Datasheet

VIS-NIR Hyperspectral Camera

ATH1010

Features:

- ◆ Low cost light splitting system, compact size
- ◆ High performance CMOS image sensor, high performance-to-price ratio
- ◆ High frame rate，USB power supply requires no extra power
- ◆ Full target surface, high imaging quality optical design, dotted line spot diameter <0.5pixels
- ◆ Objective interface is C-Mount, available in changeable objectives required by customer
- ◆ Support spectral range 400-1000nm, customized range

Applications:

Monitor Agriculture: plant diseases and insect pest, disaster, categories ID etc.

Forestry: Tree categories identification, Phytomass, nutrient elements, forest health etc.

Water Environment: Water quality parameters, water waste spatial distribution and migration analysis

Soil Pollution: heavy metal waste

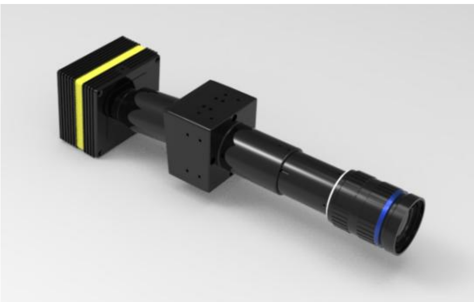
Minerals: Mineral mapping, ingredients explore, metallogenic prognosis etc.

City geological: substances classification and identification

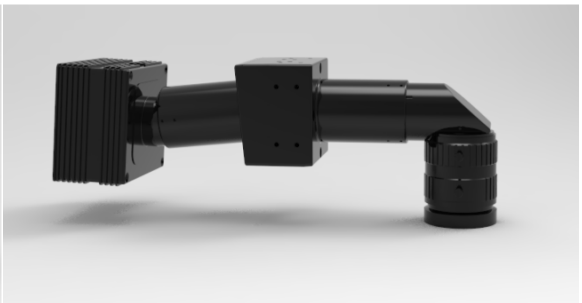
Description:

ATH1010 is low cost hyperspectral camera for industrial application, with compact, lightweight, and miniature hyperspectral camera, and it employs CMOS sensor, high performance-to-price ratio. Hyperspectral imaging camera employs convex grating technology and good aberration characteristics. 1920X1200 pixels high-performance imaging Hyperspectral Imaging camera is used to detect real time geological spectrum data such as plant, water creature, soil etc. They receive spectral imaging to make analysis, and build up relationship with physical and chemical properties of plants, then data collected are applied to research plant classification, growth etc. The whole system has compact design, and it employs high resolution, external push broom imaging, setup independent detection system separately in combination with outdoor rotation platform and indoor linear scanning platform, and mounted in the UAVs to operate flight remote sensing.

Model	Description
ATH1010	Narrow FOV，1920X1200 pixel
ATH1010W	Wider FOV，2048X2048 pixel
ATH1010L	L hyperspectral imaging camera ，narrow FOV，Suitable for fixed wing
ATH1010LW	L hyperspectral imaging camera，wider FOV，Suitable for fixed wing



ATH1010



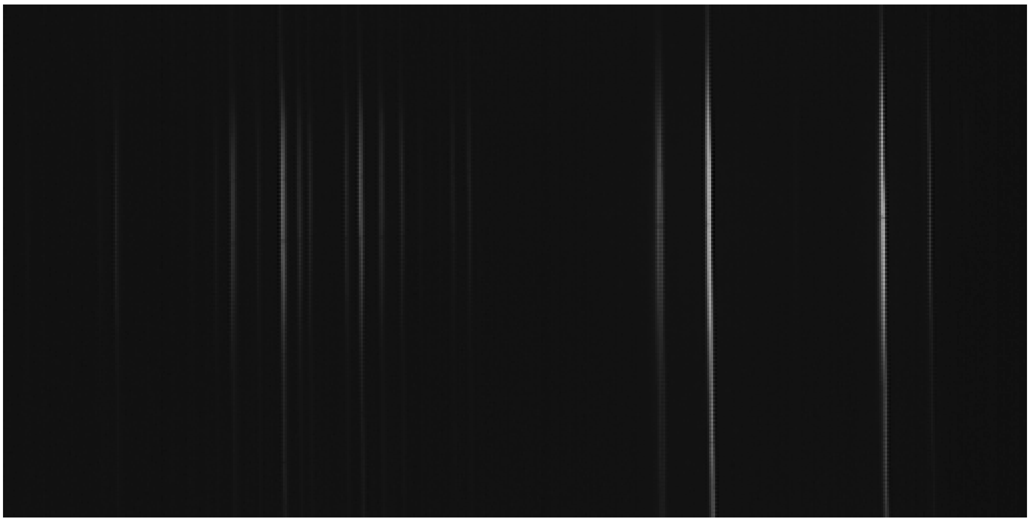
ATH1010L

1. Technical Specification

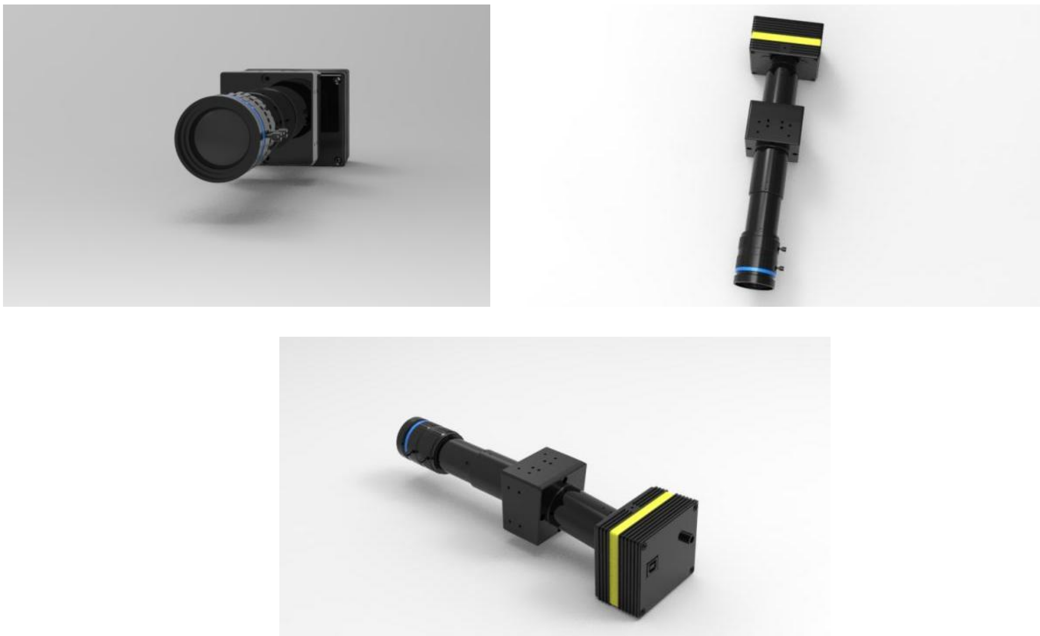
S/N	Items	Parameters	
		ATH1010	ATH1010W
1	Spectral Range	400-1000nm	400-1000nm
2	Spectral Resolution	≤2.3 nm	≤2.3 nm
3	Number Aperture	F/2.6	F/2.6

