OPTOSKY Spectroscopy Solutions

# Datasheet

## Handheld Wideband Fieldspec Spectroradiometer | ATP9100S

### Features

- Provide the smallest available spectral sampling interval in a field handheld device.
- Ultra-wide band range: 200 nm~1700nm or 200 nm~2500nm.
- Ultra-small size, ultra-light weight.
- Built-in Android operating system, no additional computer is required for operation.
- The matching drop-resistant backpack can be held and operated by one person.
- Built-in secondary diffraction elimination coating and filter, high accuracy.
- Displays the probe inclination angle and laser indicates the detection position for easy adjustment.
- The host is dustproof and waterproof, not easily damaged.
- Handheld, special carrying case, easy to carry.
- HD touch screen control or PC software control.
- HD camera displays spectrum shooting area.
- Directly calculate vegetation index.

### Application

- Agriculture, forestry and animal husbandry, geological research, prospecting, ground truthing evaluation
- Remote sensing measurement, satellite remote sensing data calibration
- Forest research, oceanographic research
- Environmental damage assessment
- Meteorology, flux stations

### Description

ATP9100S-17 and ATP9100S-25 handheld full-band Fieldspec spectroradiometers are raster-scanning, ultra-light full-band objects launched by Optosky based on years of experience in the research and development of Fieldspec spectroradiometers, with wavelength ranges of 200nm~1700nm and 200nm~2500nm respectively, and weighing less than 1.6Kg. In addition to the functions of conventional handheld Fieldspec spectroradiometers, ATP9100S-17 and ATP9100S-25 can also directly and intuitively display the monitored spectrum area in real time, making the experiment more accurate. It is suitable for applications in various fields such as hyperspectral remote sensing measurement, crop monitoring, forest research to oceanographic research.

ATP9100S-17 and ATP9100S-25 Fieldspec spectroradiometers are cost-effective, fast and accurate in measurement, simple to operate, and easy to carry. They are equipped with powerful software packages. In addition to reflectivity measurement, they can also be used for radiometry, photometry and colorimetric measurements.

| Model | Description |
|---|---|
| ATP9100S-17TC | 200-1700nm band range, detector cooling |
| ATP9100S-25TC | 200-2500nm band range, detector cooling |


