Cultural Relics 01 Satellite: Prospects and Pathways for the Application of Satellite Remote Sensing Monitoring in the Protection of Major Archaeological Sites on the Qinghai-Xizang Plateau

Case Studies of the Guge Kingdom Ruins, the Piyang Dongga Grottoes Group, and the Reshui Tomb Complex

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ABSTRACT

On June 15,2026, China's first remote sensing satellite for cultural relics industry, "Cultural Relics 01 Satellite", was successfully launched at Jiuquan Satellite Launch Center, marking the official entry of China's cultural relics protection into the era of "space-air-ground" collaborative space-based monitoring. There are a large number of high-value archaeological sites in the Qinghai-Xizang Plateau, such as the Guge Kingdom Ruins, the Piyang Dongga Grottoes Group, and the Reshui Tomb Complex. However, due to extreme natural conditions such as high cold and hypoxia, steep terrain, and inconvenient transportation, traditional manual inspections and ground monitoring are faced with outstanding difficulties such as long coverage period, high inspection cost, and difficulty in reaching remote areas. From the perspective of users in the cultural and museum industry, this paper does not involve the specific research and development of remote sensing and aerospace technology, but focuses on how the technical capabilities of the Cultural Relics 01 Satellite can be connected with the actual needs of the protection of the great sites on the Qinghai-Xizang Plateau, and analyzes its application prospects in site monitoring, disease early warning, law enforcement supervision, archaeological investigation and other aspects, and puts forward the preliminary idea of constructing the three-level linkage mechanism of "satellite data - local cultural and museum institutions - grassroots guardians", in order to provide ideas for the application of new cultural relics protection techniques in the difficult conditions of the Qinghai-Xizang Plateau.

Keywords: *Cultural Relics 01 Satellite, Remote sensing monitoring, Qinghai-Xizang Plateau, Protection of great ruins, Multidisciplinary integration, Guge Dynasty, Reshui Tomb Complex.*

1. INTRODUCTION

The Qinghai-Xizang Plateau is an important area for the formation of the pluralistic integration pattern of Chinese civilization. It is distributed with a large number of archaeological sites and cultural heritages from the Paleolithic Age to the Ming and Qing Dynasties. However, most of these sites are located in alpine areas above 4,000 meters above sea level. The natural environment is harsh and the traffic is extremely inconvenient. Traditional cultural relics protection methods face severe challenges in terms of coverage, inspection frequency and response time. Taking the Guge Kingdom Ruins and the Piyang Dongga Grottoes Group in the Ali area of Xizang as examples, the ruins are scattered among the forest gullies. The most remote caves need to be reached by walking for several hours, and the guardians of cultural relics at the grass-roots level have long been in a state of "fighting alone".

On June 15,2026, China's first remote sensing monitoring satellite for cultural relics industry, "Cultural Relics 01 Satellite", was successfully

launched at Jiuquan Satellite Launch Center and successfully entered the scheduled orbit. The satellite is developed by the State Administration of Cultural Heritage and Changguang Satellite Technology Co., Ltd. It is equipped with high-precision optical remote sensing load, and the panchromatic resolution is better than 0.5 meters. It is equipped with multi-spectral imaging channels and can be operated together with more than 130 satellites of the "Jilin-1" satellite constellation, which lays a data base for the construction of a "space-air-ground" collaborative cultural heritage resource supervision technology system. This major technological breakthrough provides a new possibility for the protection of great sites in the Qinghai-Xizang Plateau: space-based monitoring makes up for the natural shortcomings of ground inspections, multi-spectral data identifies subtle changes in the cultural relics and the surrounding environment, and high-frequency revisits to achieve normalized dynamic early warning.