4	Detector	CMOS	CMOS
5	Detector Interface	USB3.0	USB3.0 or CamLink
6	Detector Power Supply	USB，3.4W	USB，4.5W
7	Detector Target Surface Size	1/1.2” , 11.3mm x 7.1mm	11.26 × 11.26 mm
8	Detector Raw Resolution	1920 x 1200	2048 × 2048
9	Detector Raw Pixels Size	5.86 µm x 5.86 µm	5.5 µm x 5.5 µm
10	Pixels Bit Depth	12bits	14 bits
11	SNR	45 dB	43 dB
12	Slit Width	15 µm，25µm (optional)	15 µm，25µm (optional)
13	Pixels Binning	4x4/2x4	4×4 / 2×4
14	Max spatial Bands	1200	2048
15	Max Spectral Bands	1920	2048
16	FOV	15.2°@f=35mm	24.6°@f=35 mm
17	IFOV	0.7mrad@f=35mm	0.7mrad@f=35 mm
18	Frame Rate	120fps	180 fps
19	Size	279mm x 64mm x 55mm	239.7mm × 68 mm × 84.9 mm
20	Weight	< 545g	< 680 g
21	Working Temp.	0 - 50°C	0 - 50°C
22	Storage Temp.	-30-70°C	-30-70°C

