



INTERNATIONAL RESEARCH CENTER OF BIG DATA  
FOR SUSTAINABLE DEVELOPMENT GOALS  
可持续发展大数据国际研究中心



# Sustainable Development Satellite Program and Monitoring of SDG Indicators

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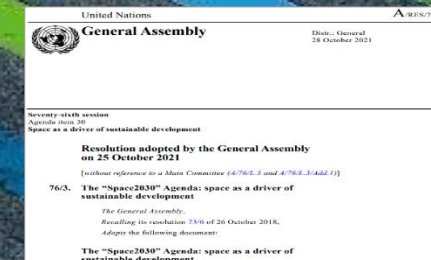
**October 4, 2026    Antalya, Türkiye**

# SUSTAINABLE DEVELOPMENT GOALS

# 2030

# 2026

# 2015

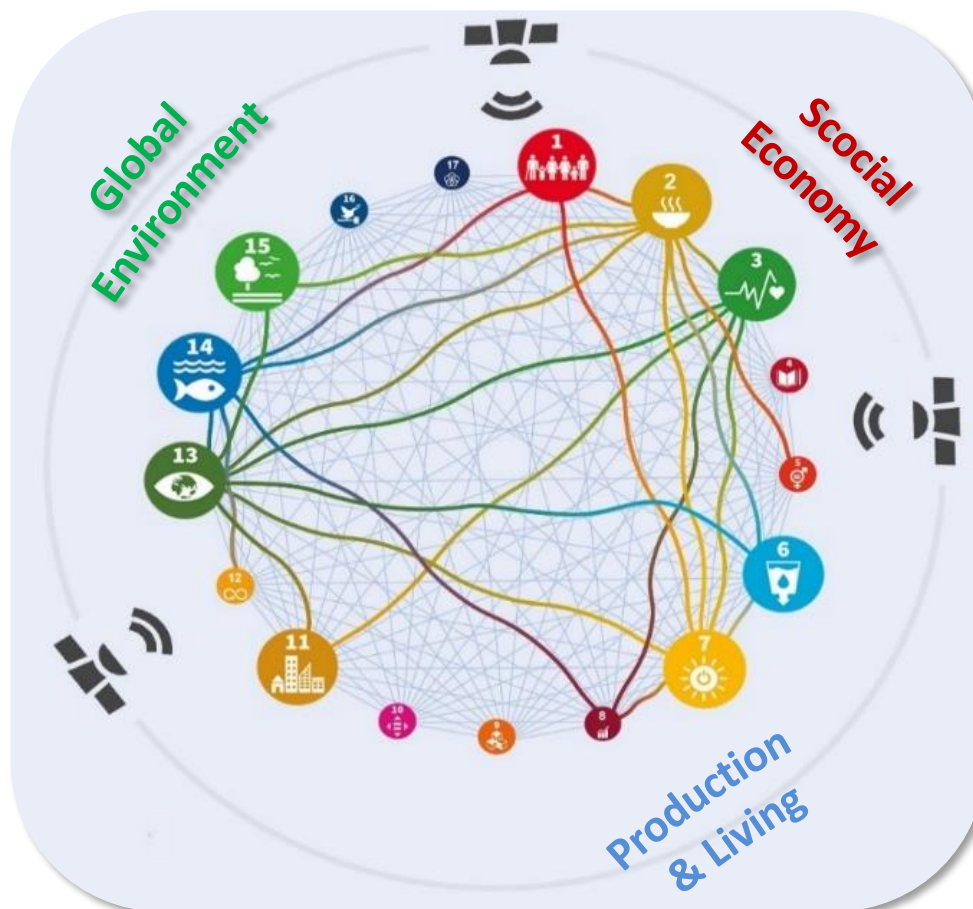
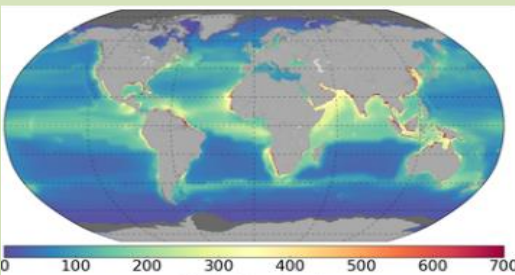
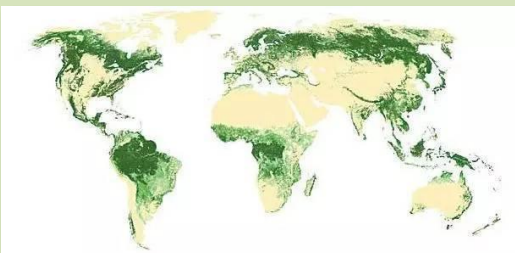


# Space Technology Serves SDGs

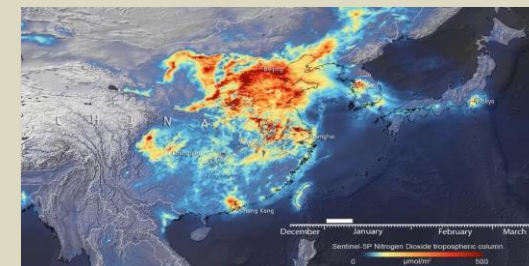


Earth observation has **dynamic, macroscopic, high-precision** and long-span characteristics. Detecting **environmental elements** and **socio-economic development** indicators. Direct observing **7 SDGs** and can contribution to all 17 SDGs.

Large range, long time series and dynamic changes of key environmental elements of **the Earth system in multiple circles**



Fine, three-dimensional, objective **human social development and economic production information data**

