



6TH ASIA-OCEANIA GROUP ON EARTH OBSERVATIONS (AOGEO) WORKSHOP

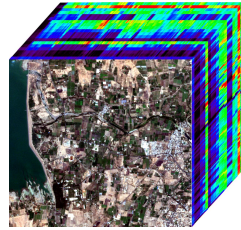
MACAU CHINA 5.29-31 2023

Development, Sharing and Applications of JLS-5M Dataset from CGSTL's Medium-high- resolution Multispectral Satellites

Dr. Zhong Xing

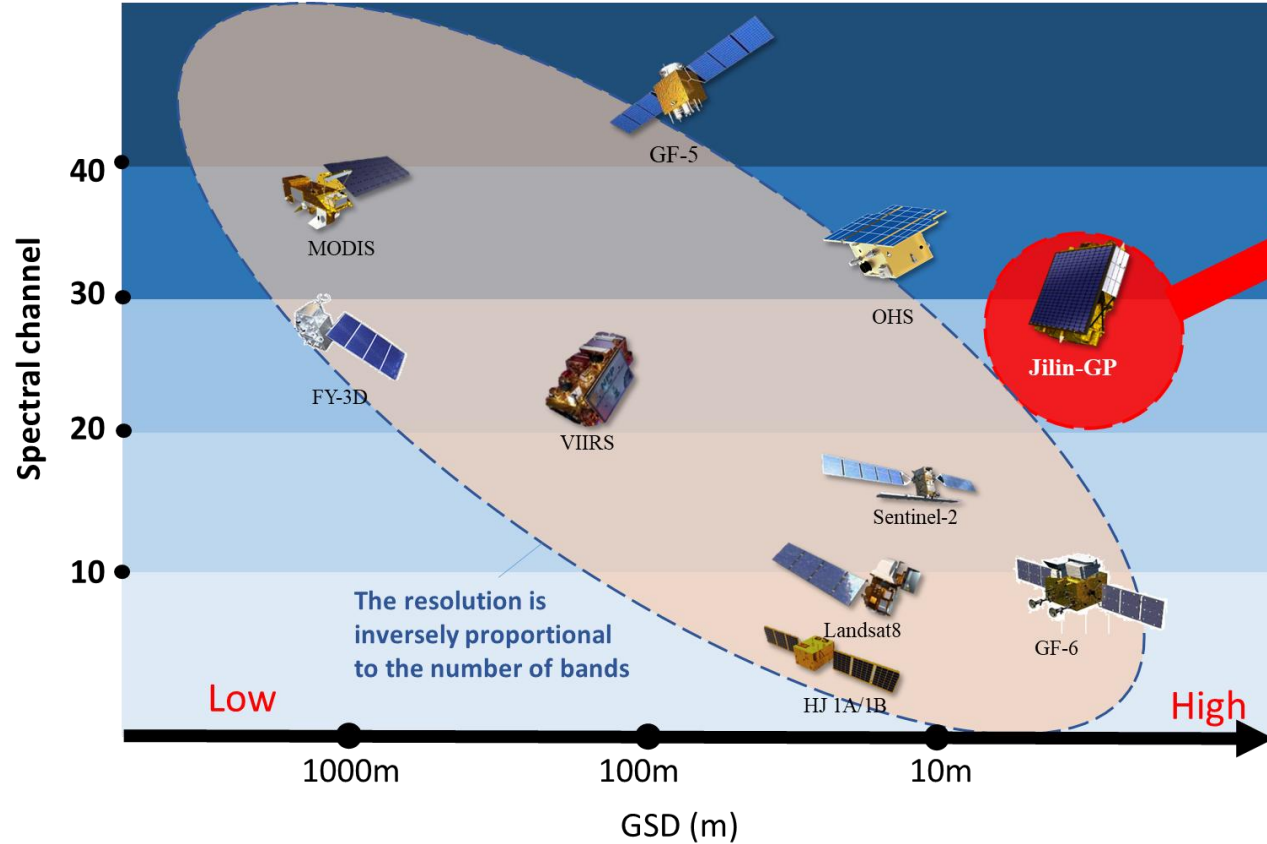
Chang Guang Satellite Technology, Co., Ltd.

Overview of JLS-5M Dataset



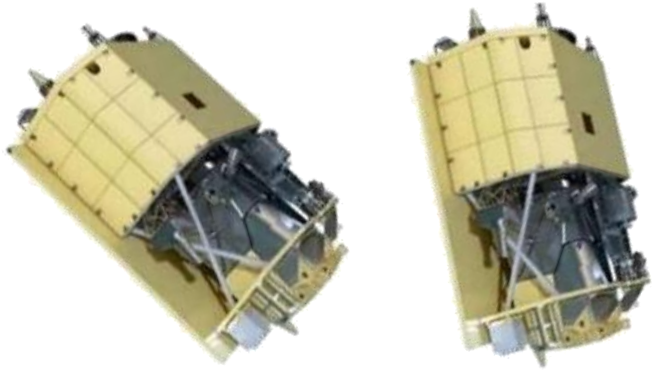
- Developed by **CGSTL** leading team
- Developed using data from **Jilin-1GP** multispectral satellites
- The first **5-meter** wide-coverage dataset with **20 multispectral bands**
- Provided to all communities through **ChinaGEOSS**

Satellites with broadband imaging capability



combining higher resolution with more spectral channels

Jilin-1 GP Satellites



Jilin-1GP01 & GP02

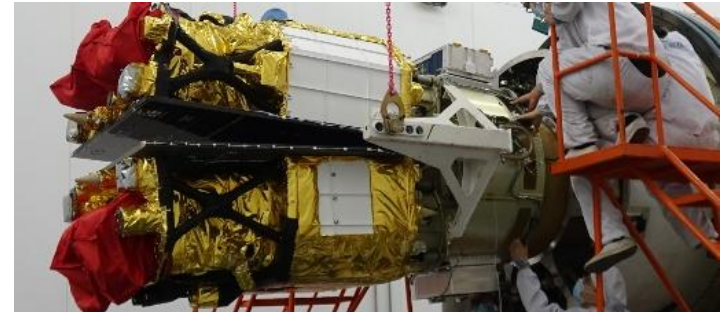
The two satellites were launched in Jan, 2019, using one rocket, 180 degree phasing in-orbit.



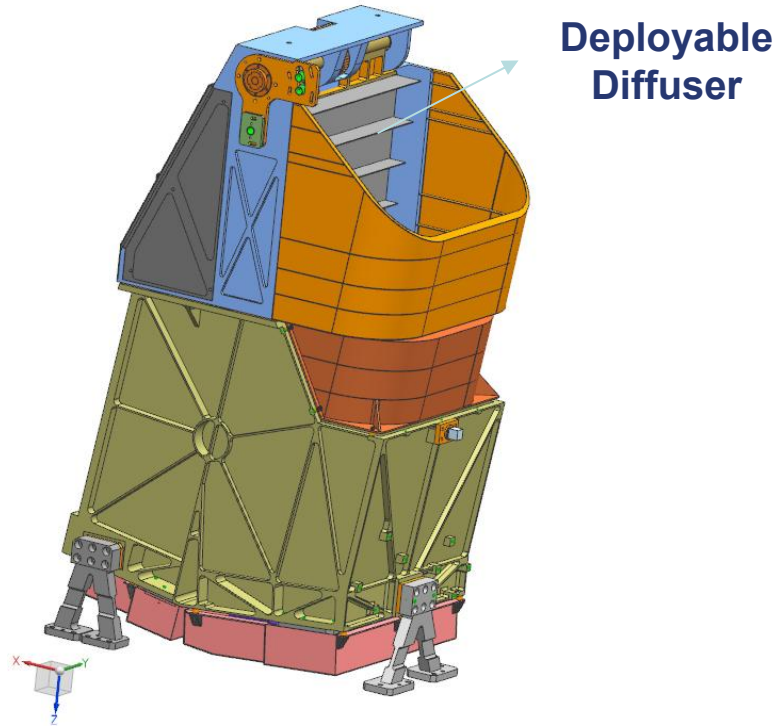
Specifications



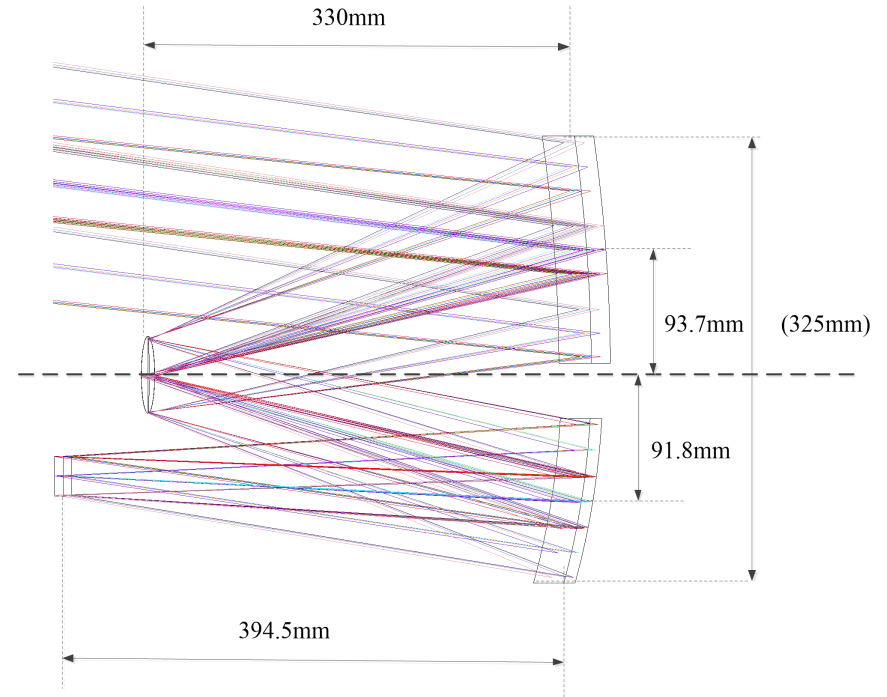
Parameter	Value
GSD and Spectral bands	Main terrestrial bands: B0-B6, 5m Secondary terrestrial bands: B7-B12, 10m Atmospheric bands: B13-B19, 20m
Swath	115 km
Revisit Period	7 days
LTND	12:00am
Designed Lifetime	>5 years