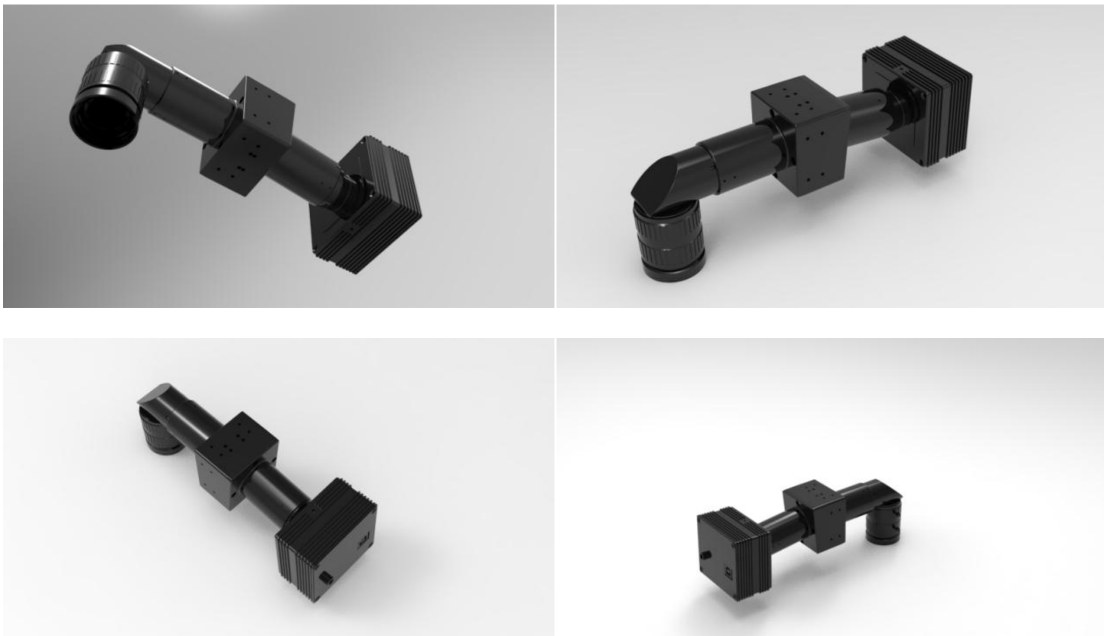
2. ATH1010 Spectral Image



3. ATH1010 Series Appearance Design



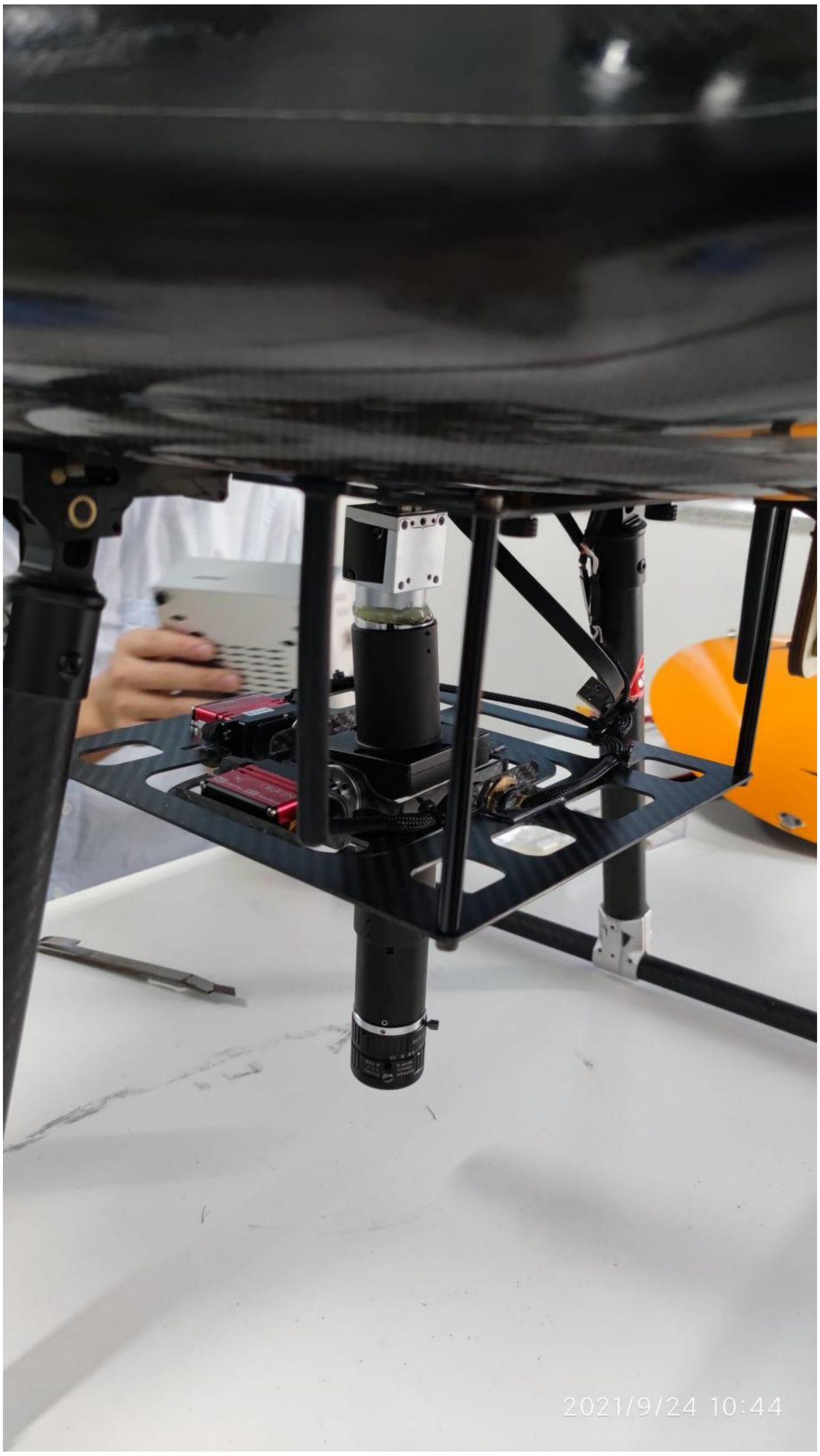
ATH1010 Appearance Design



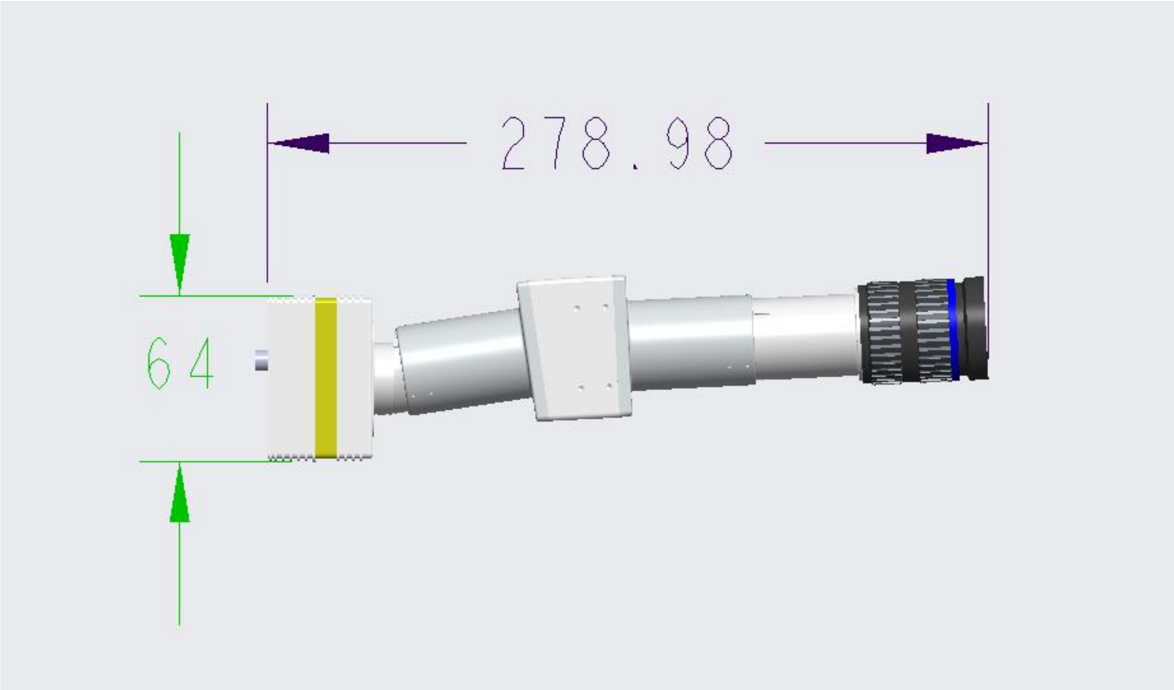
ATH1010L Appearance Design

ATH1010 Physical Objects

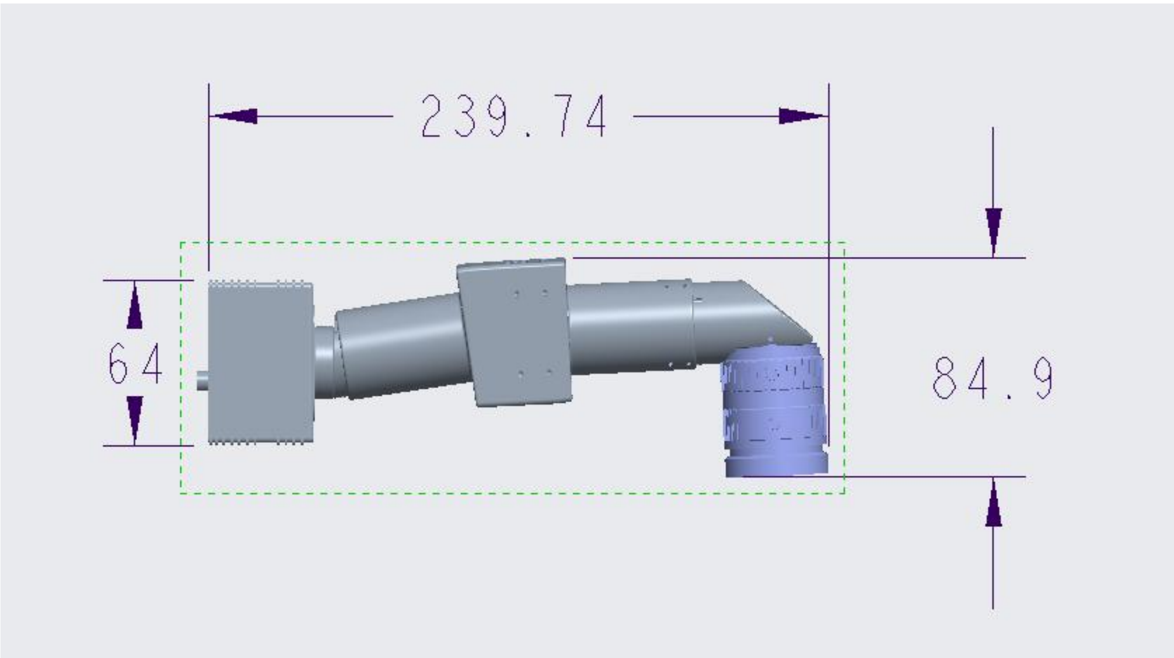
ATH1010 hyperspectral imager mounted on the drone



ATH1010 hyperspectral imager mounted on the drone



Boundary Dimensions of ATH1010



Boundary Dimensions of ATH1010L

4. Application:

Figure 1 Drone experiment

Figure 2 Outdoor experiment scene


Figure 3 Outdoor experiment scene Ⅱ


Figure 4 Outdoor experiment scene Ⅲ

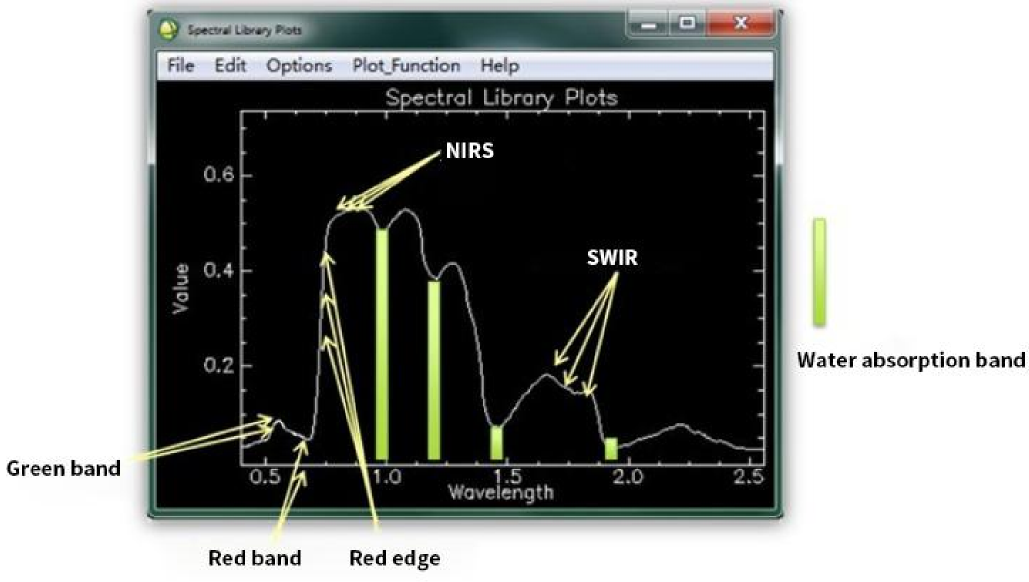


Figure 5 Green plants measured spectrum

1.1. Geological Prospecting Application

Spectral remote sensing technology evolved from the multi-spectral remote sensing technology represented by Landsat and took initial shape in the mid-1980s (Goets et al., 1985, Tong Qingxi et al., 2006).