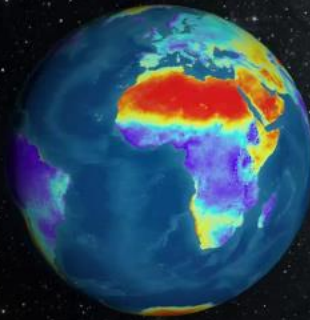


# Digital SDG Platform



SDG 2

Zero Hunger



SDG 6

Clean Water and Sanitation



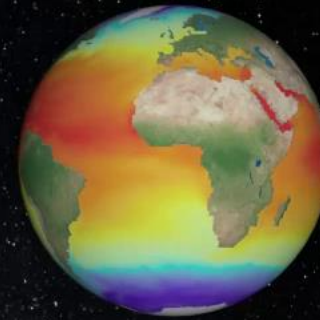
SDG 11

Sustainable Cities and Communities



SDG 13

Climate Action



SDG 14

Life below Water

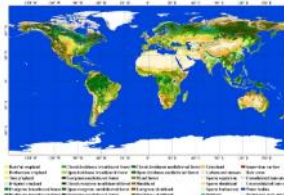


SDG 15

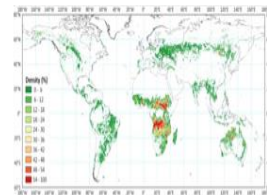
Life on Land



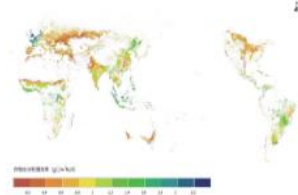
Global Land Cover



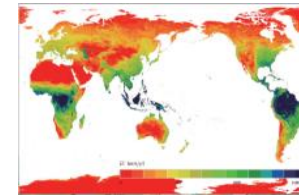
Global Burned Area



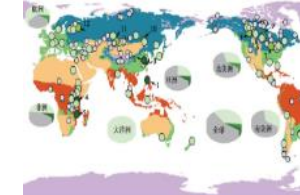
Global Farmland Water



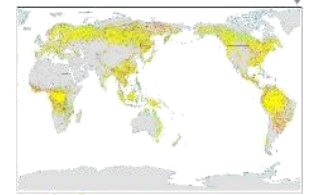
Terrestrial Evapotranspiration



Algal Bloom in Lakes



Global Forest Cover



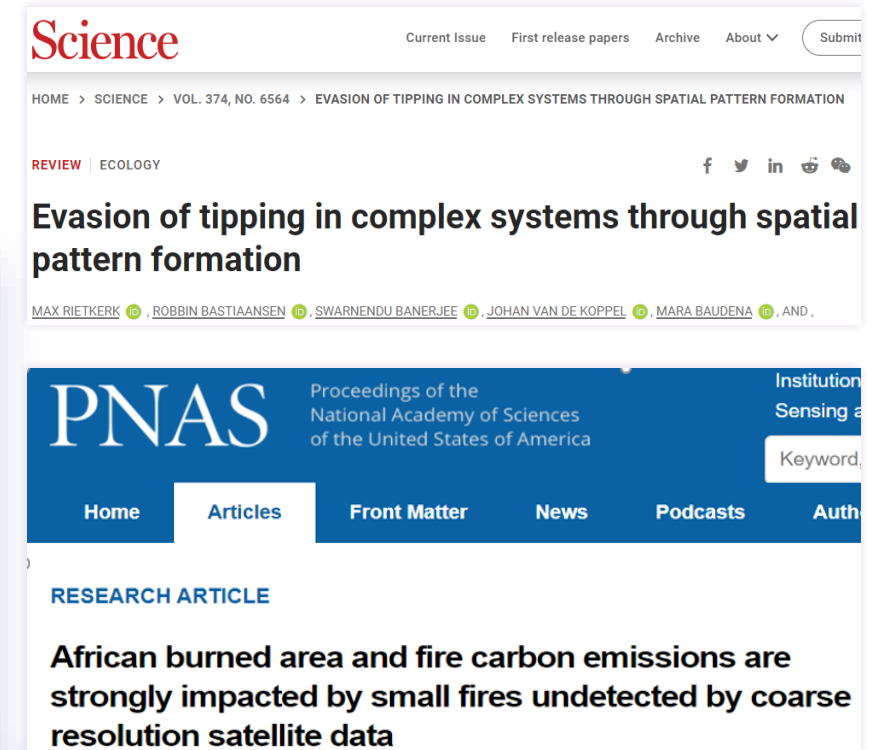
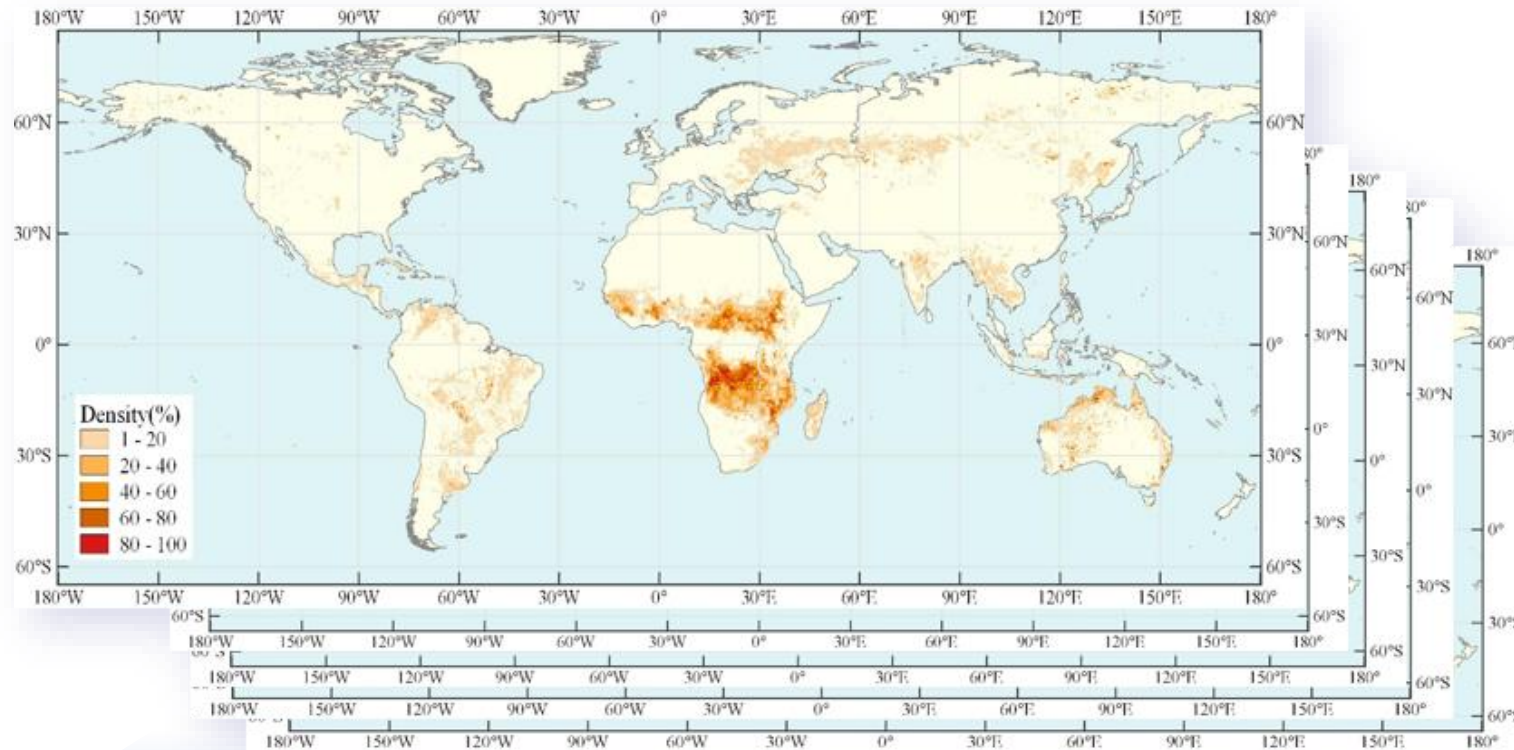
# Big Earth Data in Support of the SDGs

The Big Earth Data in Support of the SDGs series showcases China's STI-driven contributions to the UN 2030 Agenda, provides a "China Solution" for global sustainable development governance, and highlights the value of digital technologies for sustainable development worldwide.



- ◆ 7 SDGs across diverse geographical scales
- ◆ 391 case studies
- ◆ 327 data products
- ◆ 229 innovative methods and models
- ◆ 304 decision-support outputs

# Global 30-m burned area data products



- The global wildfire burn area product with the **highest spatial resolution** currently available
- It has users in more than **100 countries** and has been downloaded over **600,000** times.
- Cited in numerous top-tier SCI journals, e.g. Nature, Science, PNAS, Nature Comm., RSE, etc.

# SDGSAT-1: The World's first Science Satellite for SDGs

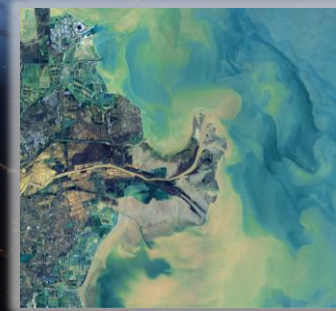


**Launched on Nov. 5th 2021, depicting anthropogenic interaction with Earth's environment**



**Synergetic observation** by three sensors, with **300km** swath width

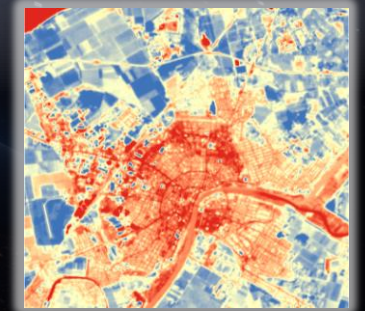
- **Glimmer: 10m** panchromatic & / **40m** RGB
- **TIR: 3 bands, 0.2K** temp. recognition
- **Multispectral: 2 deep blue & 1 red edge** bands



**Multispectral**



**Glimmer**



**Thermal Infrared**

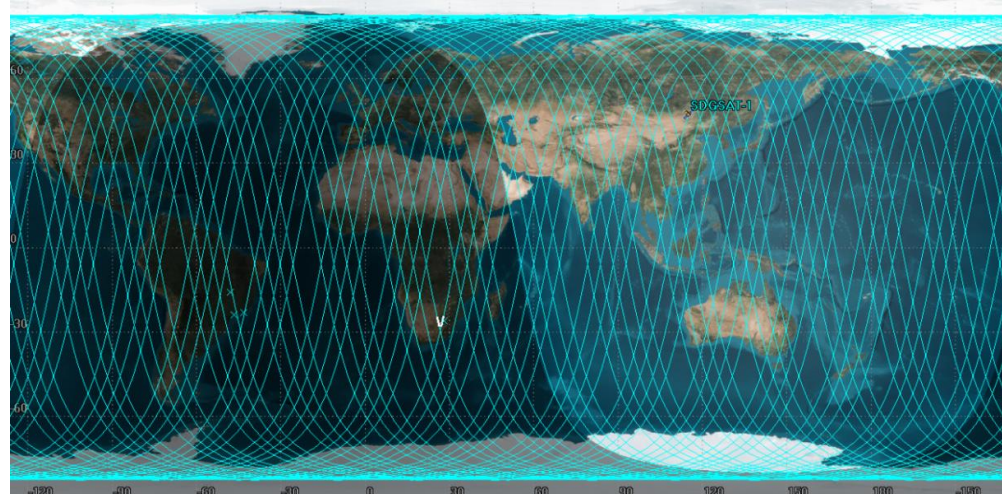
# Technical Specifications

- ❖ Designed life: **3 years**
- ❖ Orbit type: **sun-synchronous**
- ❖ Orbit altitude: **505 km**
- ❖ Orbit inclination angle: **97.5°**
- ❖ Swath width: **300 km**
- ❖ Data collect mode: **TIS + Glimmer (night), TIS + Multispectral (day), and single sensor.**

| Type                          | Index                     | Specifications                                                                                                                                  |
|-------------------------------|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| Thermal Infrared Spectrometer | Bands                     | 8~10.5 $\mu\text{m}$<br>10.3~11.3 $\mu\text{m}$<br>11.5~12.5 $\mu\text{m}$                                                                      |
|                               | Spatial Resolution        | 30 m                                                                                                                                            |
| Glimmer /Multispectral Imager | Bands /Glimmer            | P: 444~910 nm<br>B: 424~526 nm<br>G: 506~612 nm<br>R: 615~894nm                                                                                 |
|                               | Resolution /Glimmer       | P: 10 m, RGB: 40 m                                                                                                                              |
|                               | Bands /Multispectral      | B1: 374 nm~427 nm<br>B2: 410 nm~467 nm<br>B3: 457 nm~529 nm<br>B4: 510 nm~597 nm<br>B5: 618 nm~696 nm<br>B6: 744 nm~813 nm<br>B7: 798 nm~911 nm |
|                               | Resolution /Multispectral | 10 m                                                                                                                                            |