Multispectral Optical Payload



Primary payload- VIS-NIR camera



TMA system used for primary payload

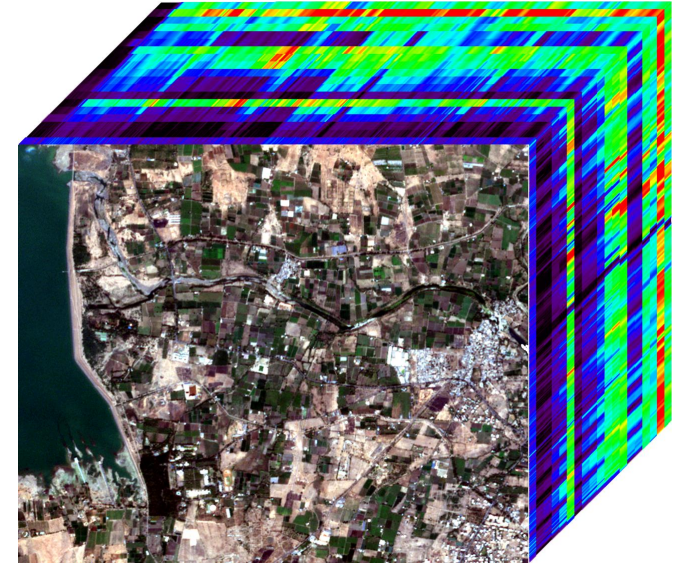
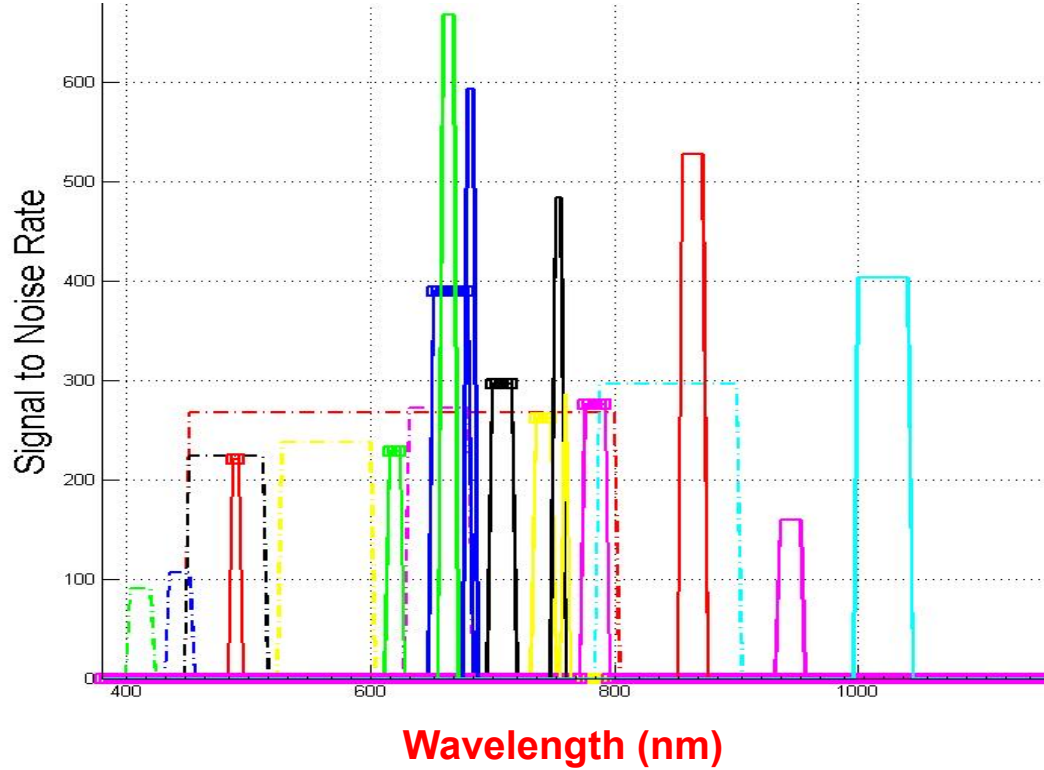
Multispectral Optical Payload

Spectral Channel Specifications



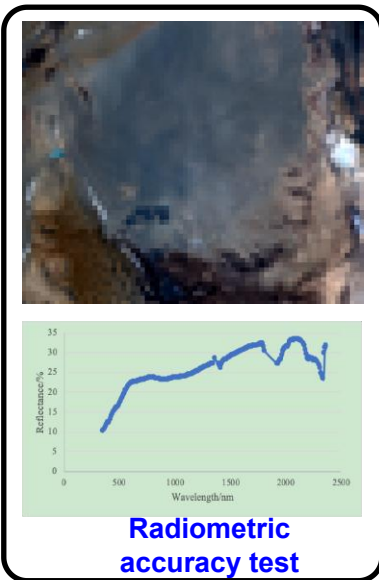
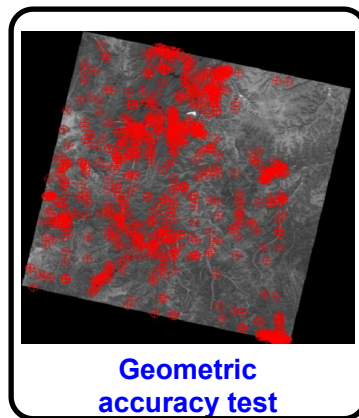
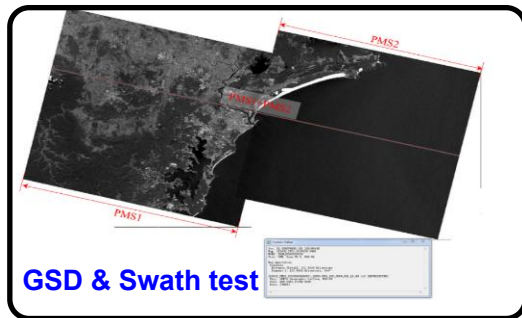
Spectrum	Starting Wavelength(nm)	Cut-off Wavelength(nm)	GSD(m)	Spectral Characteristics
B0	450	800	5	PAN Spectrum
B1	403	423	5	Sensitive spectrum to yellow substances
B2	433	453	5	Seaclanseost
B3	450	515	5	Blue
B4	525	600	5	Green
B5	630	680	5	Red
B6	784.5	899.5	5	Leaf Area Index
B7	485	495	10	Chlorophyll and other pigments
B8	615	625	10	sediment discharge
B9	650	680	10	Peak spectrum of chlorophyll absorption
B10	698.75	718.75	10	Chlorophyll Fluorescence reference spectra
B11	732.5	747.5	10	Red-edge spectrum
B12	773	793	10	Leaf Area Index
B13	855	875	20	Sensitivity to chlorophyll, biomass and LAI
B14	660	670	20	Chlorophyll, sediment transport, sediment
B15	677.5	685	20	Peak Spectrum of Chlorophyll Fluorescence, Red Edge Spectrum
B16	750	757.5	20	O2 Absorption Reference Spectrum
B17	758.75	762.5	20	O2 Absorption spectrum
B18	935	955	20	Steam correction
B19	1000	1040	20	Atmospheric and aerosol correction

Multispectral Optical Payload

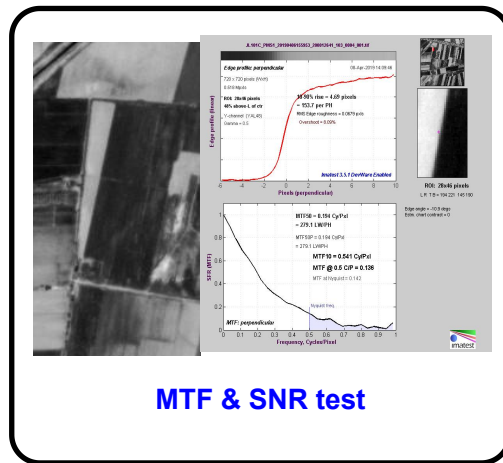


Spectral Cube

IOT items & results



IOT



IOT results for GP satellites

Parameter	Value
SNR	Main terrestrial bands >40dB
MTF	Average MTF > 0.16
Relative radiometric accuracy	<4%
Absolute radiometric accuracy	<7%
Geometric accuracy	Band registration: <1 pix In - scene orientation accuracy: <5 pix Geolocation without GCPs: <20m Mapping quality: 1:50000 standard met

Specification of JLS-5M dataset



The data set provide twice coverage in three years, covering a total area of more than 73.2 million sq km, and the product level is above Level 2 (after atmospheric correction and ortho-rectification)

① Twice coverage, coverage rate **>90%** (Belt and Road region)

② GSD of the 6 main spectral segments of the image is better than **5m**, and the total number of bands is **20**

③ Geolocation without GCPs is better than **20m**

④ Absolute radiometric accuracy is better than **7%**

⑤ Relative radiometric accuracy is better than **4%**

⑥ Surface reflectance inversion accuracy is better than **7%**

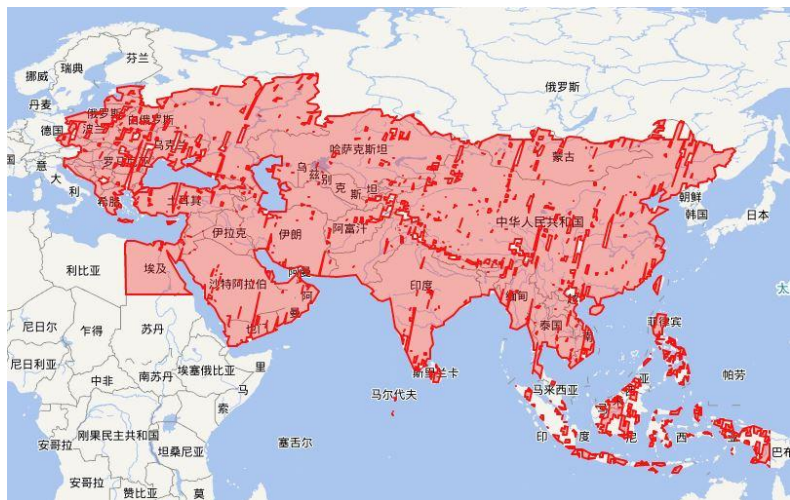
⑦ Including **>20,000 scenes**, L2, total volume **>15TB**

