AOMSUC-15 2025 FYSUC

THE 15TH ASIA-OCEANIA METEOROLOGICAL SATELLITE USERS' CONFERENCE (AOMSUC-15)
2025 FENGYUN SATELLITE USER CONFERENCE (2025 FYSUC)

FengYun Satellites Drive Sustainable Agricultural Ecology Development in Heilongjiang

Xu Zuomin

Contents

1. About Us—Geography

Protected Areas, Wild Fauna and Flora: There are 331 various natural reserves in the province, covering a total area of 9.156 million hectares.

The Three-North Shelterbelt Program: By 2023, the province had largely established a comprehensive shelterbelt system. It forms an integrated system where agriculture, forestry, and animal husbandry are interwoven and function cohesively.

Forests: The forest area reaches 21.5 million hectares, ranking third in the country, while the forest coverage rate stands at 47.3%, ranking ninth nationally.

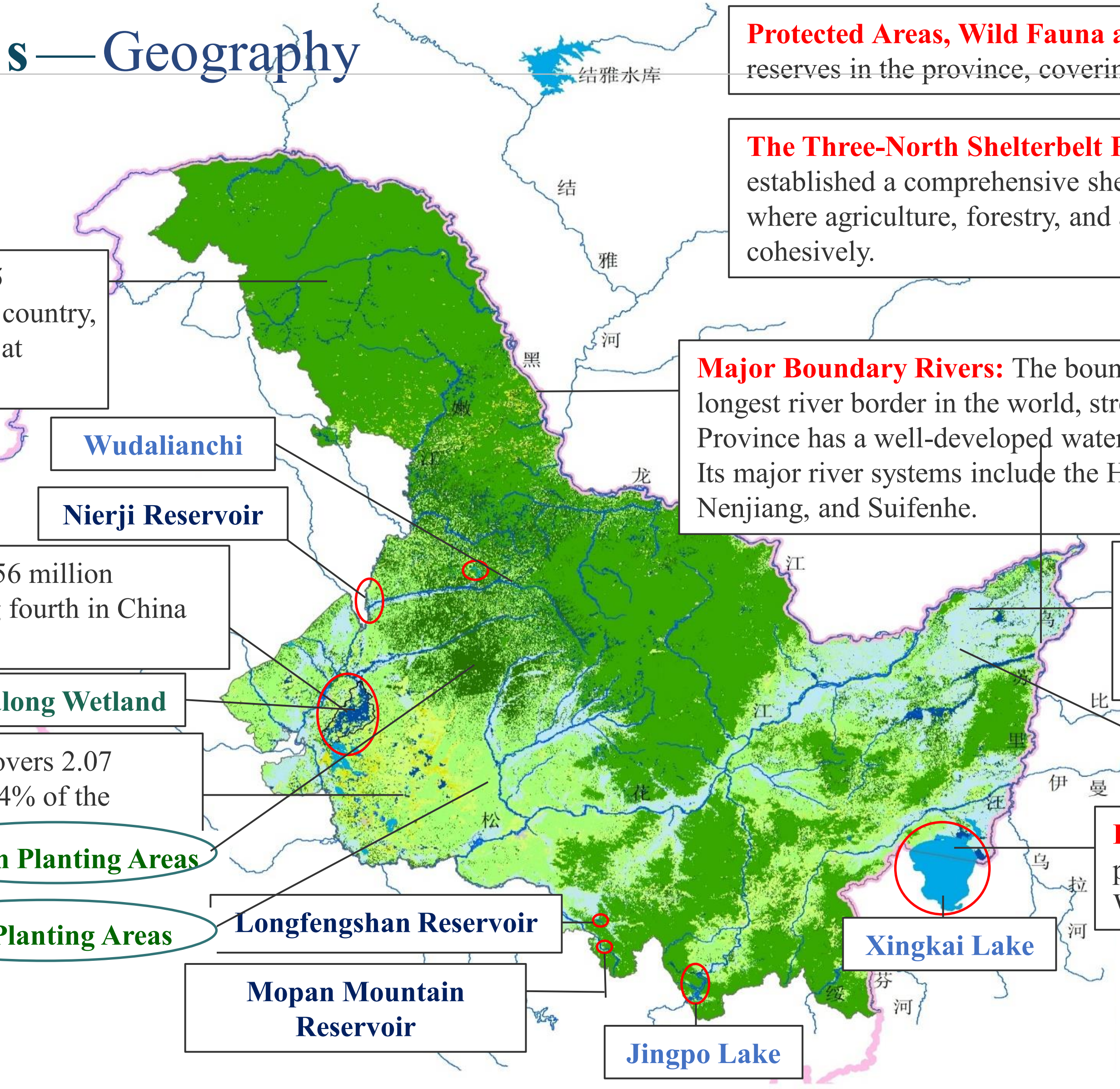
Major Boundary Rivers: The boundary rivers between China and Russia form the longest river border in the world, stretching 3,575 kilometers in total. Heilongjiang Province has a well-developed water system with numerous interconnected rivers. Its major river systems include the Heilongjiang, Songhuajiang, Wusulijiang, Nenjiang, and Suifenhe.

Wetlands: The province contains 5.56 million hectares of natural wetlands, ranking fourth in China in terms of wetland area.

Farmland: The province currently has 239 million mu (approximately 15.93 million hectares) of cultivated land, accounting for one-ninth of the national total.

Grasslands: The grassland area covers 2.07 million hectares, accounting for 4.4% of the province's total land are

Lakes: The province boasts numerous lakes, primarily including Xingkai Lake, Jingpo Lake, Wudalianchi, and Lianhuan Lake.



1.About Us—Institutional Introduction

Heilongjiang Meteorological Bureau:

- In October 2018, the Heilongjiang Ecological Meteorology Center (Heilongjiang Ecological Remote Sensing Center) was established.

China Meteorological Administration:

- In 2020, the China Meteorological Administration approved the establishment of the Northeast Satellite Meteorology Data Center.

Heilongjiang Provincial Government:

- In 2020, the Provincial Institutional Committee approved the allocation of 8 additional public institution staff positions.
- In 2022, the provincial government approved an investment of 87.836 million yuan for the construction of the operational building of the Northeast Satellite Meteorology Data Center.

Longfengshan Regional Atmospheric Background Station:

- Collaborates with the Chinese government, the UN World Meteorological Organization (WMO), the Global Environment Facility (GEF), and other relevant institutions to implement an international cooperation project monitoring mesoscale atmospheric background pollution concentrations.
- One of the three earliest regional background stations established in China.
- Incorporated into the Global Atmosphere Watch (GAW) program of the WMO and cited in IPCC international reports.
- Designated as a National Field Scientific Observation and Research Station by the Ministry of Science and Technology.
- Classified as a Category II National Station for Harsh Working Conditions.

2.Advancing Agriculture with Remote Sensing

STEP 01 Spring Sowing

- ✓ Snow Cover
- ✓ Straw Utilization
- ✓ Spring Sowing Prediction (Drought, Temperature, ...)

STEP 02 Summer Growth

- ✓ Planting Area Mapping
- ✓ Crop Growth Monitoring
- ✓ Drought/Waterlogging Monitoring
- ✓ Crop Pests and Diseases
- ✓ Fertilization Effect Evaluation
- ✓ ......

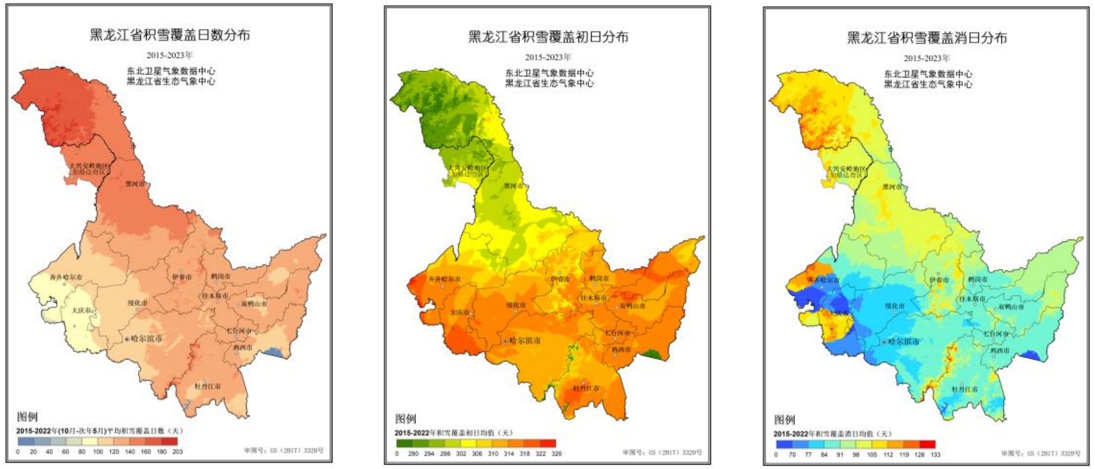
STEP 03 Autumn Harvest

- ✓ Crop ConditionAutumn Harvest Suitability Assessment
- ✓ Autumn Harvest Progress
- ✓ ......

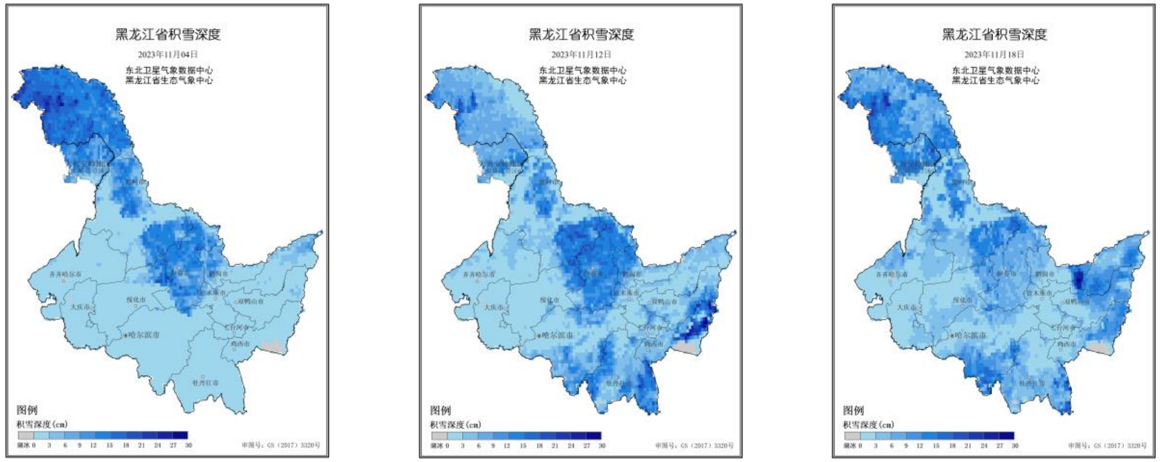
STEP 04 Winter Storage

- ✓ Autumn Straw Disposal
- ✓ Snow Cover Monitoring and Assessment
- ✓ ......

