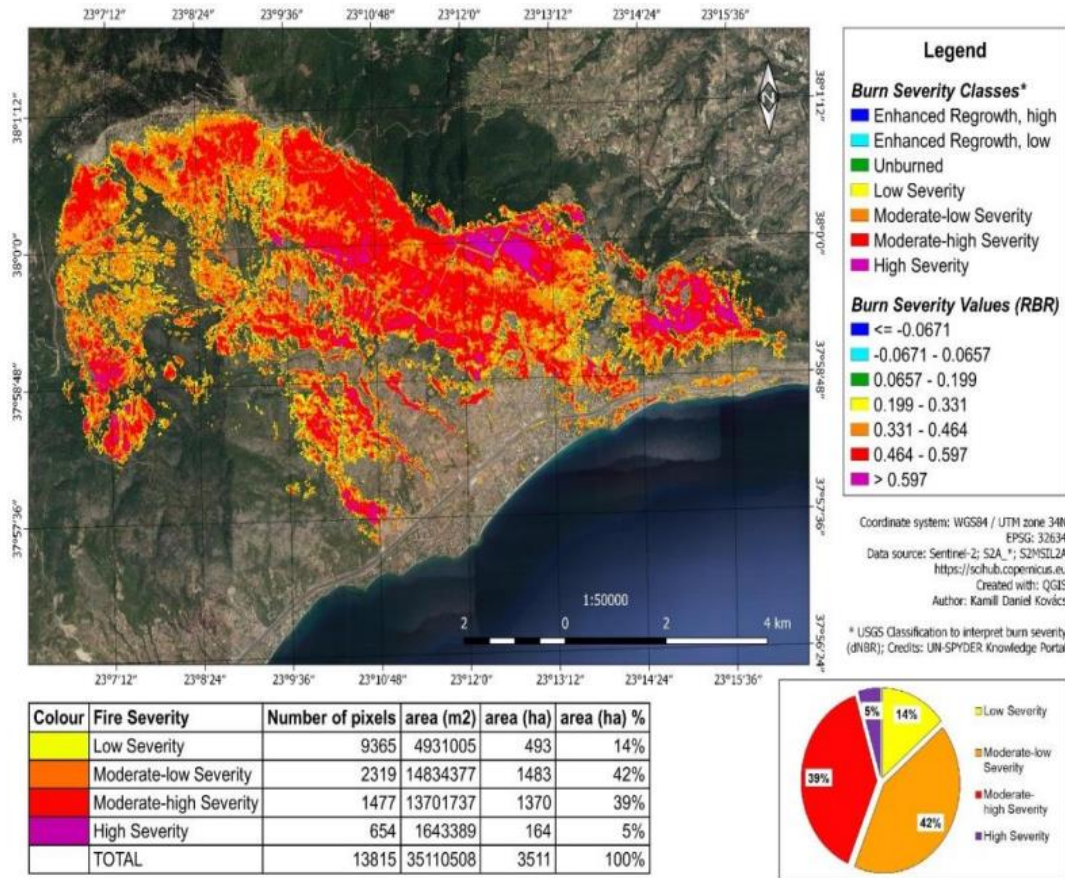


Post Wildfires Monitoring (Area and Severity)



Burned area size and burn severity levels, Kineta-Greece July 2018 using Sentinel-2. (Source: Kovács, K.D., 2019. Evaluation of burned areas with Sentinel-2 using SNAP. Geographia Technica, 14(2), pp.20-38.)

Product Category

- Land Use Natural Disaster Coast Management Earth's Surface Motion
 Land Cover Climate Change Marine

Financial Domain(s)

- Investment management Risk analysis Insurance management Green finance

User requirements

- UN45: Need to measure the area affected by wildfires after the fact.
 UN46: Need to measure the intensity of wildfires (level of damage to assets).

Description

The Normalized Burn Ratio (NBR) is an index utilized to assess burn severity by identifying areas that have experienced significant changes in their spectral properties following a wildfire. It is derived from the energy intensity observed in the Near-Infrared (NIR) and Shortwave Infrared (SWIR) wavelength bands in satellite imagery. The formula for NBR is similar to the widely used Normalized Difference Vegetation Index (NDVI), which assesses vegetation health based on the NIR and red wavelength bands. However, NBR focuses on the NIR-SWIR ratio. High NBR values indicate regions with thriving vegetation, while low values represent bare ground or recently burned areas. Near-zero NBR values signify locations unaffected by the fire event. By calculating NBR from satellite data, we can gain insights into the severity of the wildfire's impact on vegetation and the landscape, aiding in post-fire assessment and ecological recovery efforts. Burn severity refers to the extent of impact a wildfire has on an ecosystem. It is assessed by comparing pre-fire and post-fire Normalized Burn Ratio (NBR) values derived from satellite images. To distinguish recently burned areas from bare soil and non-vegetated regions, we use the delta Normalized Burn Ratio (dNBR) index, which calculates the difference between pre-fire and post-fire NBR values. Higher dNBR values indicate a more severe level of damage caused by the



fire. On the other hand, lower dNBR values indicate areas that were not affected by the fire or have experienced regrowth of vegetation following the wildfire event.

Spatial Coverage Target

Asset level and its surrounding

Data Throughput

Rapid tasking High Low
 Data availability High Low

Product specifications	
Main processing steps	Two satellite images of the area of interest should be acquired, one pre and one post the wildfire event. The satellite images should have NIR and SWIR bands to be able to calculate NBR. One important step is to mask clouds and water bodies because these pixels may be misclassified later. After calculating NBR and masking clouds and water bodies of both images, dNBR is calculated by subtracting the post fire image from the pre fire image. Nevertheless, using dNBR as an absolute measure of change can pose challenges in regions with low pre-fire vegetation cover, where the difference may be minimal or insignificant. To address this concern, the relativized burn ratio is employed as an alternative approach. Then, we classify the areas that are burned based on the magnitude of RBR to seven classes as proposed by USGS as follows: Enhanced regrowth (high), Enhanced regrowth (low), Unburned, Moderate-low severity, Moderate-high severity, and High severity. Then, the area of each class can be easily calculated by multiplying the number of pixels of each class by the resolution of the satellite imagery.
Input data sources	Optical: Sentinel-2, VHR with SWIR bands based on the availability like Worldview-3 Radar: N.A Satellite-based products: N.A Supporting data: N.A
Accessibility	Sentinel-2: freely and publicly available from ESA. Optical VHR imagery: commercially available on demand from EO service providers.
Spatial resolution	Sentinel-2: 10m Optical VHR: <1m
Frequency (Temporal resolution)	Sentinel-2: 6 days Optical VHR: Sub-daily to Daily
Latency	Sentinel -2: ≤ 1 day Optical VHR: ≤ 1 day
Geographical scale coverage	Globally
Delivery/ output format	Data type: Raster File format: GeoTIFF
Accuracies	Thematic accuracy: 80-90% Spatial accuracy: 1.5-2 pixels of input data
Constraints and limitations	<ul style="list-style-type: none"> ■ Availability of pre- and post-fire event images due to cloud presence ■ Lack of VHR imagery that has SWIR bands. ■ Smoke and haze from the wildfire can affect the quality of satellite images.
User's level of knowledge and skills to extract information and perform further analysis on the EO products.	Skills: Essential Knowledge: Essential
Similar products	Wildfire detection & monitoring from space from ORORA technologies