Coverage area of JLS-5M dataset



Data Acquisition Status

	Period	Scene	Coverage (km ²) (Cloud Ratio ≤20%)	Proportion of Collection
Phase I	2020.1-2021.6	28718	33,060,800	91.04%
Phase 2	2021.7-2022.10	24454	34,526,300	95.72%



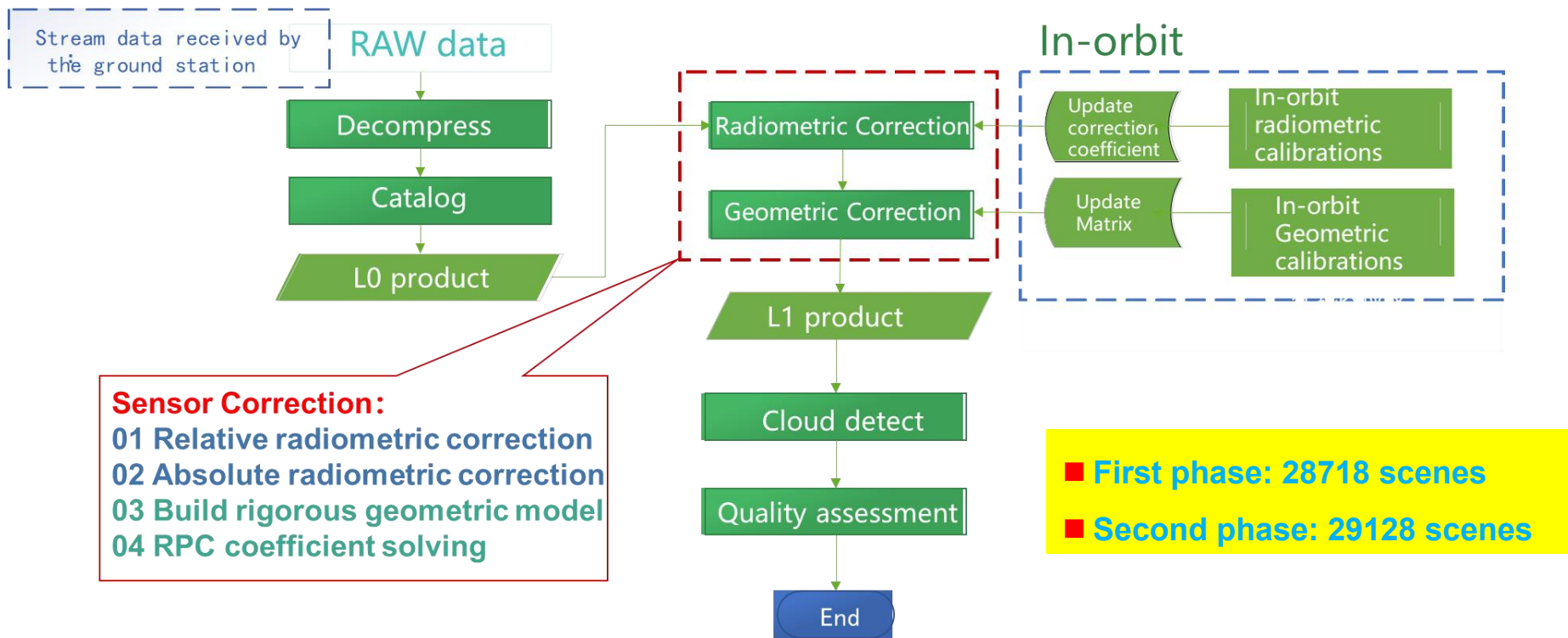
Phase 1
Belt and Road region



Phase 2
Belt and Road region

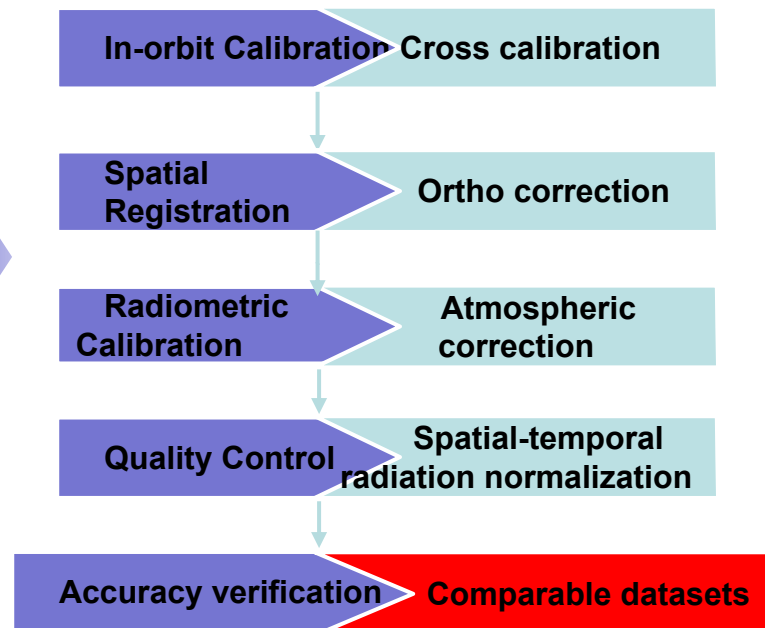
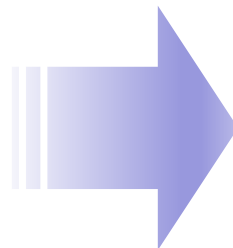
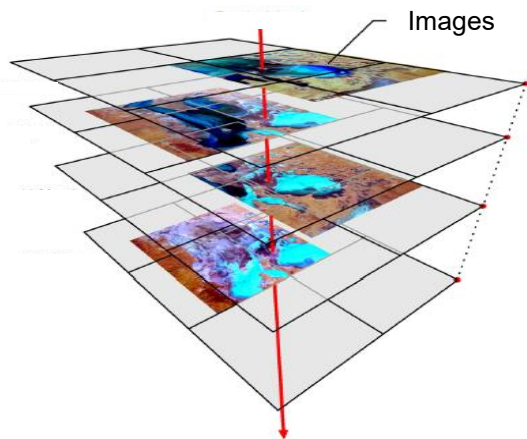
Data Producing

Data Producing Working Flowchart



Quality Control for Quantitative Applications

- Satellite radiometric calibration
- Satellite geometric calibration
- Atmospheric correction
- Spatial-temporal normalization
- Data and product comparison

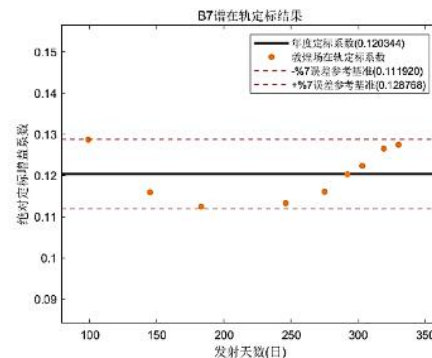
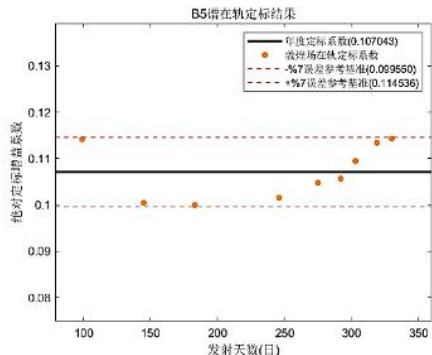
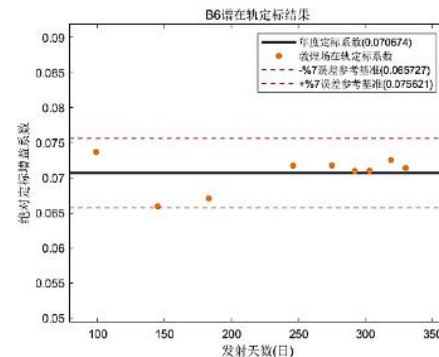
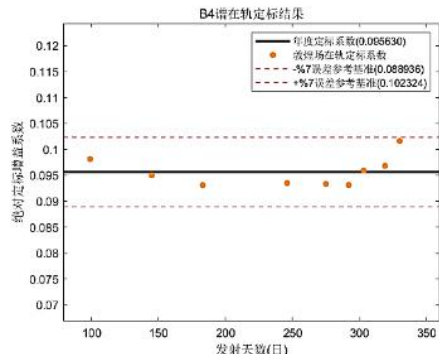


Quality Control for Quantitative Applications

Site Calibration



- The on-orbit radiation performance of each spectral segment tends to be stable, which can meet the absolute radiation calibration accuracy of better than 7%.