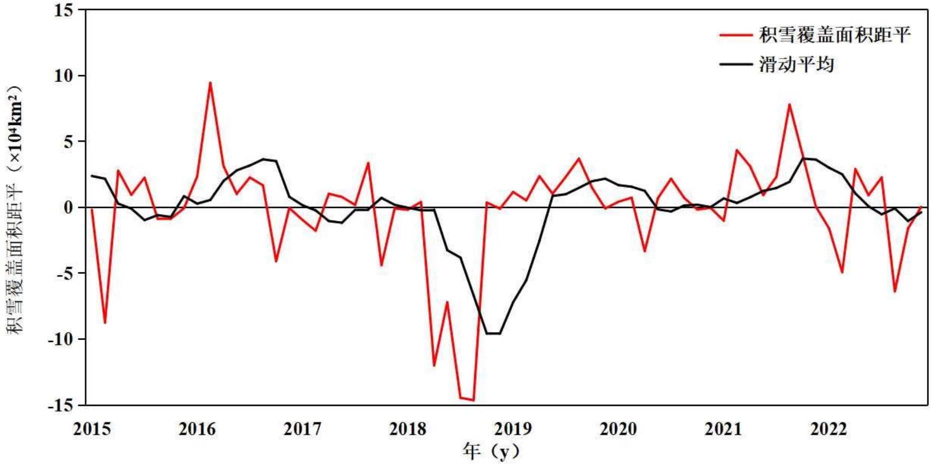
2.Agricultural Remote Sensing — Snow Cover



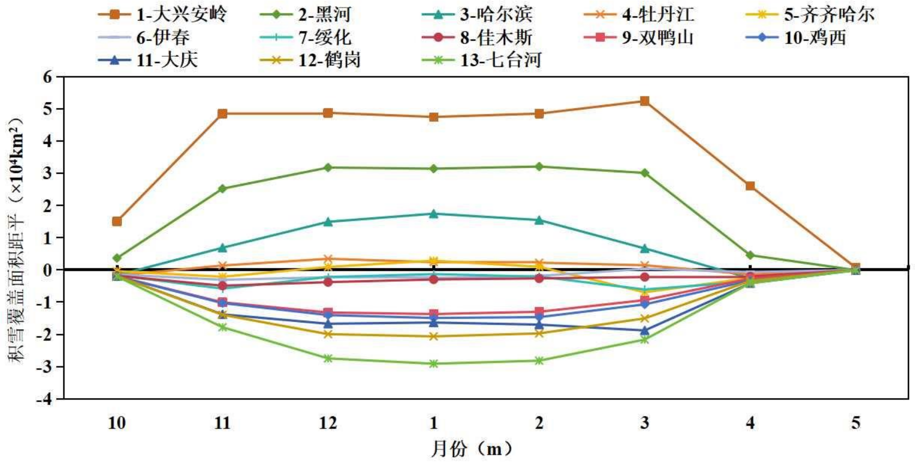
Spatial Distribution of Snow Cover Season Parameters (Duration, Onset, and End Dates) in Heilongjiang Province from October to May



Microwave-derived Snow Depth Distribution on 4 (left), 12 (middle), and 18 (right) November 2023



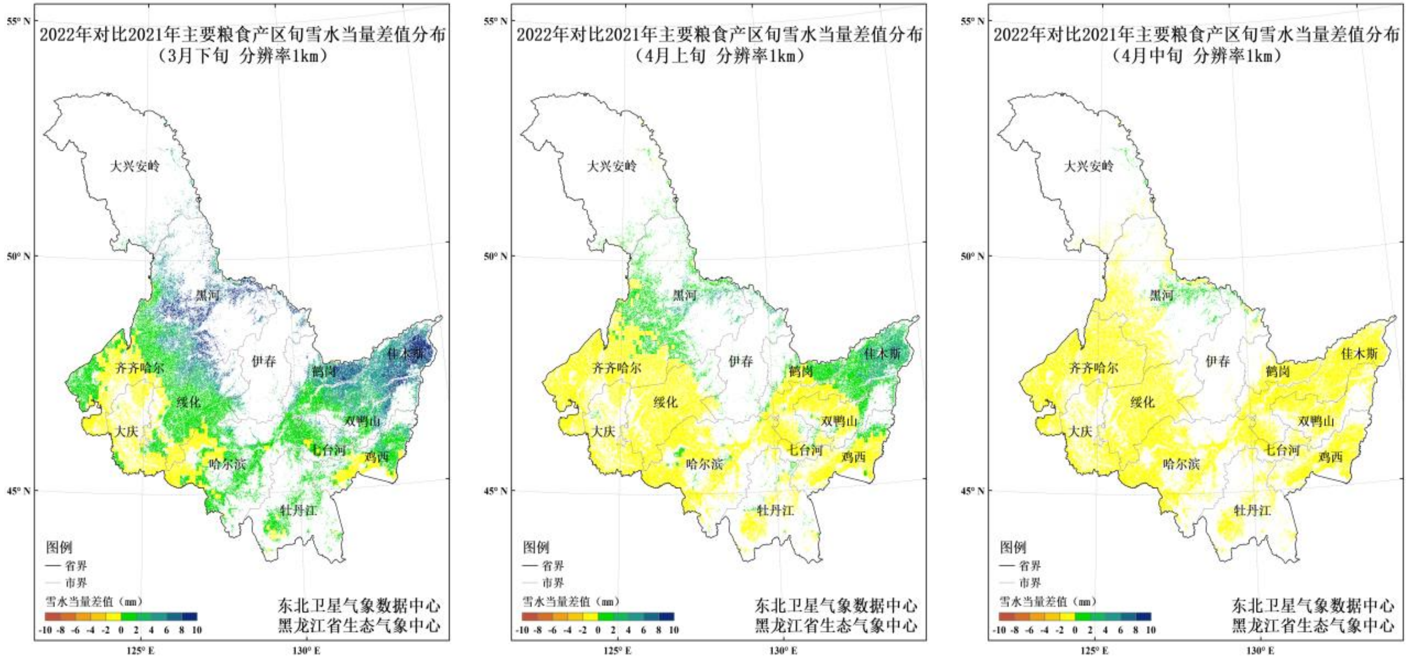
Anomaly in the Mean Snow-Covered Area in Heilongjiang Province (October–May)



Monthly Anomalies in Mean Snow-Covered Area by City in Heilongjiang Province (October–May)

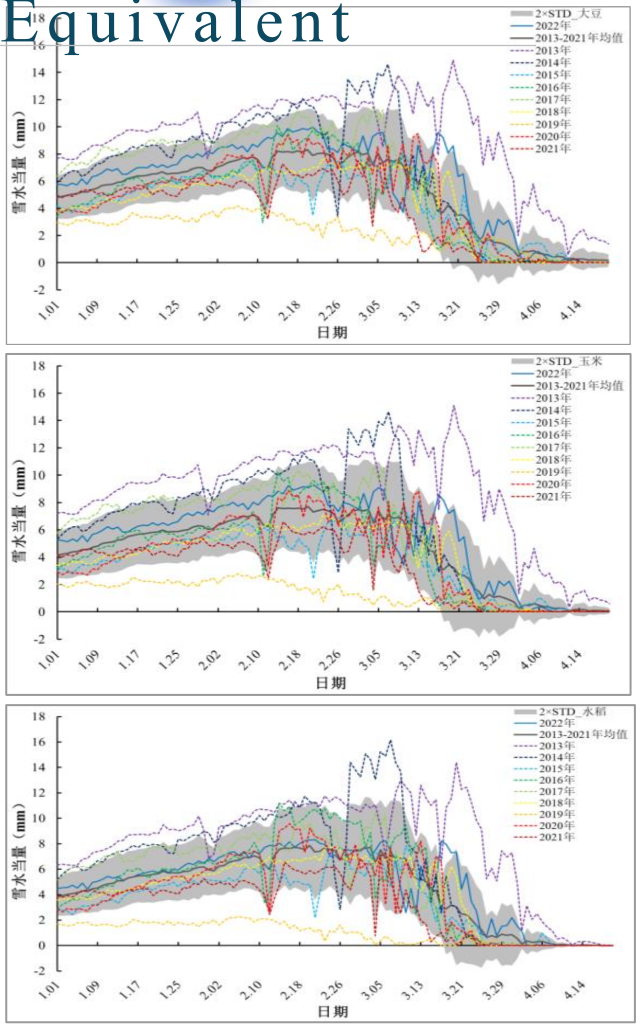
2.Agricultural Remote Sensing — Snow Water Equivalent

Snow Water Equivalent (SWE) serves as a significant indicator of soil moisture content following snowmelt and permafrost thaw. It **provides critical guidance for monitoring and predicting soil moisture levels**, thereby **supporting preparedness for spring ploughing and sowing**. This part monitored and analyzed spatiotemporal variations in SWE and soil moisture content within the primary production regions of key crops (soybean, corn, rice) in Heilongjiang Province during the pre-spring farming period.



（a）3 月下旬　（b）4 月上旬　（c）4 月中旬

Spatial Distribution of 10-Day Mean SWE Differences in Major Grain-Producing Regions



SWE Variations in Three Major Grain-Producing Regions

2.Agricultural Remote Sensing — Straw Burning

Ultimate Goal: High-quality agricultural development and high-level ecological conservation.

Efficient Utilization

The comprehensive utilization of straw is achieved through its conversion into forage, bioenergy, cultivation substrates, and industrial raw materials, with an overall comprehensive utilization rate reaching 95%.

Delineation of No-Burn Zones

A one-kilometer buffer around sensitive sites (e.g., urban built-up areas, airports, highways) and a 200-meter buffer in the Wildland-Urban Interface.

Crop Residue Management

A 'wall-chart operation' approach was implemented, delineating differentiated control units and demarcating zones for prescribed burning.

Integrated

Precise prescribed burning is ensured through stringent planning, thorough inventory, meticulous organization, and comprehensive supervision.

Effectiveness Evaluation

Regions with no fire spots and no severe pollution (local or downwind) during the ban are eligible for a reward.

2. Agricultural Remote Sensing — Straw Burning

Fengyun Series and multi-source satellites conduct real-time monitoring of straw burning hotspots.

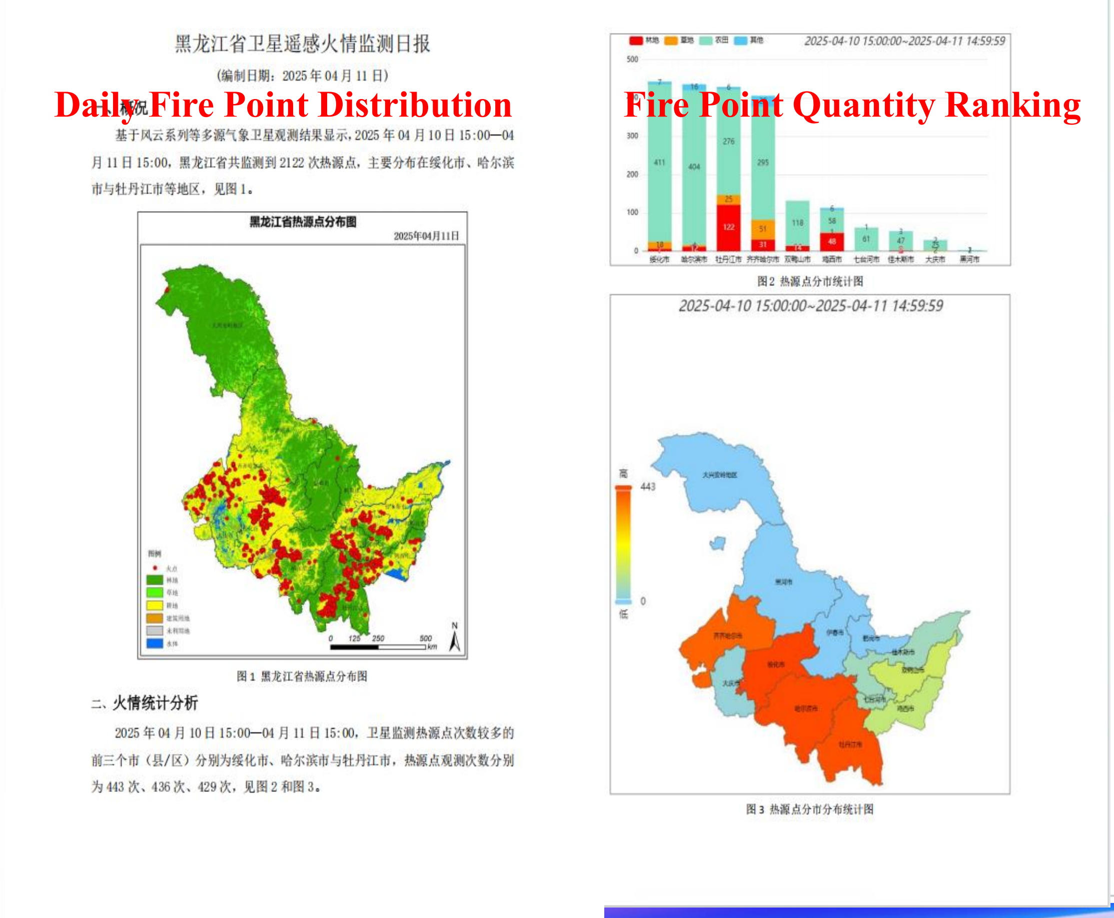
FY-3C	Polar-Orbiting Satellite	<45	1000	70
FY-3D		<45	1000	70
FY-3E		<45	250 / 1000	70
FY-3G		<45	500	35
FY-3F		<45	1000	70
NPP		20~35	375 / 750	15 / 45
NOAA-20		20~35	375 / 750	15 / 45
NOAA-21		20~35	375 / 750	15 / 45
TERRA		45~90	1000	60
AQUA		45~90	1000	60

