

# Research on the Simultaneous Satellite-Airborne-Ground Observation Experiment Platform for Global Change

Jiantao BI\* Huadong GUO Bing Zhang Xingxing Wang

Center for Earth Observation and Digital Earth, CAS, Beijing, China, 100094-jtbi@ceode.ac.cn

**Abstract:** Global change has been a focus issue all over the world. How to use technology methods to get and observe real time data of different level of the earth is the basis of the global change research. In this paper, we put forward to construct a satellite-airborne-ground (SAG) observation experiment platform which integrated satellite data, airborne data and ground or ocean observing data together. The SAG has been used in Tibet Plateau and Bohai sea experiments area to get the sensitive factors for global change.

**Keywords:** Global Change the Satellite-Airborne-Ground Observation Experiment Platform ( SAG ) Simultaneous Observation Remote Sensing Monitor

## 1. INTRODUCTION

Global change has been a focus issue all over the world. How to use technology methods to get and observe real time data of different level of the earth is the basis of the global change research. In this paper, we put forward to construct a satellite-airborne-ground (SAG) observation experiment platform which integrated satellite data, airborne data and ground or ocean observing data together. In different high level, with different resolution and different scanning width, we use optical or microwave sensors to get the simultaneous and same area's indicators data which sensitive to the global change. Using this SAG platform, we can realized to observe atmosphere, terrain, marine and get different indicator data with spaceborne, airborne and ground methods, we can also integrated and assimilated these data together, using regional model to research on the global change. In SAG platform, remote sensing satellite ground station of China and remote sensing airborne system can provide spaceborne and airborne data, the ground observation and ocean observation teams can provide the ground based and vessel based data, all of above can make up a whole stereo observation network which can give us a new way to obtain the sensitive indicators of global change. As for now, the SAG has been used in Tibet Plateau

and Bohai sea experiments areas in China which are the most sensitive to the global change and obtained a lot of valuable observation data there. In the future the SAG platform will open to all over the world and will have an important role in global environment change.

## 2. SAG PLATFORM'S CONSTRUCTION

The SAG platform refers to the Satellite-Airborne-Ground Observation Experiment Platform. It includes satellite remote sensing platform, airborne remote sensing platform and ground data collecting platform. Using SAG platform we can collect the optical and microwave data in the same time of the test area. These data can be good for the remote sensing retrieval analysis and decision making.

### 2.1 Satellite Platform

The satellite platform in SAG is the remote sensing satellite ground station of China (RSGS). Built in 1986, RSGS is a member of the international resource satellite ground station network, it is one of the highest in amount receiving and processing satellite ground stations in the world. It has three ground stations now: Miyun Station, Kashi Station and Sanya Station, which have covered 70% area of Asia. During 20 years running, RSGS has almost 2 million scenes remote sensing data. Now the RSGS has 7 antenna systems for satellite data receive, more than 20 satellite data record systems, can receive and process LANDSAT-5/7、SPOT-1/2/4/5、ERS-1/2、

RADARSAT-1/2、ENVISAT、RESOURCESAT-1 and

CEBRS02、HJ1A\1B and so on.

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\* Corresponding author.



Figure1. The RSGS remote sensing data receiving area.

## 2.2 Airborne Platform

The airborne platform in SAG is the Remote Sensing Aircraft in Chinese Academy of Science (CAS). In 1986, CAS imported two advanced and high performance U.S. Cessna "certificate of merit S / II-type" high-altitude aircraft and began its formal operation. The remote sensing aircrafts were key scientific equipment for remote sensing sensors independently developed by the Chinese Academy of Sciences for airborne remote sensing information acquisition and processing. The remote sensing aircrafts are equipped with precise GPS navigation, POS, optical sensors, SAR sensors, Lidar sensors and other systems, and have all weather and days and nights working ability.



Figure2. The remote sensing aircraft of CAS

## 2.3 Ground Platform

The ground platform in SAG is the sensor or equipments which used by the researchers to collect the data from the ground. It also includes ship or vessels to collect the data under water. Using ground platform, we can collect the in site data which will be used to correct or validate the remote sensing data of satellite or airborne.

## 3. THE APPLICATION OF SAG PLATFORM

Using SAG platform we collected multi-level remote sensing data which sensitive to the global change in Tibet Plateau and Bohai bay. During these experiments, we have collected

different kinds of optical data, SAR data, atmosphere data, vegetable data, and water color and water turbidity data and so on. Using these data, we can extract sensitive indicators for the global change.