ATP9100S-17TC and ATP9100S-25TC handheld full-band Fieldspec spectroradiometers




**1503 Bld. A04, 3rd Software Park, Jimei, Xiamen, 361005, China**
**Tel: +86-592-6102588**

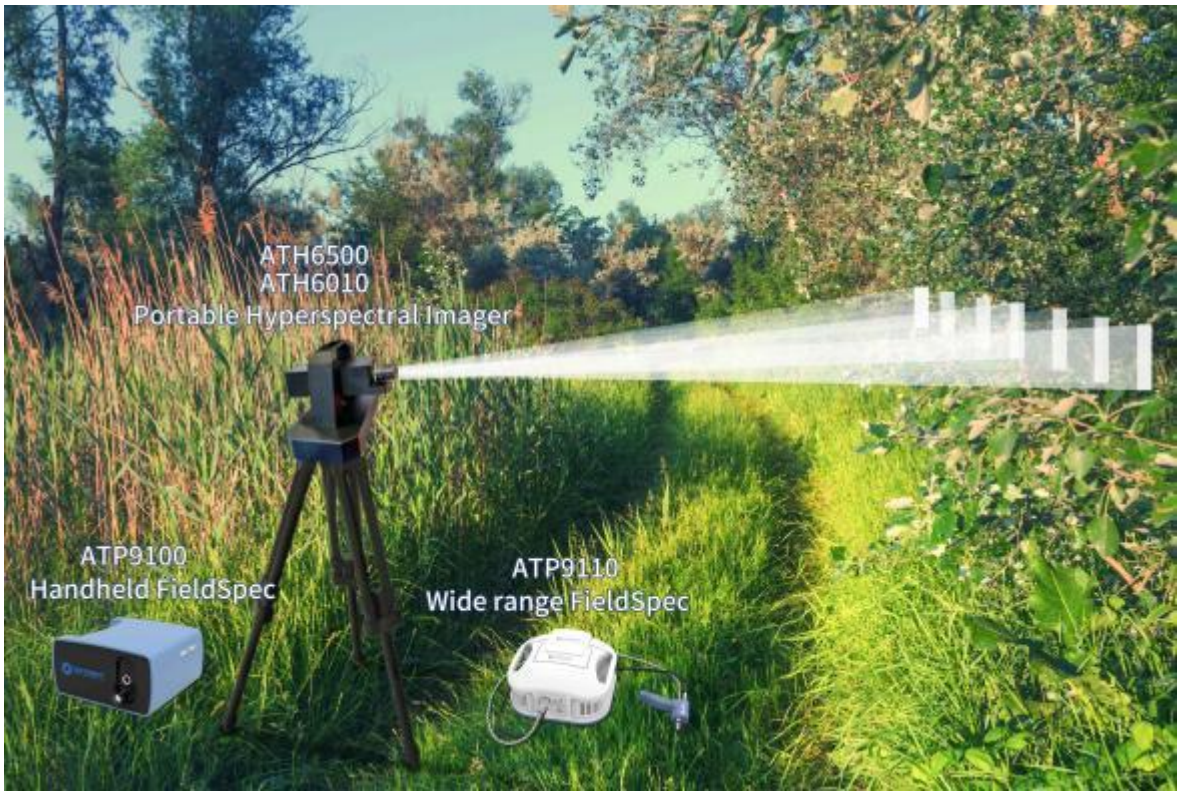


Figure 1 The cooperative use of Fieldspec spectroradiometers and hyperspectral imager.




**1503 Bld. A04, 3rd Software Park, Jimei, Xiamen, 361005, China**
**Tel: +86-592-6102588**

## 1.Selection guide

| Model | Description |
|---|---|
| ATP9100S-17TC | 200-1700nm band range, detector cooling, high signal-to-noise ratio, stable performance, and high reliability |
| ATP9100S-25TC | 200-2500nm band range, detector cooling, high signal-to-noise ratio, stable performance, and high reliability |

## 2.Performance parameters

| | ATP9100S-17TC | ATP9100S-25TC |
|---|---|---|
| Optical Parameters | | |
| Spectral Range | 200~1700 nm | 200~2500 nm |
| Wavelength Accuracy | ± 0.5 nm | ± 0.5 nm |
| Spectral Resolution | <2.0 nm@756nm<br><5.0 nm@1550nm | <2.0 nm@756nm<br><5.0 nm@1550nm |
| FOV | Small field of view lens, 1°/8°/15°/25° optional | |
| Indicate laser wavelength | Red laser, 650 nm | |
| Indicate laser power | 5 mW | |
| SNR | Visible light: >10000:1<br>Shortwave infrared: 12000:1 | Visible light: >10000:1<br>Shortwave infrared: 10000:1 |
| Spectral Sampling Interval | 0.5 nm | |
| Hardware spectral average | Up to 100,000 times | |
| Electrical parameters | | |
| Operation system | Based on Android 8.1 | |
| Camera | 13-mega front camera | |
| LCD screen | 5-inch HD capacitive touch screen, 720×1280 | |
| Integration Time | Auto optimization integration time | |
| Data Export Port | TYPE-C, bluetooth | |
| Angle data | Gyroscope optical measure angle 0°~100° | |
| Power supply | Built-in lithium battery 5200mAh | |