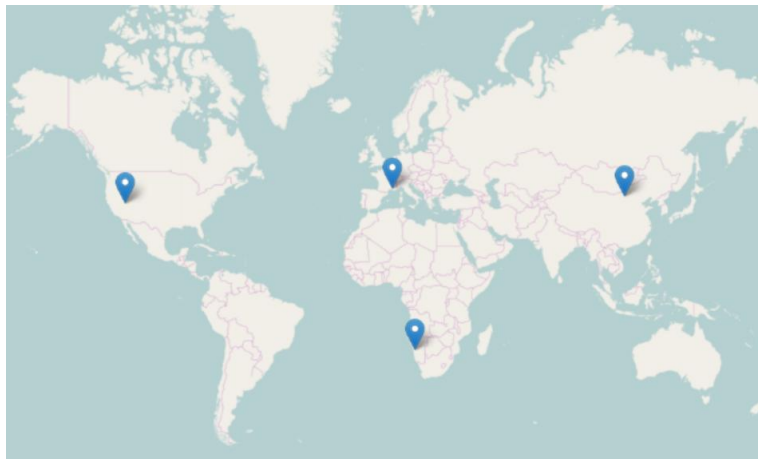
Quality Control for Quantitative Applications



CGSTL

Calibration based on RaICalNet

In-orbit radiometric calibration based on RaICalNet



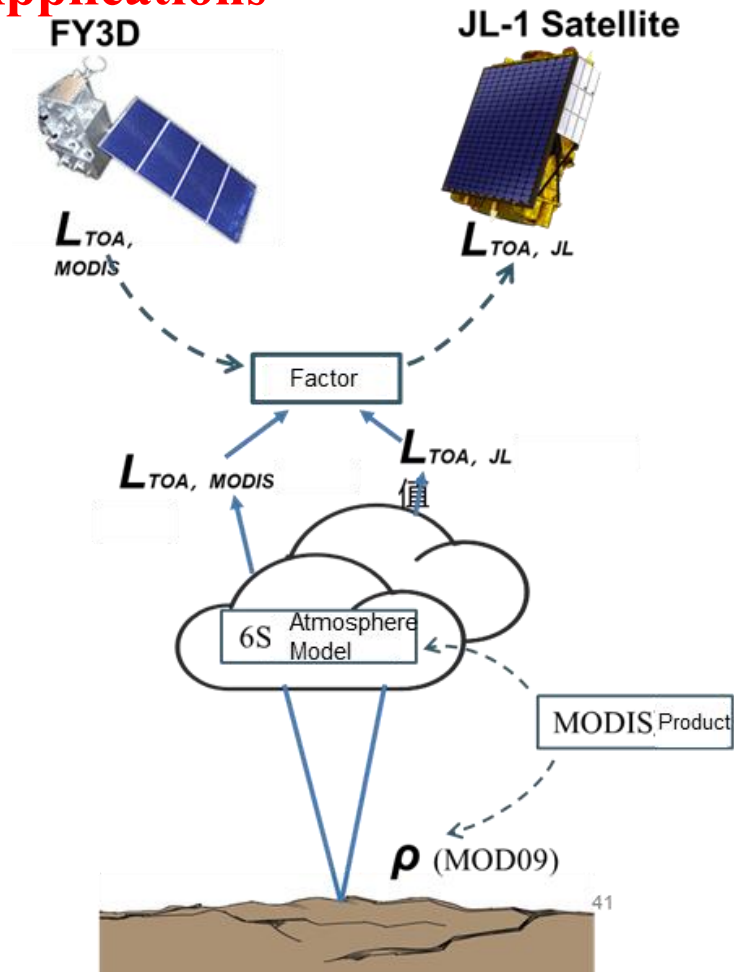
Radiation Calibration Network

	Baotou Sand	Railroad Valley Playa	La Crau	La Crau	La Crau	La Crau	Std. dev.
Date	2020 /05/05	2020 /10/29	2021 /04/07	2021 /04/15	2021 /04/23	2021 /05/03	-
B0	0.063760	0.068389	0.061868	0.062731	0.062024	0.059309	4.37%
B1	0.646124	0.699112	0.585422	0.592120	0.591646	0.610880	6.51%
B2	0.563461	0.633869	0.550618	0.582266	0.569218	0.524683	5.86%
B3	0.143537	0.155677	0.138840	0.132868	0.131553	0.127982	6.67%
B4	0.095630	0.110874	0.098223	0.097537	0.097543	0.090826	6.18%
B5	0.113669	0.117537	0.109444	0.108388	0.108543	0.107081	3.30%
B6	0.072022	0.072727	0.074598	0.076486	0.074840	0.074495	1.97%
B7	0.123969	0.119539	0.110213	0.114612	0.111707	0.106975	5.02%
B8	0.078679	0.074088	0.073526	0.073488	0.073350	0.071126	3.07%
B9	0.028659	0.028049	0.025001	0.025492	0.025182	0.024113	6.40%
B10	0.033767	0.035928	0.032878	0.032671	0.033138	0.032689	3.41%
B11	0.045321	0.048733	0.045828	0.045554	0.045953	0.047384	2.61%
B12	0.039176	0.041094	0.040114	0.039508	0.040120	0.041058	1.78%
B13	0.007888	0.007918	0.007739	0.007538	0.007728	0.007829	1.62%
B14	0.009220	0.009262	0.008695	0.008205	0.008476	0.008100	5.23%
B15	0.010834	0.011146	0.011154	0.010454	0.010802	0.010260	3.06%
B16	0.015892	0.016969	0.016439	0.015495	0.016017	0.016315	2.86%
B17	0.027662	0.030606	0.026725	0.024931	0.025821	0.025958	6.82%
B18	0.021610	0.021022	0.025261	0.021424	0.021901	0.022758	6.34%
B19	0.035615	0.036065	0.031810	0.030262	0.031169	0.033633	6.63%

Quality Control for Quantitative Applications

Cross calibration

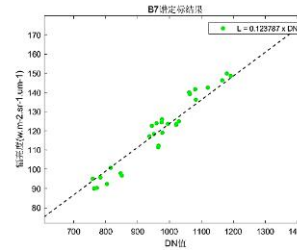
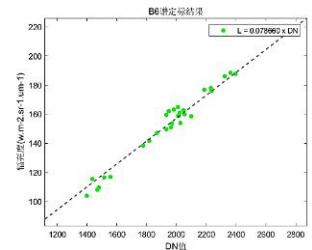
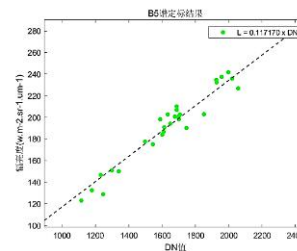
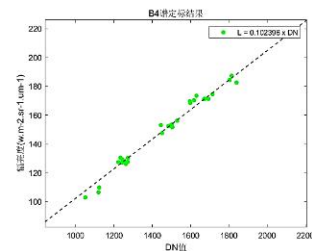
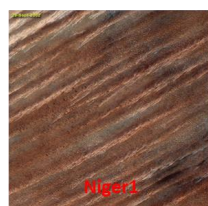
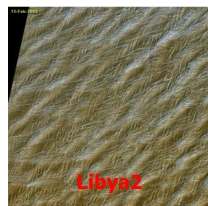
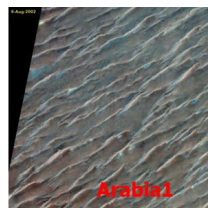
Band	Cross calibration coefficients	Band	Cross calibration coefficients
B0	0.059729	B10	0.029982
B1	0.600880	B11	0.042907
B2	0.591590	B12	0.036870
B3	0.140452	B13	0.007124
B4	0.092084	B14	0.008573
B5	0.108039	B15	0.010131
B6	0.070885	B16	0.014999
B7	0.116251	B17	0.026653
B8	0.067629	B18	0.020915
B9	0.026406	B19	0.030271



Quality Control for Quantitative Applications

Uniform stable field calibration

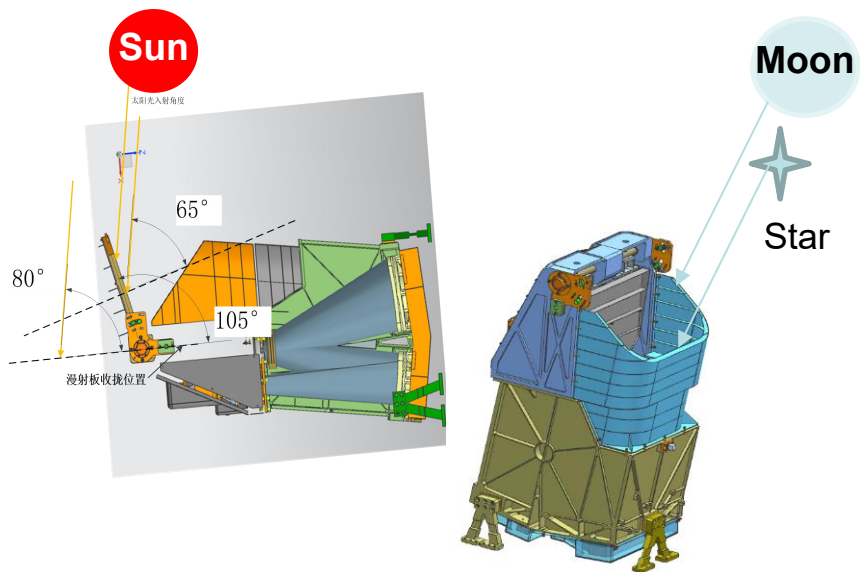
No.	Name	Lon	Lat
1	Arabia1	46.31	18.86
2	Arabia2	50.96	20.13
3	Dunhuang	94.27	40.18
4	Libya1	13.35	24.42
5	Libya2	20.54	25.09
6	White sands	-106.35	32.92
7	Mauritania2	-8.78	20.85
8	Niger1	10.59	21.37



