

## Best of both worlds

Combining the Google Earth Engine REST API with the extensibility of Spatial Modeler introduces depth of processing and expanse of data to the ease of use of Spatial Modeler. When enabled, the Google Earth Extension adds about 800 new operators to the environment that can be used like any other operator in the system. Linking these Google Earth Engine operators together, the user can create models that run on Google Cloud, but the results can be viewed on desktop and even combined with local data. Petabytes of data and hundreds of operators are available through interactive browsers.



Example of Spatial Modeler solution

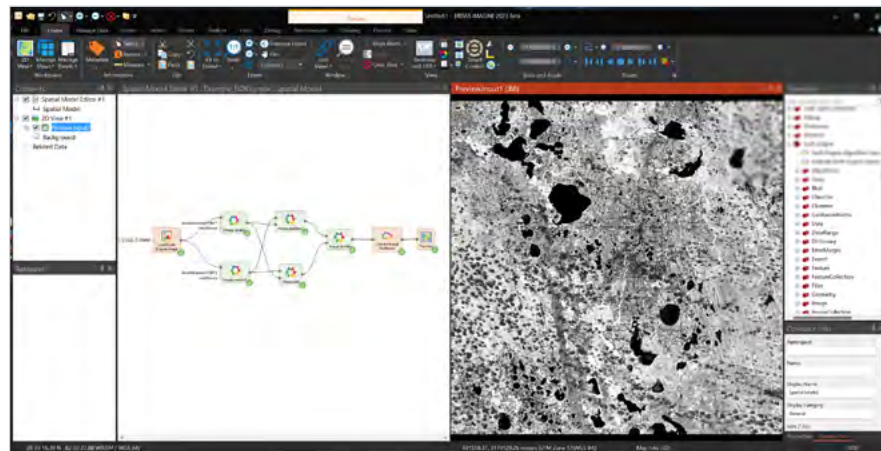
## Interactive computing

As with the rest of Spatial Modeler, Google Earth Engine models can be evaluated interactively. Creating a model is an iterative process of assembling operators into an initial model, testing it and then changing and adding to it. The results of Google Earth Engine models can be previewed and, just like the rest of the spatial model operators, are only computed for those pixels in the display.

Here are two examples of interactive computing, using the Normalized Difference Vegetative Index (NDVI), "a dimensionless index that describes the difference between visible and near-infrared reflectance of vegetation cover and can be used to estimate the density of green on an area of land." ([Science Direct](#)).

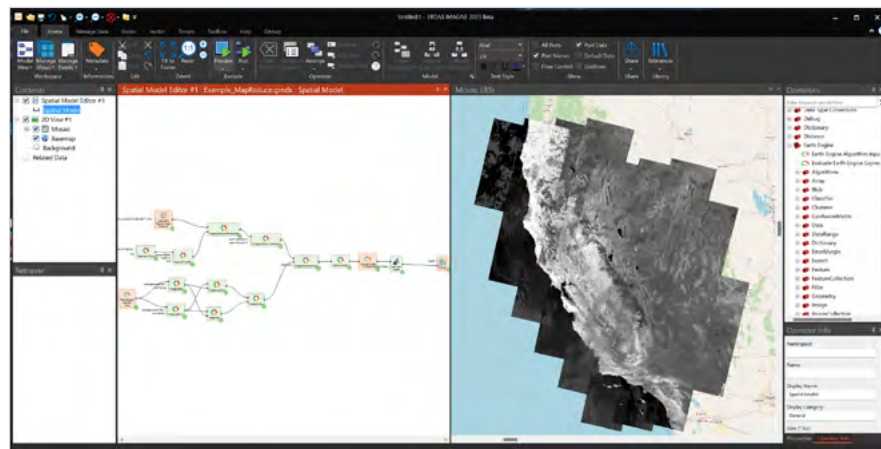
### NDVI

In this first example, the NDVI is a ratio of the difference and sum of two bands in the image which produces a measure of vegetative health.



### NDVI for an entire region

In this second example, a spatial-temporal query is used to select all images within a 600-km radius of San Francisco in 2022 and then compute the NDVI for each and combine into a single output. Just locating and acquiring this data would have been a large, time-consuming task in the past.

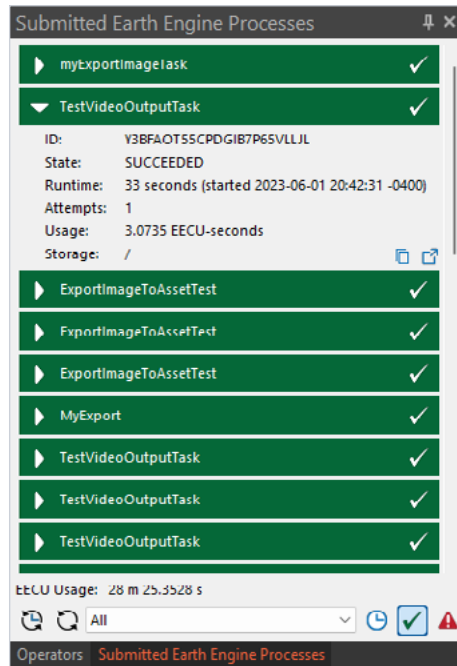
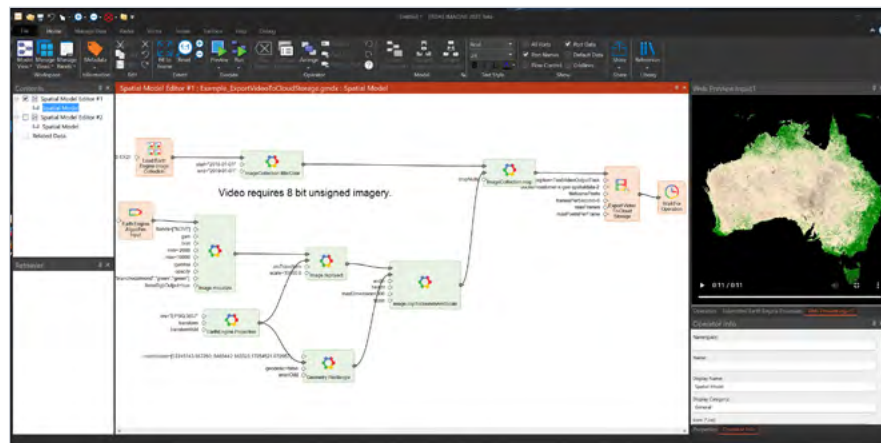


## Batch computing

Once an algorithm is properly working it can be applied to areas up to and including the whole world. Even though Google Earth Engine has massive compute facilities it can still take a while to complete these large tasks. As a result, these tasks can be submitted to a queue for processing. Once submitted there is no need to stay connected; the status can always be checked later. The results can be stored within Google Earth Engine as an asset (which can then be used by another model), or they can be saved as files to Google Cloud or Google Drive.

### Change of NDVI over time for all of Australia

In this batch computing example, MODIS data that already contains an NDVI computation is color coded and reprojected for all samples over a two-year period, then exported as an MP4 video to Google Cloud. It is then downloaded and viewed as a video in Spatial Modeler.



Submitted Earth Engine Processes panel

**About  
Octave**

Octave is a leader in enterprise software, turning data into decisive action and intelligence into your edge. Our software solves for and simplifies complexity, from the design and build to operations and protection of people, property and assets – for any scope, at any scale. For decades, we've partnered with customers to sharpen performance, elevate efficiency and amplify results. From factory floors to entire cities, our solutions are tuned to scale up what's possible from day one onward.

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