1503 Bld. A04, 3rd Software Park, Jimei, Xiamen, 361005, China
Tel: +86-592-6102588

| | | |
|---|---|---|
| Charging | USB 5V Charger | |
| Battery life span | >2h | >2.5h |
| Working Current | <2500 mA | |
| Storage Temp. | -20°C~65°C | |
| Operating Temp. | -10~45°C | |
| Working Humidity | < 90%RH | |
| Physical Parameters | | |
| Dimension | 151×157×85 mm | |
| Weight | ＜1.6 Kg | |

## 3.Attachment

| | |
|---|---|
| Standard attachment | |
| 1 | USB Data wire |
| 2 | Exclusive PC software |
| 3 | Charging adaptor 5V/3A |
| 4 | Cosine lens |
| 5 | 25° field of view lens |
| 6 | 95% whiteboard |
| Optional attachment | |
| 1 | FOV lens, 1°/5°/8°/10°/15°/25°Optional |
| 2 | Reflection probe (leaf clip), used for vegetation reflectance measurement, used for reflectance measurement, ATP0914 type |
| 3 | Other diffuse reflection standard whiteboards (30%, 50%, 70% optional, same price) |
| 4 | 12V halogen lamp accessories/ATG1021 |
| 5 | Use of test bracket + integrating sphere to test transmittance |
| 6 | Colorimetric pool to test water quality absorbance |
| 7 | Fiber Jumper |
| 8 | High-strength anti-fall outdoor backpack |

## 4.FieldSpec Pictures




1503 Bld. A04, 3rd Software Park, Jimei, Xiamen, 361005, China
Tel: +86-592-6102588

Figure 2 High-strength drop-resistant field backpack.



1503 Bld. A04, 3rd Software Park, Jimei, Xiamen, 361005, China
Tel: +86-592-6102588




1503 Bld. A04, 3rd Software Park, Jimei, Xiamen, 361005, China
Tel: +86-592-6102588






1503 Bld. A04, 3rd Software Park, Jimei, Xiamen, 361005, China
Tel: +86-592-6102588






1503 Bld. A04, 3rd Software Park, Jimei, Xiamen, 361005, China
Tel: +86-592-6102588

## 5.Application cases of Fieldspec spectroradiometers

### 5.1 Application of Fieldspec spectroradiometers (hyperspectral) in ocean and water quality

Red tide, also known as red tide, is an ecological abnormality of discoloration of water caused by the sudden proliferation or accumulation of certain phytoplankton, protozoa or bacteria in seawater in a short period of time under certain environmental conditions. In recent years, toxic red tides have occurred frequently and expanded in scale, seriously affecting coastal fisheries, mariculture, and the marine ecological environment. Red tide toxins also threaten human life.

Marine Phaeocystis, Skeletonema costa, and Skeletonema Denmark are three types of phytoplankton that cause red tides. The red worm is the only reported protozoan that can form red tides. It is colorless and feeds on phytoplankton. ; Phytoplankton pigments (mainly chlorophyll, carotene and other accessory pigments), inorganic suspended particles, and colored dissolved organic matter are the three major factors that determine the optical properties of seawater, and jointly affect the water-leaving radiation information of the ocean (such as remote sensing reflectance spectrum ), comprehensively considering the spectral properties of these three water color elements, from the spectral morphology, in the 400~900 nm band range, the spectra of different types of red tides show an obvious bimodal distribution, especially the second reflection located at 687~728nm The peak is the characteristic reflection peak of the red tide water spectrum that is different from the normal seawater spectrum. This has been successfully used in the red tide detection algorithm based on aerial hyperspectral remote sensing.

