

BENEFITS OF SWIR



Exploring the benefits of SWIR satellite imagery

Besides offering 30 centimeter resolution panchromatic and eight-band visible and near-infrared (VNIR) imagery, WorldView-3 collects shortwave infrared (SWIR) imagery in eight-bands. This allows the satellite to sense the VNIR spectrum as well as expand deeper into the infrared spectrum than any other commercial imaging satellite, providing rich data for precisely identifying and characterizing man-made and natural materials. WorldView-3's eight SWIR bands span the spectrum's three atmospheric transmittance imaging windows to capture unique information for materials identification, wildfire response, food security, mining/geology, and other applications.

Doubling the spectral bands

WorldView-3 is the first commercial satellite to have 16 high-resolution spectral bands that capture information in the visible and near-infrared (VNIR) and short-wave infrared (SWIR) regions of the electromagnetic spectrum (EMS). Operating at an altitude of 617 kilometers, the satellite provides 31-centimeter panchromatic resolution, 1.24-meter VNIR resolution, and 3.7/7.5-meter SWIR resolution, according to our operating licenses (Department of Commerce).

WorldView-3 builds upon WorldView-2's unique capabilities, providing eight additional spectral bands farther into the SWIR portion of the EMS. This spectral expansion enhances WorldView-3's capability to capture the uniqueness of each ground material's spectral signature. Due to minimal atmospheric influence or noise in this part of the EMS, as well as an enhanced ability to differentiate among ground materials, the SWIR bands open the door for automated information extraction to save time, money and possibly lives.

Moving from pixels to insight

WorldView-3's 16 spectral bands allow for automated information extraction for various applications. Because WorldView-3 provides continuity of WorldView-2 VNIR bands at a higher spatial resolution as well as a revolutionary sensor with eight new SWIR spectral bands offered on a commercial satellite for the first time, the satellite is helping to transform the remote sensing industry from a pixel-based industry into a product-based industry, expanding the use of remotely sensed data to create ways to better understand and manage our changing planet.



Materials Identification

Many industries need to understand what different material types are present. For example, the insurance industry needs to know roof types, while local governments are concerned with land cover types for tax assessment. With the SWIR bands on WorldView-3, accurate information can be gathered from satellite data that has not been available to this point.

Due to the unique way that materials reflect data in the SWIR wavelengths, it is often possible to discriminate between materials that look similar to the naked eye. In the image on the right, rooftops made of plastic or polymer materials are shown in yellow and orange and clearly differentiated from green vegetation and blue/gray asphalt and dirt.

Wildfire Response

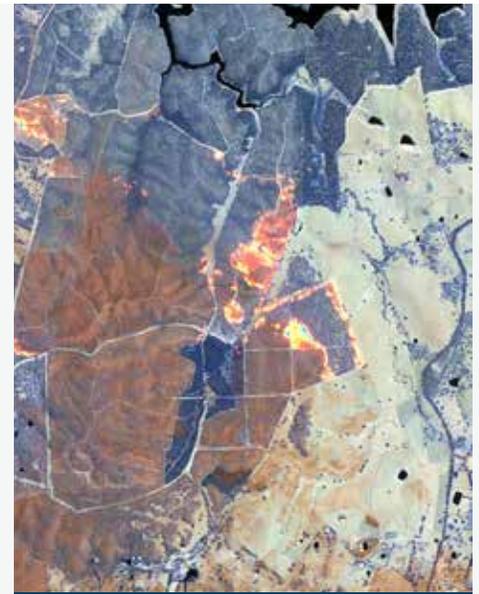
Whether called a forest fire, bush fire, or wildfire, uncontrolled fires have a devastating impact on communities and natural resources. Wildfires can cover extensive areas, move at incredible speeds, and change direction without notice. Fast and effective detection is key to protecting infrastructure and ensuring communities' safety.

A critical factor in being able to respond to wildfires is to have information about the location and severity in a timely manner. With the agility and spectral depth of WorldView-3, getting this information has never been easier. The unique SWIR band not only penetrates smoke, allowing for a clear view of the ground, but they also pinpoint sites of active burning so that response efforts can be directed most efficiently.

Food Security

As the world focuses on increasing global food security, it is critical to improve small farm productivity and yield while decreasing costs, minimizing the environmental impact with precision agriculture practices, and better managing agriculture production and associated inventory. It is important to take corrective action early in the growing season by understanding crop conditions such as crop health and stress due to problems such as nutrient deficiency, moisture stress, and pests.

WorldView-3 data is uniquely designed to observe and map these phenomena. Crop stresses change the green chlorophyll content of the leaves and replace them with carotenoids that have yellow and red colors, identifiable in the EMS. In addition, SWIR bands are used to assess crop moisture, as another health indicator. Observing soil types and conditions before, during and after a crop season is important for managing crop health. WorldView-3 offers a window into underlying soil conditions and how such conditions might affect vegetation.



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One of the agricultural community's best management practices relates to how much post-harvest crop residue is left on a field. Crop residue preserves soil moisture and prevents soil erosion during rainy months. SWIR spectral bands can be used to map and quantify how much crop residue is left behind, predicting the soil quality for future crops.

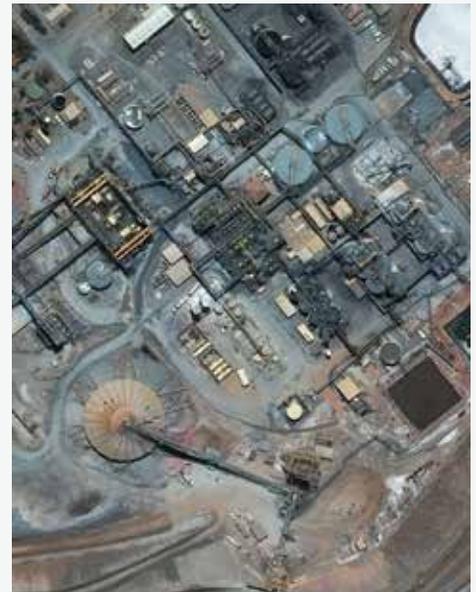
Mining/Geology

WorldView-3's spectral bands allow for unique mineral identification and chemical measurements. Energy from light is either transferred to molecules of matter or reflected away from them. Based on the mineral content, different materials absorb specific wavelengths of light and reflect others.

Electronic absorptions in the SWIR wavelengths can be used for detecting materials containing anion groups such as Al-OH, Mg-OH, Fe-OH, Si-OH, carbonates, ammonium, and sulphates - many of which are indicator minerals in the mining industry. Exposed outcrops are manifestations of potential mineral ores or sub-surface deposits. While the geology and mining industries spend millions of dollars to identify potential mining sites during their exploration phase, WorldView-3 SWIR data can cut costs and increase efficiency by narrowing the potential area before field verification is planned.

Summary

WorldView-3's increased spectral resolution of 16-bands spanning the VNIR to SWIR, allows for an extension of visual interpretation to machine interpretation and analyses using material spectral signatures. Non-visual imagery (i.e. what humans cannot see) will become a new standard for imagery information extraction and insight derivation.



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