FY-4A	Geostationary Satellite (Near Real-Time)	<20	2000	250
FY-4B		<20	2000	200
Himawari-9		<20	2000	180
GK-2A		<20	2000	150

Data from
10 polar-orbiting and 4 geostationary satellites
are fused into an integrated observation network.

2.Agricultural Remote Sensing — Straw Burning

Create a comprehensive daily straw utilization assessment report with one click. The report will include: the daily distribution of fire points throughout the region, a ranking of fire point counts by prefecture-level city, an assessment of planned burning activities, evaluation of straw dryness levels, and guidance recommendations for zones suitable for planned burning.



黑龙江省卫星遥感火情监测日报

(编制日期：2025年04月11日)

基于风云系列等多源气象卫星观测结果显示，2025年04月10日15:00—04月11日15:00，黑龙江省共监测到2122次热源点，主要分布在绥化市、哈尔滨市与牡丹江市等地区，见图1。

图1 黑龙江省热源点分布图

二、火情统计分析

2025年04月10日15:00—04月11日15:00，卫星监测热源点次数较多的前三个市（县/区）分别为绥化市、哈尔滨市与牡丹江市，热源点观测次数分别为443次、436次、429次，见图2和图3。

图2 热源点分市统计图

图3 热源点分市分布统计图

2025年04月10日15:00—04月11日15:00，卫星监测明火面积较多的前三个市（县/区）……分别为1451.43亩、1390.23亩、1331.16亩，见图3。

图4 明火面积统计图

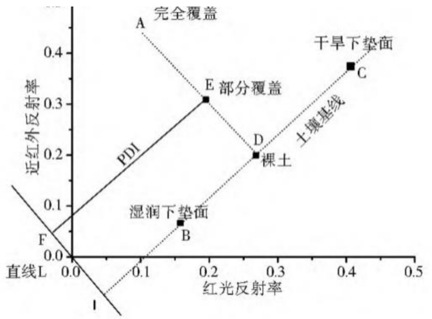
分时统计监测显示，2025年04月10日15:00—04月11日15:00，热源点较多出现……

图5 热源点分时统计图

秸秆残余物处置建议热源点叠加分布图显示，2025年04月10日15:00—04月11日15:00，热源点主要集中在利于扩散区域，不利于扩散、重点管控区域也监测到部分热源点，见图6。

2.Agricultural Remote Sensing — Drought Monitoring

Optical Remote Sensing



Perpendicular Drought Index (PDI)

计算公式为:

$$PDI = \frac{R_{red} + M \times R_{nir}}{\sqrt{M^2+1}}$$

其中Rred 和 Rnir 分别是大气校正后的红光与近红外波段反射率，M 为土壤线斜率，通过Rnir 和Rred 线性拟合计算得到。

温度植被干旱指数 TVDI

通过温度植被干旱指数（TVDI）估算土壤水分的方法，利用全遥感数据，不需要借助其他任何地面实测资料，通过归一化植被指数（NDVI）和地表温度（Ts）计算温度植被干旱指数（TVDI）

1）地表温度（Ts）计算方法见 1.LST 计算。

2）归一化植被指数（NDVI）计算方法见 2.NDVI 计算。

3）温度植被干旱指数（TVDI）。其计算式为:

Temperature Vegetation Dryness Index (TVDI)

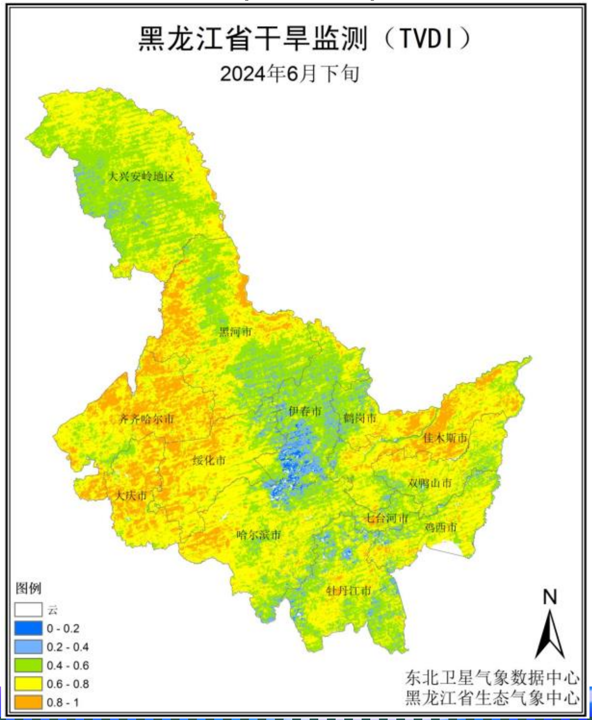
植被垂直干旱指数 VAPDI

引入垂直植被指数 PVI，对 PDI 进行改进，得到植被垂直干旱指数 VPDI，计算公式为:

$$VPDI = PDI(A) - \frac{|PDI(A) - PDI(X)| * PVI(A)}{PVI(A) - PVI(X)}$$

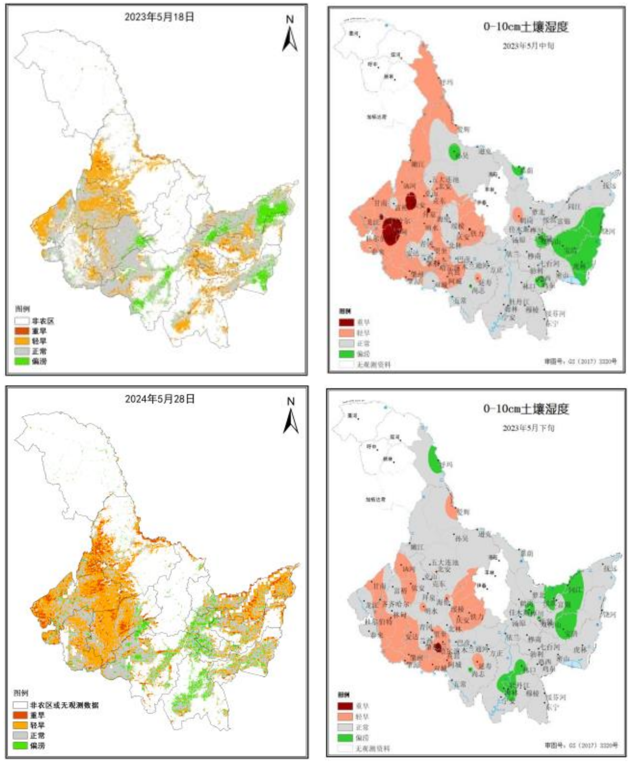
$$PVI = \frac{|NIR - M * RED - I|}{\sqrt{M^2+1}}$$

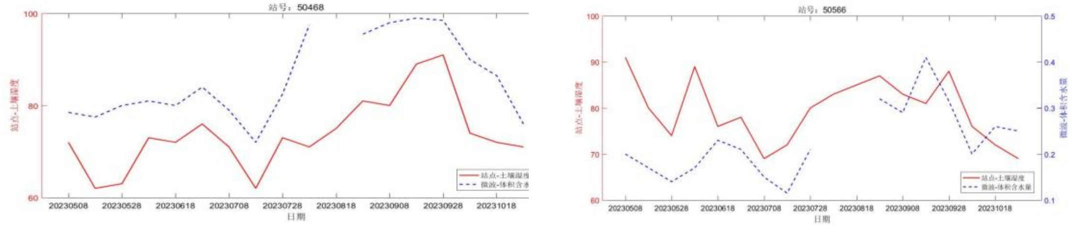
Vegetation Atmosphere Perpendicular Drought Index (VAPDI)



Microwave Remote Sensing

- The spatial distribution trends of soil moisture from the two datasets are generally consistent.
- The temporal variation trends of soil moisture displayed by the two products are relatively consistent.
- The multi-source microwave soil moisture product indicates overall drier soil conditions in Heilongjiang Province compared to the 0-10 cm soil moisture product, which is related to the monitoring depth of microwave remote sensing.





Microwave Remote Sensing Soil Moisture vs. Agricultural Weather Station Soil Moisture Monitoring

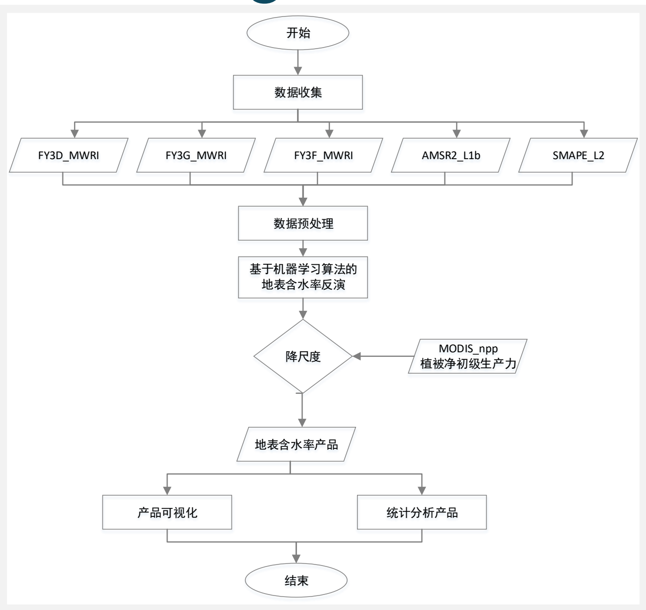
2.Agricultural Remote Sensing — Drought Monitoring