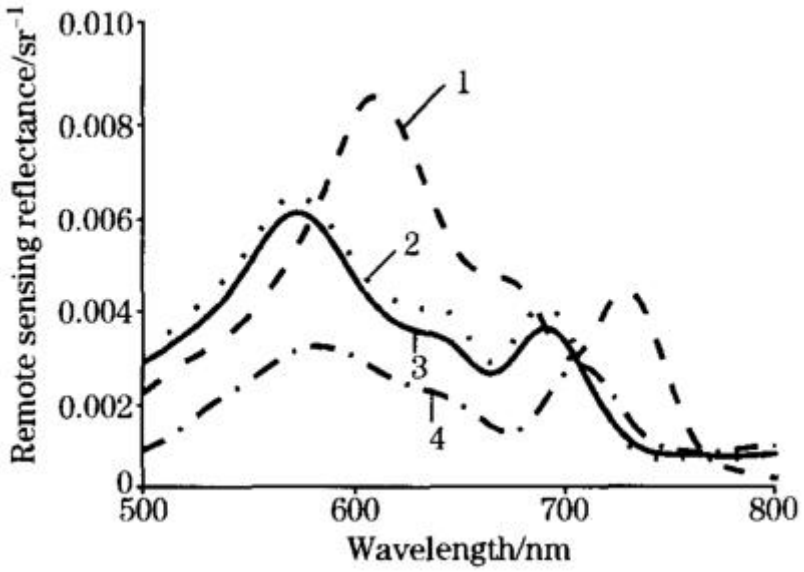


Figure 3 Hyperspectral spectrum curves of different red tide species, 1: Eriophora rubrum; 2: Skeletonema costatum; 3: Cylindrophyllum danishi; 4: Marine Phaeocystis.

1) The relatively high concentration of inorganic suspended matter is the main reason for the generation of the first reflection peak at 570~585 nm. Due to its strong scattering effect on light, the reflection peak of chlorophyll at 550 nm is annihilated, making it unobvious from the spectral curve. It is shown that the occurrence of higher concentrations of inorganic suspended solids is directly related to the near shore of the experimental sea area.



1503 Bld. A04, 3rd Software Park, Jimei, Xiamen, 361005, China
Tel: +86-592-6102588

2) The absorption of Phycocyanin, an accessory pigment, at 615~630nm forms a reflection spectrum shoulder peak near the wavelength of 640nm.

3) The absorption peak located near 670 nm originates from the strong absorption of chlorophyll.

4) The second reflection peak of the red tide water spectrum has nothing to do with the presence and content of yellow substances and suspended sediment, and is attributed to the fluorescence characteristics of chlorophyll in this band.

5) In previous ocean optical research, it is generally believed that the fluorescence peak of chlorophyll is at 685nm. However, experimental observations and spectral simulation studies in recent years have shown that as the concentration of chlorophyll a increases, while the intensity of the fluorescence peak increases, the fluorescence The outgoing wavelength will also be red-shifted.

6) The tiny reflection peak in the spectral curve near 800 nm occurs because pure water has an absorption minimum in this band.

ATP9100S-17 and ATP9100S-25 handheld hyperspectral Fieldspec spectroradiometers are the latest products of Optosky. They have a wavelength range of 200~2500 nm and are suitable for remote sensing measurements, crop monitoring, and forestry. Research and application in various fields such as oceanographic research.

ATP9100S-17 and ATP9100S-25 Fieldspec spectroradiometers are cost-effective, fast and accurate in measurement, simple to operate, and easy to carry. They are equipped with powerful software packages. In addition to reflectivity measurement, they can also be used for radiometry and photometry. and colorimetric measurements. In April 2020, the Xiamen University Jiageng ship successfully monitored red tides in the waters of Sanduao, Ningde. Based on the distribution maps monitored at different times, the movement direction of the red tides was determined, and a red tide early warning was successfully carried out.