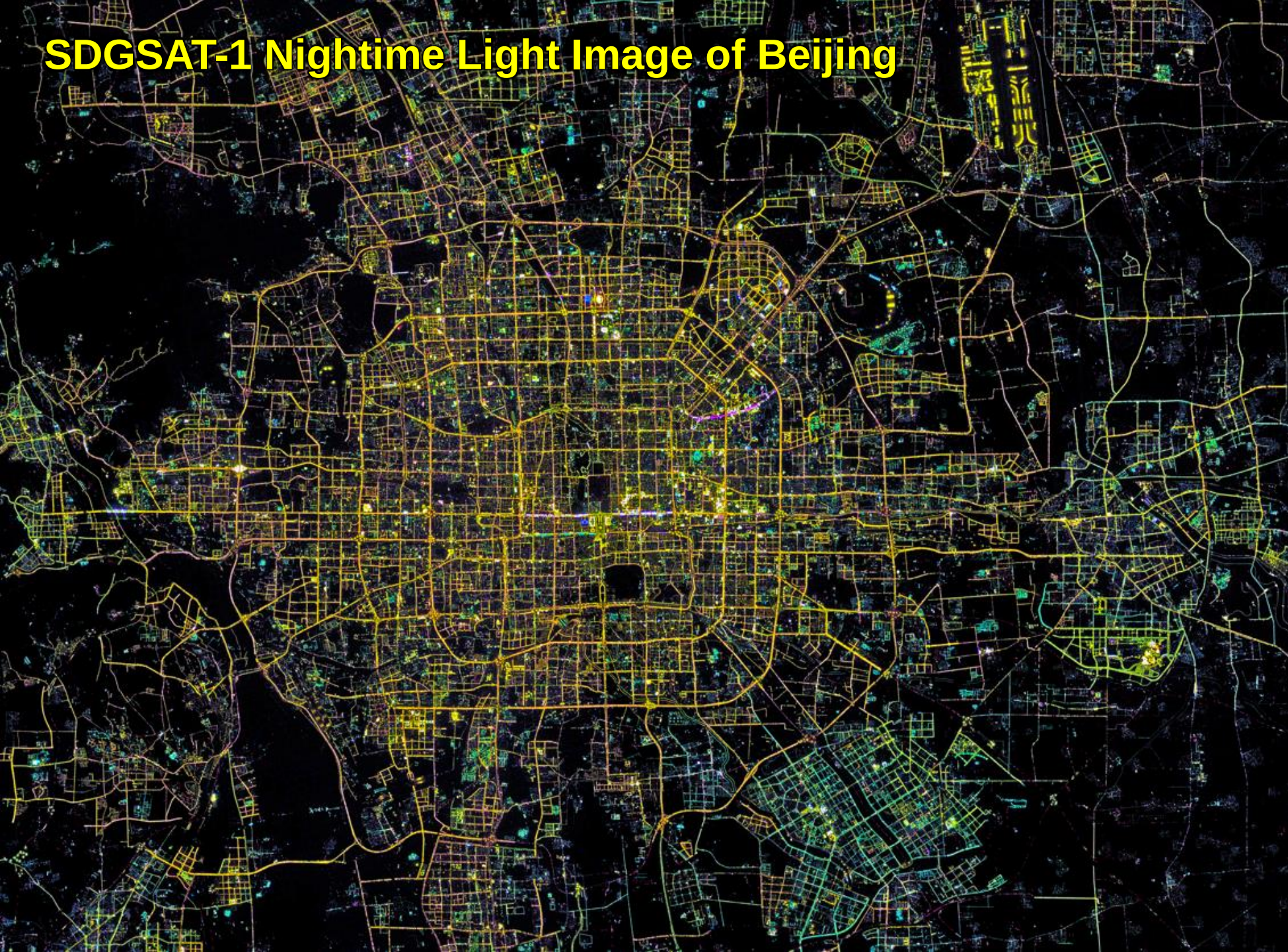


The orbit of SDGSAT-1



Tracks of satellite nadir points of SDGSAT-1

# SDGSAT-1 Nighttime Light Image of Beijing

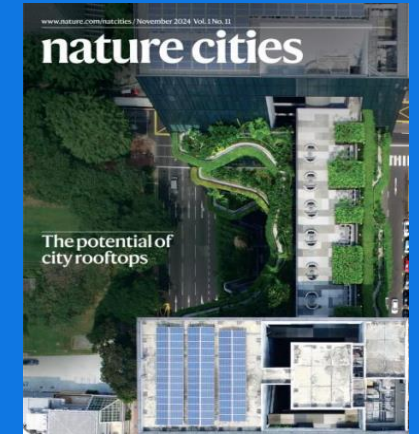
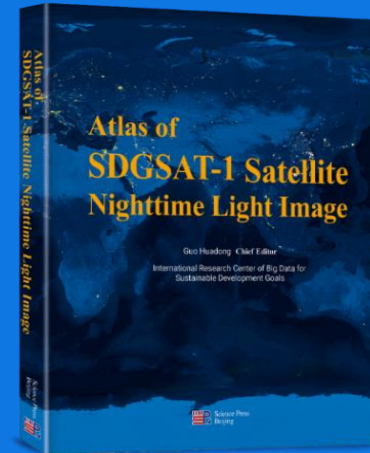