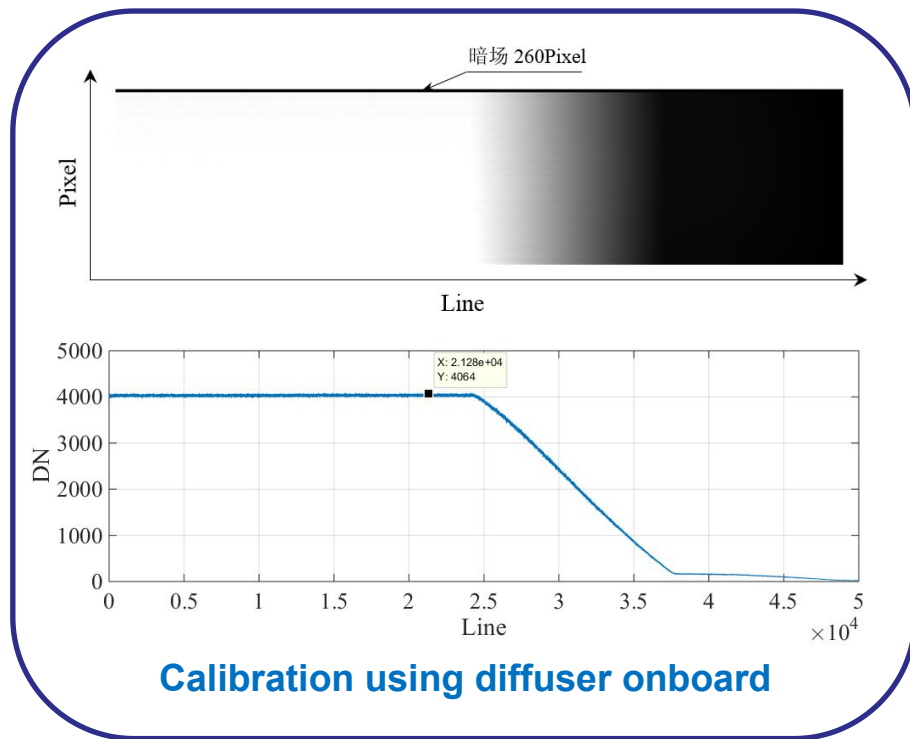
Summary: The accuracy of the in-orbit calibration of each spectral segment of the data set reaches the accuracy requirement of 7%.

Quality Control for Quantitative Applications

Calibration without Ground Sites



Calibration using sun, moon and stars



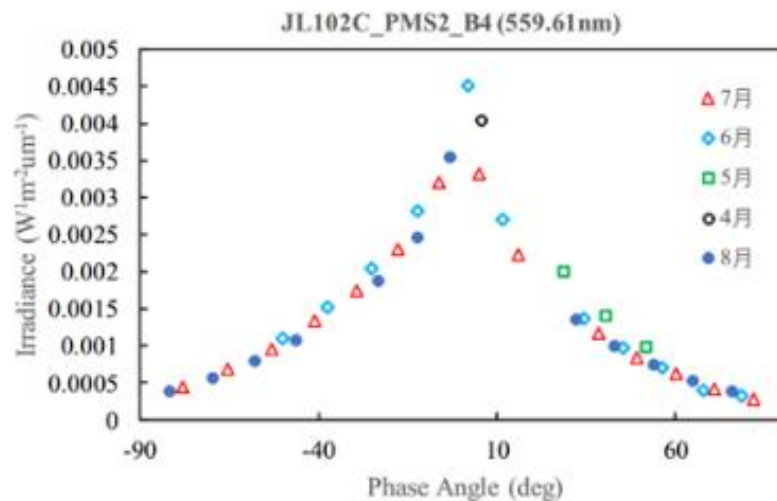
Calibration using diffuser onboard

Quality Control for Quantitative Applications

Calibration without Ground Sites



Daily lunar images

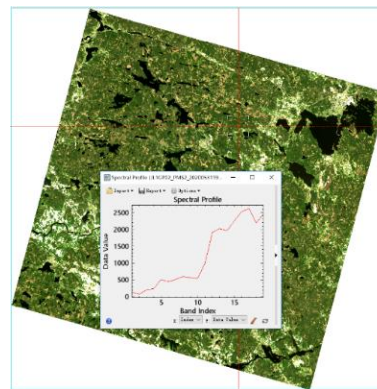
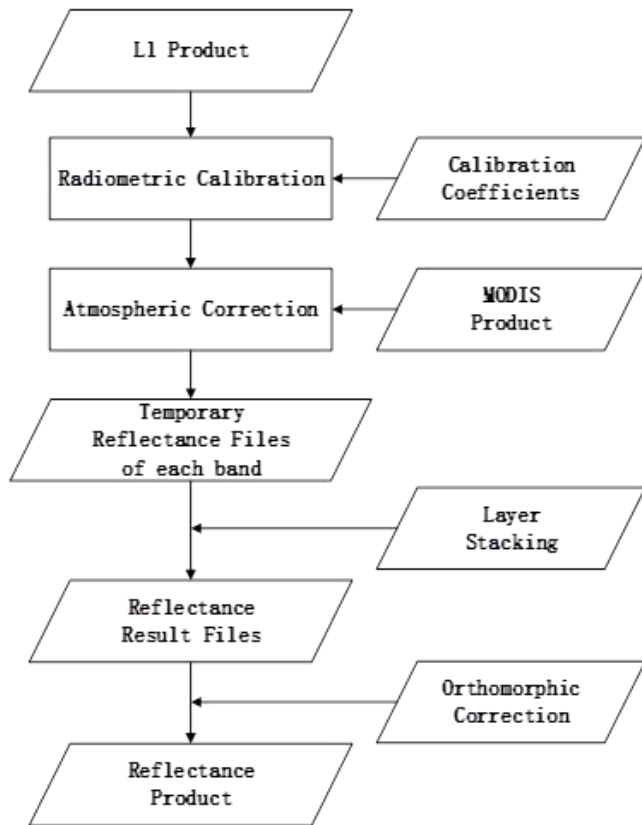


Radiance acquired with different lunar phase

Moon monitoring

Quality Control for Quantitative Applications

Atmosphere Correction and Reflectance Product

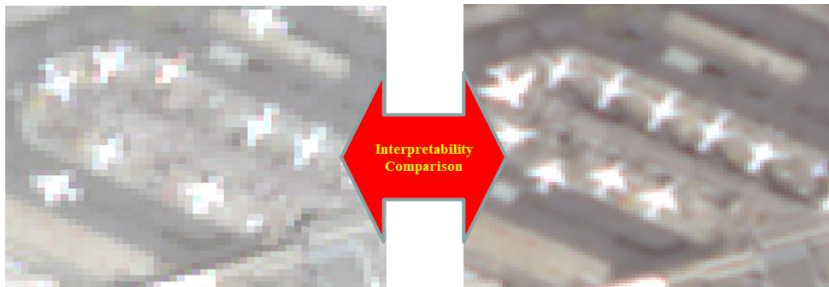


- JL1GP01_PMS1_20190201114535_200011250_101_0003_001_L3B.jpg
- JL1GP01_PMS1_20190201114535_200011250_101_0003_001_L3B_5m.hdr
- JL1GP01_PMS1_20190201114535_200011250_101_0003_001_L3B_5m.tif
- JL1GP01_PMS1_20190201114535_200011250_101_0003_001_L3B_10m.hdr
- JL1GP01_PMS1_20190201114535_200011250_101_0003_001_L3B_10m.tif
- JL1GP01_PMS1_20190201114535_200011250_101_0003_001_L3B_20m.hdr
- JL1GP01_PMS1_20190201114535_200011250_101_0003_001_L3B_20m.tif
- JL1GP01_PMS1_20190201114535_200011250_101_0003_001_L3B_B0.hdr
- JL1GP01_PMS1_20190201114535_200011250_101_0003_001_L3B_B0.tif
- JL1GP01_PMS1_20190201114535_200011250_101_0003_001_L3B_meta.xml
- JL1GP01_PMS1_20190201114535_200011250_101_0003_001_L3B_thumb.jpg