1503 Bld. A04, 3rd Software Park, Jimei, Xiamen, 361005, China
Tel: +86-592-6102588

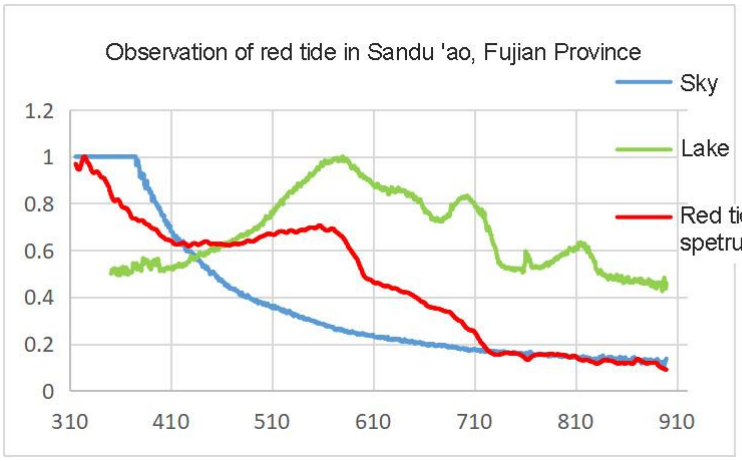


Figure 4 In April 2020, Optosky ATP9100S Fieldspec hyperspectrometer monitored red tide in Sanduao, Ningde, Fujian.

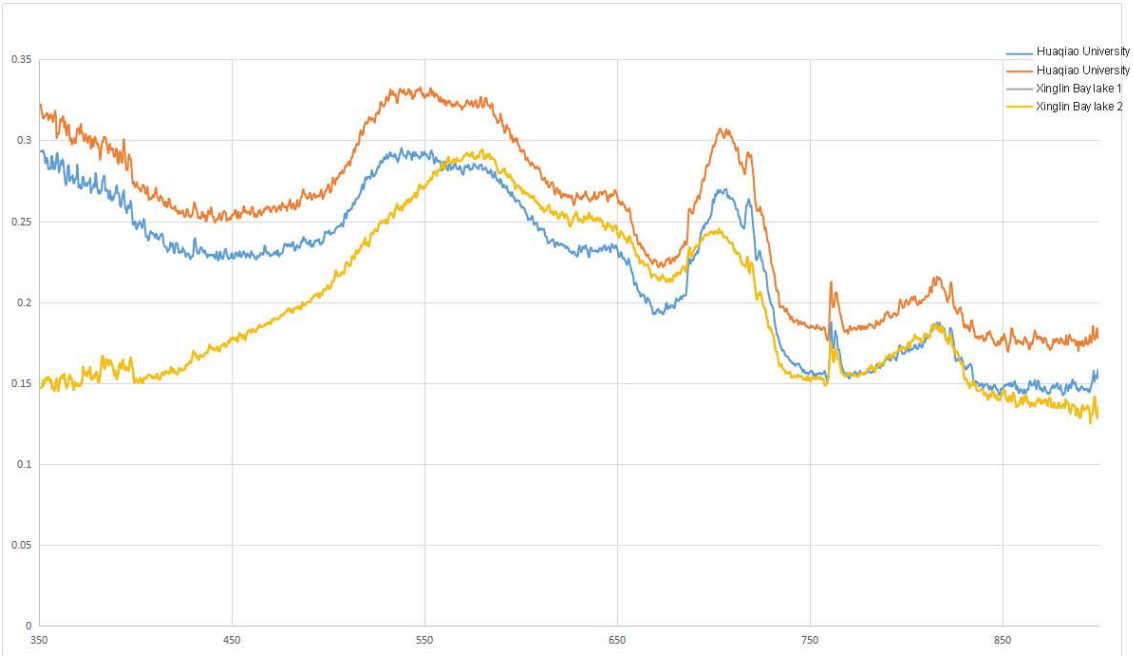


Figure 5 Application of Fieldspec hyperspectral analyzer in analyzing lake water color.