Due to its advantages of high spectral resolution and atlas integration, hyperspectral remote sensing technology has the ability of fine detection and analysis of surface rock mineral composition on a large scale. It can not only provide a macro image of the ground, but also determine the type and abundance of minerals in the geological body, and even the chemical composition of some minerals at pixel level details (Wang Runsheng et al., 2010).

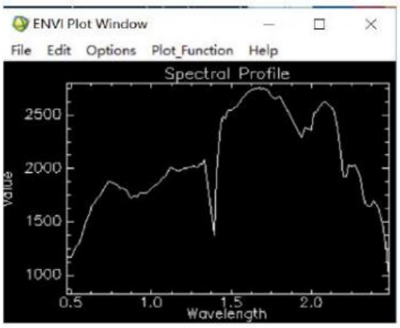
In recent years, with the continuous development of hardware, data processing methods and software related to imaging spectrometer, the application of hyperspectral remote sensing technology in the field of geological survey has been accelerated.

Hyperspectral remote sensing technology has played an important role in geological mapping, the definition and division of hydrothermal alteration zones, and the delineation and discrimination of mineralization anomalies from large metallogenic areas to medium-scale ore fields (e.g. Bierwirth et al., 2002; Company Changyun et al., 2005; Kruse et al., 2006; Cudahy et al., 2007; Wang Runsheng et al., 2010; Liu Dechang et al., 2011; Yan Baikun et al., 2014; Yang Zian et al., 2015; Graham et al., 2017).

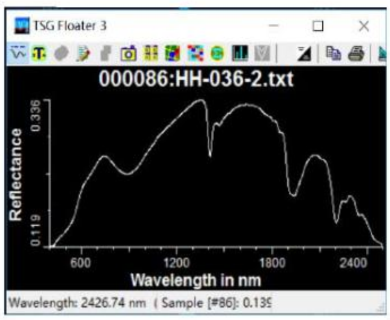
With the theory of metallogenic system (Wyborn et al., 1994) becoming the guiding principle of prospecting practice, thematic mineral mapping on the scale of large ore concentration areas and metallogenic belts will provide key regional material composition information for predictive prospecting and exploration.

The spectral wavelength ranges used for mineral mapping include visible light (400-700nm), NIR (700-1000nm), SWIR (1000-2500nm), and thermal IR (7000-15000nm). At present, the most widely used in mining is the short-wave infrared region (1000-2500nm).

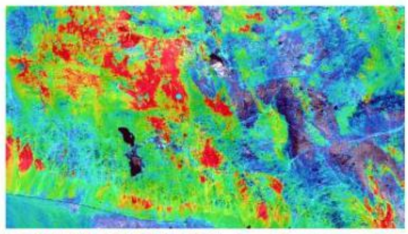
Because the frequency is close to the cofrequency and combined frequency of the chemical bond vibration in the mineral lattice, the mineral containing water or OH- (mainly layered silicate and clay) as well as some sulfate and carbonate minerals can be observed in the range of short-wave infrared wavelength.



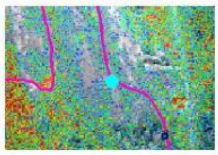
HH036 point image spectrum



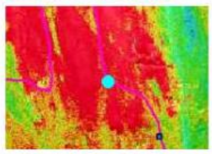
HH036 point measurede spectrum



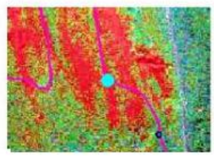
Sericite Filling Results Comparison of known deposit points between HH036 and measured



Chlorite extraction results



Sericite extraction results



Feb3+ extraction result

Sampling point photos

Long-range photos of sampling points

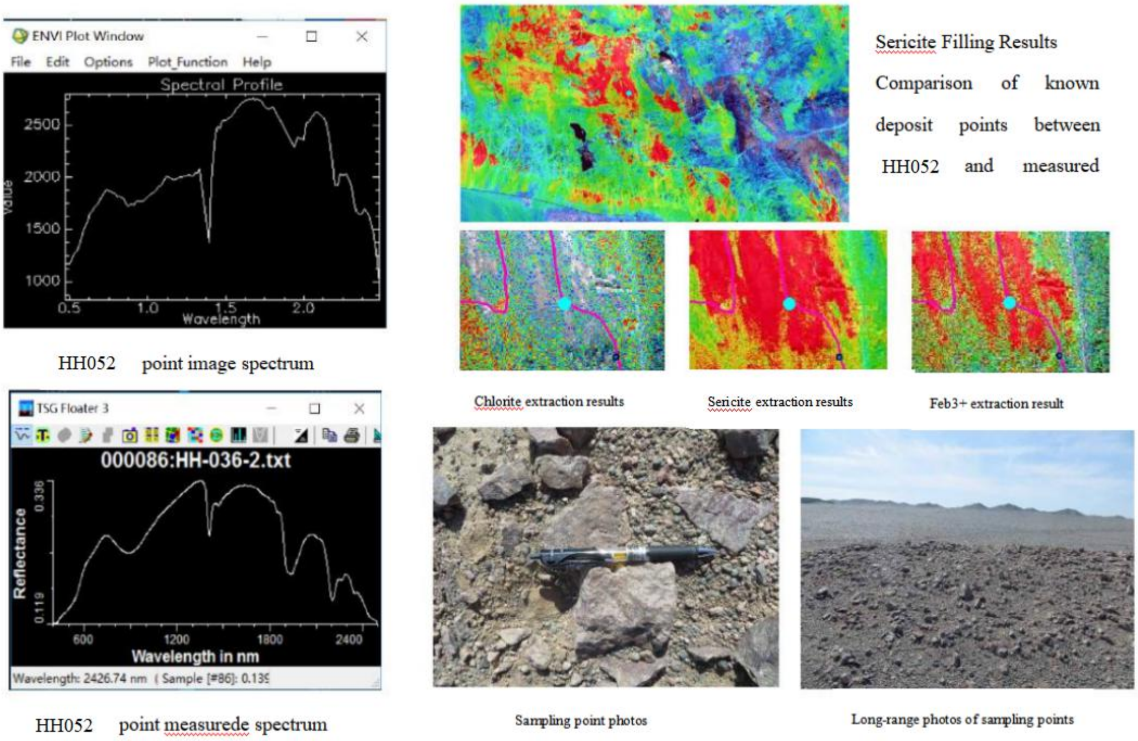


Figure 6 Application of hyperspectral imager in prospecting

Soil salinization is one of the important ecological and environmental problems in arid and semi-arid areas. Soil salinization causes soil hardening, fertility decline, acid-base imbalance, land degradation and other consequences, which seriously restricts agricultural development in China and affects the strategic situation of sustainable development in China at present.Remote sensing technology, with its characteristics of large scale, wide range, strong timeliness and economy, makes up for the deficiency of traditional methods for monitoring salinization phenomenon, and provides a new way for quantitative monitoring of soil salinization phenomenon.

