

# STRATEGIES TO PROMOTE THE APPLICATION OF SATELLITE REMOTE SENSING IN DEVELOPING COUNTRIES

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**ABSTRACT:** With the development of satellite remote sensing technology, many countries or regions where satellite technology started late, began to pay attention to the applications of satellite remote sensing technology. These countries or regions began to try to study and application by free download data, or participating in international organizations to obtain data or information when necessary. Especially in recent years, the relationship between satellite remote sensing technology and social development become more and more closely, for example in the agricultural production, mineral resources development, disaster monitoring, city construction and management, transportation, and other industries. Satellite remote sensing has gradually become one industry indispensable for social development.

May foresee, the countries or regions which start satellite remote sensing technology late, will in the near future have more extensive interest and demand for the application of satellite remote sensing, and wish using satellite remote sensing technology and application to promote the development of the region rapidly. As countries who have accumulated in the remote sensing satellites and applications, how to promote the application of satellite remote sensing and technical to the countries and regions who start later, and easy to work in the application, but also conducive to the sustainable development in the region, is a valuable research direction, and the result of course must be combined according to the characteristic of these regions and satellite remote sensing technology and application.

## PREFACE

The rapid and globalized development of satellite remote sensing technology leads the human to a new era with multi-layer, three-dimensional, multi-angle, omni-directional, all weather and time earth observation. Global earth observation system, which combined with high, middle and low orbits, collaborated with large, medium and small satellites, and compensated by high, middle and low resolutions, is capable of providing earth observation data with multiple spatial, time and spectral resolution accurately, effectively, rapidly and timely. Satellite remote sensing technology has been applied in political, economy, military and social domains and other numerous domains, gradually become the powerful method to change existing manufacture and life style, establish new industry and promote modernization construction.

Global satellite remote sensing technology is at the flourish developing phase. Remote sensing satellite is increasingly deep into the service in many fields like meteorology, ocean, resource investigation, environmental and disaster reduction. China, through more than thirty years efforts and accumulation, has successfully launched many remote sensing satellites of different types and multiple applications, which have provided significant support for resource, environment, meteorology, disaster reduction and national economic construction, and played an irreplaceable role in China constructions.

Nevertheless, not every country in the world could benefit from the satellite remote sensing technology. Therefore, it is necessary to share the advanced technology and to create a world of harmony together. What is interesting is that most remote sensing satellites periodically conduct observation of most area on the earth because of their low orbit characteristic. It seems they were born with the globalized services gene, and is convenient for sharing.

## **1. SATELLITE REMOTE SENSING TECHNOLOGY DEVELOPMENT CHARACTERISTIC AND ELEMENTS**

Satellite remote sensing technology is a comprehensive and integrated science technology, which combined the achievement of space science, modern electronic engineering, optical engineering, mechanical engineering, computer science, earth natural science and so forth, is a significant component of modern science and technology region. Therefore, the comprehensive development of satellite remote sensing technology need to meet the following three elements at least.

### **1.1 Science and Technology Research**

Remote sensing satellite involves the engineering technologies including satellite development, launch vehicle, ground receiving system, data processing, and remote sensing application service technology, which are all belong to advanced modern high technology, and require a fairly complete technology system and industry foundation;

### **1.2 Civil Applications**

Along with the remote sensing technology development recent years, satellite remote sensing technology has spread gradually from developed countries to most developing countries, and expanded from high-end military reconnaissance to various civil regions and numerous industries, such as meteorology, resources, ocean, environment, agricultural, water conservancy and urban applications. Those application products or technologies are universally applicable. Although the core technology of the products are quite complicated and protected with property rights, the application and utilization are designed based on humanization, and are convenient to be applied in countries and areas without or with relative backward remote sensing technology;

### **1.3 Science Research**

Technologies always serve for applications, but the premises and motivation of technology progress is derived from the research and discovery of scientific law. Therefore, along with the gradual deepening of applications and increasing of requirement, apart from remote sensing technology research, other relative disciplines need continuous scientific level improving and applications understanding. Thereby, the technology and application will supplement each other and keep progressing together.

Because of historical reasons and current situation of social development, not every country possess the basic capability of satellite remote sensing technology, however, through mutual help and cooperation, every country could improve local social life and development with the help of satellite remote sensing technology.