**“Water Cube”**



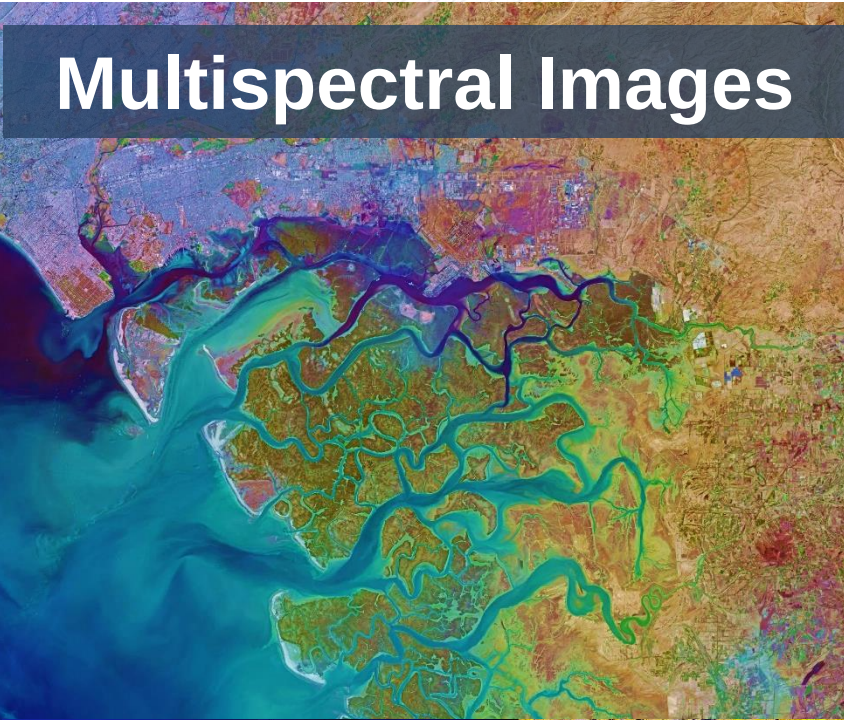
**Tianmen Square**

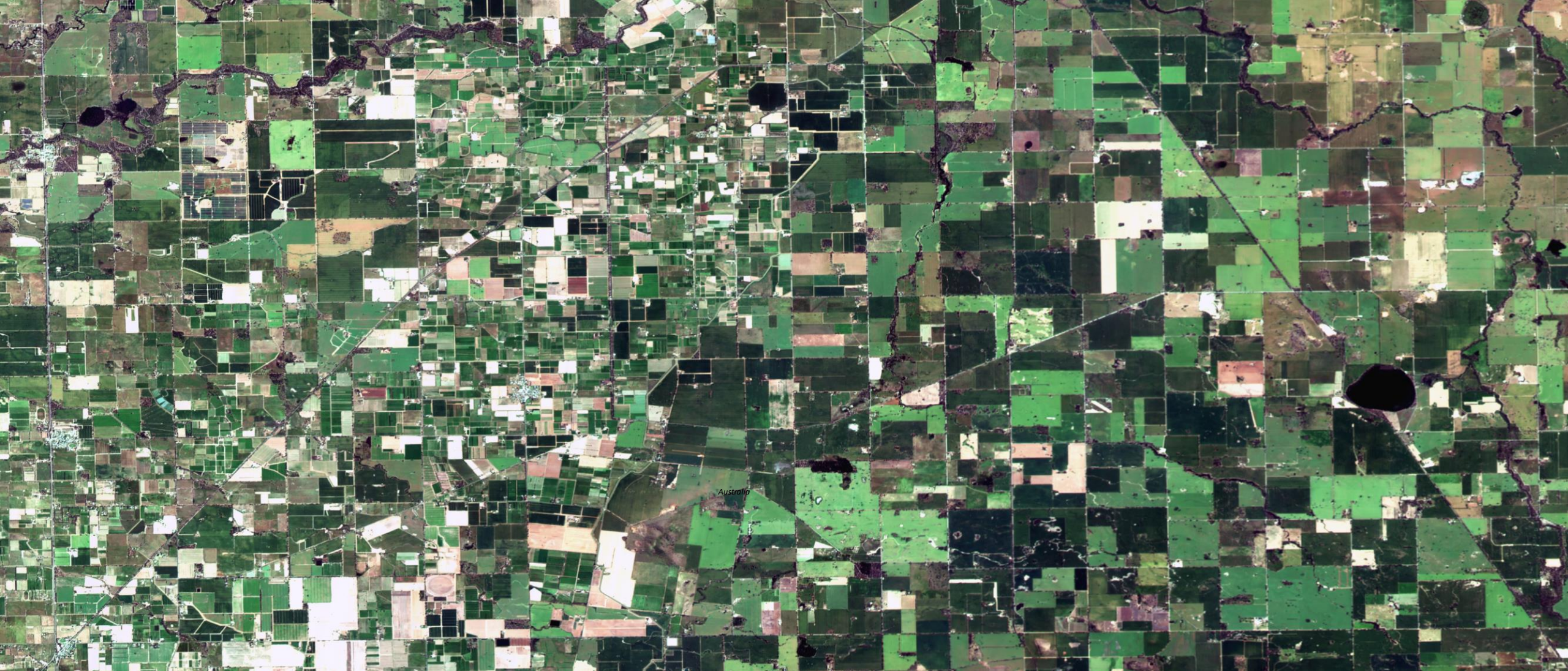
# SDGSAT-1 Satellite Nighttime Light Image Atlas



*SDGSAT-1 Satellite Nighttime Light Image Atlas* features **nighttime light data of 147 cities across 105 countries**, captured by the **SDGSAT-1 satellite** at a 10-meter resolution, **filling a critical gap in global high-resolution urban nighttime remote sensing atlases**.

# Multispectral Images





*Imagerie multispectrale de SDGSAT-1 / SDGSAT-1 Multispectral  
Imager Résolution spatiale / Spatial Resolution : 10 m  
Bandes / Bands: 5(R) 4(G) 3(B)*

#### **La science au service de la sécurité alimentaire**

Produire suffisamment de denrées alimentaires pour une population mondiale croissante dépend de la santé des sols, d'un approvisionnement d'eau fiable et d'écosystèmes résilients. L'observation des paysages agricoles permet de suivre l'état des cultures, leur productivité saisonnière ainsi que les pratiques de gestion des terres, contribuant ainsi à la sécurité alimentaire et à une agriculture durable.

*Localisation : Champs agricoles à Victoria, Australie / Location:  
Agricultural Fields in Victoria, Australia Date d'imagerie / Imaging  
Date : 08/07/2022*

#### **Science for Food Security**

*Producing enough food for a growing population depends on healthy soils, reliable water supplies and resilient ecosystems. Observations of agricultural landscapes help monitor crop health, seasonal productivity and land management practices, supporting food security and sustainable agriculture.*



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International Research Center of Big Data for  
Sustainable Development Goals



unesco

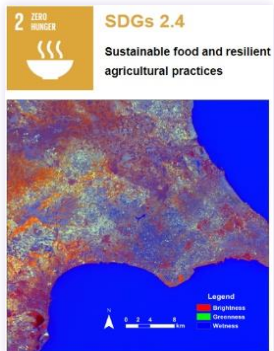
# Light · Heat · Water: A New Way to Observe Human–Earth Interactions



## Light, heat and water reveal human activity at fine spatial scales

**LIGHT** traces night-time activity - **HEAT** reveals production - **WATER** maps living environments  
Multispectral-thermal infrared-nighttime light payloads work together, day and night for SDG monitoring

**MS**



Crop Health



Water Quality

**TIR**

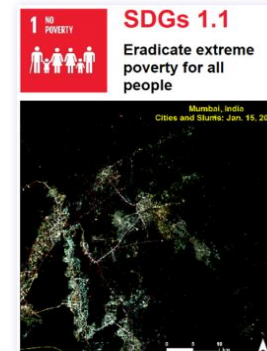


Industrial heat



Lake ice

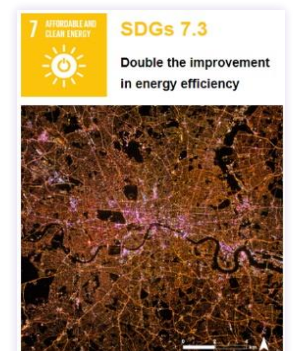
**GLI**



Poverty mapping



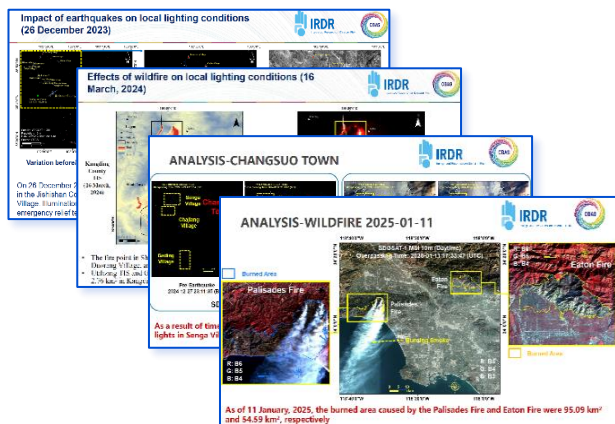
Light pollution



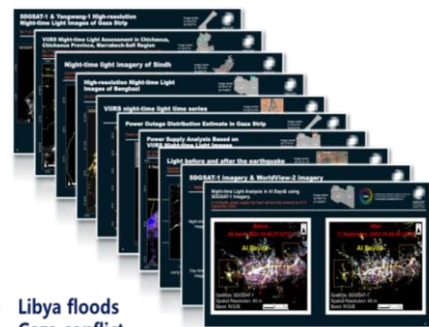
Light efficiency

**17** SDG reports released through UN channels · **200+** peer-reviewed studies using SDGSAT-1

# SDGSAT-1 for Emergency Response



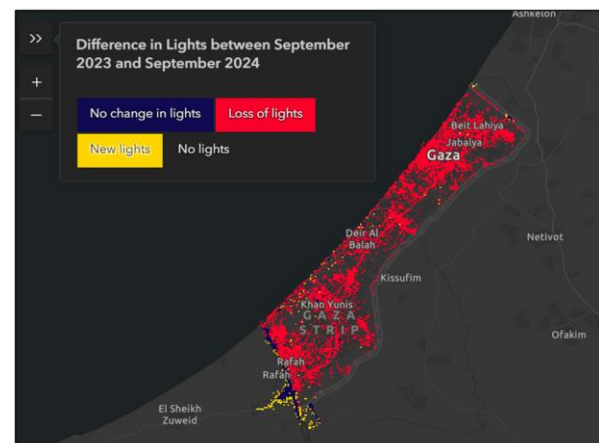
Earthquake, wild fire, etc.



- Libya floods
- Gaza conflict
- Earthquake assessment in Turkey & Syria
- ...

