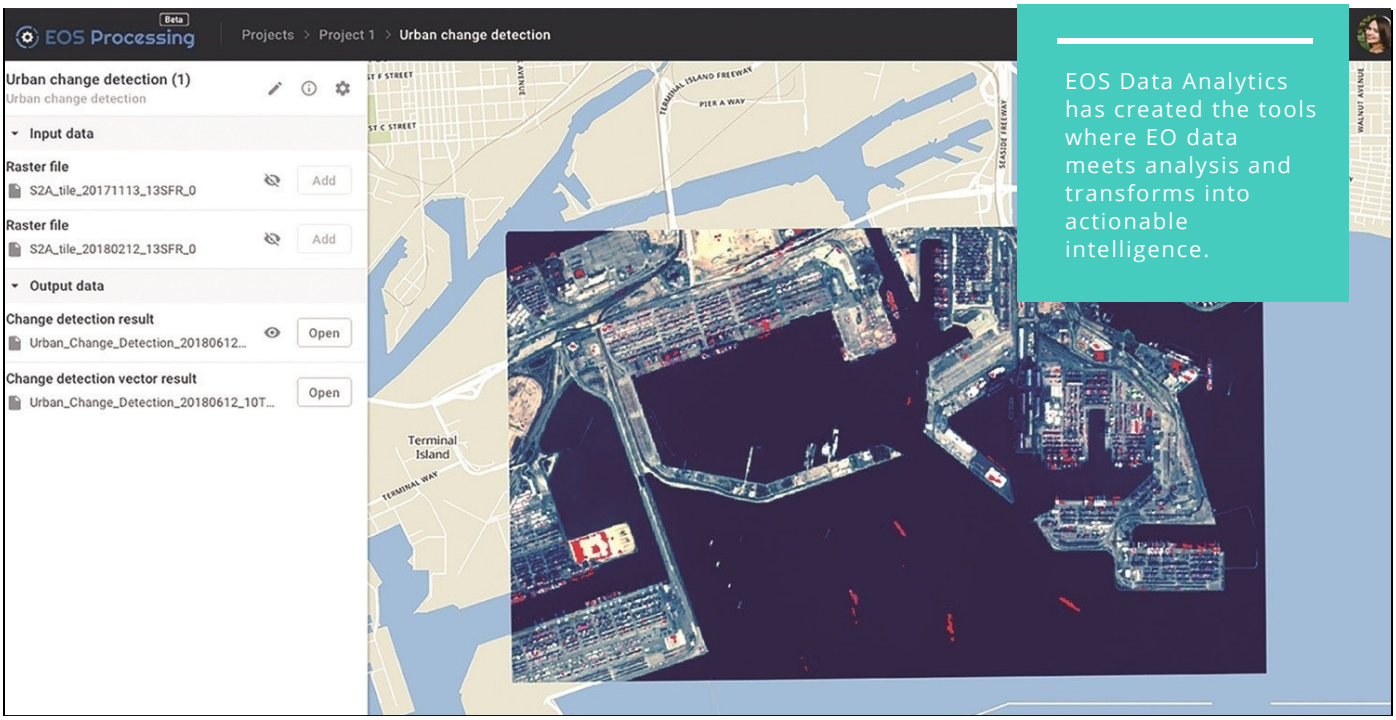
WATCHING CITIES FROM SPACE: URBAN CHANGE DETECTION USING SATELLITE IMAGERY

EOS Processing has an Urban Change Detection algorithm capable of highlighting changes from a pair of medium- or high-resolution multispectral images taken by the same satellite.

by Earth Observing System (EOS)



EOS Data Analytics has created the tools where EO data meets analysis and transforms into actionable intelligence.

World population is projected to reach 11 billion by 2100. This, coupled with the ongoing wave of rural-urban migration, poses a significant risk to safety and quality of living conditions in urban areas. An even bigger danger comes from the climate change driving more frequent and devastating hurricanes. It is a global necessity to adapt cities' infrastructure in order to meet the needs of increased population, invest into creating disaster-proof urban environment with account for the existing risks and weak spots.

The range of urban development tasks, where Earth observation data has proved its value, varies from visual inspection of remote areas with ongoing construction from satellites to 3D modeling of the complex landscapes using LiDAR point clouds. EOS Data Analytics has created the tools where EO data meets analysis and transforms into actionable intelligence.

When a natural or manmade disaster occurs, high resolution imagery from commercial satellites provides significant aid in mitigation of impact and damage assessment. EOS company has partnered with Airbus Defence and Space, SpaceView and SI Imaging Services to add their VHR

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satellite data into LandViewer, where images can be easily searched for, acquired, stored and processed.

These are two true color images (Figure 2) from SuperView-1 satellite collected over Nea Makri, Greece, before and after 2017 earthquake.

Nea Makri was far from the epicenter, however, on zooming in a considerable amount of damaged houses can be seen (especially along the coastline).

Areas hit by earthquakes, hurricanes or wildfires require remote monitoring, and that's where satellite imagery comes in handy. Knowing the exact areas, where buildings got badly damaged by an earthquake or engulfed during a storm is critical in setting up timely rescue operations; active fire spots seen from space are helpful in evacuation planning and fire spread prediction; awareness of which roads have been blocked or destroyed aids in faster traffic rehabilitation.