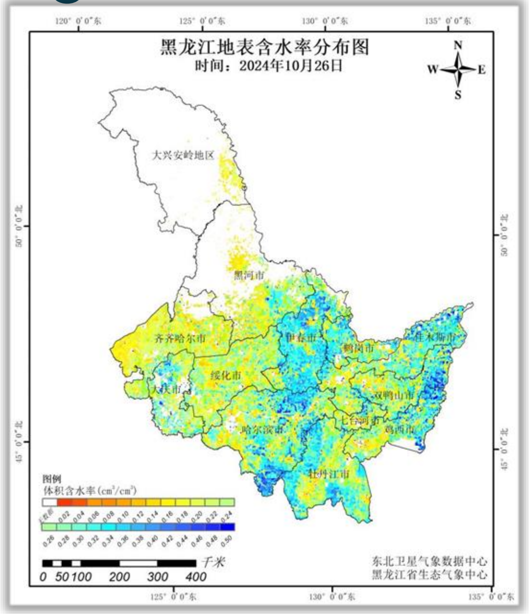
Multi-sensor Microwave Soil Moisture Retrieval Algorithm

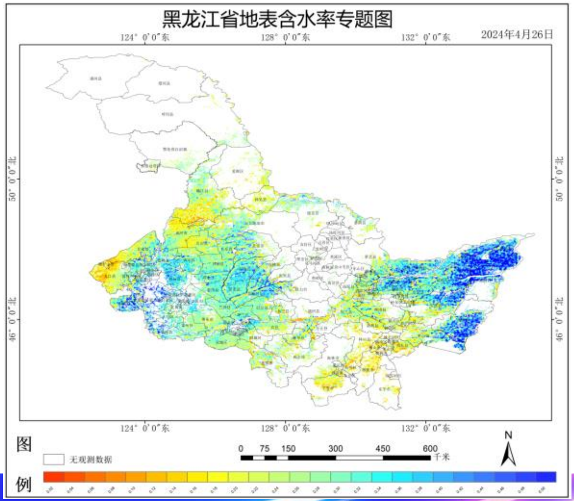
——Daily soil moisture product with 1km resolution.

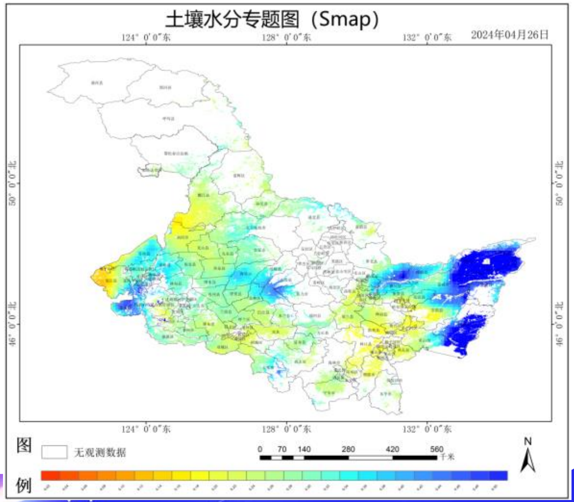
The **Microwave Soil Moisture Inversion Algorithm** utilizes multi-source satellite microwave remote sensing data (**FY3D-MWRI, FY3F-MWRI, FY3G-MWRI, AMSR2, SMAP**) and **machine learning techniques** for the quantitative retrieval of soil moisture content. Its objective is the precise monitoring of soil hydrographic conditions within Heilongjiang Province, supplying critical parameters for soil moisture assessment.

No.	Data Name	Satellite	Sensor	Temporal Resolution	Spatial Resolution	Data Format	Description
1	FY3D_MWRI	FY3D	MWRI	Once per day	25km	.TIF	Preprocessed
2	FY3G_MWRI	FY3G	MWRI	Once per day	25km	.TIF	Preprocessed
3	FY3F_MWRI	FY3F	MWRI	Once per day	25km	.TIF	Preprocessed
4	AMSR2_L2	GCOM-W1	AMSR2	Twice per day	10km	.img	Preprocessed
5	SMAP_L2	SMAP	L-band Microwave Radiometer	Twice per day	10km	.img	Preprocessed
6	MODIS_npp	Aqua/Terra	MODIS	Twice per day	1km	.TIF	Preprocessed









2.Agricultural Remote Sensing — Drought Monitoring

The microwave soil moisture data is utilized in the **"Food Security Service Report"** of Heilongjiang Province and is **regularly submitted to the provincial government**.

气 象 信 息

第 107 期

黑龙江省气象局 2023 年 8 月 11 日 14 时

保障粮食安全服务专报（第 011 期）

气 象 信 息

第 68 期

黑龙江省气象局 2024 年 6 月 7 日 14 时

保障粮食安全服务专报（第 13 期）

气 象 信 息

第 74 期

黑龙江省气象局 2024 年 6 月 20 日 14 时

保障粮食安全服务专报（第 15 期）

三、前期地表含水量遥感监测

使用微波遥感数据对黑龙江省 8 月 1 日以来的地表含水量进行监测，结果显示哈尔滨市中部地区、牡丹江市和伊春市地表含水量明显高于其它地区，伊春市地表含水量大于 0.5m³/m³（图 4）。

与近三年同期相比，哈尔滨、牡丹江、佳木斯西部、绥化东部和七台河地表含水量显著升高（图 5）。

8 月 1-7 日地表含水量与 7 月 25-31 日空间分布对比显示，大庆市地表含水量减少，受近期降水影响，哈尔滨、齐齐哈尔东部、牡丹江、七台河、双鸭山、伊春南部、黑河南部和绥化北部地表含水量增加明显，部分地区地表含水量增加大于 0.2m³/m³。7 月 25 日以来黑龙江省平均地表含水量呈现明显增加趋势。

注：地表含水量（单位：m³/m³）是土中水的体积与土的总体积的比值。

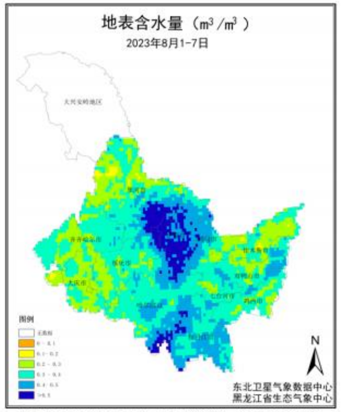
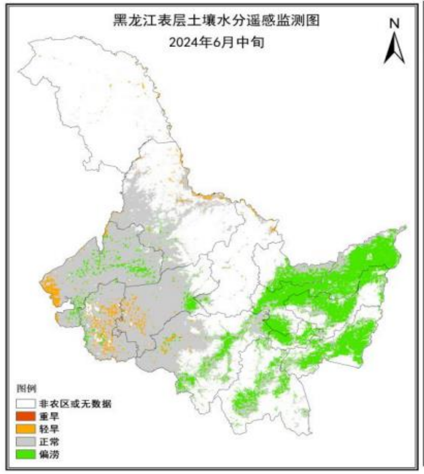


图 4 2023 年 8 月 1-7 日地表含水量空间分布

二、当前农田墒情

截至 6 月 18 日，我省耕层（0-10 厘米）土壤龙江、杜尔伯特和哈尔滨市辖区共 3 个测墒点土壤轻旱，三江平原大部、牡丹江大部、黑河局部及松嫩平原个别县（市）共 38 个测墒点土壤处于偏涝状态；其它测墒点土壤墒情正常（图 4）。根据多源卫星遥感数据对黑龙江省作物种植区表层（0-3 厘米）土壤水分监测显示：6 月中旬我省三江平原和牡丹江地区土壤偏涝，松嫩平原西部和南部局地土壤偏旱，其它区域土壤墒情正常（图 5）。



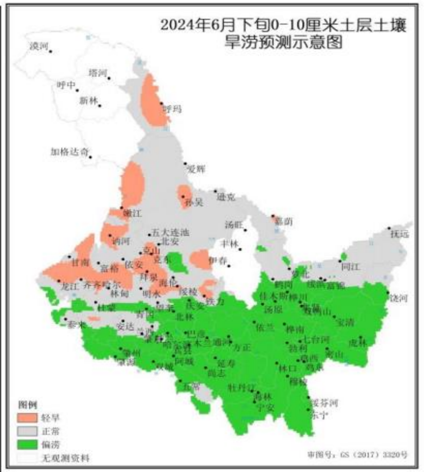


图 5 6 月中旬表层（0-3 厘米）土壤水分遥感监测 图 6 6 月下旬 0-10 厘米土壤旱涝预测

2.Agricultural Remote Sensing — Drought Monitoring

Microwave soil moisture data played a key role in the **Suihua Soil Moisture Monitoring Report**, forming a critical evidence base for its decisions. **The mayor's directive on the report prompted the full adoption and affirmation of its analysis and actionable recommendations.**

报告很好，能够在关键时间精准分析监测，为春播生产提了精准服务。请转发至市农业农村局各县市区。

4.29

土壤水分监测公报

2025 年第 7 期

东北卫星气象数据中心
黑龙江省生态气象中心
绥化市气象局

2025 年 4 月 29 日

绥化市 2025 年 4 月 29 日土壤水分监测公报

一、表层土壤水份监测

根据多源卫星遥感监测数据，2024 年 4 月 29 日绥化市表层土壤水分呈现出显著的空间差异。其中，西部和东部部分地区土壤水分偏高，东部大部分地区表层土壤含水率超过 0.3 cm³/cm³，处于湿润状态，部分地区甚至达到偏涝程度。爱民乡海伦农场南部、四海店镇、发展乡和新华乡局部地区土壤含水率偏低，出现轻旱现象；其他地区土壤墒情正常（见图 1）。与近 2 年同期相比，绥化市东北部局部地区土壤墒情明显偏湿，而其他区域土壤墒情与近 2 年同期基本持平（见图 2）。

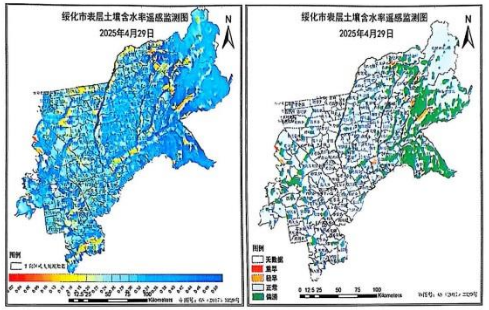


图 1 多源卫星遥感绥化市表层土壤水份监测图（2025 年 4 月 29 日）

图 2 多源卫星遥感绥化市表层土壤水份监测对比图
（2025 年 4 月 29 日与近 2 年同期）

二、0～30cm 深度土壤水份监测

4 月 28 日测墒结果显示：0～30cm 深度平均土壤相对湿度，全部正常（见图 3）。其中 10cm 深度土壤，全部正常。20cm 深度土壤，全部正常。30cm 深度土壤，北林偏涝，其它正常。

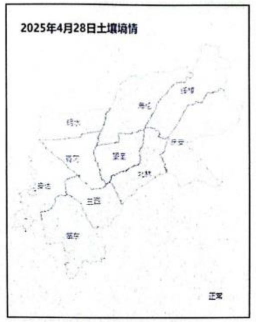


图 3 4 月 28 日 0～30 厘米平均土壤相对湿度

三、未来天气预报

4 月 29 日-5 月 5 日绥化市以晴到多云天气为主，5 月 1 日、3 日多云有分散性阵雨，前期气温下降，5 月 2 日开始气温波动回升。4 月 29 日、5 月 3 日我市大部有 4～5 级偏西风或偏南风，阵风可达 8 级。具体预报结论如下：