Quality Control for Quantitative Applications

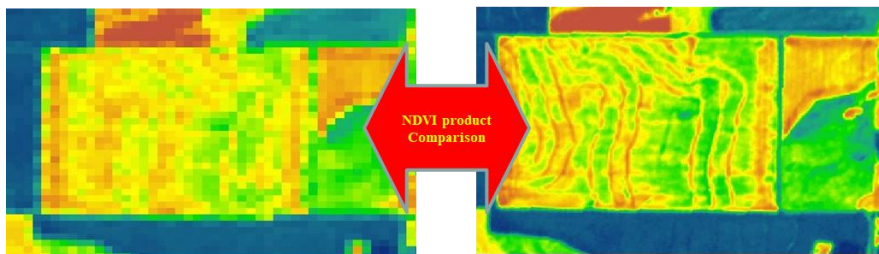
Product Comparison

- Interpretability,
- Ground reflectance
- Inversion results of index



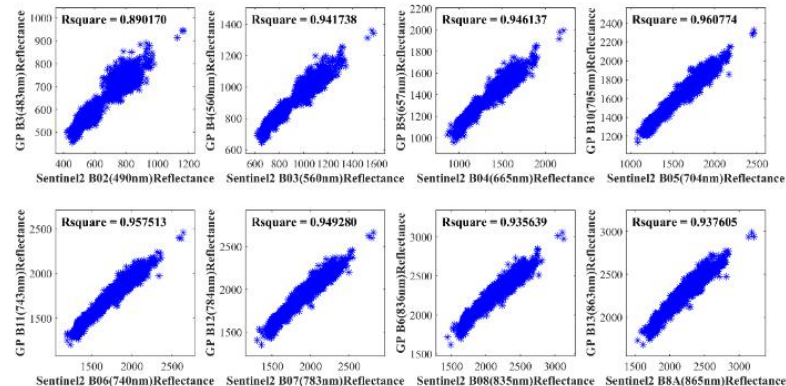
Sentinel-2A June 9, 2019

Jilin-1GP June 8, 2019

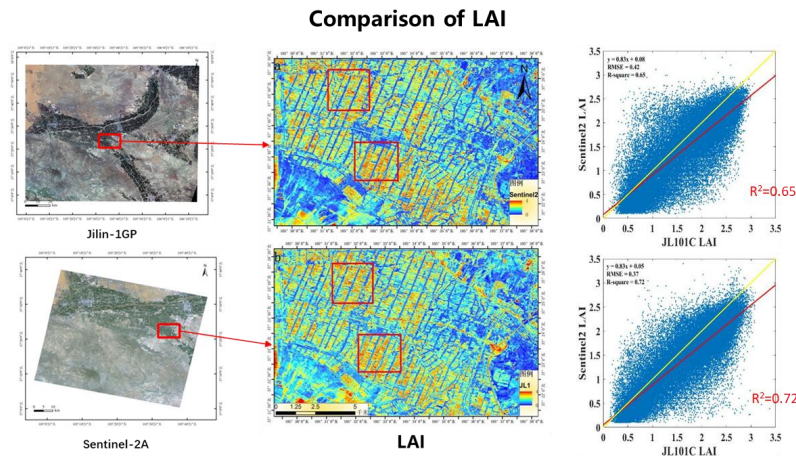


Landsat 8 NDVI, June 2, 2019

Jilin-1GP NDVI, June 2, 2019



Accuracy verification compared to Sentinel 2 reflectivity products



Quality Control for Quantitative Applications

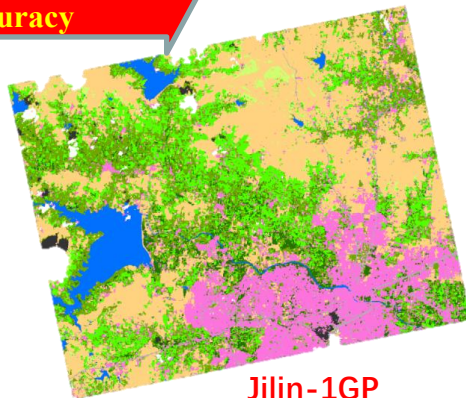


CGSTL

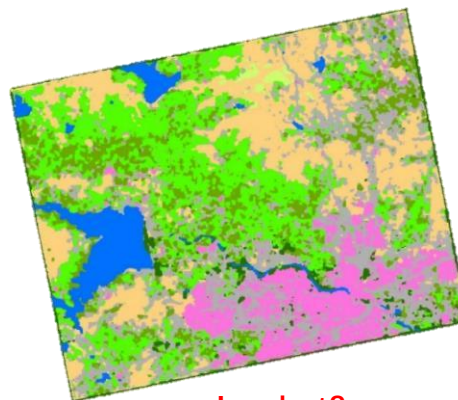
Product Comparison

Comparison of
Classification
Accuracy

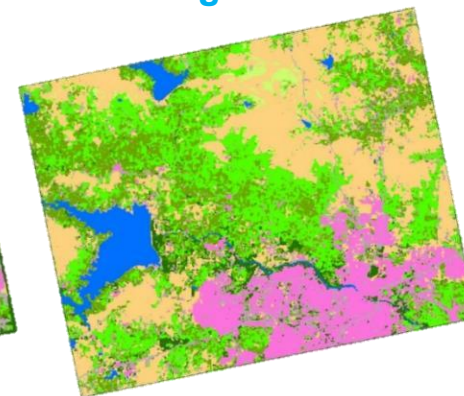
The same classification algorithm is used to evaluate the classification accuracy of the same area images on the same day



Jilin-1GP



Landsat8



Sentinel-2A

Comparison of Classification Accuracy of Different Datasets Based on Improved Deep CNN(Accuracy/Recall, F1)

Satellite	JL101C		Landsat8		Sentinel-2A	
Undeveloped	0.94/0.93	0.93	0.91/0.83	0.87	0.96/0.89	0.92
Cropland	0.94/0.89	0.91	0.81/0.88	0.84	0.83/0.98	0.9
Building	0.96/0.97	0.97	0.94/0.79	0.86	0.97/0.94	0.96
Grass	1.00/0.88	0.93	1.00/0.73	0.85	1.00/0.82	0.9
Bare	0.96/1.00	0.98	0.96/0.93	0.94	0.94/0.99	0.96
Road	0.95/0.80	0.87	0.43/0.80	0.56	0.85/0.83	0.84
Forest	0.71/1.00	0.83	0.62/1.00	0.76	0.69/1.00	0.82
Water	1.00/1.00	1	1.00/0.97	0.98	1.00/0.93	0.96
Overall	0.95		0.86		0.93	

Dataset service system



JLS-5M dataset

The introduction page features a blue header with the NODA logo and navigation links. A central banner highlights the '国产中高分辨率波段多光谱卫星数据构建和高效国际化服务' (Domestic medium and high resolution multi-spectral satellite data construction and efficient internationalization service). Below this, a grid of product cards is displayed, each with a 'JLS-5M' logo and a brief description of the data product, including its resolution and spectral bands.

Introduction page of JLS-5M dataset

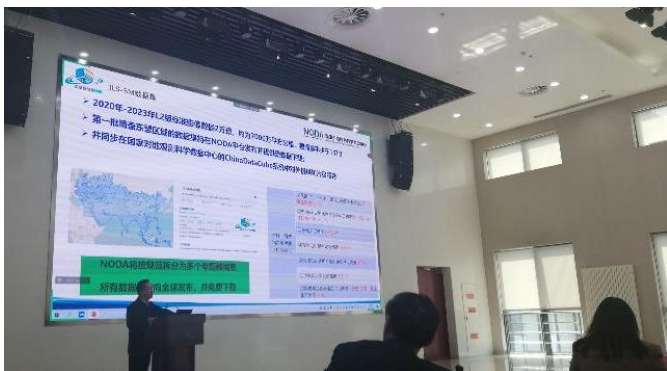
The data retrieval page includes a search bar with date and time filters, and a map showing the search area. A table lists search results with columns for product name, acquisition time, satellite, and status.

主题名称	拍摄时间	卫星	传感器	拍摄时间	操作
JLS-5M1_0M62...		JLS-5M1	PM51	2021-05-15 12:...	✓ []
JLS-5M1_0M61...		JLS-5M1	PM51	2021-05-15 12:...	✓ []
JLS-5M2_0M62...		JLS-5M2	PM52	2021-05-22 12:...	✓ []
JLS-5M2_0M61...		JLS-5M2	PM52	2021-05-22 12:...	✓ []
JLS-5M1_0M62...		JLS-5M1	PM51	2021-05-15 12:...	✓ []
JLS-5M1_0M61...		JLS-5M1	PM51	2021-05-15 12:...	✓ []
JLS-5M2_0M62...		JLS-5M2	PM52	2021-05-22 12:...	[] []
JLS-5M2_0M61...		JLS-5M2	PM52	2021-05-22 12:...	[] []

Data retrieval page of JLS-5M dataset

Dataset service system

On-line trial operation



Data set trial release

Major International Joint Research Project: JLS-5M Data

Home About project About data Events

Project Information

The National Key Research and Development Program project "Construction of Domestic Medium High Resolution Wide Band Multi-spectral Satellite Data set and Efficient International Service" was officially approved in December 2020. The project was undertaken by CGSTL (Changguang Satellite Technology Co., LTD.), AIR (Aerospace Information Research Institute), and Geoscience Australia.

1,438 Scenes 5,715 TB 2 Years

NODADATASETS SHARING

JLS-5M-ASEAN Dataset (2020)

Visits: 1441 times Data pieces: 1493 scenes
Downloads: 15511 times Data bulk: 5898.24 GB

View Download

数据详情

吉林一号光谱星 (JLS-5M) 东盟十国数据集 (2020)

DOI: 10.11878/db.202203.001253 CSTR: 10441.11.202203.001253

2022-03-02 最新更新时间

数据详情

数据基本信息

数据时间: 2020年7月-2021

空间位置: 东盟区域

关键词: 吉林一号 JLS

学科类别: 420测绘科学技术 - 420.201

主题分类: 对地观测数据产品

数据类型: 原始遥感影像数据

数据摘要

吉林一号光谱星 (JL1GP01-5M) - 阿富汗 (2020-2021)

DOI: 10.11878/db.202305.009816 CSTR: 10441.11.202305.009816

2023-05-06 最新更新时间 5557801 数据集

数据基本信息

数据时间: 2020.01-2021.05

空间位置: 一带一路区域——阿富汗

关键词: 吉林一号 光谱卫星 一带一路

学科类别: 420测绘科学技术 - 420.200摄影测量与遥感技术

主题分类: 对地观测数据产品 - 光学数据产品

数据类型: 原始遥感影像数据

数据摘要

吉林一号光谱星 (JL1GP01-5M) - 印度 (2020-2021)

DOI: 10.11878/db.202303.008084 CSTR: 10441.11.202303.008084

2023-03-15 最新更新时间 131886748552 MB 数据集 11 数据集下载 5 数据集评价

数据基本信息

数据时间: 2020.01-2021.05

空间位置: 一带一路区域——印度

关键词: 吉林一号 光谱卫星

学科类别: 420测绘科学技术 - 420.200摄影测量与遥感技术

主题分类: 对地观测数据产品 - 光学数据产品

数据类型: 原始遥感影像数据

数据摘要

吉林一号光谱星 (JL1GP01-5M) - 中国 (2020-2021)