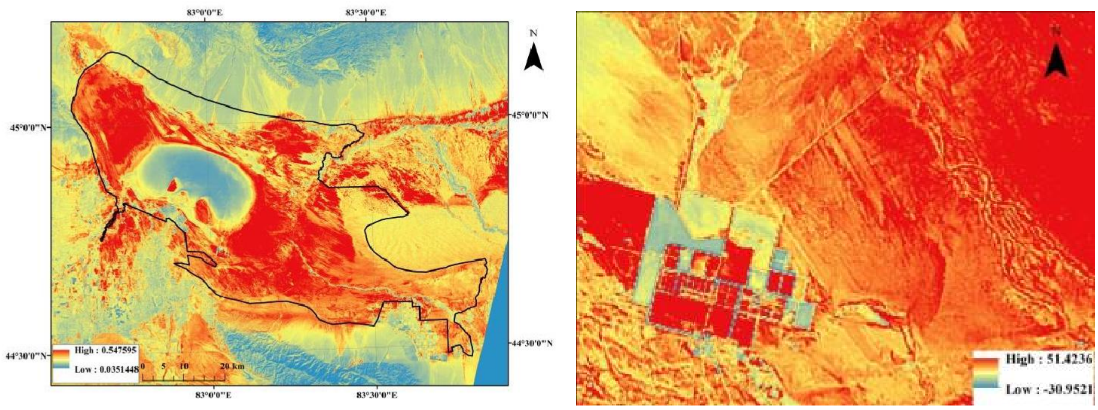


Figure 7 The surrounding area of a salt field

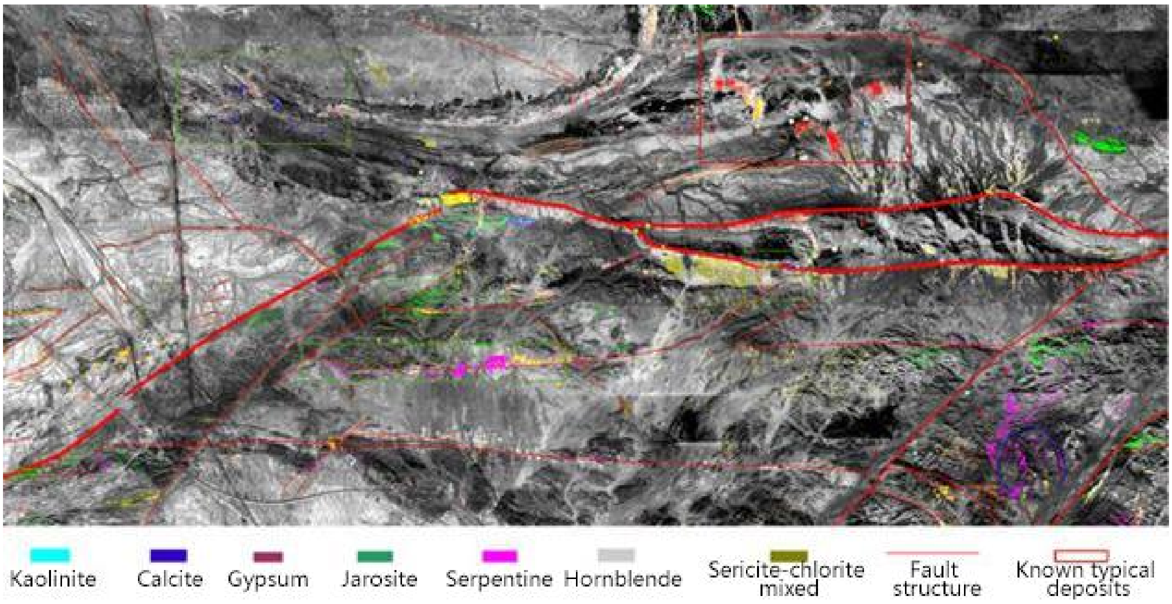


Figure 8 Field chart

1.2.Application of vegetation growth

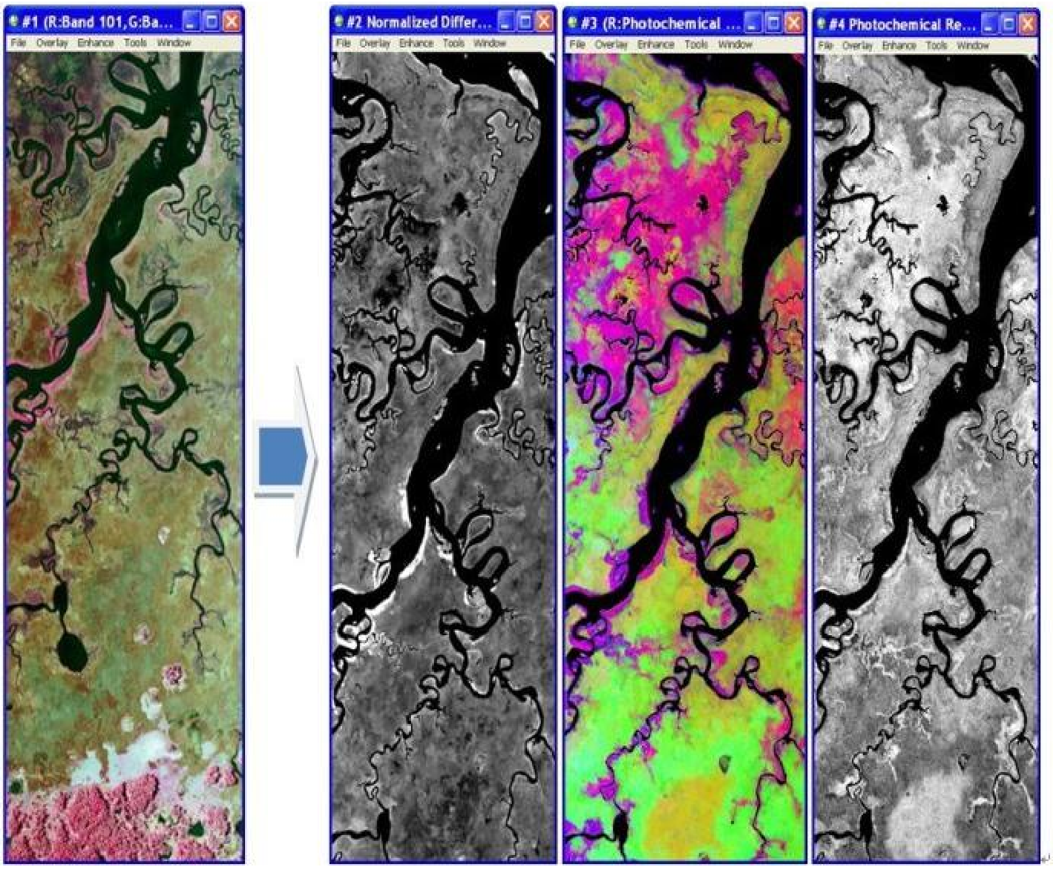


Figure 8 Hyperspectral image of plant growth

1.1 Forest Health Application

Used for pest monitoring and forest resource assessment.