1503 Bld. A04, 3rd Software Park, Jimei, Xiamen, 361005, China
Tel: +86-592-6102588

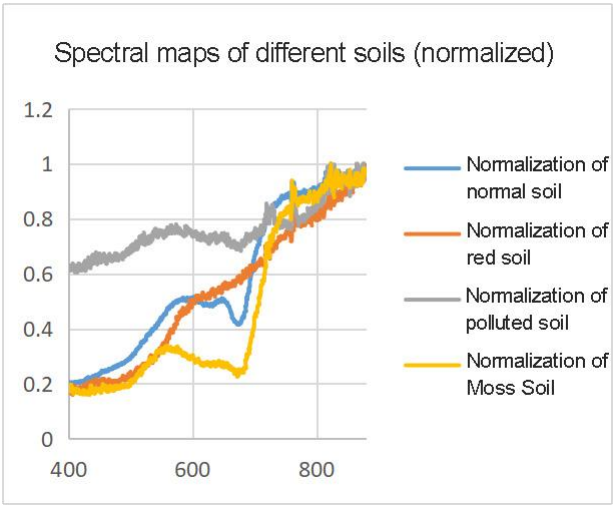


Figure 6 Application of Fieldspec hyperspectrometer in monitoring marine soil pollution.

ATP9100S is completely a self-developed product of Optosky. It has high measurement accuracy, strong portability and low cost. It can perfectly replace imported products, reduce costs and enhance the market share and competitiveness of our city's enterprises in high-end marine detection equipment.

**5.2 Application of Fieldspec spectroradiometers (hyperspectral) in agriculture**

Nitrogen is one of the main limiting factors for improving crop yields and economic benefits in arid areas. Nitrogen nutrition index (NNI) can effectively determine the nitrogen nutrition abundance and deficiency of crops in each growth period. Using hyperspectral remote sensing technology to quickly and accurately diagnose the nitrogen nutritional status of drip-irrigated cotton fields, and then optimizing the nitrogen supply during each growth period of the crop, is a key measure to improve the nitrogen use efficiency of crops and improve the soil environment. With the maturity of hyperspectral technology, the application of hyperspectral technology and algorithms to invert physiological and biochemical parameters such as crop leaf nitrogen content, chlorophyll concentration, leaf area, and biomass is currently the main means to study the nitrogen nutritional status of cotton. However, these parameters will vary depending on several aspects such as growth period, canopy density, plant morphology, climate and light. In addition, the above-mentioned parameters can only give a relatively general understanding of the nutritional status of cotton, and cannot give a qualitative judgment on the degree of nutrient



1503 Bld. A04, 3rd Software Park, Jimei, Xiamen, 361005, China
Tel: +86-592-6102588

deficiency and excess nutrition. The vegetation index is highly sensitive to nitrogen and is less affected by other factors. Therefore, changes in the vegetation index can be used to infer changes in nitrogen. The nitrogen nutritional index is more closely integrated with nitrogen content, so monitoring the nitrogen nutritional index The changes can accurately monitor the nitrogen nutritional status of plants.

