Reaching new scales of sight

What it means to see the earth in hyperspectral

Imagine you need to fix something you cannot see or measure. At first, it's not an obvious problem. You make your best effort to manage the negative side effects, but your inability to see the full picture allows the problem to proliferate beyond your control. This continues for several years until you hit a breaking point, where change is inevitable and necessitates an entirely new set of tools so that you can adapt and thrive.

This is the turning point industry and governments find themselves today as they face enormous challenges at the intersection of digital transformation, climate change, and sustainability. Businesses must innovate to stay ahead of global competitors, de-risk their supply chains, and expand revenue; the financial sector is looking to mitigate risk; meanwhile, governments must implement effective policies to avert negative climate impacts, while also balancing the need for economic growth.

To make meaningful progress on these overlapping fronts, industry and governments will require new scales of sight to drive holistic management, prudent investment, and technological innovation needed to overcome the challenges ahead.

SEEING BEYOND

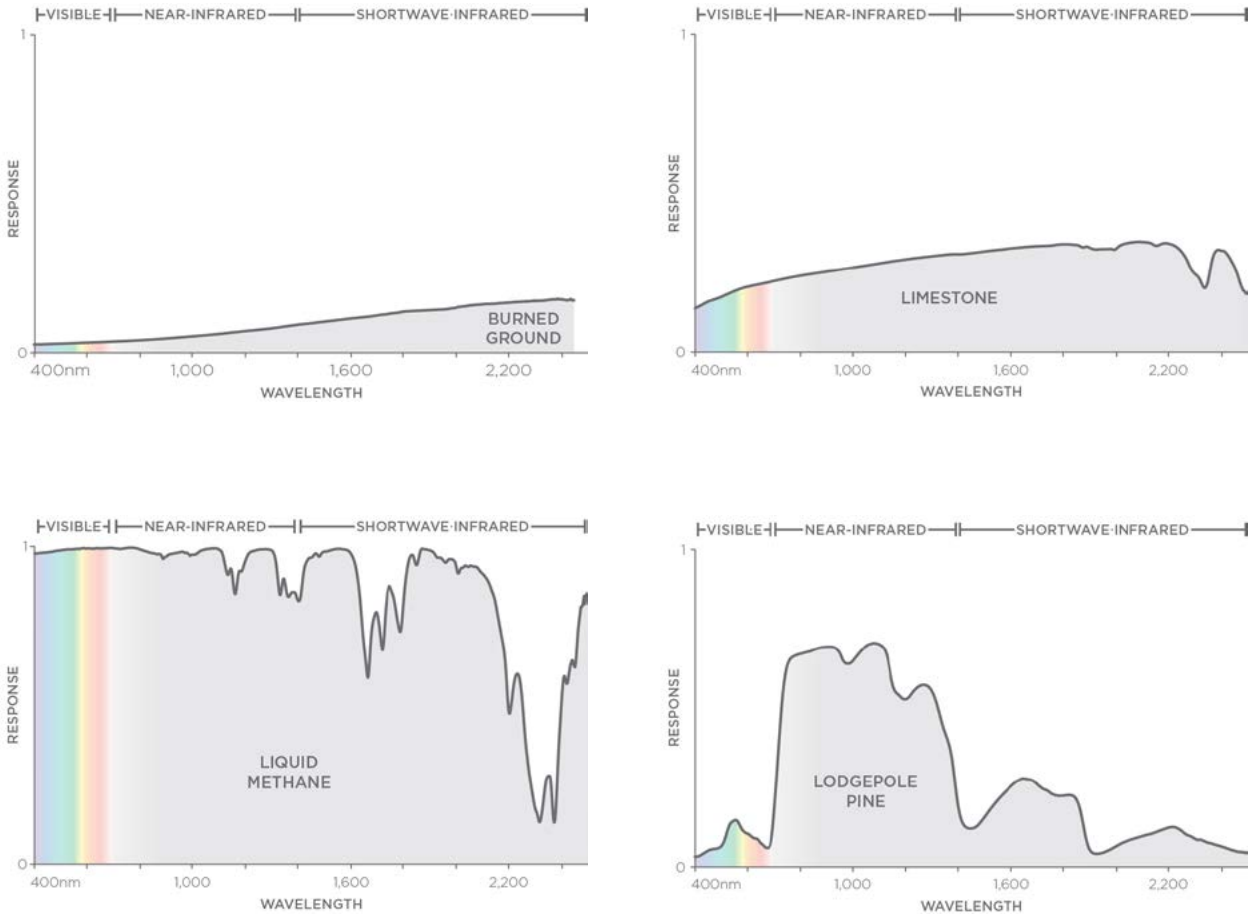
One of the major barriers to achieving this is a lack of comprehensive, frequent, and specific Earth observation data that can be joined with other data to create reliable indicators of economic and environmental health. To date, the commercial Earth observation industry has focused on capturing what is visible to the human eye in three-band (RGB) imagery. A good majority of Planet users, for example, visually inspect imagery to see if change has taken place between different days.