Principle: The health of vegetation is related to greenness index, leaf area index, leaf moisture content and light use efficiency;

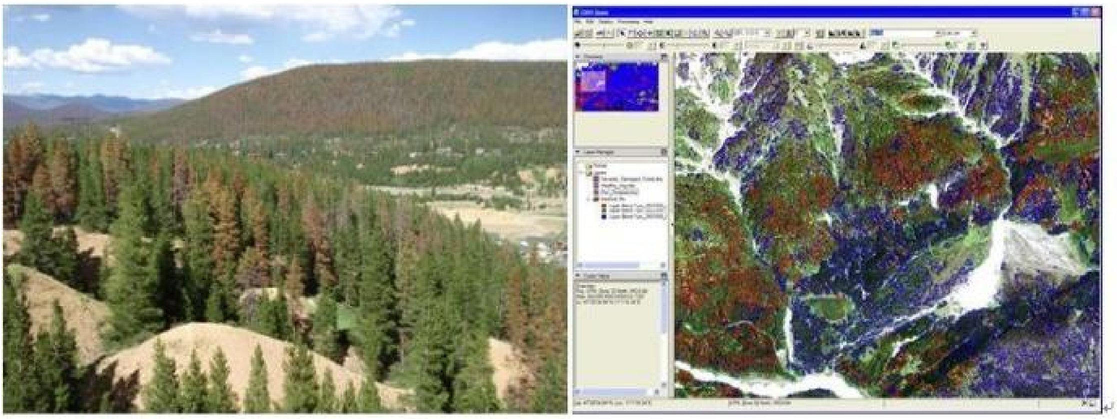


Figure 9 Hyperspectral image of Pinus massoniana

1.2. Application of forest fire prevention

Fire probability analysis, identification of fire range and ignition point.

Vegetation ignition probability is related to greenness index, canopy water content, drought, and carbon attenuation caused by non-photosynthetic plants.

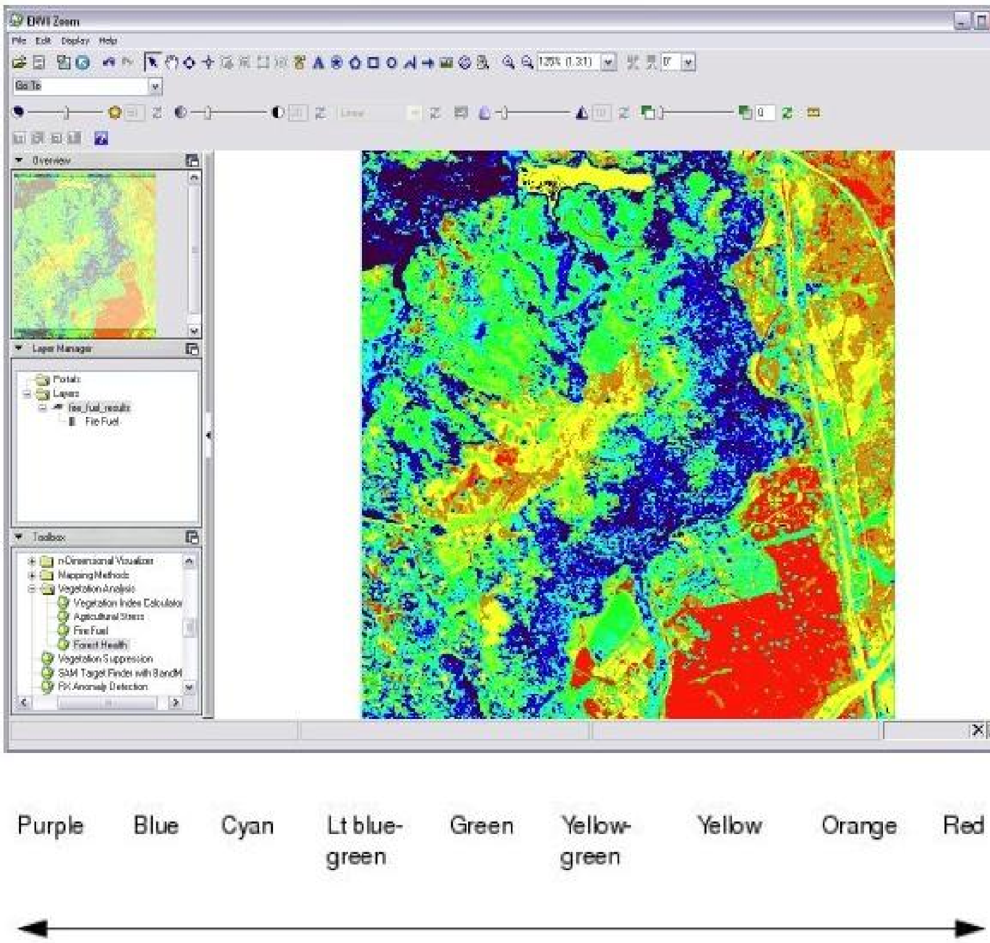


Figure 10 Application of forest fire prevention

1.3. Medical Microscopic Imaging Application

Objective: online detection and navigation positioning during tumor surgery

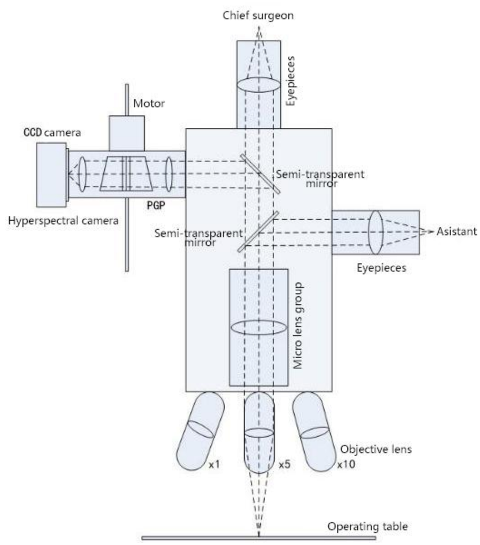


Figure 11 Medical microscope imager optical path schematic diagram

Is shown in the figure of medical microscopic imaging spectrometer principle diagram, the operating table for the target after the objective lens, microscope lens group is divided into three road, visual observation for the surgeon, all the way all the way for the assistant auxiliary visual observation, a routing imaging spectrometer detection, driven by a motor to imaging spectrometer measuring target space d scanning, imaging spectral information of the target under test, then through data analysis, image processing, through the display to the doctor.