### 3.1 The Tibet Plateau experiment

The Tibet Plateau is the third pole of the earth and it's environment is so sensitive to the global change, especially to the global warming. In order to show the role and mathematics of Tibet Plateau response to global change, we used SAG platform to monitor the ecology, icebergs, lakes and vegetation of plateau, establish an integrated, simultaneous monitoring, high conforming of space and tempo dataset of Tibet Plateau, which will be great helpful to the mathematics of Tibet Plateau response to global change.

During the experiment, we used different satellites data such as ENVISAT, RADARSAT1\2, LANDSAT and SPOT2\4\5 to cover the whole area of Tibet Plateau; we used aircraft to collect high resolution multi-spectrum and high-spectrum data in the source of Yangzi and Yellow river and Dongkemati Iceberg in Kunlun Mountain; we collect ground data such as geographic objects spectrum, meteorology features, vegetable classification in the ground station in Tibet Plateau: Ali station, Everest Station, Linzhi Station and Muztaga station.

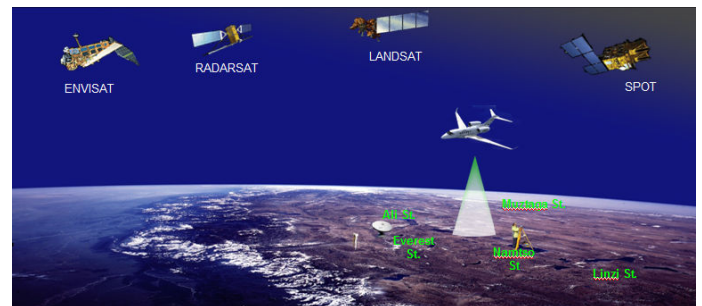


Figure3. The SAG application in Tibet Plateau

### 3.2 The Bohai Bay experiment

Unlike the Tibet Plateau area which is mainly a nature environment where there is few people affection there, the Bohai Bay is one of the areas which were greatest affected by people. Another different is that in Bohai Bay, there is interchange by atmosphere, land and ocean. It is so complicated in the sensitive indicators in this area. So in this area we just want to make clear the affection of people activity to the global change and the interchange of land, ocean and atmosphere. During the experiment, we also use different satellites data such as ENVISAT, RADARSAT1\2, LANDSAT, SPOT2\4\5 and QUICKBIRD to cover the research area of Bohai Bay; we used aircraft to collect high resolution multi-spectrum and

high-spectrum data in the estuary of Yellow river, Yellow river delta and some counties; we collect ground data such as geographic objects spectrum, meteorology features, vegetable classification in the ground station; we also collect water data and underwater data by vessel, such as water color, water salinity and water turbidity.

X. Li, M. Ma, J. Wang, etc, "Simultaneous Remote Sensing and Groundbased Experiment in the Heihe River Basin : Scientific Objectives and Experiment Design" *Advances in Earth Science*, Vol 23, No.9, Sep.2008.

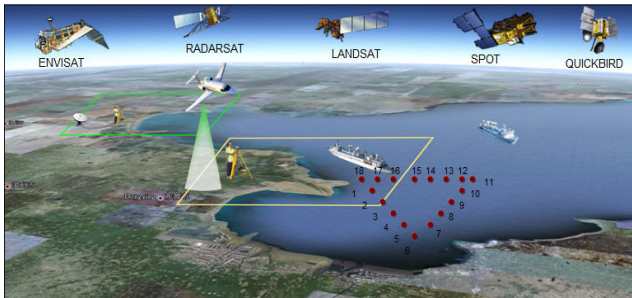


Figure4. The SAG application in Bohai Bay

#### 4. CONCLUSION

The SAG platform is a good method to monitor and research in global change in large area. Though different level of remote sensors we can collect the simultaneous data in the same area, this will provide the precision analysis for the sensitive indicators for global change. The ground data we collect can also correct and validate the remote sensing data and make the result of remote sensing retrieval model more and more exact. The SAG platform is also an open system, we welcome other researcher who want to use this platform to research the global change in China to join us together.

#### REFERENCES

- H. Guo, "Understanding global natural disasters and the role of earth observation", *International journal of digital earth*, Vol 3, Issue 3, Page 221-230, 2010.
- H. Guo, "Digital Earth: decadal experiences and some thoughts" *International journal of digital earth*, Vol 3, Issue 1, Page 31-46, 2010.