4 月 29 日午后到夜间：晴间多云，偏南风 4～5 级转 3～4 级，最高气温 16～18℃，最低气温 3～5℃。

4 月 30 日：晴转多云，南风 3～4 级，最高气温 15～17℃，最低气温 5～7℃。

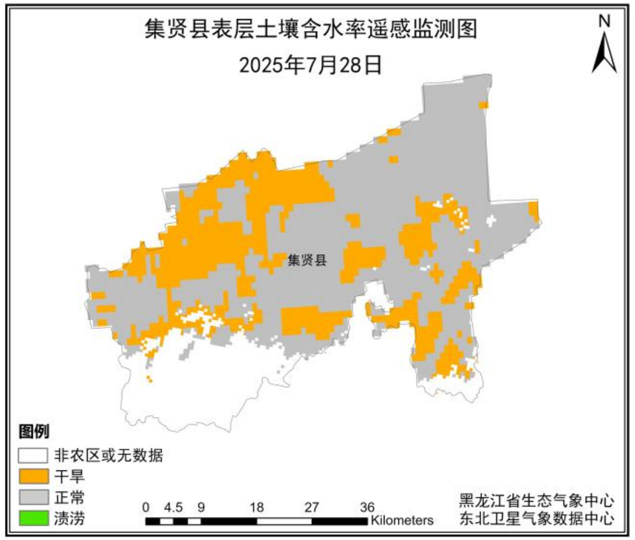
5 月 1 日：多云有分散性阵雨，西北风 2～3 级，最高气温 14～16℃，最低气温 1～4℃。

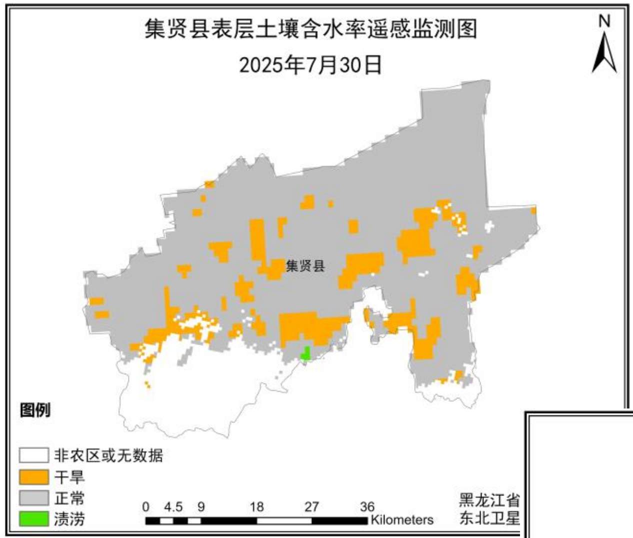
5 月 2 日：晴间多云，西北风 3～4 级，最高气温 16～18℃，最低气温 4～7℃。

5 月 3 日：多云有分散性阵雨，偏西风 4～5 级，最高气温 14～16℃，最低气温 4～6℃。

2.Agricultural Remote Sensing — Drought Monitoring

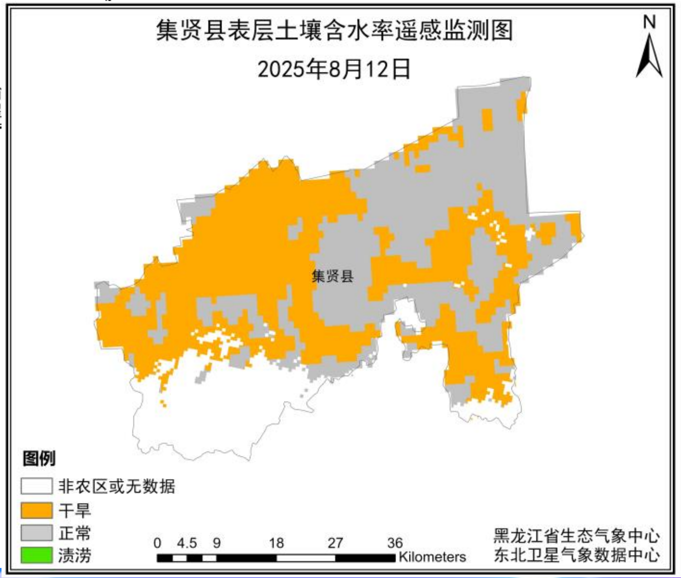
Upon **the request of the Jixian Meteorological Bureau**, we conducted an **evaluation of the artificial rainfall enhancement operations implemented** during late July and early August 2025.

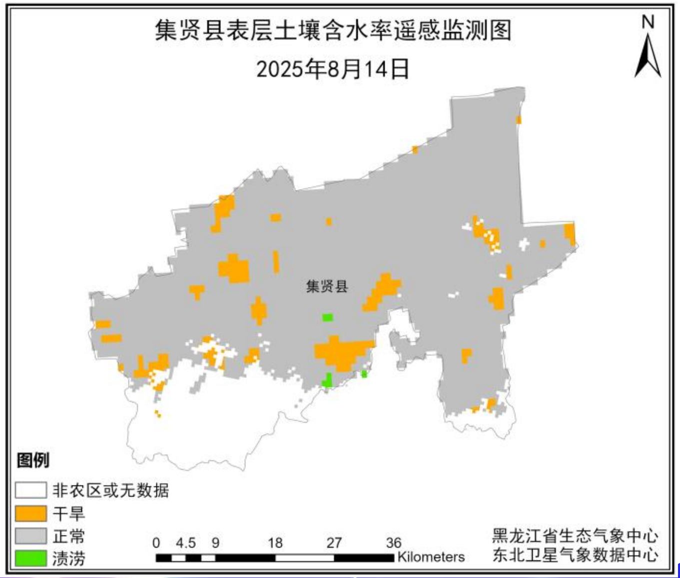




On July 28, 2025, partial areas of Jixian County experienced relatively dry soil moisture conditions, with the **drought-affected area covering 832 km²**. Following artificial rainfall operations, the soil drought area was **reduced to 401 km²**, representing a decrease of approximately 51.80% compared to the pre-operation period.

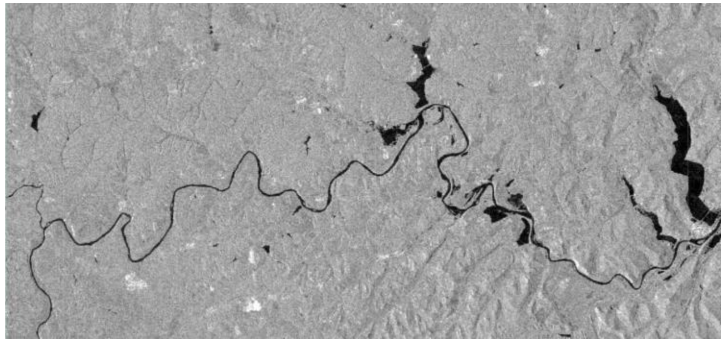
On August 12, 2025, certain areas of Jixian County experienced soil drought conditions, with **the affected area covering 1,297 km²**. Following artificial rainfall operations, the drought-affected area was **reduced to 197 km²**, representing a decrease of approximately 84.81% in the soil drought area. Both artificial rainfall operations effectively alleviated drought conditions within the county to varying degrees.





2. Agricultural Remote Sensing — Waterlogging Monitoring

Description of Data Parameters:				
Type	Satellite	Resolution	Revisit Cycle	Characteristics
Radar	Sentinel-1	10 m	5-6 days	High spatial and temporal resolution; primary operational data
	GF-3	1-10 m	3-30 days	Relatively long temporal cycle
Optical	Sentinel-2	10 m	5-6 days	High spatial and temporal resolution; primary operational data
	Landsat-9	30 m	16 days	Relatively long temporal cycle
	GF	0.8-10 m	4-40 days	Relatively long temporal cycle
	FY	**250-2000 m**	**10 min / Daily**	**High temporal resolution; multiple channels**
Timelines	30-60min			
Products	Flood water extent/area; Crop type distribution/area in inundated zones; Number of inundation days; Various disaster loss assessments; Monitoring and analysis reports			
Service	Routine: Daily 8:30 AM – 10:00 PM, Intensive: 24/7 continuous operation			



Waterlogging Monitoring Case:
Farmland Inundation in Qitaihe, Heilongjiang after Extreme Rainfall


卫星遥感农田渍涝监测报告

2024 年第 00 期

东北卫星气象数据中心
黑龙江省生态气象中心　　签发时间：2024 年 00 月 00 日

七台河市农田渍涝监测

……影像范围内监测结果显示：6 月 24 日七台河区域内农田渍涝分布情况（图 1）……67.55 平方公里，占农田分布总面积 2.71%（图 2）；其中，渍涝水稻田面积约 30.21 平方公里（图 3），占水稻田总分布面积的 12.34%；渍涝大豆田面积……（图 4），占大豆田总分布面积的 2%；渍涝玉米田面积约 26.82 平方公里……布面积的 1.56%（图 5）。渍涝区域多在水体附近，强降水后的水体扩大导致淹渍；部分区域的渍涝则可能由于降水、地形和坡度等因素导致的积涝。

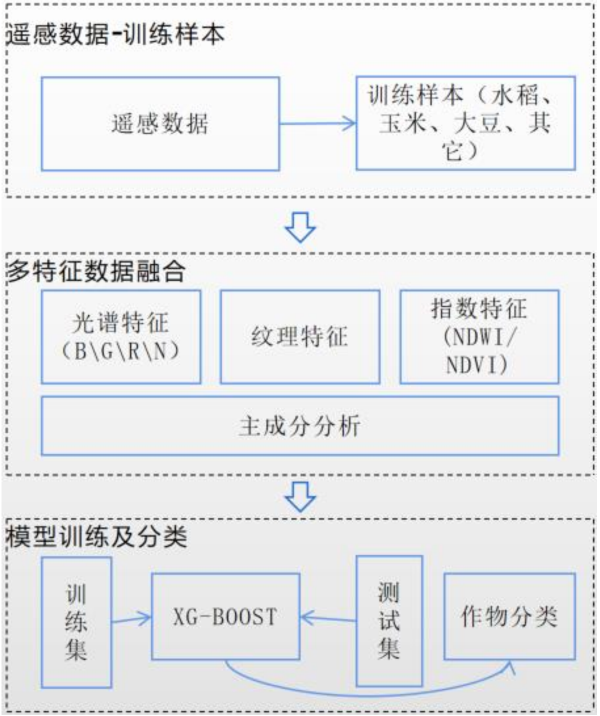
图1 高分三号卫星监测渍涝农田分布图

2.Agricultural Remote Sensing — Major Crop Classification

Large-Scale Crop Classification Algorithm via Machine Learning

XG-Boost (eXtreme Gradient Boosting) is an efficient machine learning algorithm based on the gradient boosting framework.