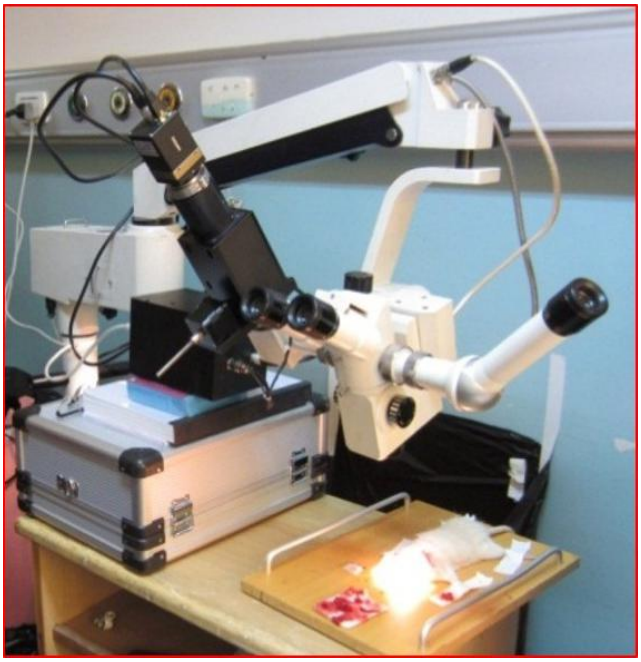


Figure 12 Medical microscope imager figure

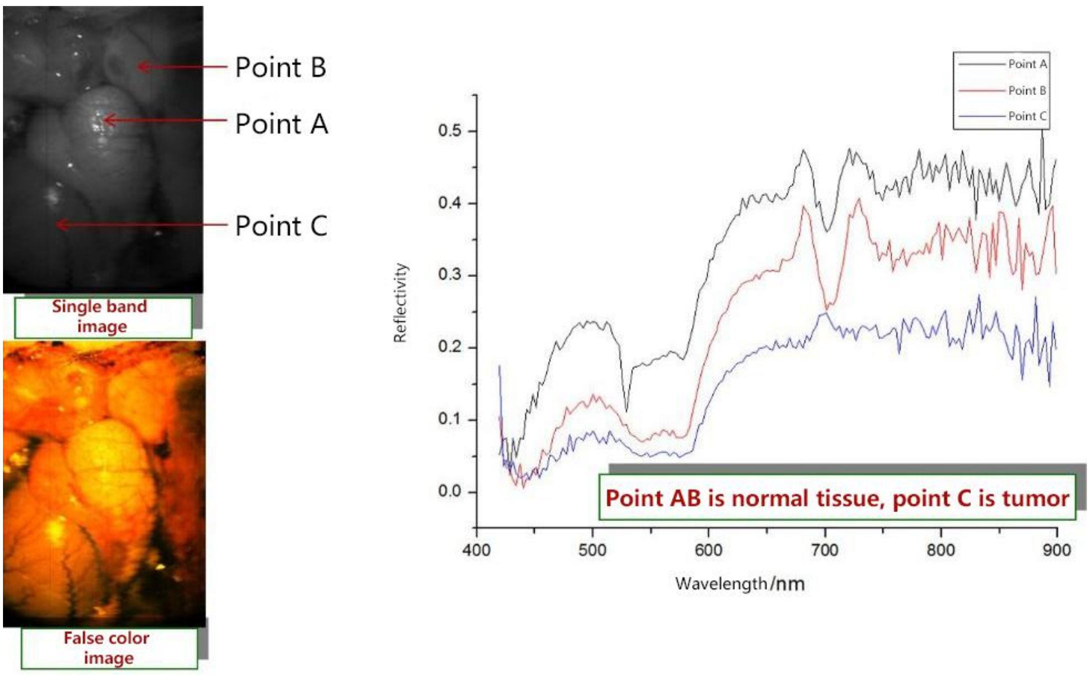


Figure 13 Data collect by medical microscopic imager

1.4. Airborne Imaging Spectroscopy Application

Objective: Airborne remote sensing

Application: Figure shows airborne imager consists of SpecVIEW-VIS, stable platform and POS modules. Figure 30 and Figure 31 show data was collecte. Figure 7 shows pseudo color image processed through geometric correction, flight strip spice and radiatation correction. Figure 31 shows typical geology spectral curve.