11 Reports  
(UNOSAT)

11 Reports  
(IRDR/UNDRR)



Nighttime Lights in Gaza assessed  
by SDGSAT-1 (2023 vs 2024)

BEST STORY



Best Story of the UN World  
Data Forum (2024)

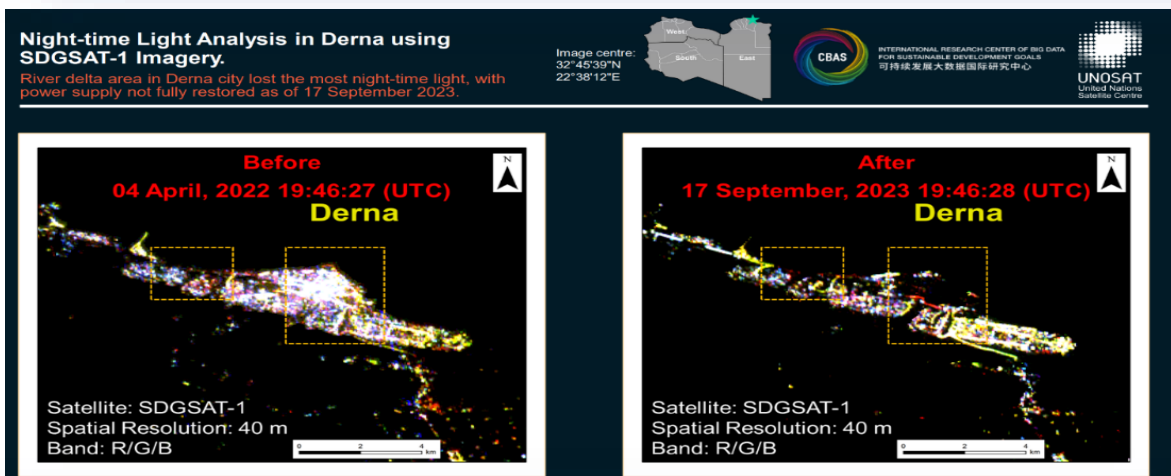
Published 17 Scientific Reports on UN Website  
of **UNOSAT**, **UNDRR**, **OCHA**

The StoryMap was awarded Best Story at the  
UN World Data Forum in November 2024

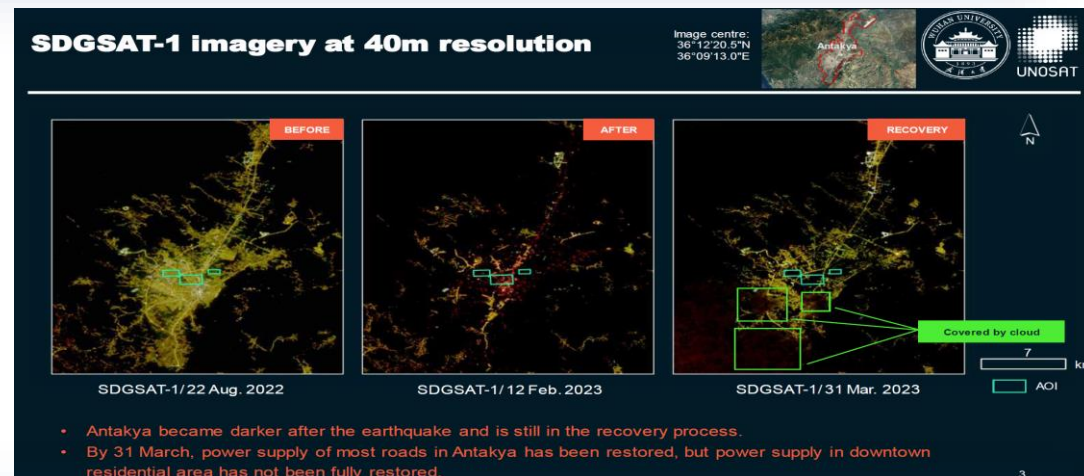
# SDGSAT-1 for Libya Floods and Turkey-Syria Earthquake



## UNOSAT issued disaster assessment reports for the Libya floods & Türkiye–Syria earthquake in 2023



- **5 km<sup>2</sup>** reduction in nighttime lights in Derna and **4 km<sup>2</sup>** in Al-Bayda after the flood.
- Most lights in Derna's river delta area remained off, indicating **incomplete power restoration** as of 17 Sep. 2023.
- Al-Bayda's **power supply** had largely **recovered** by 17 Sep. 2023.



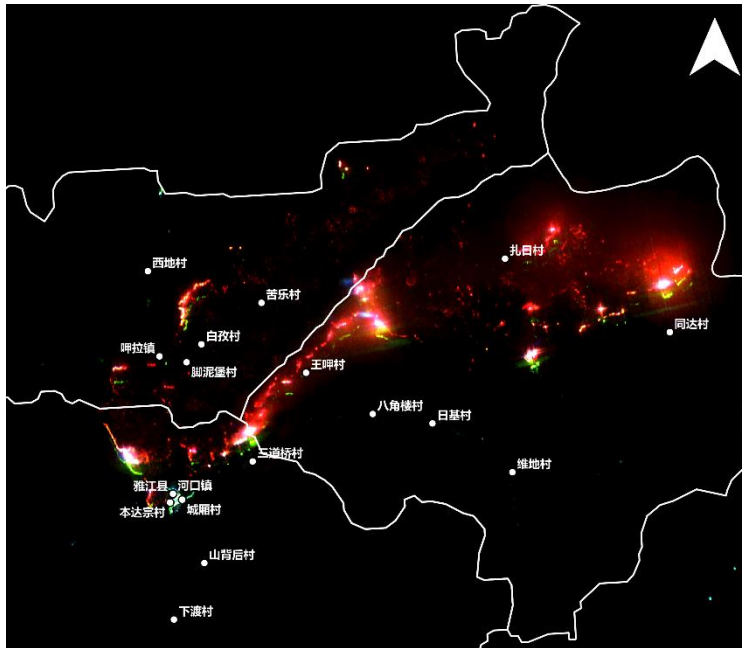
- **Power outage areas** were mainly concentrated along the **Kahramanmaraş–Antakya fault zone**.
- Widespread reduction of nighttime lights across affected cities.
- SDGSAT-1 imagery indicates that nighttime lighting in Hatay **decreased by more than 90%**.

# Wildfire Monitoring in Sichuan Province, China

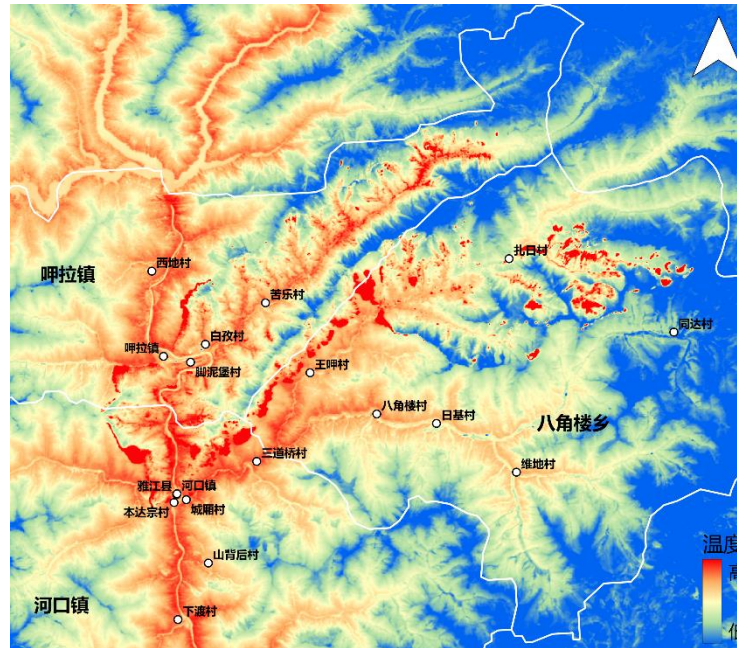


Fire Monitoring in Ya'an, Sichuan: Three-sensor synergetic observation enables detection of **fire points**, **heat**, and **burned area**, as well as the onset, progression, and impact of fires

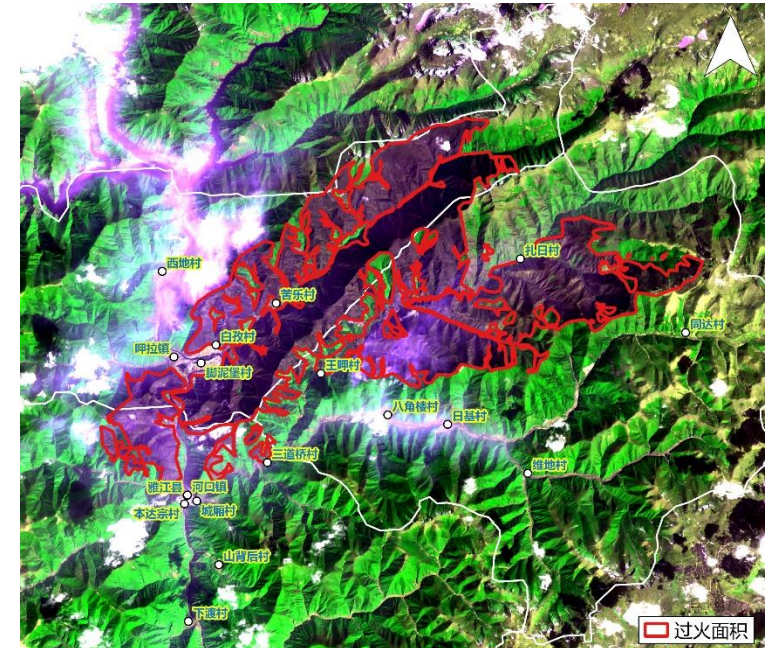
*The Innovation, 2024*



Precise Detection of Nighttime Fires



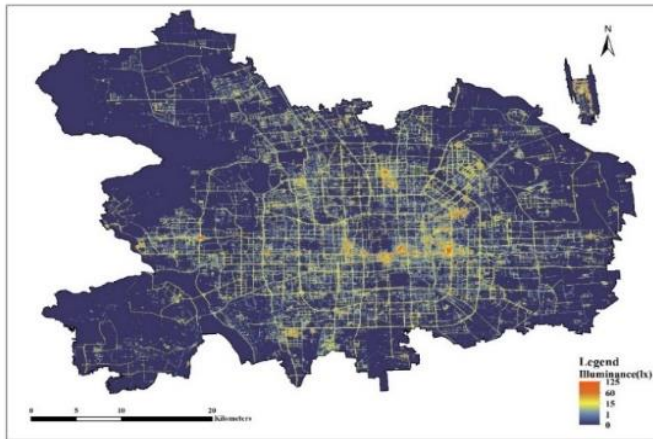
Detection of the Spatial Distribution and Dynamic Changes of Wildfires