This paper does not involve the specific technical principles of remote sensing and space technology, but from the perspective of the users of the cultural and museum industry, discusses the docking path between the technical capabilities of the Cultural Relics 01 Satellite and the protection needs of the great sites on the Qinghai-Xizang Plateau, analyzes the typical application scenarios, and puts forward the preliminary idea of the application of technology application, in order to provide a path reference for the application of space-based remote sensing monitoring technology in the protection of the great sites on the Qinghai-Xizang Plateau.

2. THE REALISTIC DILEMMA AND TECHNICAL REQUIREMENTS OF THE PROTECTION OF THE GREAT SITES ON THE QINGHAI-XIZANG PLATEAU

2.1 The Dilemma of Cultural Relics Protection Under Extreme Natural Conditions

The average altitude of the Qinghai-Xizang Plateau is more than 4,000 meters above sea level, known as the "roof of the world". The distribution of archaeological sites shows four characteristics: "high, scattered, dangerous and cold". "High" refers to the high altitude of the site. For example, the Guge Kingdom Ruins is located on the soil forest at an altitude of about 3,900 meters in Zanda County, Ali Prefecture, Xizang, China and the Piyang Dongga Grottoes Group are distributed in the mountains above 4000 meters above sea level. "Scattered" refers to the scattered distribution of sites, often spanning tens or even hundreds of kilometers. For example, the hot water tombs are distributed on the vast grasslands on both sides of the Chahanwusu River in Dulan County, Qinghai Province, with a total area of more than 300 tombs. "Dangerous" refers to the steep terrain. Many cave sites are excavated on steep cliffs, and it is difficult to reach them. Some sites even need to climb rocks to enter. The "cold" refers to the cold climate of the plateau, the average annual temperature is below 0℃, the window period of field work is short, and the effective time available for the protection of cultural relics is limited every year.

Under such extreme conditions, the protection of traditional cultural relics faces three dilemmas. First, the inspection coverage is limited. There is a shortage of personnel in the grass-roots cultural relics management station, and often only a few staff members are responsible for the inspection of dozens of sites in the jurisdiction. Many remote sites can only be inspected once or twice a year, forming a large number of monitoring blind spots. Second, the response time is hysteretic. Due to the inconvenience of transportation, it often takes days or even longer from the discovery of cultural relics safety hazards to the arrival of professionals at the site, which delays the best disposal time. Third, the monitoring method is single. At present, the daily monitoring of the large sites on the Qinghai-Xizang Plateau mainly relies on manual inspections and fixed-point cameras. The former has limited coverage, and the latter is restricted by power supply and communication conditions, making it difficult to deploy on a large scale in uninhabited areas.

2.2 Typical Cases: The Protection Status of Three Plateau Sites

2.2.1 Guge Kingdom Ruins

The Guge Kingdom Ruins is located in Zaburang Village, Zanda County, Ali Prefecture, Xizang, China. It is the capital site of the Guge Kingdom established by the descendants of the Tibetan royal family around the 10th century. There are 879 caves, 445 houses, 58 fortresses and 28 pagodas, with a total area of about 720,000m^2. In 1961, it was listed as the first batch of national key cultural relics protection units. The site is built on

the mountain, and the height difference from the foot of the mountain to the top of the mountain is about 170 meters. The mountain is a loose soil forest accumulation, and the weathering erosion is serious. In the annual rainy season, mountain torrents and debris flows pose a direct threat to the site itself; the dry season is faced with the pressure of sand erosion and tourist activities. The staff of the Ruins Management Institute is less than 10 people. It has multiple responsibilities such as daily inspections, visitor management, and protection engineering assistance. It is unable to dynamically monitor the vast area around the site.