DOI: 10.11878/db.202303.008052 CSTR: 10441.11.202303.008052

2023-03-15 最新更新时间 4062348.86 MB 数据集 34 数据集下载 5 数据集评价

数据基本信息

数据时间: 2020.01-2021.05

空间位置: 一带一路区域——中国

关键词: 吉林一号 光谱卫星 一带一路 大气校正

学科类别: 420测绘科学技术 - 420.200摄影测量与遥感技术 - 420.2040遥感信息工程

主题分类: 对地观测数据产品 - 光学数据产品 - 多光谱数据产品 -

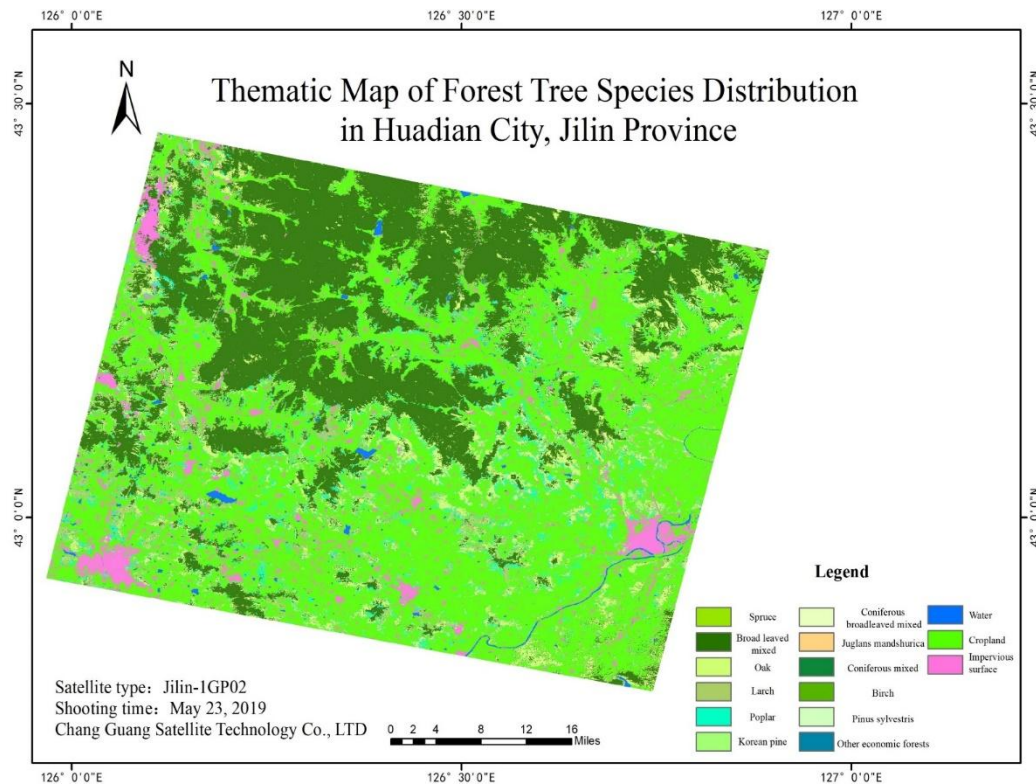
数据类型: 原始遥感影像数据

数据摘要

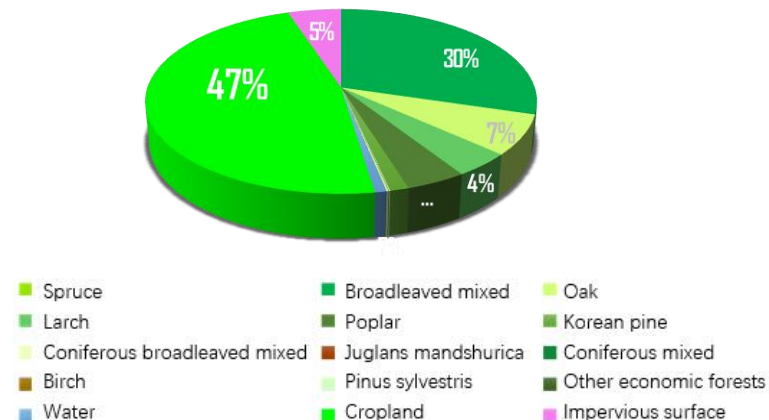
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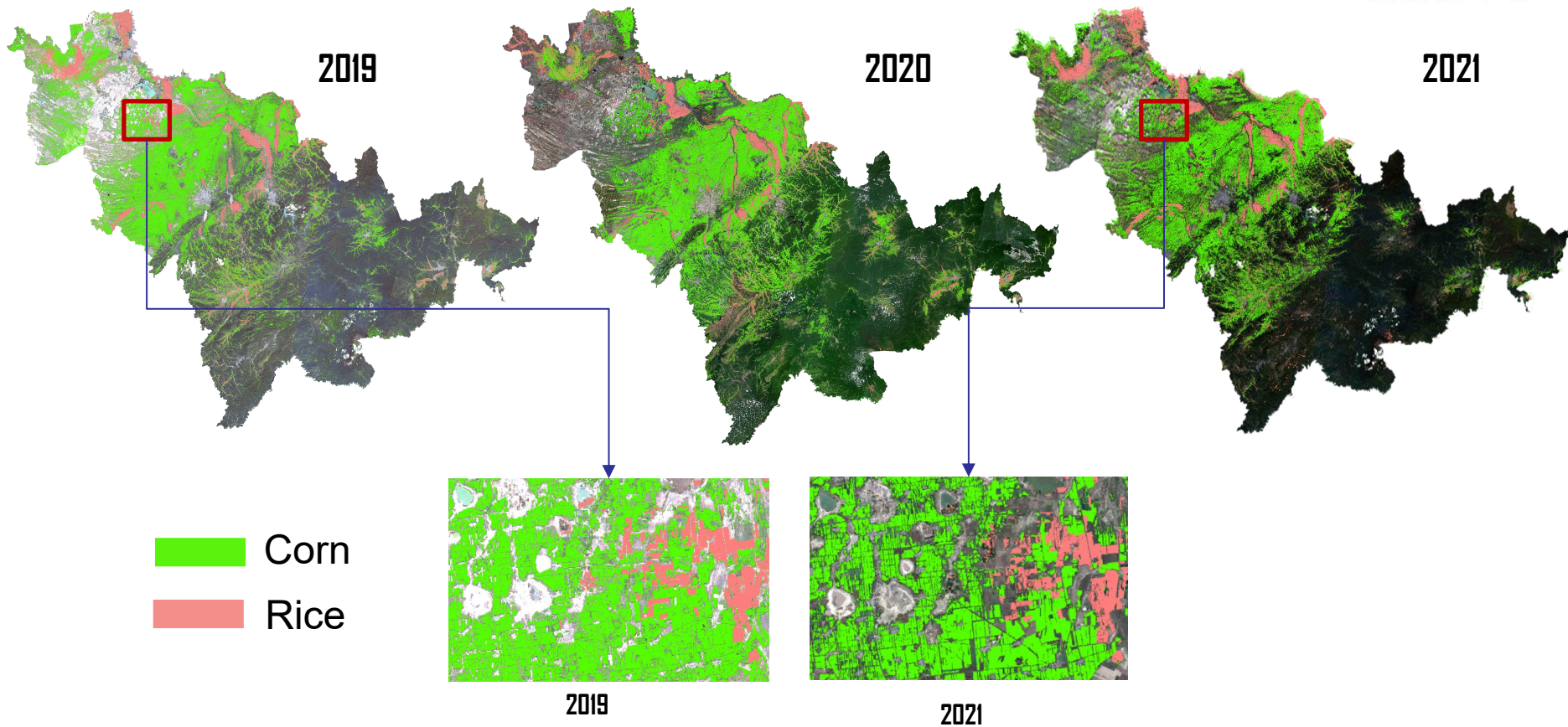
Dataset Application



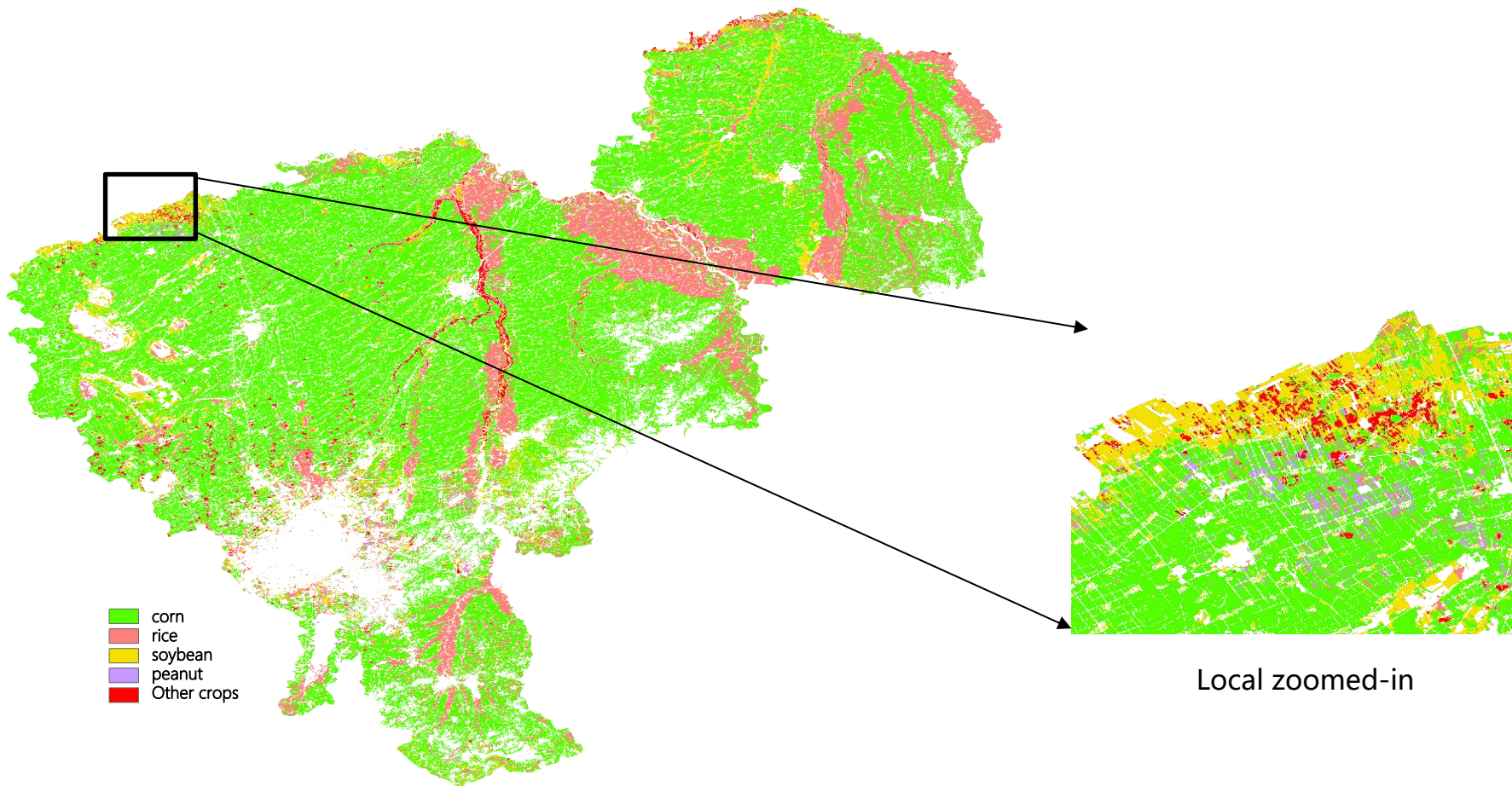
Because of its rich bands and high resolution, JLS-5M can not only monitor and analyze land cover types, but also fine classify different types of land based on the diverse spectral characteristics. The data has been widely used in the field of agriculture and forestry.