While three-band (RGB) imagery remains valuable for a range of use cases, it has also precluded use of a broad swath of signals invisible to the human eye (often best analyzed by machine learning algorithms) that can provide immense information about our changing environment.

Tigers appear green to their prey because they cannot distinguish between green and red/orange tones, leaving them at a disadvantage. Humans only see a sliver of the electromagnetic spectrum, but have the advantage of technologies that can measure physical properties invisible to the human eye.

Given the urgency to address critical climate and sustainability issues, this could soon change. The recent development of lower cost hyperspectral sensor technologies, which capture information beyond the visible spectrum, are opening up new possibilities for measuring and monitoring different aspects of activity previously unseen by the human eye.

Whether captured from airplanes or UAVs or satellites, over the coming decades, hyperspectral data is poised to become more available and accessible to the broader commercial, policy, and academic sectors. The popularity of hyperspectral imaging is already increasing, especially in agriculture, ecology and environmental monitoring, urban planning, and many more.



Charts showing the spectral response of materials across the visible, near infrared, and shortwave infrared portions of the electromagnetic spectrum. Hyperspectral imaging can capture small changes in spectral response, enabling the accurate identification of many different materials.

GLOBAL PARADIGM SHIFT

From large-scale agriculture, to forest and land stewardship, to managing pollution and greenhouse gas emissions, to water quality monitoring, there is a broad range of interconnected economic activities that need to be measured appropriately for sustainability to become central to business and policy. To serve this range of use cases, Planet is designing a groundbreaking hyperspectral satellite constellation, to be launched in 2023, that aims to create a paradigm shift in the way businesses and governments understand human activities and their economic and environmental impacts.

In addition to tracking methane and carbon dioxide emissions via its partnership with Carbon Mapper, the satellite constellation will deliver 25 or more environmental indicators useful for understanding changes on land and at sea, from coastal zones, to forests, to crops and land cover types.

By identifying the spectral “signatures” of chemicals, materials, and processes across the globe, hyperspectral data helps data scientists and analysts track human-driven planetary change. This, in turn, helps businesses and governments mitigate risk, align incentives, and promote sustainable growth.

APPLICATIONS OF HYPERSPECTRAL DATA

AGRICULTURE

From identifying crop stress, to managing irrigation levels, to classifying crop types, hyperspectral data provides immense value to the agricultural sector. As global food demand accelerates over the coming century, hyperspectral satellite data may become a key source of information about precision agriculture practices and global food security.

POLLUTION & GREENHOUSE GAS EMISSIONS TRACKING

Hyperspectral data can empower detection and quantification of pollution and greenhouse gases in the atmosphere. Depending on the coverage and spatial resolution, this can be achieved down to the facility level, enabling fast response to leaks or getting insight into emissions in far-reaching, remote areas.

WILDFIRE DETECTION & MITIGATION

The increasing frequency and intensity of wildfires across the globe is creating a need for hyperspectral satellite data, which can support more precise estimation of wildfire risk by measuring the health and moisture levels of vegetation. Fast and effective response to wildfires, at the source, is critical for protecting communities and infrastructure from devastating losses.

MINING

Mineral exploration could become much more efficient and precise with the use of hyperspectral data, which can help identify materials by their spectral signature – often in difficult-to-reach locations. It can also be used to detect illegal removal of materials or as proof of compliance with regulations.

WATER RESOURCE MANAGEMENT

Protection of water resources is critical in the coming decades, particularly as countries grow their populations and industrialize. Hyperspectral satellite data has been used to estimate water quality, monitor algal blooms in reservoirs and lakes, and assess urban development plans.

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