



Satellite Data Interpretation – Indices

Interpreting satellite data to derive insights about Earth's surface features and changes is a complex task. Index-based analysis has emerged as a powerful tool to extract information from satellite data. Various indices, derived from combinations of spectral bands, highlight specific features, patterns, and environmental conditions:

Vegetation: Vegetation indices are fundamental in monitoring plant health, biomass, and land cover changes. Indices like the Normalized Difference Vegetation Index (NDVI) use the contrast between the reflectance in the red and near-infrared bands to quantify vegetation density. High NDVI values typically indicate healthy and dense vegetation, while lower values may suggest stressed or sparse vegetation. These indices are crucial for applications ranging from agriculture monitoring to ecosystem health assessments.

Urbanisation: Urbanisation indices help analyse and monitor the extent and characteristics of urban areas within satellite imagery. The Urban Heat Island Index (UHII), for example, compares the temperature of urban and rural areas, highlighting the increased heat in urban environments. Other indices, like the Normalized Difference Built-Up Index (NDBI), focus on the built-up areas within the landscape, aiding in urban planning and infrastructure development studies.

Water: Satellite data are used to assess water quality through specific indices. The Normalized Difference Water Index (NDWI) is used to identify surface water bodies, while indices like the Water Quality Index (WQI) use multiple bands to assess parameters such as chlorophyll concentration and sediment loads, offering insights into aquatic ecosystems and water resource management.

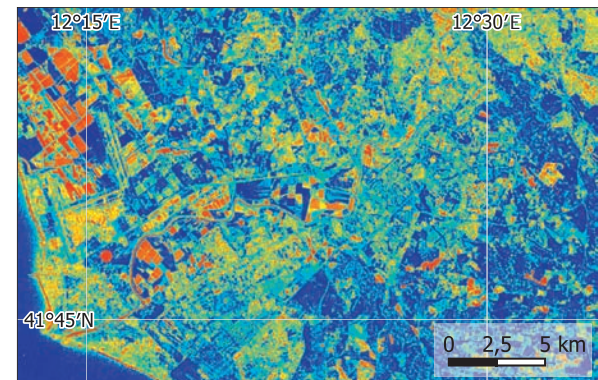
Burned Area: Monitoring and assessing burned areas and wildfires are critical applications of satellite data. Indices like the Normalized Burn Ratio (NBR) highlight changes in vegetation cover after a fire. With them, analysts can quantify the severity and extent of the burned area, aiding in post-fire recovery planning and ecological restoration.

Snow and Ice: In polar and mountainous regions, monitoring snow and ice cover is vital for understanding climate change impacts. Indices like the Normalized Difference Snow Index (NDSI) help differentiate between snow and other surfaces. These indices contribute to snowpack assessments, glacier monitoring, and water resource predictions.

Minerals: Satellite data is used in mineral exploration and resource mapping. Indices help e.g. identifying minerals associated with water bodies, facilitating the detection of potential mineral deposits. These indices assist in geological surveys and resource management.



1. True colour image of the region southwest of Rome, showing the mouth of the Tiber, Ostia, and the Fiumicino airport. Data: Sentinel-2, 2022-03-21.



2. Soil moisture index map of the region southwest of Rome. Red colours show dry areas such as built-up areas and bare land, dark blue highlights moist, mostly vegetated areas. Data: Sentinel-2, 2022-03-21.



3. NDVI (Normalised difference vegetation index) map of the region southwest of Rome. From red to green the intensity or vitality of the vegetation increases. Data: Sentinel-2, 2022-03-21.



4. NDWI (Normalised difference water index) map of the region southwest of Rome. Water bodies (blue) can be clearly identified, from green to white the water content of the surface decreases. Data: Sentinel-2, 2022-03-21.