2.2.2 Piyang Dongga Grottoes Group

Located 40km north of Zhada County, the Dongga Grottoes are composed of the Qulin Temple site and the Piyang Grottoes Group. It is an important cultural center during the Guge Dynasty. Among them, there are nearly 200 caves in the Qulin Temple site. The exquisite murals of the caves are known as “Plateau Dunhuang”. The site was listed as the seventh batch of national key cultural relics protection units in 2013. Due to its remote location, only the local villagers such as Awangmirang and other guardians have been taking care of themselves for a long time, and they have not been included in the formal protection system until recent years. The main threats faced by the site include: mural paint layer falling off, grotto seepage, rock cracking, wildlife disturbance and so on. The first phase of the mountain drainage and cave treatment project invested 9.06 million yuan, and the second phase of the mural restoration project is still in progress. Such fine protection work is inseparable from the long-term and high-frequency dynamic monitoring data support for the site itself and the surrounding environment.

2.2.3 Reshui Tomb Complex

Reshui Tomb Group is located in Reshui Township, Dulan County, Haixi Mongolian and Xizang Autonomous Prefecture, Qinghai Province. It is a large Tubo tomb group in the early Tang Dynasty. It entered the academic field after the discovery of “Xuewei No.1 Tomb” in 1982. In 1996, it was selected as the “Top Ten New Archaeological Discoveries in China”.In 2020, the excavation of “2018 Xuewei No.1 Tomb” was again selected as the top ten new archaeological discoveries. The tombs are distributed on the vast grasslands on both sides of the Chahanwusu River. There are more than 300 known tombs, which are the largest tombs of the Tubo period in Qinghai. The tomb group has long faced the threat of theft and excavation. From November 2017 to March 2018, 26 suspects stole 646 cultural relics, with a price of CNY 180 million, and the tomb body was seriously damaged. Although the cultural relics were recovered afterwards, the historical information of the tombs has been permanently lost. This painful lesson profoundly shows that for large sites with wide distribution and remote location, it is difficult to effectively curb the illegal excavation behavior by manual inspection alone, and a wide range and high frequency technical monitoring means are urgently needed.

2.3 Technical Requirements Analysis

Based on the above difficulties and cases, the protection of large sites on the Qinghai-Xizang Plateau puts forward five core requirements for new technical means: first, a large-scale coverage capacity, which can realize the normal monitoring of the site itself and the surrounding hundreds of square kilometers; the second is the ability of high-frequency revisits, which can detect human vandalism such as theft and illegal construction in a timely manner; the third is the multi-dimensional identification ability, which can distinguish between natural changes and human disturbances, and identify environmental risks such as vegetation erosion and soil erosion. The fourth is the non-destructive detection ability, which obtains the preservation status information without contacting the cultural relics. The fifth is the ability of data sharing and collaboration, which can transmit monitoring data to local cultural institutions and grass-roots guardians in time, forming a closed loop of “discovery - forewarning - response”. The remote sensing satellite technology is highly compatible with the above requirements, which is also the significance of the launch of the Cultural Relics 01 Satellite.

3. THE TECHNICAL ABILITY OF CULTURAL RELICS 01 SATELLITE AND THE APPLICATION DIRECTION OF CULTURAL RELICS PROTECTION

3.1 Basic Situation of Cultural Relics 01 Satellite

On May 17,2026, the State Administration of Cultural Heritage and Changguang Satellite Technology Co., Ltd. held the "Cultural Relics 01 Satellite" expedition ceremony in Changchun, Jilin. At 12:00 on June 15, the satellite was successfully launched by the force rocket No.1 Yaoshi 14 carrier rocket at Jiuquan Satellite Launch Center, and successfully entered the predetermined orbit. This is China's first customized remote sensing monitoring satellite focusing on the protection of cultural relics, marking an important step in the direction of normalized space-based monitoring of cultural relics protection in China.