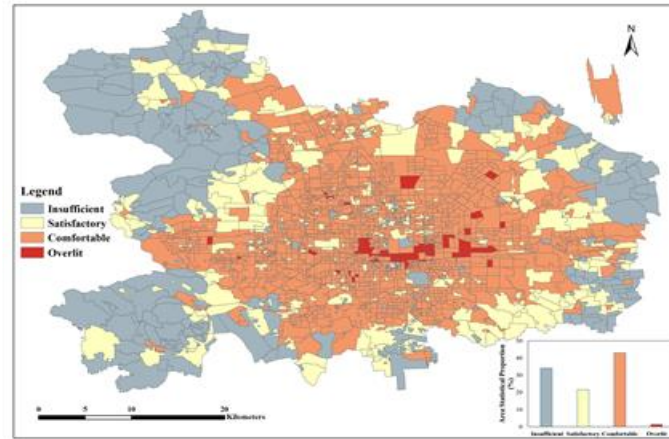
Detection of Burned Area

Three-sensor synergetic observation: Enabling comprehensive fire detection across the **nighttime light**, **thermal**, and **spectral** domains

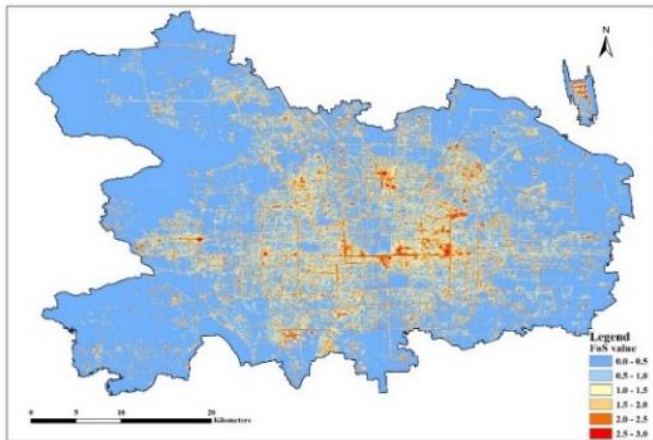
# SDG 3 Good Health and Well-being



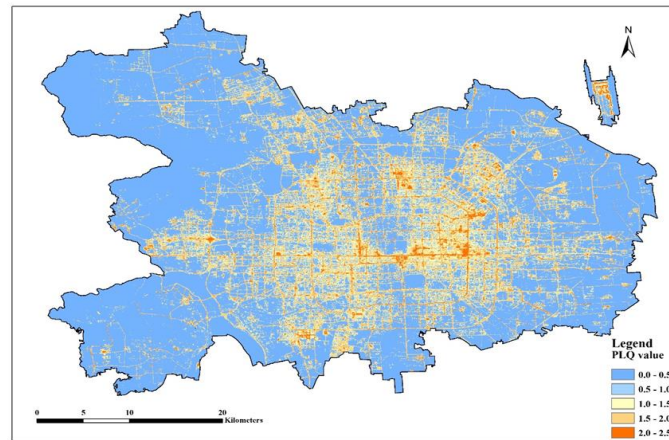
Panoramic illuminance



Public perception of lighting



Nighttime feeling of safety



Nighttime visual comfort

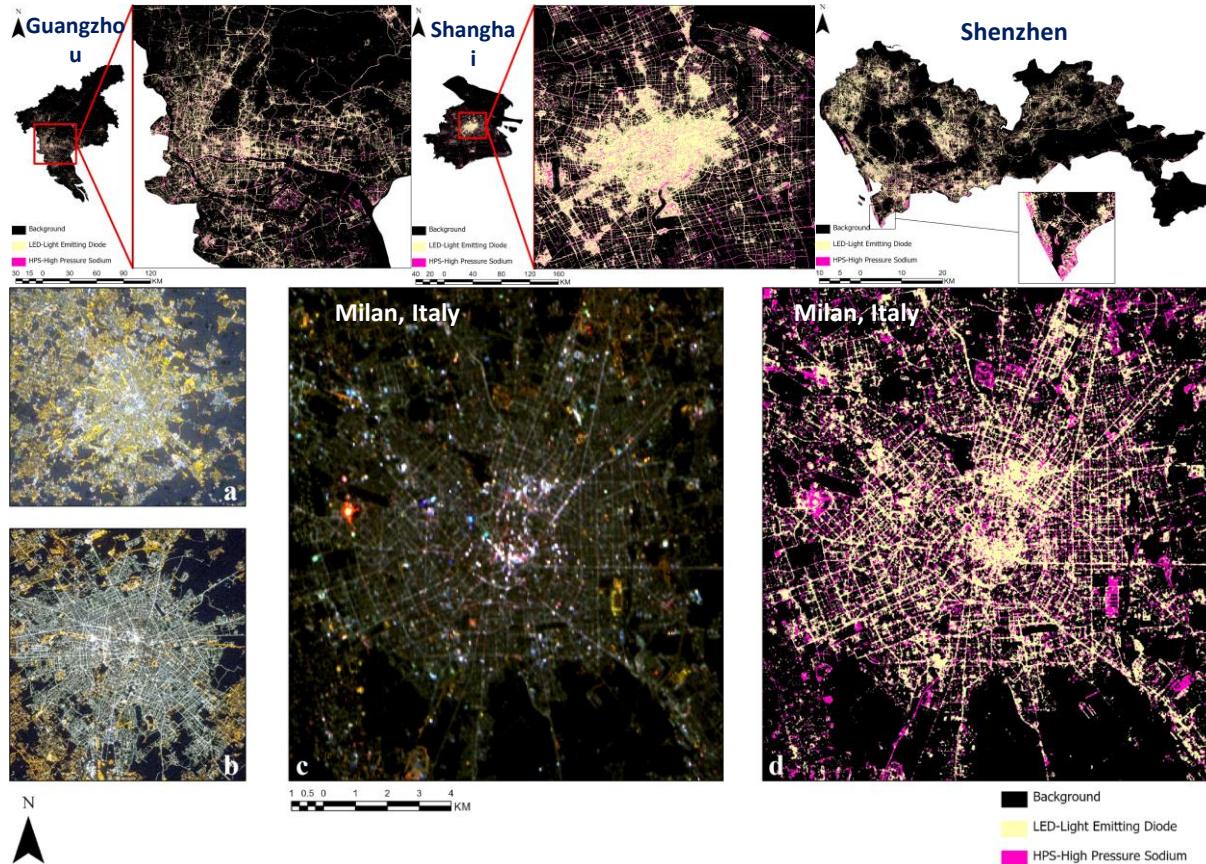


## SDG 3

- *Reduce illnesses and deaths from pollution*
- *SDG 3.9*

- Illumination is **positively correlated** with safety and comfort, but higher illumination is not necessarily better.
- In some commercial and landscaped areas, light intensity is too high and leads to energy waste and **light pollution**.
- SDGSAT-1 data can provide decision support to the design and sustainable use of resources for urban nighttime lighting.