- **Theoretical Basis:** Gradient boosting ensemble learning
- **Missing Sample Compatibility:** Automatically handles missing categories; outputs confidence scores to identify unknown regions
- **Data Distribution Requirements:** No distributional assumptions; adapts to nonlinear/high-dimensional data
- **Feature Processing Capability:** Automatically evaluates feature importance; supports multi-source data fusion
- **Classification Robustness:** High noise resistance; prevents overfitting via regularization
- **Output Results:** Probability confidence + hard classification; enables uncertainty quantification



XGBoost Classification Methodology

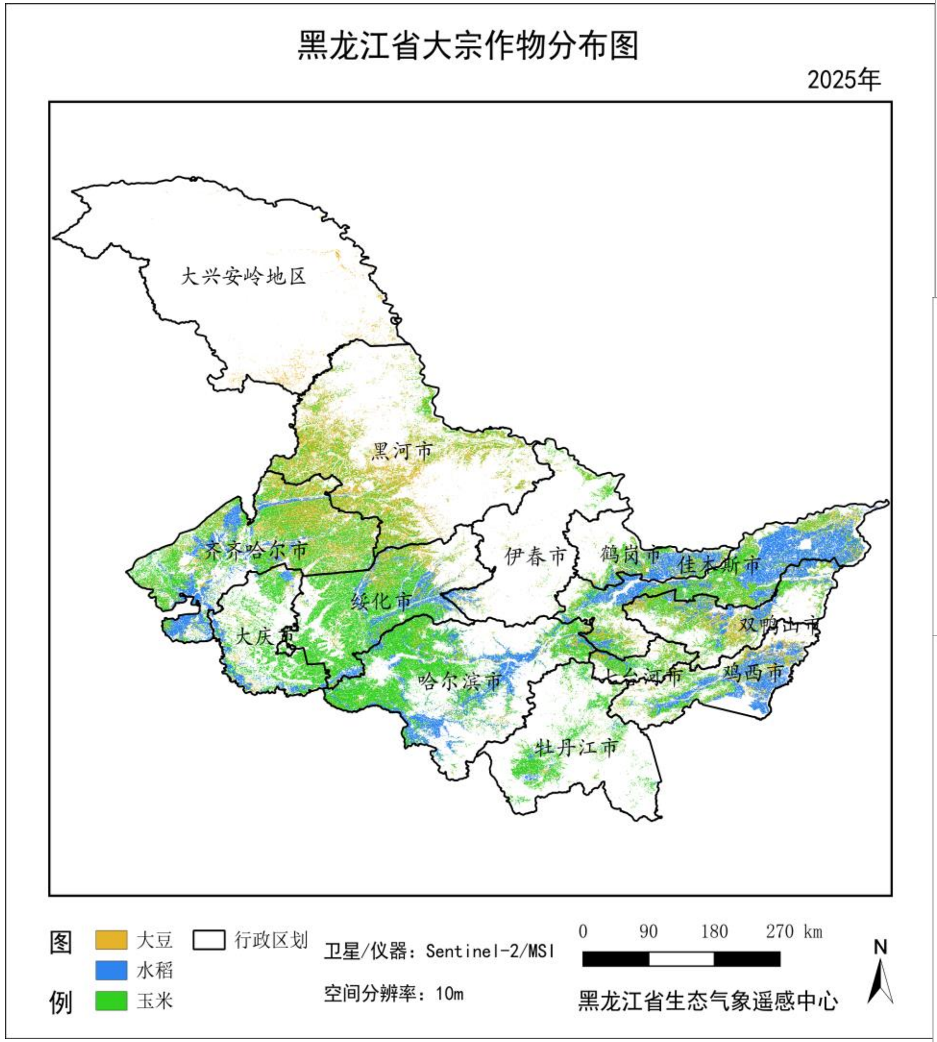
Maximum Likelihood Classification (MLC) remains irreplaceable in scenarios meeting its underlying assumptions (e.g., terrain zoning, stable feature classification), particularly in terms of efficiency and interpretability.

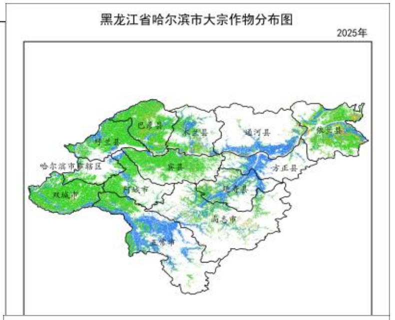
- ✓ **Normality Assumption:** The spectral features of each feature category are assumed to follow a multivariate normal distribution.
- ✓ **Parameter Interpretability:** The output directly quantifies the probability of a pixel belonging to a specific category.
- ✓ **Likelihood-Based Decision Rule:** Classification is achieved by comparing the likelihood of a pixel belonging to different categories.
- ✓ **Hard Classification Output:** Only final class labels are output; probability rasters are not retained and require additional computation.

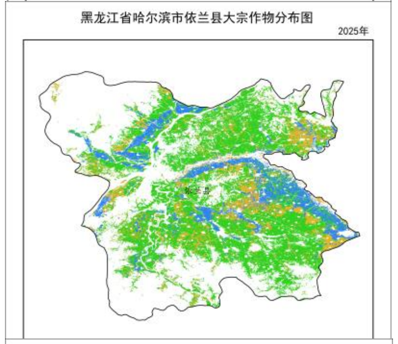
Large-Scale Classification with High-Dimensional Features

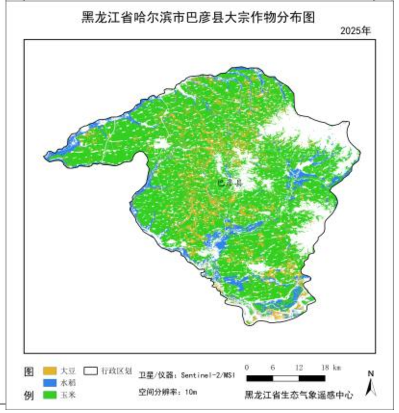
Classification at small scale and high resolution

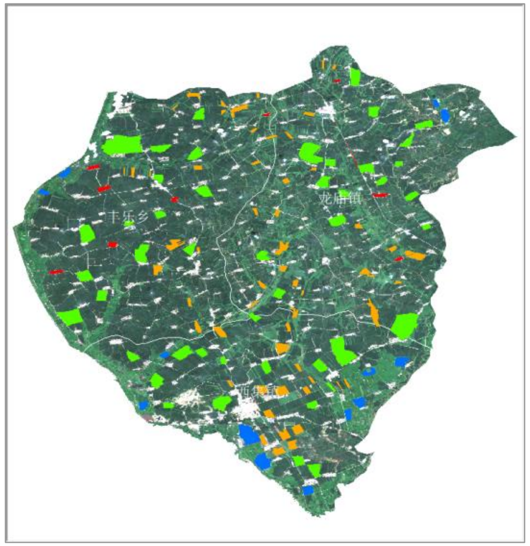
2.Agricultural Remote Sensing — Major Crop Classification



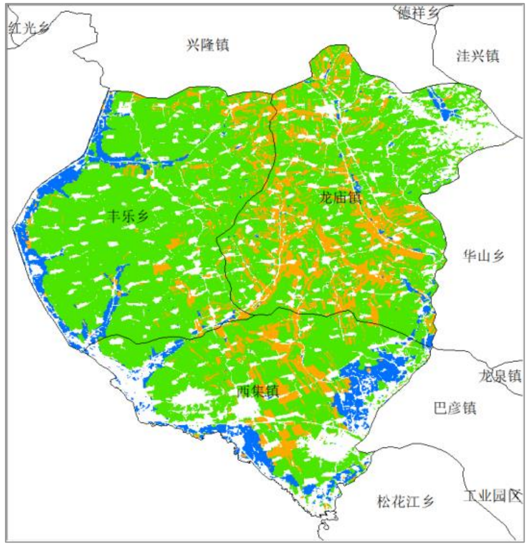








Samples



Classified Output

	Crop	Other	Misclassification	Accuracy
Soybean	156	21	11.9%	0.881
Rice	215	11	4.9%	0.951
Corn	507	46	8.4%	0.916

The final classification accuracy is 0.911, with a Kappa coefficient of 0.896.

2.Agricultural Remote Sensing — Crop Growth Monitoring

Crop Vegetation Growth Monitoring and Analysis utilizes **time-series vegetation indices** as its data foundation. By **extracting change information from vegetation indices across different temporal scales**, it enables dynamic monitoring of crop.

表 1 不同植被指数计算公式

Table 1 Formulas of various vegetation indices

植被指数	计算公式
归一化差异植被指数 NDVI	$NDVI=(NIR-R)/(NIR+R)$
增强植被指数 EVI	$EVI=2.5(NIR-R)/(NIR+6R-7.5B+1)$
差值植被指数 DVI	$DVI=NIR-R$
比值植被指数 RVI	$RVI=NIR/R$
调整土壤亮度植被指数 SAVI	$SAVI=1.5\times((NIR-R)/(NIR+R+0.5))$
土壤调节植被指数 OSAVI	$OSAVI=(NIR-R)/(NIR+R+0.16)$

注：NIR、R、B 分别为近红外、红光、蓝光波段的反射率。

Vegetation indices are widely used in vegetation type discrimination, vegetation growth assessment, and crop yield estimation.


卫星遥感夏季作物长势专报

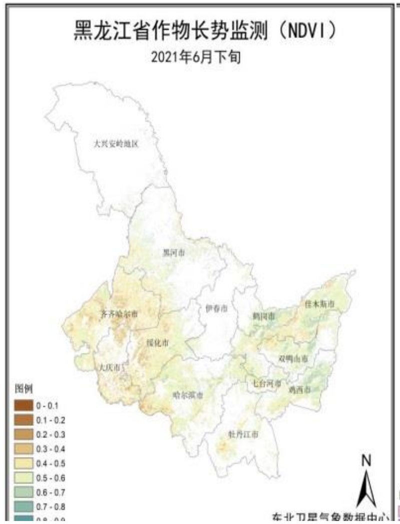
2021 年第 01 期

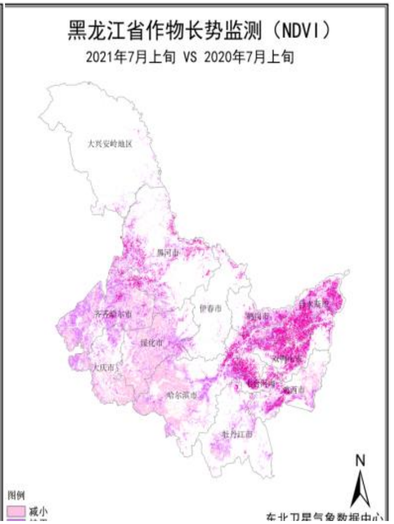
东北卫星气象数据中心

黑龙江省生态气象中心 签发时间：2021 年 06 月 11 日

2021 年 06 月上旬农区植被覆盖度较低

FY-3D 气象卫星 2021 年 6 月上旬卫星遥感作物长势监测显示，全省农区植被覆盖率为 0.4 左右（图 1）。





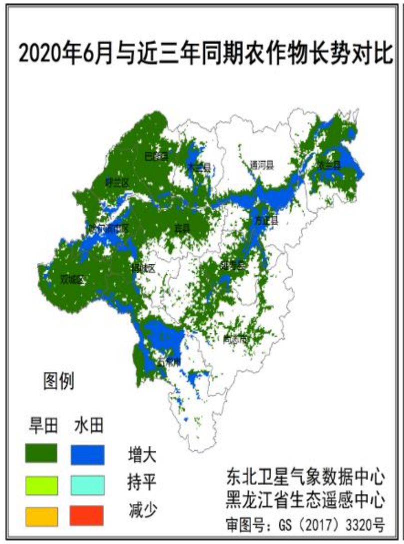

气 象 信 息 专 报

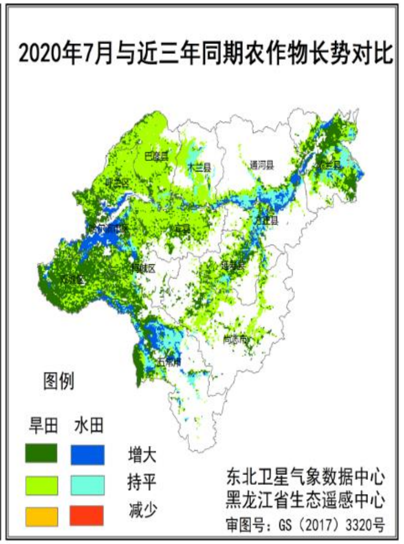
哈尔滨市气象局 2020 年 8 月 4 日第 37 期 签发：陈怀亮

哈尔滨市近期农作物长势地面监测和卫星遥感监测分析报告

摘要：全市 7 月降雨特少，气温偏高，日照特多；7 月 28 日测墒结果显示，1 个测墒点土壤旱象较重，10 个测墒点土壤轻旱；2 个测墒点土壤墒情正常。测墒后，7 月 28 日-8 月 3 日，我市出现明显降水天气，有效缓解了各地旱情。