From the published technical parameters, the cultural relics 01 star has the following core capabilities: First, high-resolution optical imaging, panchromatic resolution is better than 0.5 meters, which means that objects about 50 centimeters square on the ground can be distinguished from hundreds of kilometers of space orbit. This accuracy is sufficient to identify small changes in large-scale sites, illegal buildings within the scope of cultural relics protection, and stolen excavation traces. Second, multi-spectral imaging capabilities, the spectrum covers five spectral bands of panchromatic, blue, green, red, and near-infrared. Different materials (bricks, rocks, vegetation, and soil) have different reflection characteristics in each spectral band. Based on this, the satellite can identify the material changes of the cultural relics and the surrounding environment, and even monitor the loss of mural pigments. Third, the same-orbit stereo imaging capability. When the satellite flies over the same area, it can be continuously photographed from different angles to synthesize a three-dimensional model, which provides a data basis for the digital twin of ancient buildings and large sites. Fourth, the agile imaging mode supports various modes such as conventional push-broom, stereo imaging, strip splicing, and inertial space imaging, and can customize the processing image data according to different application scenarios.

More importantly, after the Cultural Relics 01 Satellite is orbited, it is connected with more than 130 satellites of the “Jilin-1” satellite constellation. Relying on the networking advantages of large-scale constellations, it can achieve higher-frequency revisit monitoring, continuously provide massive, accurate, and time-series remote sensing data, and greatly improve the ability of high-precision, high-frequency, normalized, and full-coverage dynamic monitoring of cultural relics protection units at all levels across China. This set of network operation mode is of special significance for the large ruins of the Qinghai-Xizang Plateau with a vast area and complex topography.

3.2 The Application Direction of Cultural Relics 01 Satellite in the Protection of Great Sites on the Qinghai-Xizang Plateau

Combined with the application plan published by the State Administration of Cultural Heritage and the actual needs of the protection of the great sites on the Cultural Relics 01 Satellite, this paper believes that the application of the Qinghai-Xizang Plateau in the Cultural Relics 01 Satellite can focus on the following five directions.

3.2.1 Law Enforcement Supervision and Forewarning of Cultural Relics

The Cultural Relics 01 Satellite can carry out regular image comparison on the protection scope and construction control area around the site, and accurately identify the suspected illegal construction, geomorphological changes and other spots. Taking the hot water tomb group as an example, the tomb group is distributed in the vast grassland, and the theft and excavation behavior is often carried out at night. It is difficult to find on the ground inspection, but the theft and excavation activities will inevitably change the surface morphology, leaving traces such as theft holes, ruts, and abandoned soil. These traces are clearly identifiable on satellite images with a resolution of 0.5 meters. By regularly comparing the two images before and after, the abnormal changes of the surface can be automatically detected, which provides objective data support for law enforcement supervision. In fact, Qinghai Province has taken the lead in piloting the satellite remote sensing law enforcement monitoring of cultural relics protection in 2025, covering 51 national key cultural relics protection units and 457 provincial

cultural relics protection units in the province, rectifying and dealing with the illegal construction problems found in 51 satellite remote sensing law enforcement monitoring, and accumulating valuable practical experience. After the launch of the Cultural Relics 01 Satellite, this monitoring model is expected to be promoted throughout the Qinghai-Xizang Plateau.

3.2.2 Site Ontology Disease Monitoring and Preventive Protection

The multi-spectral imaging capability of the Cultural Relics 01 Satellite enables it to monitor the subtle changes of the cultural relics and the surrounding environment, including potential risks such as soil erosion, vegetation erosion, and rock mass weathering. Taking the Piyang Dongga Grottoes Group as an example, the murals of the grottoes are faced with multiple diseases such as armoring, water seepage and cracking. Although satellite images cannot directly observe the state of the murals inside the grottoes, they can predict the risk of water seepage in the grottoes by monitoring indirect indicators such as mountain vegetation changes, surface water distribution, and surrounding drainage channel conditions, and provide decision-making basis for preventive protection projects. For large earthen sites such as the Guge Kingdom Ruins, the satellite can regularly monitor the development of mountain gullies, the expansion of wind erosion area, the change of catchment path in the rainy season, etc., establish a time-series data file of the preservation status of the site body, and support the analysis of disease development trend.