# SDG 7 Clean Energy



SDGSAT-1 GLI data and classification results of urban lighting types



## SDG 7

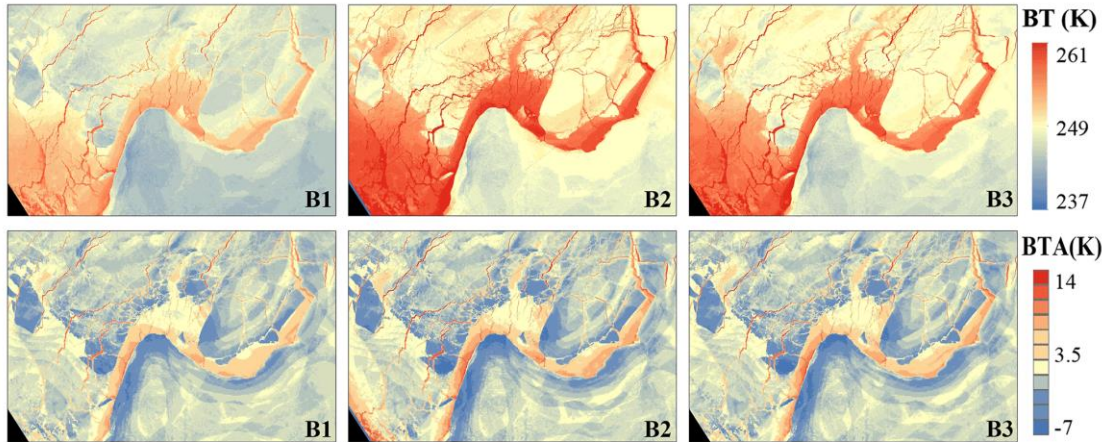
- *Global rate of improvement in energy efficiency*
- *SDG 7.3*

- Classification of **urban light types** can be achieved with good generalizability at the regional scale based on SDGSAT-1 GLI data.
- In 2022, Beijing, Shanghai, Guangzhou and Shenzhen all reached more than 50% of LED lighting due to **industry clustering**.
- By replacing 10% of HPS lamp to LED lights every year, **municipal funding pressures** can be mitigated.

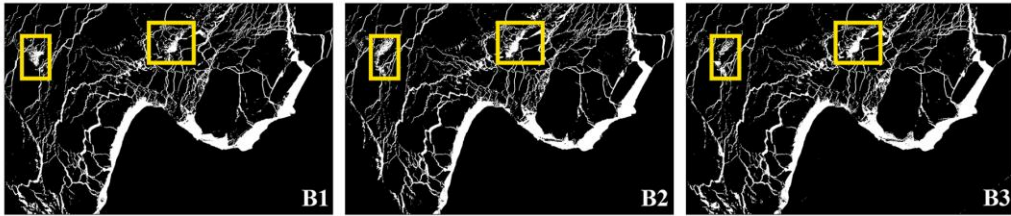
# SDG 13 Climate Action



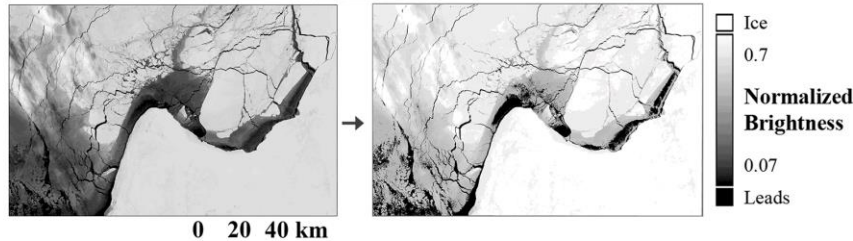
SDGSAT-1 TIS



Detected Sea Ice Leads



Sentinel-2



Ice lead detection using TIS data acquired over the Laptev Sea

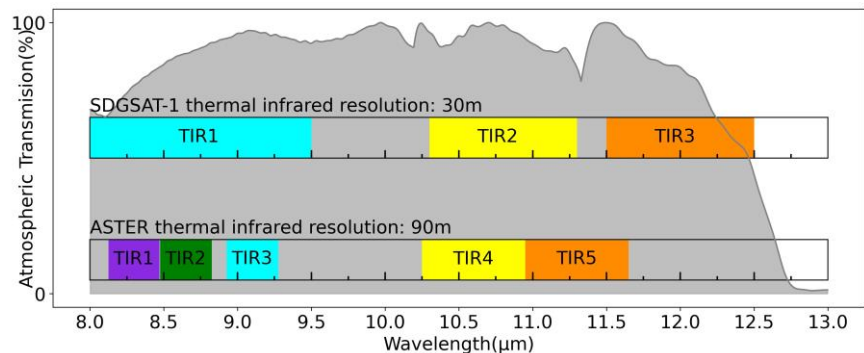


## SDG 13

- *Integrate climate change measures into national policies, strategies and planning*
- *SDG 13.2*

- The sequential SDGSAT-1 TIS data with sufficiently high resolution can provide new insight into the contribution of **narrow leads to rapid sea ice changes** in the Arctic.
- For the first time, the Arctic sea ice region was detected with TIS of 30 m, 415 sea ice leads were found, with a detection accuracy of **96.3%**.
- The SDGSAT-1 TIS data has excellent potential for detecting **sea ice leads formation and refreezing** in polar regions.

# SDG 15 Life On Land



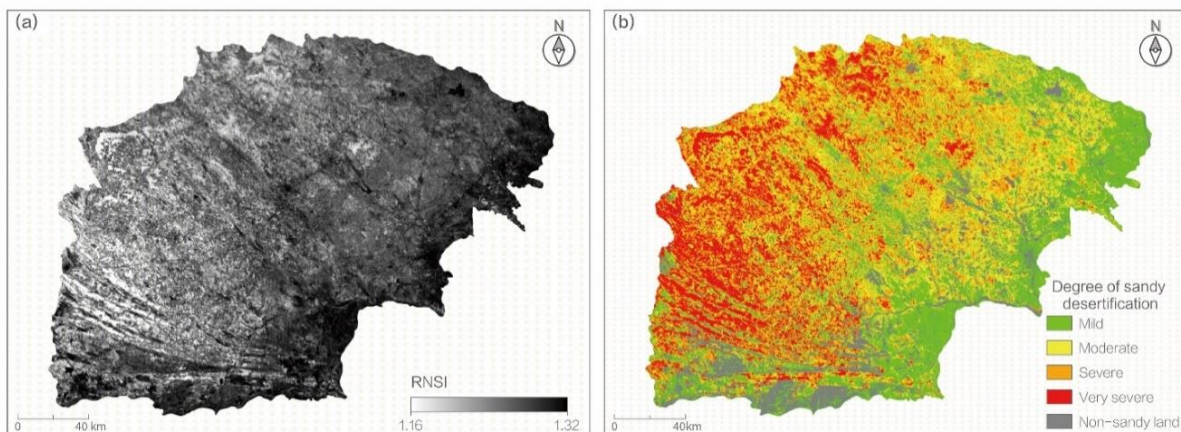
Band 1 of TIS data is sensitive to silica



## SDG 15

- *Combat desertification, restore degraded land and soil*
- *SDG 15.3*

- Based on the sensitivity to silica of the TIS bands in SDGSAT-1, a **Relative Normalized Silica Index (RNSI)** with good spatial consistency was constructed to monitor **sandy desertification levels** in the Mu Us Sandy Land.
- SDGSAT-1's three-band TIS data with wide swath width helps achieve **high-precision** monitoring of **large-scale** sandy desertification levels.

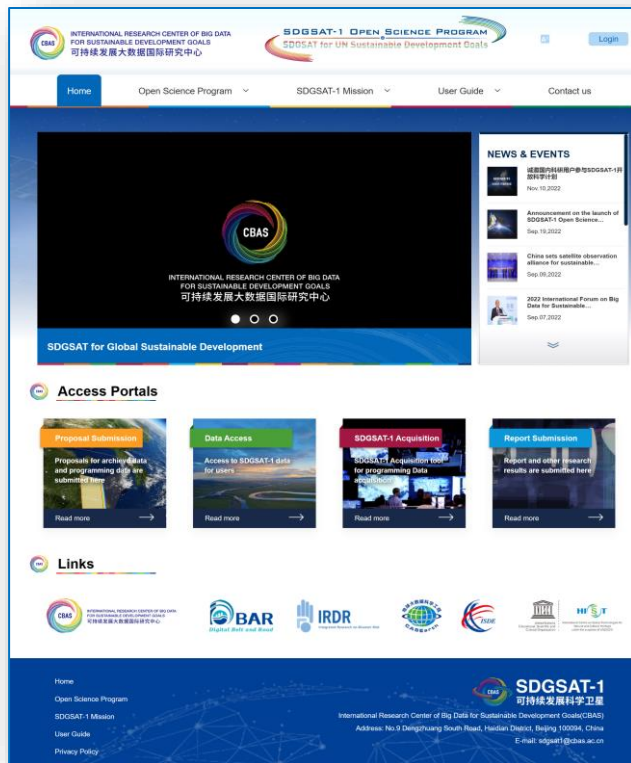


SDGSAT-1 TIS data extracting different sandy desertification levels in the Mu Us Sandy Land

# SDGSAT-1 Open Science Program



CBAS encourages scientists around the world to commit to the 2030 Agenda through shared SDGSAT-1 data via **SDGSAT-1 Open Science Program** ([www.sdgsat.ac.cn](http://www.sdgsat.ac.cn)).