利用东北卫星气象数据中心提供的生长季作物长势卫星遥感监测资料分析，结果表明：目前我市大部分农区作物长势好于





2.Agricultural Remote Sensing — Phenological Analysis

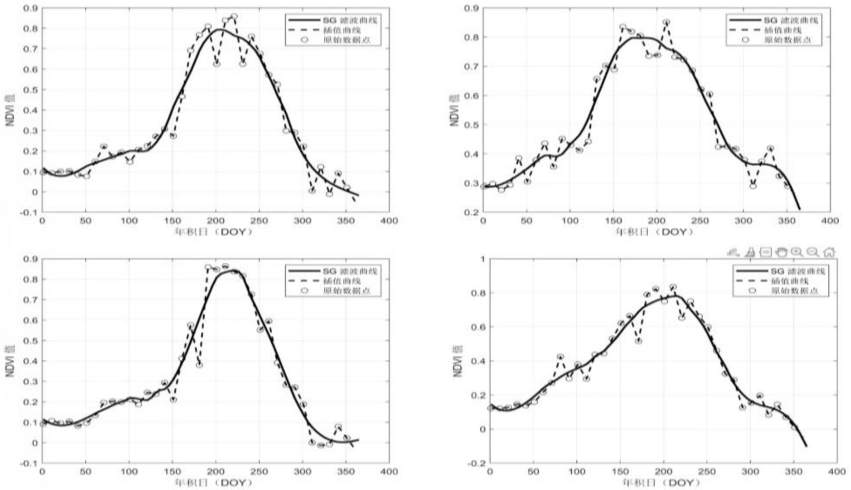
Phenological Analysis Algorithm

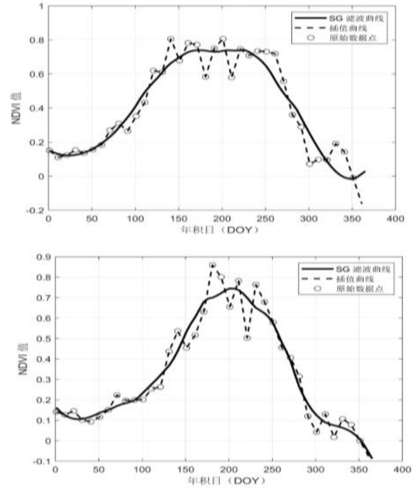
➢ **NDVI Time-Series Data**

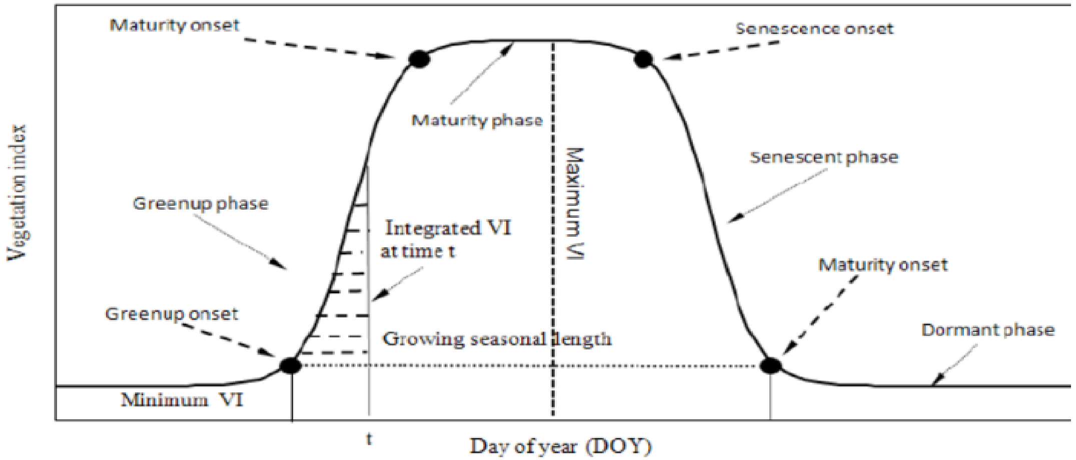
Time-series vegetation index data can reflect the characteristics of crops at different growth stages, thus enabling the extraction of typical phenological phases.

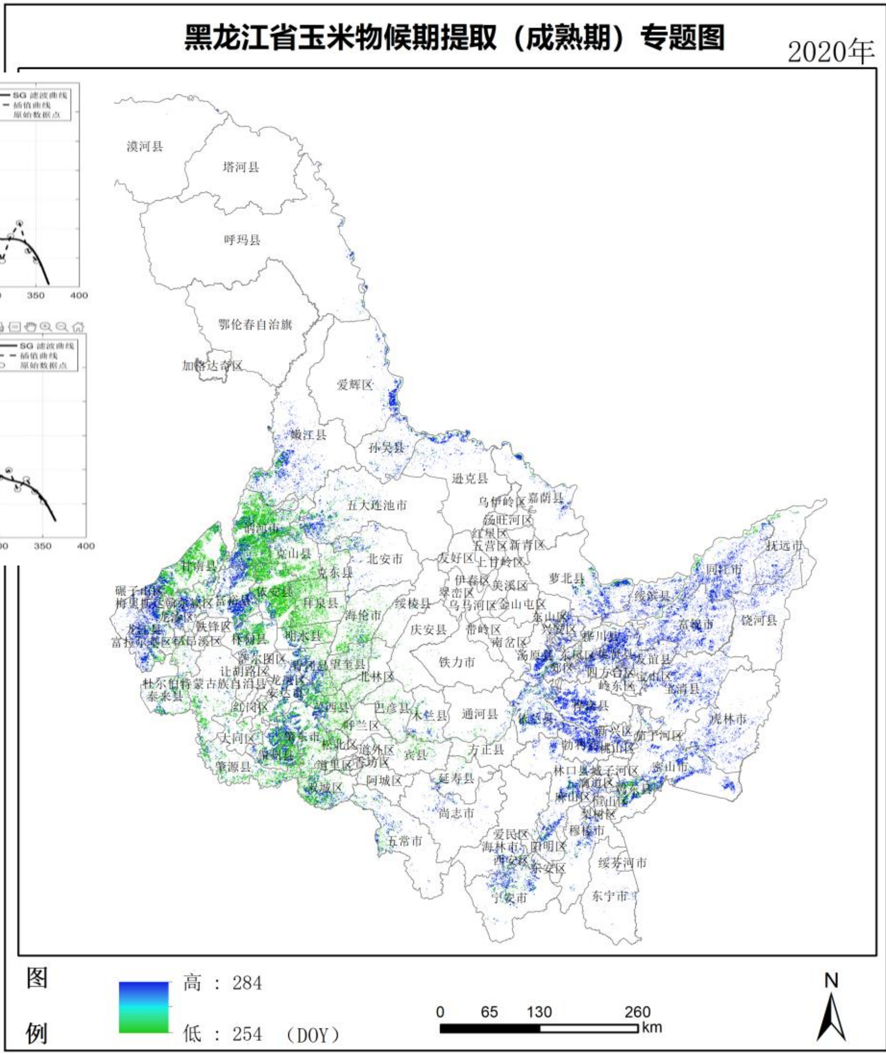
➢ **S-G Filtering**

Raw time-series vegetation index data may contain abrupt changes and noise caused by satellite sensor errors, atmospheric conditions, and other environmental factors, which can adversely affect the extraction of phenological phase nodes. Therefore, filtering and smoothing processing is necessary.