3.2.3 Archaeological Investigation and Site Discovery

Remote sensing technology has unique advantages in archaeological survey, which can overcome the influence of complex terrain on traditional ground survey. Many areas of the Qinghai-Xizang Plateau are inaccessible, and the coverage of traditional field archaeological surveys is limited. Satellite remote sensing can perform rapid geomorphological scanning on a wide range of areas to assist in identifying potential site clues. The research of the Institute of Aerospace Information Innovation of the Chinese Academy of Sciences shows that archaeological marks such as vegetation marks, soil marks and shadow marks on remote sensing images can be used to identify archaeological sites on the surface and shallow surface. In the grassland and desert areas of the Qinghai-Xizang Plateau, the sealing soil of ancient tombs, the foundation of ancient city walls, the relics of ancient settlements, etc., often form recognizable abnormal spots on satellite images. The 0.5-meter resolution high-definition image of the Cultural Relics 01 Satellite will significantly improve the efficiency and coverage of the archaeological survey on the Qinghai-Xizang Plateau.

3.2.4 Three-dimensional Modeling and Digital Protection of the Site

The same-orbit stereo imaging capability of the Cultural Relics 01 Satellite can generate a wide range of digital elevation models and three-dimensional scenes, providing a data basis for the digital protection of large-scale sites. The Guge Kingdom Ruins are built on the mountain, and the mountain and the ruins are integrated. The traditional ground three-dimensional laser scanning is difficult to cover the whole picture, while the satellite three-dimensional imaging can obtain the three-dimensional shape of the whole ruins at one time and establish the digital twin model. Regular comparison of three-dimensional models in different periods can accurately quantify deformation information such as mountain settlement, wall displacement, and gully development, and provide an objective basis for the evaluation of protection engineering effects.

3.2.5 Protection Planning and Heritage Management

The satellite remote sensing data can provide base map data and analysis support for site protection planning, construction control zone delineation, and surrounding development impact assessment. For the protection planning of the linear cultural heritage of the Qinghai-Xizang Plateau (such as the ruins along the Tangbo Ancient Road, the ruins of the Tea Horse Ancient Road, etc.), satellite images are an indispensable macro-perspective tool.

4. PRACTICAL CHALLENGES AND PATH EXPLORATION OF APPLICATION LANDING

4.1 Realistic Challenges

Although the technical ability of the Cultural Relics 01 Satellite is remarkable, the application of

its technical achievements in the protection of the great sites of the Qinghai-Xizang Plateau still faces several practical challenges, which need to be examined calmly.

The first is the threshold of data acquisition and processing. The data products of the Cultural Relics 01 Satellite are oriented to the cultural relics protection units at all levels in the country, but the technical capabilities of the grass-roots cultural and museum institutions in the Qinghai-Xizang Plateau in data processing, image interpretation, change detection and other aspects are relatively weak. Taking the Ali area of Xizang, China as an example, the staff of the regional cultural relics bureau and the county cultural relics management institute are mostly cultural and museum professional background, lacking professional training in remote sensing technology. Even if satellite data are obtained, it is difficult to independently complete image analysis and anomaly recognition. This problem is difficult to fundamentally solve in the short term, and needs the technical support of the higher cultural relics departments and scientific research institutions.

The second is cloud cover and plateau climate impact. There are many cloudy and foggy weather in some areas of the Qinghai-Xizang Plateau. Optical remote sensing satellites are affected by cloud cover and may not be able to obtain effective images. This limitation needs to be supplemented by microwave remote sensing (synthetic aperture radar) and other technical means of penetrating clouds. At present, the Cultural Relics 01 Satellite is mainly based on optical imaging. In the application, it is necessary to fully consider the climatic factors and reasonably arrange the time sequence of image acquisition.