The high spatial resolution of 0.5-2.5 m/pixel allows to detect all these problems even in the visible range. For a more in-depth analysis the remote sensing toolset of LandViewer or another GIS software should be used. For example, the multispectral SpaceView-1 imagery also contains a panchromatic band and a near infrared band, which is most useful in vegetation change analysis (NDVI, EVI, etc.) - farmers can estimate the damage that a hurricane has done to their fields by calculating the vegetation index.

Now if you want to fully unlock the power of satellite data in monitoring and analysis of urban territories, add computer vision to the equation. EOS Processing is a tool (which works within the same cloud platform as LandViewer) that utilizes the trained neural networks to extract different features from imagery. It has an-Urban Change Detection algorithm capable of highlighting changes from a pair of medium- or high-resolution multispectral images taken by the same satellite. It requires 4 spectral bands (red, green, blue, near infrared) for analysis, and produces an output image with highlighted changes.

These are the changes in urban landscape of Long Beach coastline, California, which have been derived from two Sentinel-2 images (10 meter/pixel resolution) taken three months apart. Unlike the common Change Detection algorithm, the Urban Change Detection is set to "hide" vegetation cover changes thanks to the raster of vegetation index values. It shows new buildings, transport highways, changes in the megacities' structure and any other man made objects. As seen on the example of Long Beach territory, it can also be used to identify ships and boats.

Use EOS tools to get a hands-on experience with urban area analysis at: *https://eos.com/platform*

Figure 1. Two SuperView-1 images of Greece visualized in LandViewer's Comparison slider.

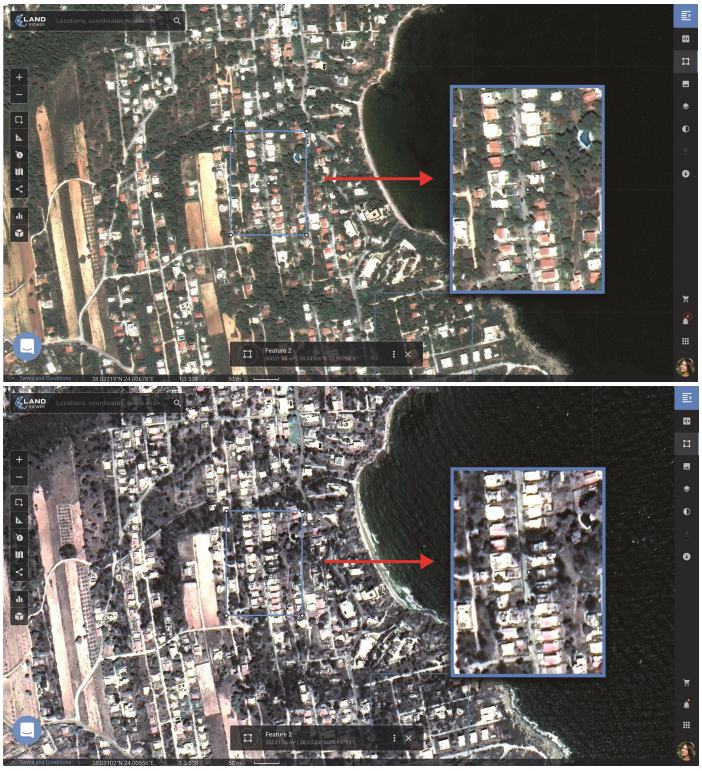

Figure 2: Nea Makri, Greece, a month before the earthquake (above). Earthquake effects. Damaged houses with missing rooftops (bottom).

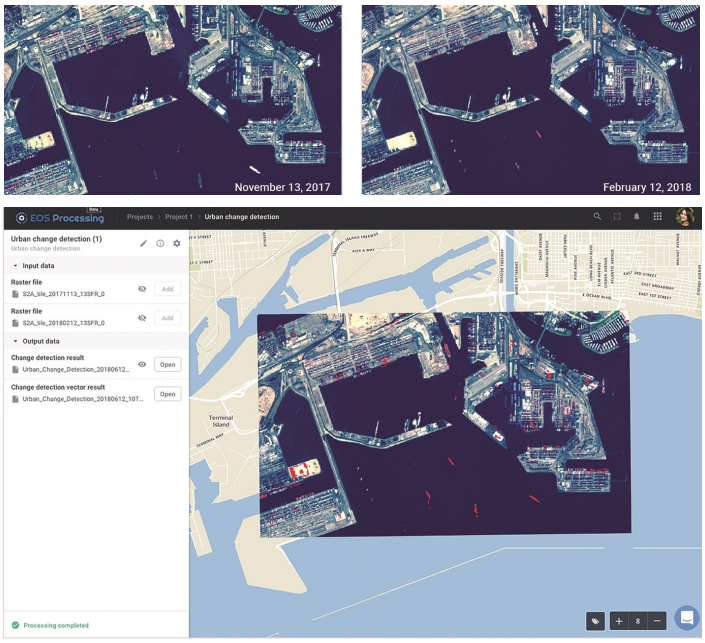

Figure 3. Urban Change Detection inputs and result, made and viewed in EOS Processing.