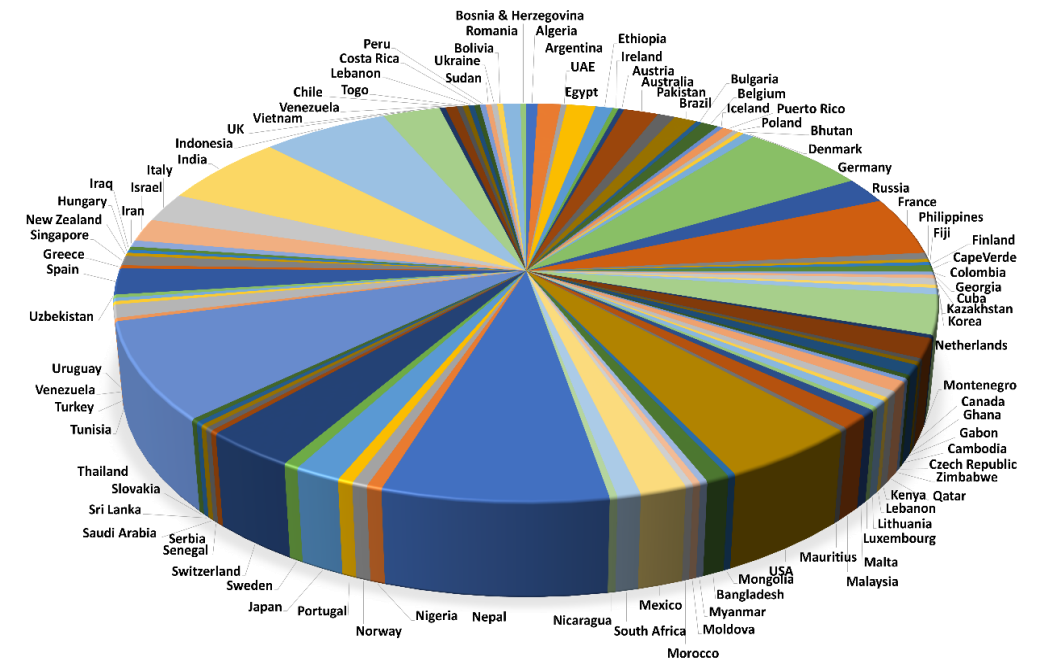
[www.sdgsat.ac.cn](http://www.sdgsat.ac.cn)



360,000+ Images of SDGSAT-1



2 Journals that include  
Special Issues of SDGSAT-1



More than **540,000** SDGSAT-1 images are shared  
with scientists from over **119 countries** through  
"SDGSAT-1 Open Science Program"

SDGSAT-1 data are shared to global users **free of charge**



### Meteorological Satellites:

*FY-1 and FY-3 series: polar orbit satellites; FY-2 and FY-4 series: stationary orbit satellites*



### Resource Satellites:

*CBERS series: developed jointly by China and Brazil;  
ZY3-01/02: surveying, mapping and resource investigation.*



### Ocean Satellites:

*HY-1A/B: ocean color satellites; HY-2A: ocean dynamics and environmental satellite; CFOSAT: surface waves.*



### Disaster Reduction and Environmental Satellites:

*HJ-1A/B: optical sensors;  
HJ-1C: S-band SAR sensor.*



### High-resolution Satellites:

*GF series: construction period: 2010-2020; including optical and SAR satellites.*



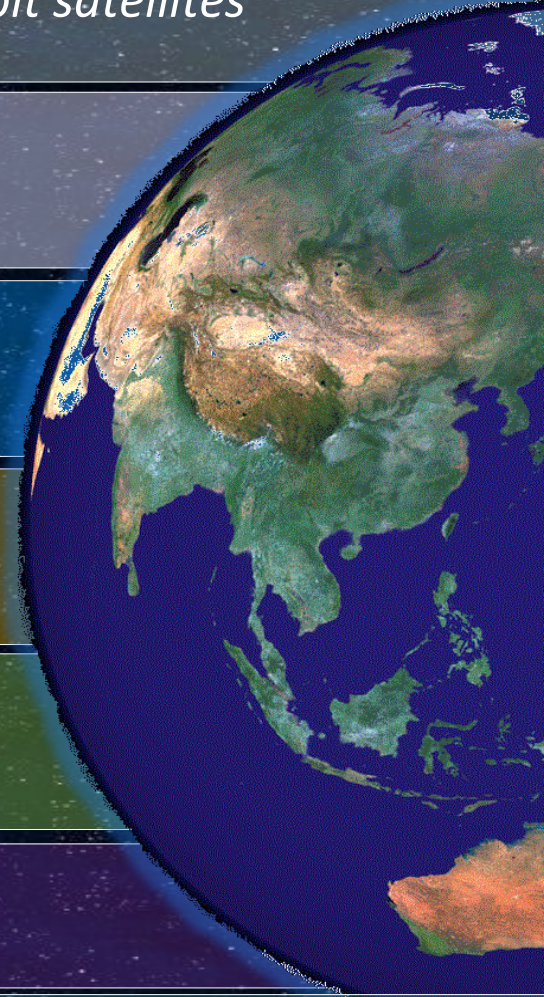
### BeiDou Navigation and Positioning Satellites:

*BeiDou series: including 35 satellites; global coverage.*

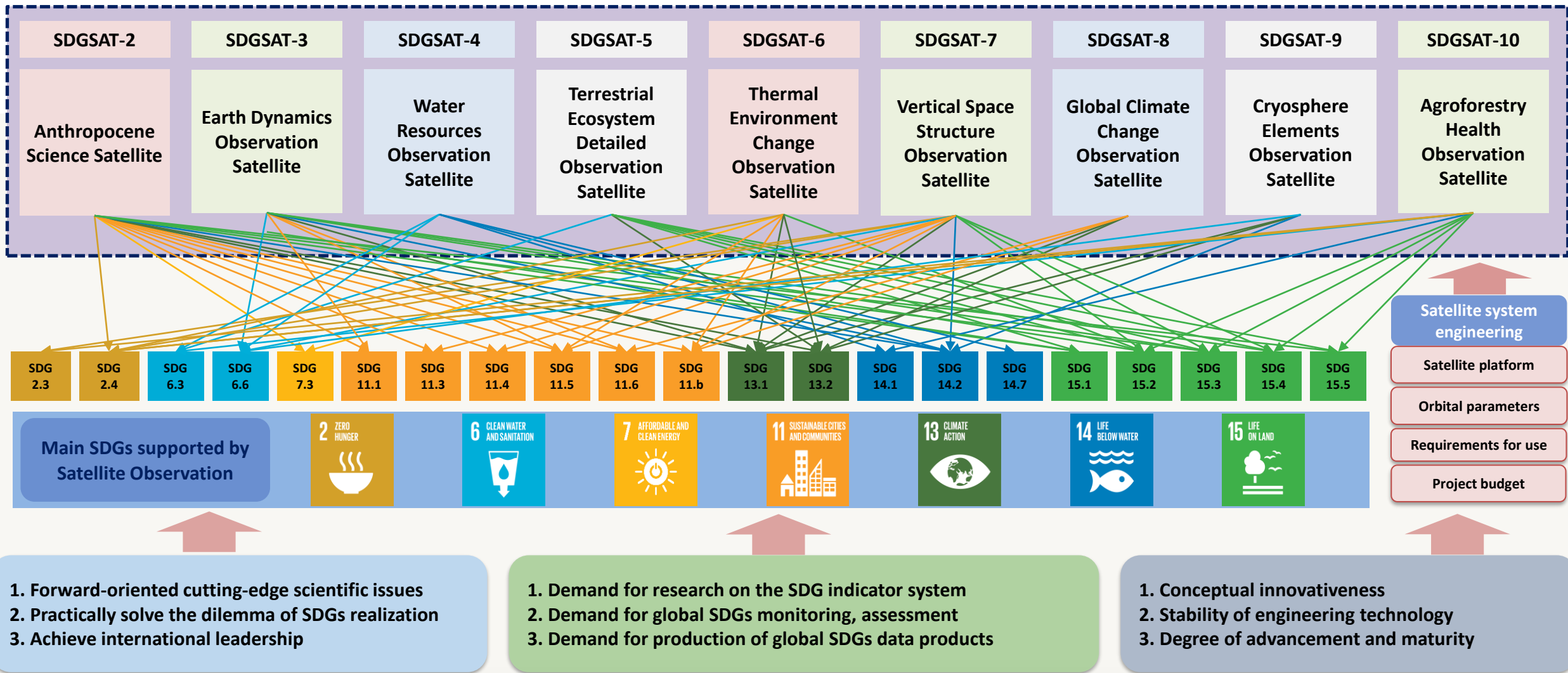


### SDG Satellite:

*Widescale (300 km), high-resolution (10 m), thermal infrared + nighttime-light + multi-spectral.*



# Sustainable Development Satellite Constellation Plan



**Sustainable Development Satellite Constellation Plan**



Digital Sustainable Development  
Goals Programme

# **CBAS Launches**

**“Digital Sustainable Development  
Goals Programme (DSP)” .**

**SDG Satellite Constellation is a  
key component of DSP .**



# THANKS



可持续发展大数据国际研究中心  
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