The third is the matching of monitoring accuracy and site scale. The resolution of 0.5 meters of the Cultural Relics 01 Satellite is more sufficient for the monitoring of large sites (such as the overall layout of the Guge Kingdom Ruins and the distribution of the Reshui Tomb Complex), but for the fine diseases of the single cultural relics (such as the shedding of the mural paint layer and the cracking of the single cave), the accuracy is insufficient. This means that satellite remote sensing monitoring should be used as a macro-monitoring method, combined with micro-monitoring methods such as UAV low-altitude remote sensing, ground close-range photogrammetry, and three-dimensional laser scanning to form a multi-scale monitoring system.

The fourth is the coordination of technology application and system construction. Technology is only a tool, and its effectiveness depends on the construction of supporting systems. A clear response mechanism and disposal process are needed for the abnormal spots found by satellite monitoring, otherwise “found but not disposed” will weaken the practical value of technology application. At present, the State Administration of Cultural Heritage is promoting the construction of satellite remote sensing monitoring system platform for cultural relics, but the response mechanism at the local level is still under exploration.

4.2 Exploration of Application Path

Based on the above challenge analysis, this paper puts forward the preliminary path conception of the application of Cultural Relics 01 Satellite technology in the protection of large sites on the Qinghai-Xizang Plateau from the perspective of users in the cultural and museum industry.

4.2.1 Constructing a “National - Provincial - Grassroots” Three-level Data Linkage Mechanism

The data of Cultural Relics 01 Satellite is uniformly received and preprocessed by the data center of the State Administration of Cultural Heritage. It is suggested to establish a hierarchical data push mechanism on this basis: the national platform is responsible for macro monitoring and key early warning nationwide; provincial cultural relics departments (such as the Xizang Autonomous Region Institute of Cultural Relics Protection, Qinghai Provincial Institute of Cultural Relics and Archaeology) are responsible for the regular monitoring and abnormal preliminary screening of the sites within their jurisdiction; grass-roots cultural and museum institutions (such as Ali Regional Cultural Relics Bureau, Dulan County Cultural Relics Management Institute) receive monitoring briefings and early warning information on sites in their jurisdictions, and are responsible for on-site verification and disposal. The three-level linkage can bridge the gap in technical capabilities to a certain extent, so that grassroots institutions can “use” satellite data.

4.2.2 Establishing a "Satellite Data + Grassroots Guardian" Collaborative Model

The daily protection of many remote sites on the Qinghai-Xizang Plateau is actually undertaken by local villagers and grassroots cultural relics guardians. For example, the guardian of the Piyang Dongga Ruins, Awangmirang, has been guarding the grottoes for decades. Satellite remote sensing monitoring can complement the ground inspection of the primary guardian: the satellite is responsible for large-scale, high-frequency macro-scans. Once suspected anomalies are found, the coordinates and images are pushed to the primary guardian's mobile terminal (mobile phone or tablet) for on-site verification and feedback by the guardian. This collaborative mode of "space-based discovery - ground verification" not only gives full play to the technical advantages of satellites, but also makes full use of the local advantages of grassroots guardians, which is expected to significantly improve the monitoring efficiency of remote sites.

4.2.3 Promoting the Construction of Multi-scale Monitoring System

According to the monitoring requirements of different scales, a multi-scale monitoring system of "satellite remote sensing-UAV low-altitude remote sensing-ground close-range measurement" should be constructed. The satellite remote sensing is responsible for the macroscopic monitoring of the site and its surrounding hundreds of meters to several kilometers. The UAV is responsible for the meso-level monitoring of the site body from tens of meters to hundreds of meters. The ground close-range photogrammetry and 3D laser scanning are responsible for the microscopic monitoring of individual cultural relics and detailed diseases. The data of the three scales check and complement each other to form a three-dimensional monitoring network. In this system, the Cultural Relics 01 Satellite plays the role of "top-level vision". Its value is not to replace other monitoring methods, but to provide a macro framework and a wide range of dynamic early warning for the entire monitoring network.