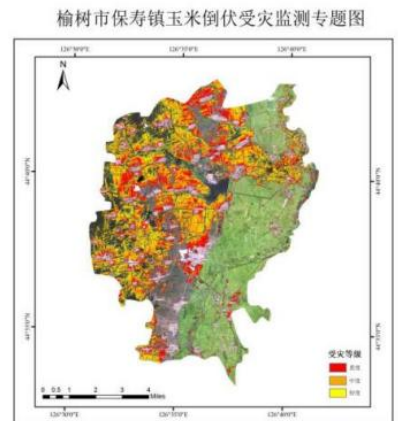
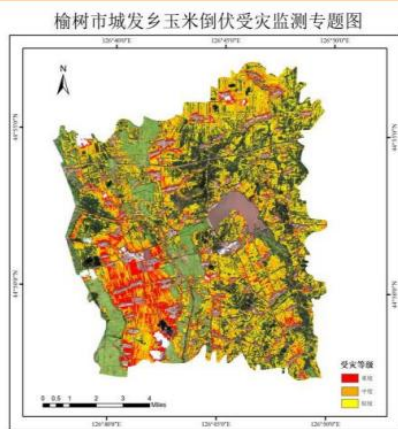
Dataset Application



Dataset Application

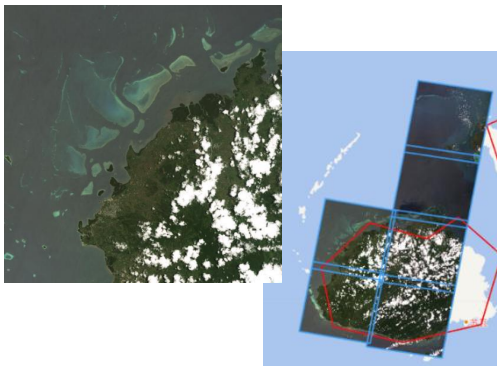


Dataset Application



Field proven with overall accuracy better than 90%

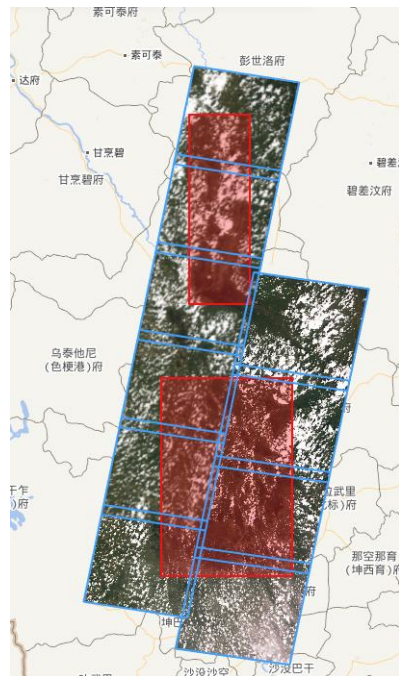
Dataset Application



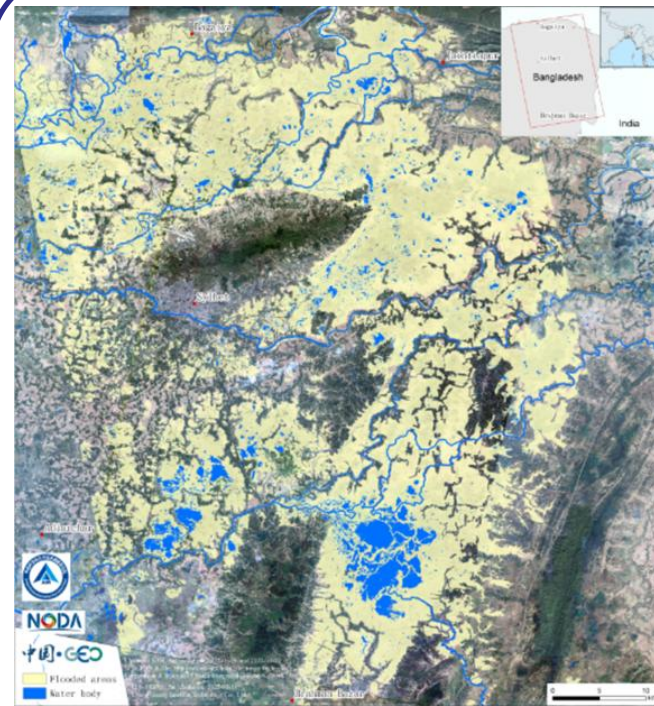
Typhoon Disaster in Fiji,
19 December 2020
Jilin-1GP satellite
image



May, 2021
Tropical Cyclone Yasi

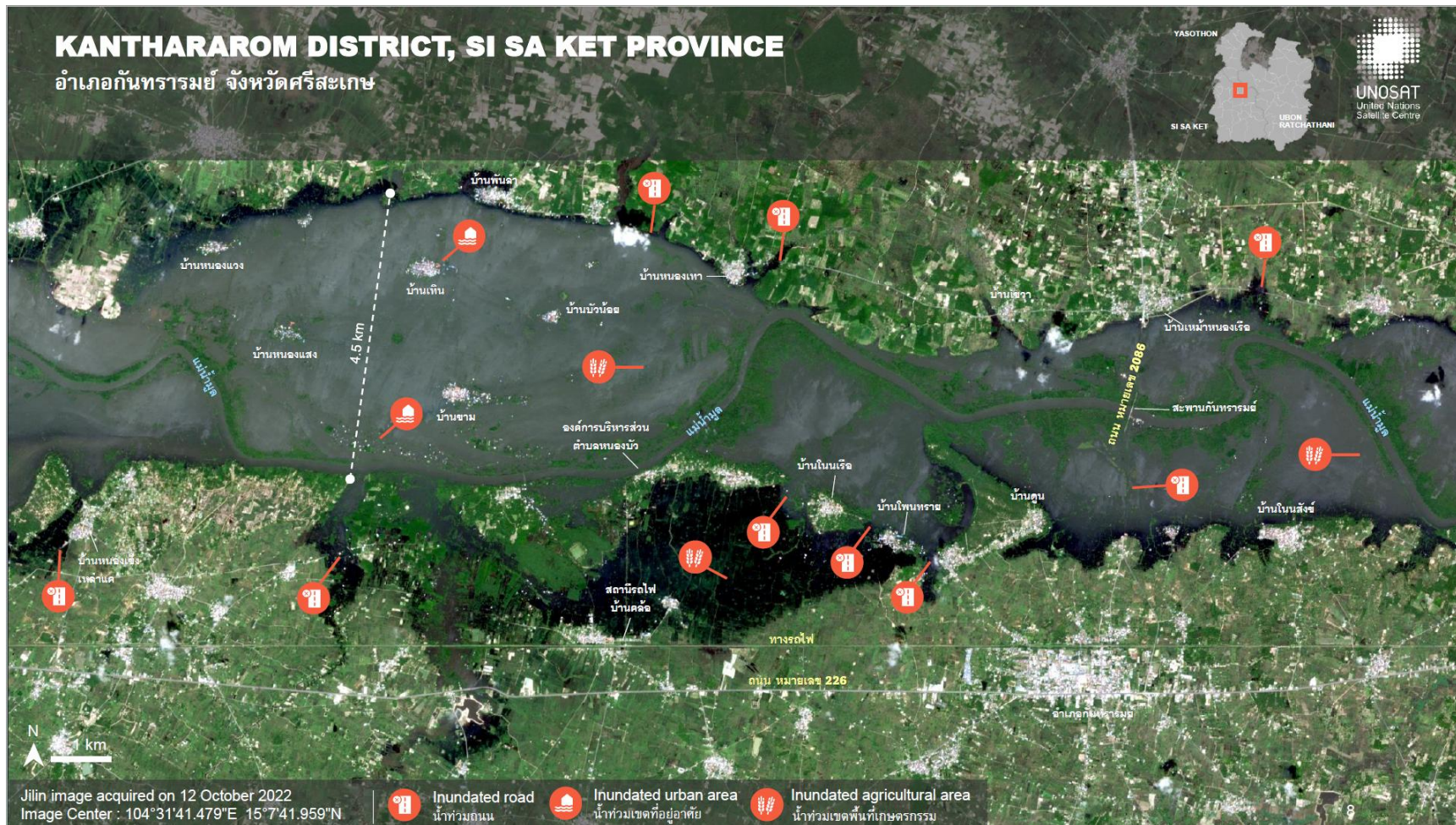


October 20, 2021
flood disaster in Thailand



Flood-stricken areas of Bangladesh, May 2022

Dataset Application





6TH ASIA-OCEANIA GROUP ON EARTH OBSERVATIONS (AOGEO) WORKSHOP

MACAU CHINA 5.29-31 2023

Thanks

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viewThemeById?id=JLS5M](https://www.chinageoss.cn/datasharing/theme/viewThemeById?id=JLS5M)

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