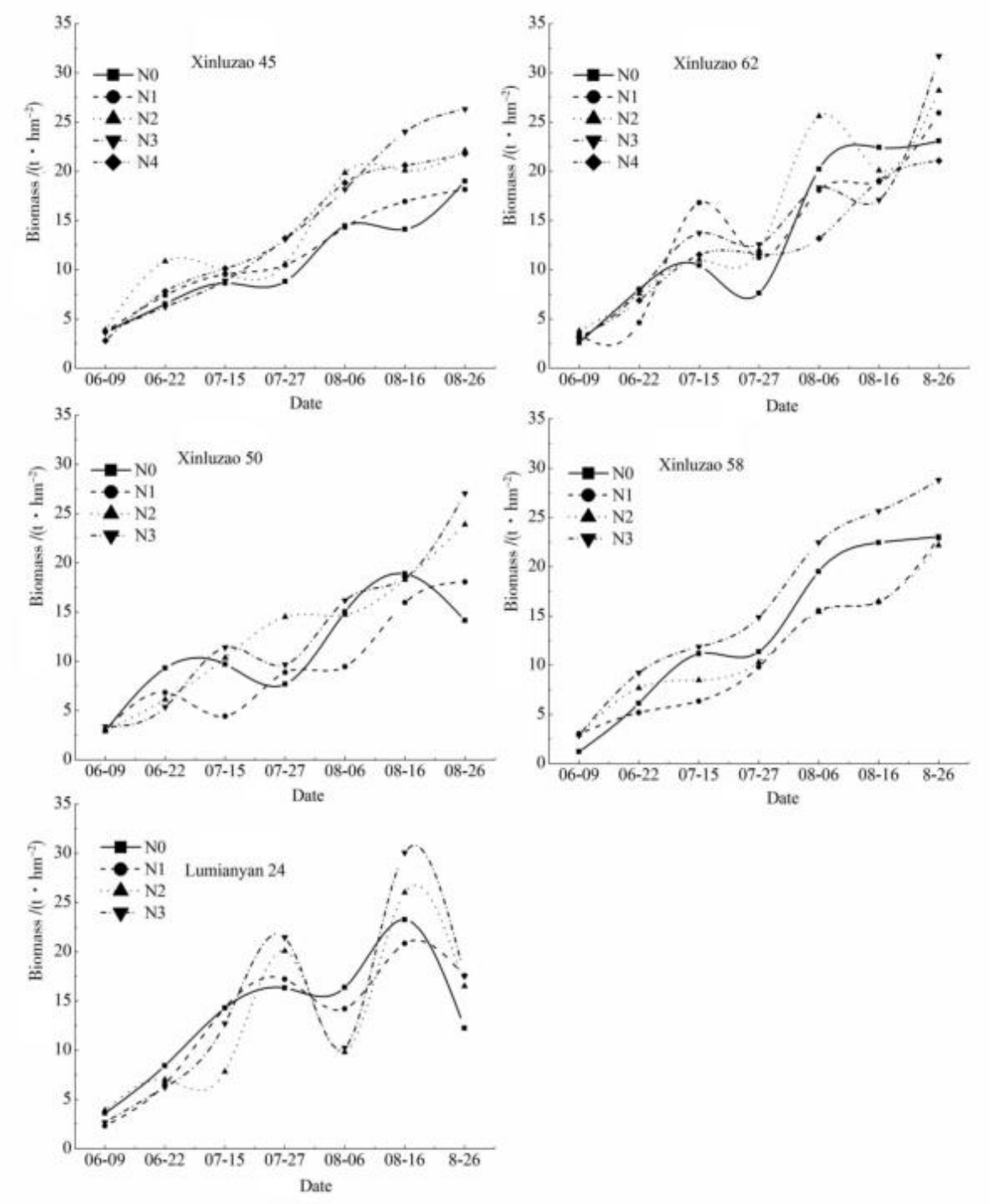


Figure 7 Biomass dynamics of different cotton varieties throughout the growth period.