4.2.4 Strengthening the Cultivation of Remote Sensing Literacy of Cultural and Museum Professionals

In the long run, the key to the wide implementation of remote sensing technology such as Cultural Relics 01 Satellite in the cultural industry is to cultivate compound talents who not only understand the professional knowledge of cultural relics, but also have the application literacy of remote sensing data. The author suggests that remote sensing archaeology, geographic information system (GIS), spatial information technology and other course modules should be appropriately introduced in the training programs of cultural relics and museology, master of cultural relics and other majors, so that students can have basic data reading, image interpretation and spatial analysis ability. This proposal does not require cultural relics students to become remote sensing technology experts, but hopes that cultural relics practitioners can "understand" satellite data and "make good use" of remote sensing tools to become an effective bridge between technology supply and demand.

4.2.5 Exploring Cross-regional and Cross-agency Cooperation Mechanisms

The protection of large sites on the Qinghai-Xizang Plateau involves Xizang, Qinghai, Sichuan, Yunnan, Gansu and other provinces. It is difficult to fully undertake the analysis task of satellite monitoring data by cultural and museum institutions in a single province. It is suggested that based on Xizang Minzu University, Northwest University, Sun Yat-sen University, Renmin University of China, Xiamen University, Shaanxi Normal University and other relevant universities, an academic cooperation mechanism of "joint research on satellite monitoring of Qinghai-Xizang Plateau sites" should be established to gather multi-school and multi-disciplinary scientific research forces to jointly carry out the application of satellite data in archaeological sites on the Qinghai-Xizang Plateau. In this collaboration mechanism, local cultural and museum universities can assume the role of "industry demand combing - application scenario verification - talent training docking", and provide real demand feedback from grassroots cultural and museum practice for technology landing.

5. CONCLUSION

The successful launch of the Cultural Relics 01 Satellite is an important milestone for China's cultural relics protection industry to move towards science and technology, intelligence and precision. It is also a vivid footnote to the development trend of multidisciplinary integration and empowerment

of cultural relics protection. For the Qinghai-Xizang Plateau, which has the most difficult natural conditions and the most urgent need for cultural relics protection, the introduction of space-based remote sensing monitoring is expected to fundamentally change the traditional single mode of "human inspection + fixed-point monitoring" and provide a new technical path for the protection of large sites.

At the same time, it should be clearly recognized that technology itself is not omnipotent. The effectiveness of satellite remote sensing monitoring depends on the collaborative construction of data-talent-system trinity: the data level needs to establish a hierarchical push and multi-scale monitoring system, the talent level needs to cultivate the remote sensing literacy of cultural practitioners, and the system level needs to improve the response closed loop from monitoring discovery to on-site disposal. The wide application of new technologies requires interdisciplinary bridge talents who can not only understand the technical language, but also take root in the practice of cultural relics, which is exactly the subject of the times that contemporary cultural relics education should respond to.

Looking forward to the future, with the continuous networking operation of the Cultural Relics 01 Satellite and the subsequent satellite constellation, and the gradual improvement of the “space - air - ground” collaborative supervision technology system of the State Administration of Cultural Heritage, the protection of the great sites of the Qinghai-Xizang Plateau will usher in unprecedented opportunities for technological empowerment. It is expected that in the near future, every gully change of the Guge Kingdom Ruins, every surface disturbance of the hot water tomb group, and every seepage risk of the Piyang Dongga Grottoes Group can be timely captured by the “eye of cultural relics” in space, and reach the hands of grassroots guardians through an efficient data transmission mechanism, so that science and technology can truly become a solid barrier to protect the heritage of plateau civilization.

Limited by professional vision and data acquisition conditions, this paper is still superficial, and the practical application effect of satellite data needs to be further verified by follow-up research. The follow-up research can select the typical sites of the Qinghai-Xizang Plateau to carry out the empirical analysis of the application cases after obtaining the Cultural Relics 01 Satellite public data products, and transform the path concept of this paper into an operational technical scheme.

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