## **2. APPROACHES FOR PROMOTING SATELLITE REMOTE SENSING TECHNOLOGY IN DEVELOPING COUNTRIES AND REGIONS**

## 2.1 Free Preliminary Service Products Delivery

As communication methods are developing quickly nowadays, global communication could be realized through ground communication network and satellite communications. Therefore, providing satellite remote sensing regular application information through communication network and internet is perfectly doable.

✧ **Disaster information service:** It has been found that satellite remote sensing could play a significant role in disaster reduction field. Especially in the aspect of emergency disaster relief and post-disaster reconstruction, disaster information provided by satellite is more rapid, objective and comprehensive than other regular methods.

Relative effective disaster prevention and reduction work at present are:

(1) Disaster Prediction. Predict the potential disaster including happening time, scope and scale, to prepare effective disaster prevention;

(2) Disaster Monitoring. Monitor all kinds of disasters, especially serious disaster occurrence, such as flood, drought and earthquake;

(3) Emergency Disaster Relief. Provide the disaster information rapidly and accurately at the occurrence of major disasters, which is required by emergency rescue.

(4) Post-Disaster Reconstruction. Accurate disaster assessment is the foremost foundation of post-disaster reconstruction.

Without Doubt, some disaster prediction is still incomplete, such as the major disaster prediction like earthquake, of which predictions is not worked out yet.

✧ **Meteorological Information:** Remote sensing, with the help of radiation measurement technology, through science algorithm inversion, could accurately reflect various physical and ecological parameters of the state of atmosphere, land and ocean, play a significant role at aspects like climate monitor, atmosphere monitor and meteorological disaster monitor, and has been verified in major meteorological disaster prevention and reduction work.

(1) Weather and Climate. The distribution and change status of temperature, rainfall, fog and aerosol could be detected by meteorology remote sensing satellite or other environmental monitoring remote sensing satellite, the weather and climate change trend could be estimated accordingly.

(2) Meteorological Disaster. Through remote sensing methods, the crop drought damage could be researched directly or indirectly; Using visible light and infrared multispectral satellite information to distinguish sand dorm is still one of the best methods; Using meteorological satellite information could locate typhoon center, estimate typhoon intensity, monitor typhoon movement direction and speed, and estimate the regions where might have stormy weather, and play a vital role in typhoon disaster prevention and reduction.

- ✧ **Agriculture Service Information:** In agriculture area, remote sensing technology is used for cultivated land monitoring, crop distribution survey, grain yield estimation and etc.
- ✧ Remote sensing technology could also be used for fishery, forestry and animal husbandry, which will not be enumerated here. Typical application examples of satellite remote sensing are shown below.



(Agriculture Estimation)



(Weather Forecast)



(Flood Monitor)



(Drought Assessment)

Figure 1 Typical application examples of satellite remote sensing

About all kinds of satellite remote sensing product mentioned above, they could be acquired through internet. meteorological satellite data and earth observation satellite data could be obtained through direct data receiving, and the ground receiving system could be established through reconstruction and assistance. Also, through assistance mechanism establishment to guarantee those basic information transfer to those regions in time.

## 2.2 Training Providing and Relative Domain Talent Team Training

Satellite remote sensing application products usually involve application professional monitor methods, results, analysis and prediction, which require certain time or short time training, and possibly certain amount of satellite remote sensing knowledge training. China Ministry of Science and Technology and China Aerospace Science and Technology Corporation have held short term training course of satellite system and applications at summer from year 2012 to 2014, which is aimed to provide free training of Chinese satellite technology to developing counties with requirement.

## 2.3 Forming Joint Work Team Devoting to National Public Affairs or International Public Benefit Affairs

Many works are globally, such as environment, ocean and earth research, which requires joint participation of every

country and regions. According to the works conducting situation, like the extent of remote sensing technology possess and acceptance by the local organizations, those organization might be developed into a long term international public service organization.

#### **2.4 Using Satellite Remote Sensing Technology to Inject Energy for Local Development**

Because of geographic location and environment difference, some countries naturally become the agriculture leading country, tourist industry leading country, ocean island country, or disaster country. On the basis of local requirement and practical situation, through integrating and updating, specialized satellite remote sensing application platform could be formed, which can be used to improve local life and productivity, and provide engine for its civil development.

### **3. CONCLUSION**

Through the above mentioned strategies, developing countries or technology lagging countries will utilize and enjoy the advanced achievement of satellite remote sensing technology, then raising local productivity and promoting harmonious development of the global village.