1503 Bld. A04, 3rd Software Park, Jimei, Xiamen, 361005, China
Tel: +86-592-6102588

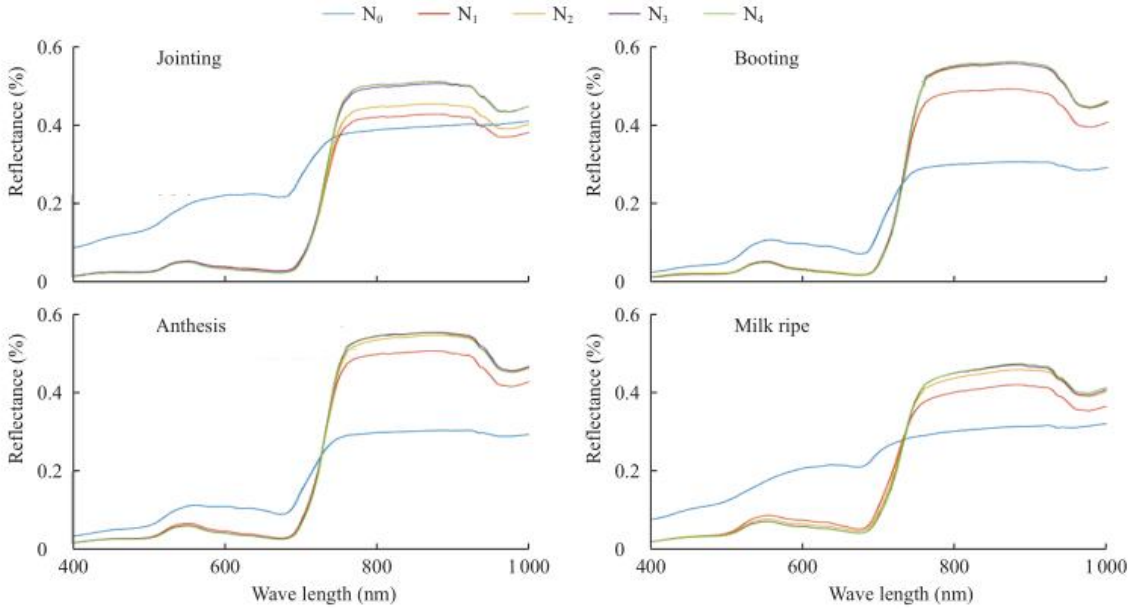


Figure 8 Spectral reflectance of winter wheat canopy under different nitrogen fertilizer gradients.

Taking full advantage of the advantages of reflectance spectral data in monitoring physiological and biochemical parameters and the advantages of canopy SIF data in monitoring the photosynthetic physiological status of vegetation, the reflectance spectral data and canopy SIF data were fused to invert the incidence of wheat stripe rust. Through comparative analysis of experimental data, it can be concluded that the accuracy of the wheat stripe rust monitoring model constructed by collaborative reflectance spectral data and canopy SIF data is higher than that of the monitoring model constructed by reflectance spectral data.

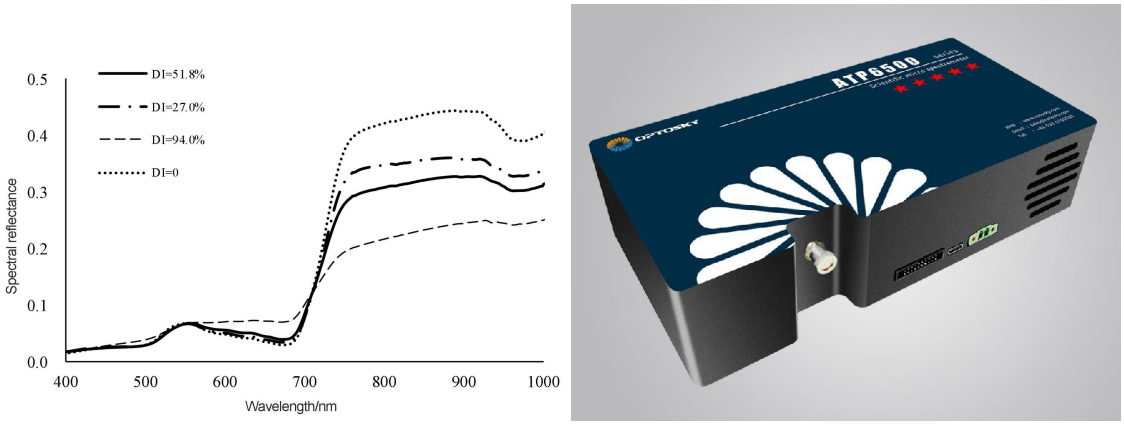


Figure 9 Original curve chart of canopy spectrum for different wheat stripe rust severity. Comprehensive use of reflectance spectral data and canopy SIF data can improve the monitoring accuracy of wheat stripe rust severity. On the right is the SIF detector produced by Optosky.



1503 Bld. A04, 3rd Software Park, Jimei, Xiamen, 361005, China
Tel: +86-592-6102588