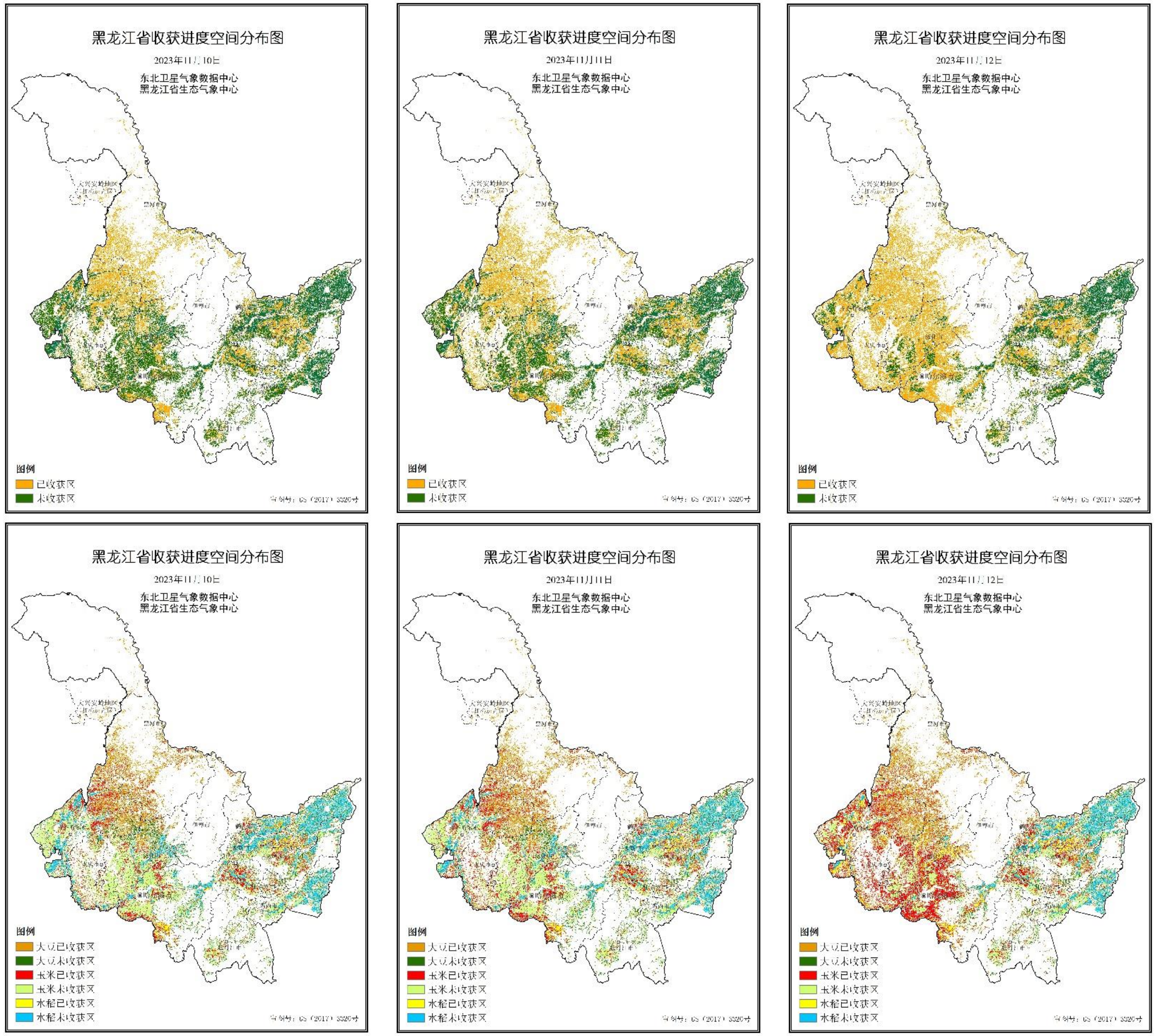




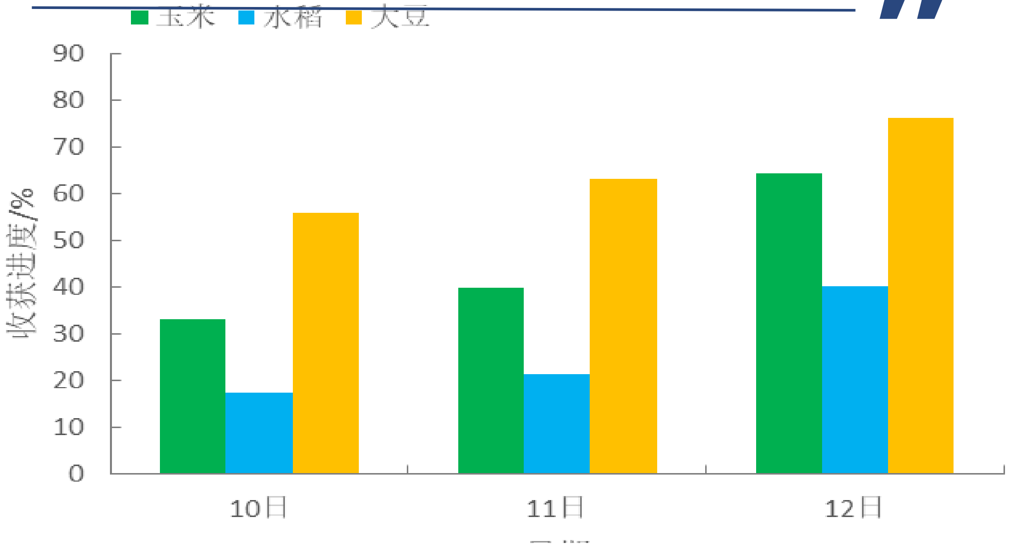




2.Agricultural Remote Sensing — Crop Harvest Monitoring



"Satellite remote sensing technology can accurately identify crop types in farmland and monitor the completion of autumn harvest. **This facilitates dynamic tracking of harvest progress, enables thorough preparation for autumn harvesting activities, ensures strict adherence to schedules, and guarantees that grain crops are fully gathered with minimal loss.**"

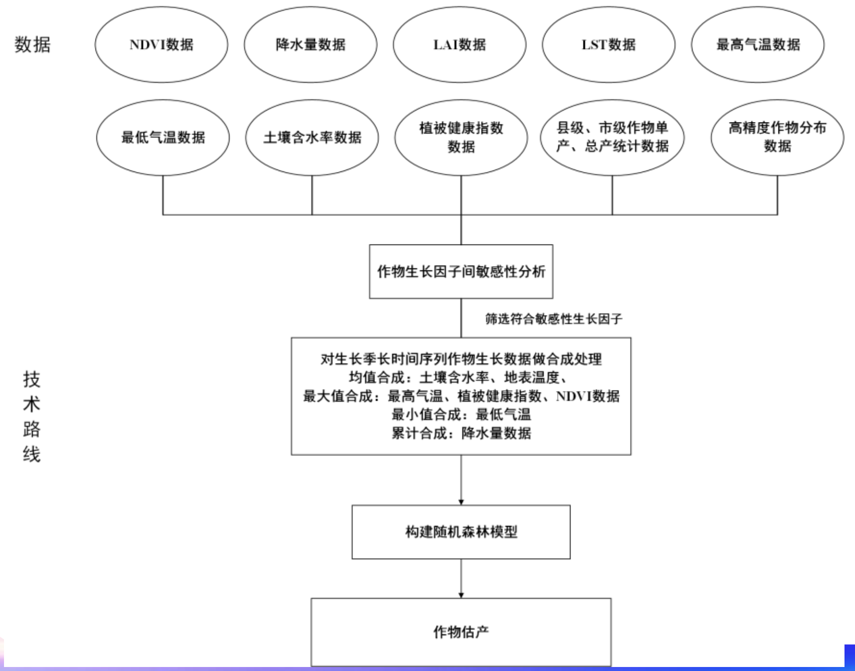


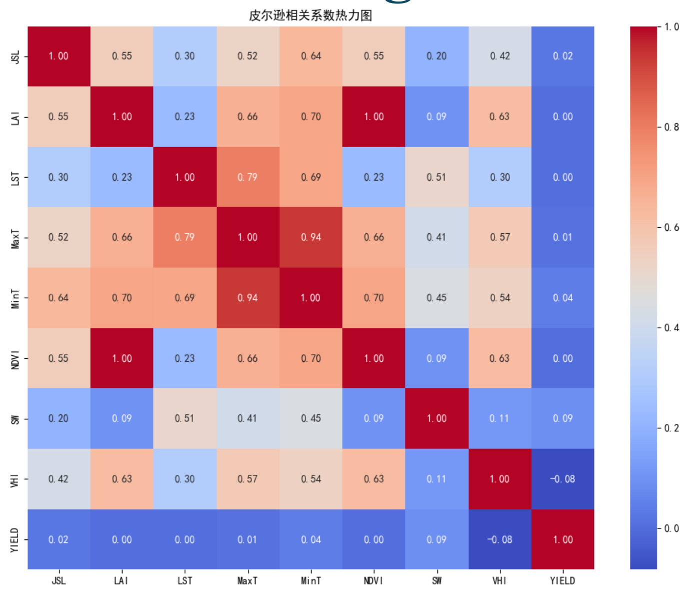
Harvest Progress Map of Major Grain Crops in Heilongjiang Province

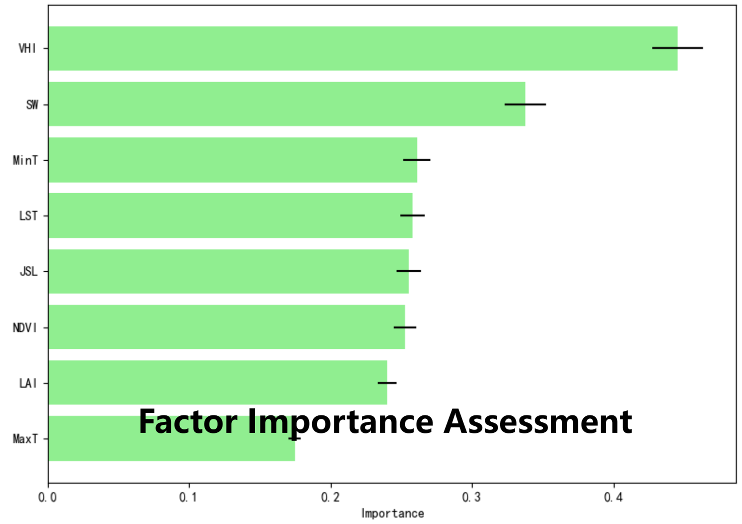
2.Agricultural Remote Sensing — Yield Estimation

➢ **Data Acquisition:** NDVI, maximum temperature, minimum temperature, land surface temperature, soil moisture content, vegetation health index, and other auxiliary data during the growing season.

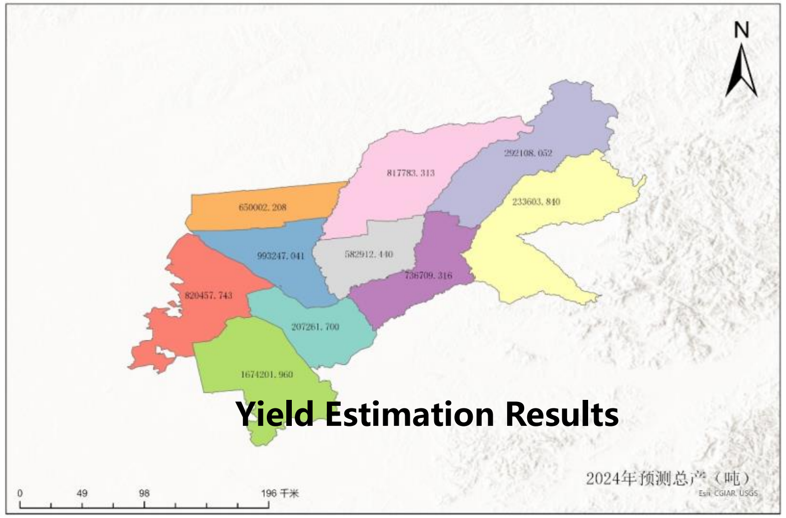
➢ **Crop Growth Stage Identification and Yield Estimation:** Crop yield is estimated during the growing season, with consideration of the impacts of meteorological factors on crop growth.







Factor Importance Assessment



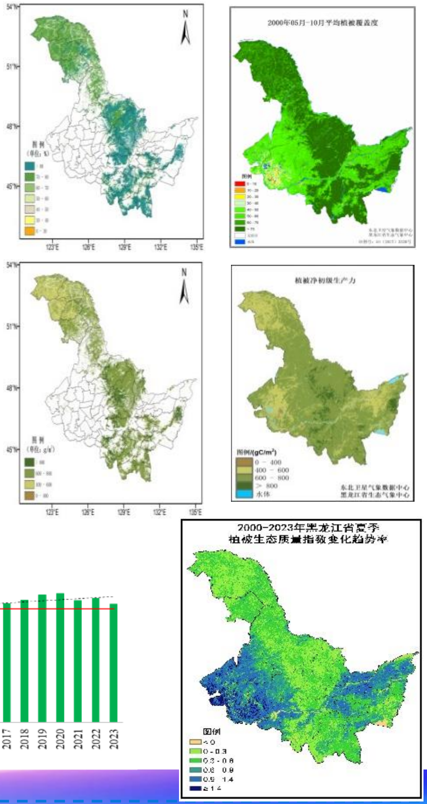
Yield Estimation Results

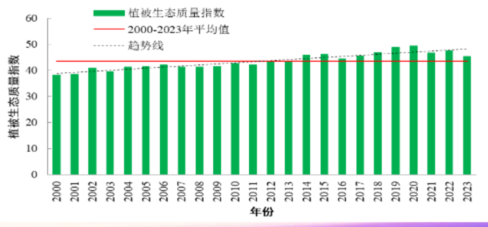
3.Ecological Conservationn

To meet the specific demands of local authorities, tailored specialized services have been delivered, including the production of nearly **20 ecological monitoring reports**. These reports cover key ecological functional zones such as **Zhalong Wetland**, **the 60th anniversary of development and construction in the Greater Khingan Mountains**, and 13 administrative regions including Harbin, Heihe, and Daqing.

Monitoring of Ecological Indicators → **Monitoring of Comprehensive Ecological Indicators**

- Vegetation Coverage
- NPP
- Carbon Sequestered
- Oxygen Released





Monitoring of Vegetation Ecological Quality

- Key Ecological Functional Areas
- Provincial
- Municipal
- County
- others

Ecological Quality Index

4.Future Prospects

Prospects of Agricultural Remote Sensing Services

AOMSUC-15 2025 FYSUC

THE 15TH ASIA-OCEANIA METEOROLOGICAL SATELLITE USERS' CONFERENCE (AOMSUC-15)
2025 FENGYUN SATELLITE USER CONFERENCE (2025 FYSUC)

Thank you!

Heilongjiang Ecological Meteorology Center

Xu Zuomin