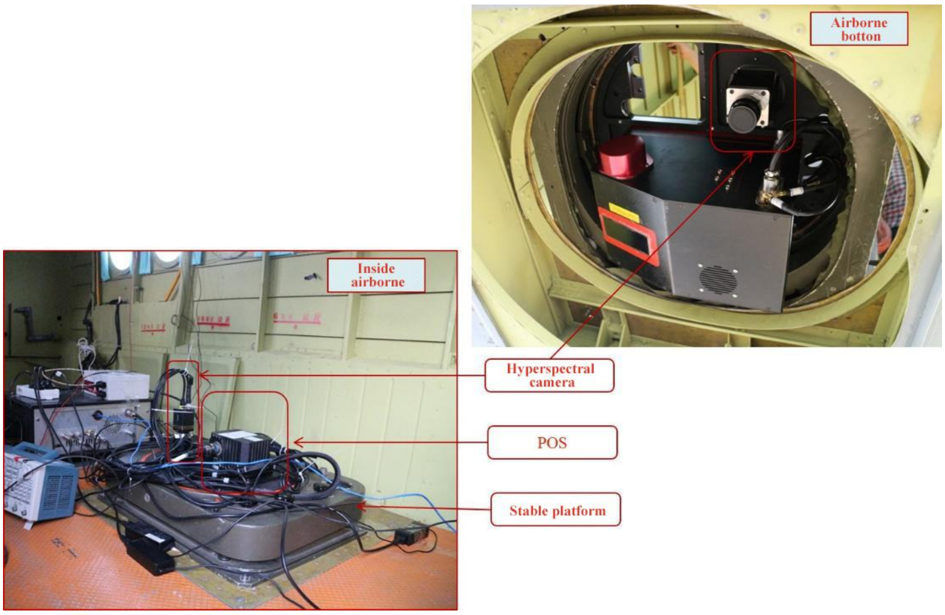


Figure 14 Airborne remote sensing application

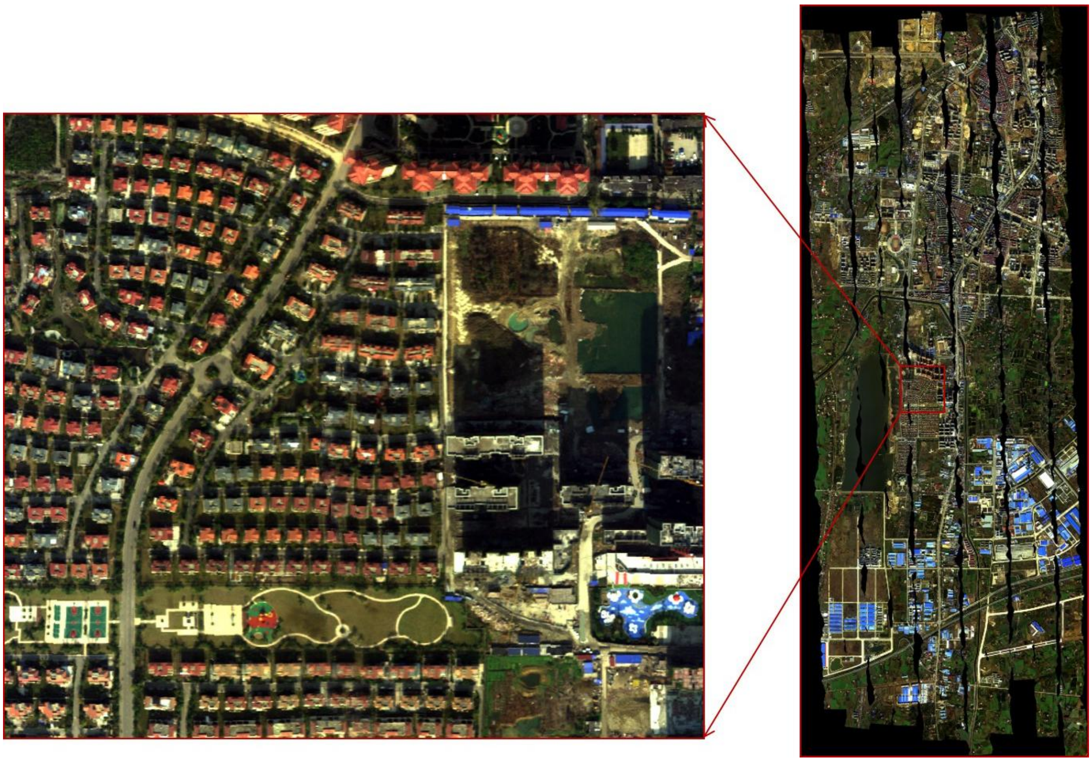


Figure 15 Airborne application data-pseudocolor image

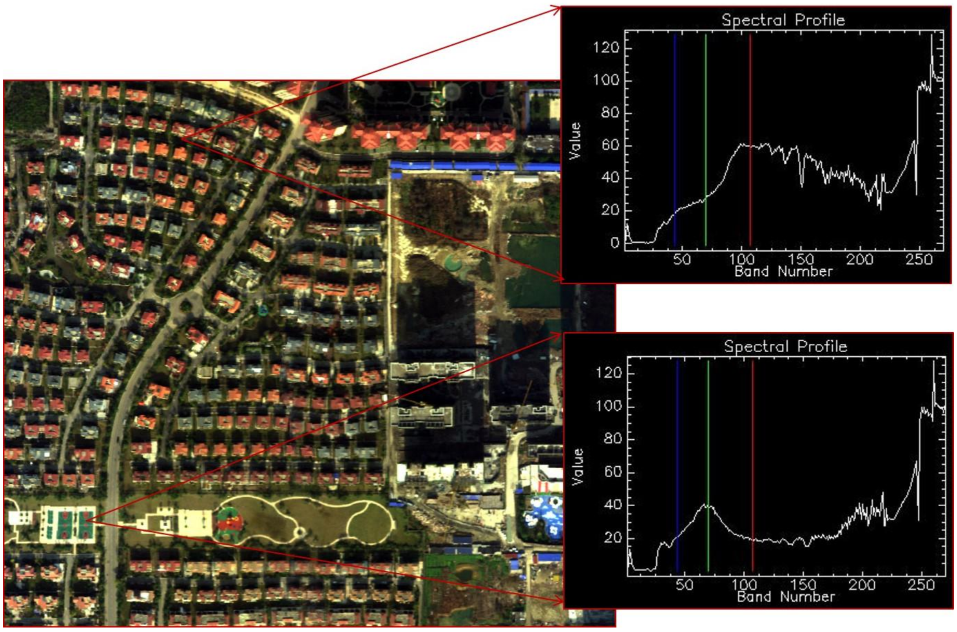


Figure 16 Airborne application data-spectral curve

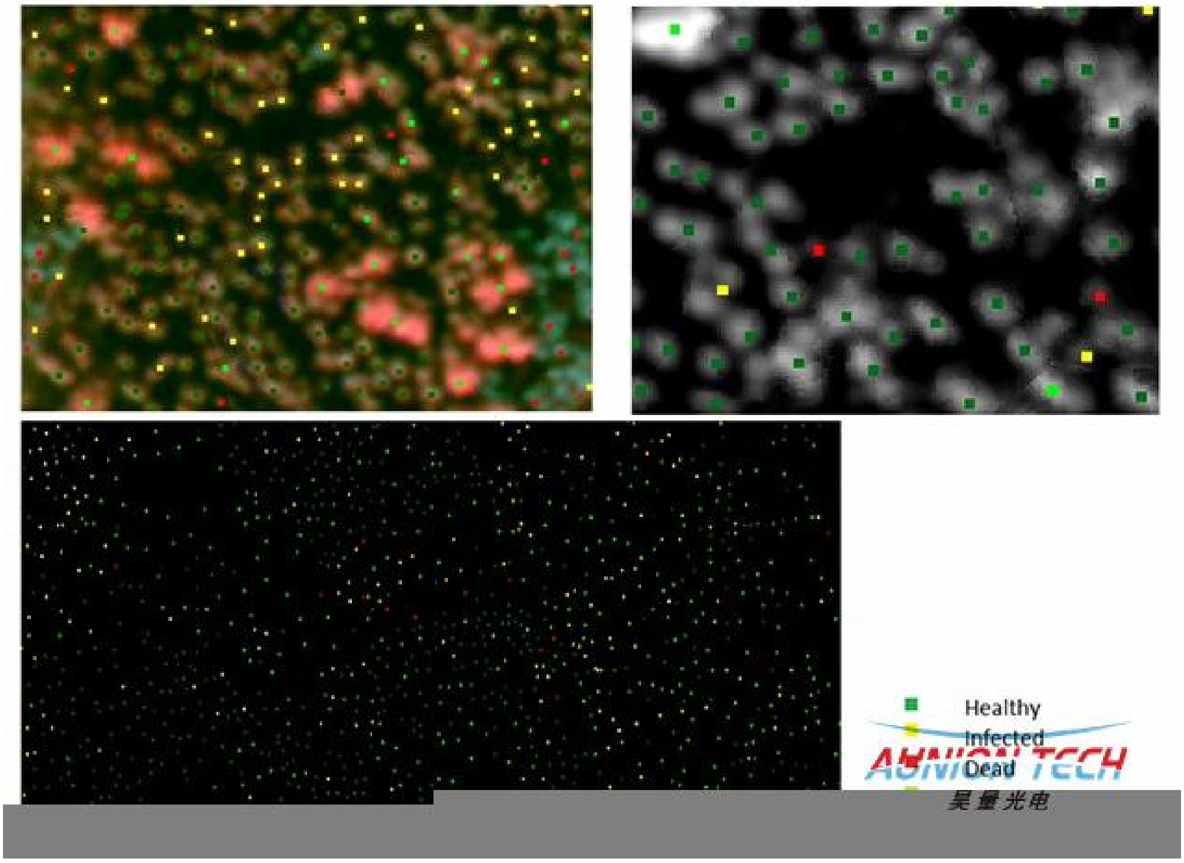


Figure 17 Forest remote sensing, Airbone hyperspectral monitor forest disease and pest

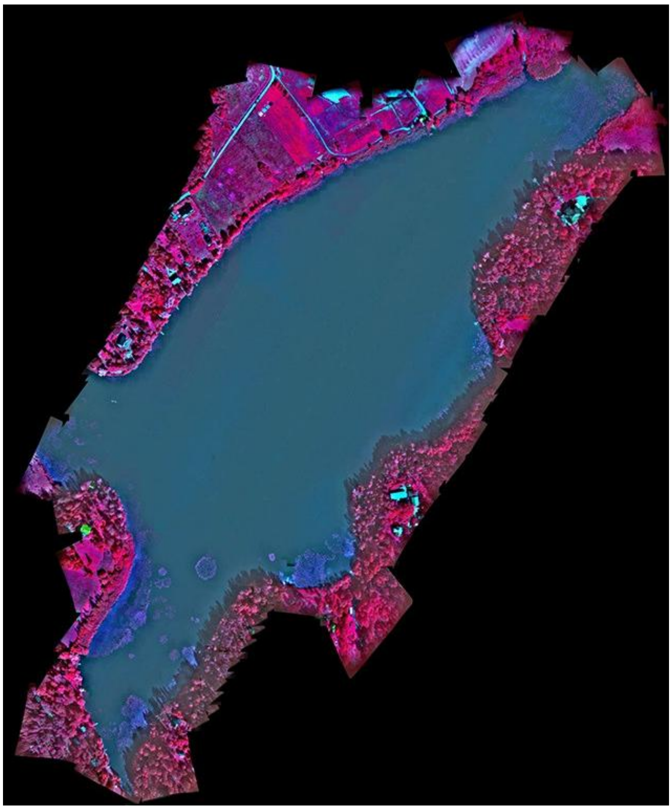


Figure 18 Water detection (lake plankton, algae, vegetation studies)