Institute of Remote Sensing and Digital Earth
Chinese Academy of Sciences

A new way to access remote sensing satellite image
——Virtual Ground Station

LIU Jianbo
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Outline

- Traditional Data Service
- Concept of Virtual Ground Station
- Features of VGS(©SatSee System)
- Further Development

Traditional Data Service

As Data Providers:

Reception → Processing → Archiving → Distribution

- Remote sensing data received through satellite ground station
- Radiometric and geometric correction
- Corresponding catalog information created and ingested into database.
- Data is then waiting there for users to inquire, search, order and download.

Traditional Data Service

As Users:

- Users log into the data service platform supported by data provider
- Search data by specific parameters
- Once interested data are found from the database, users then submit order

Limitations:

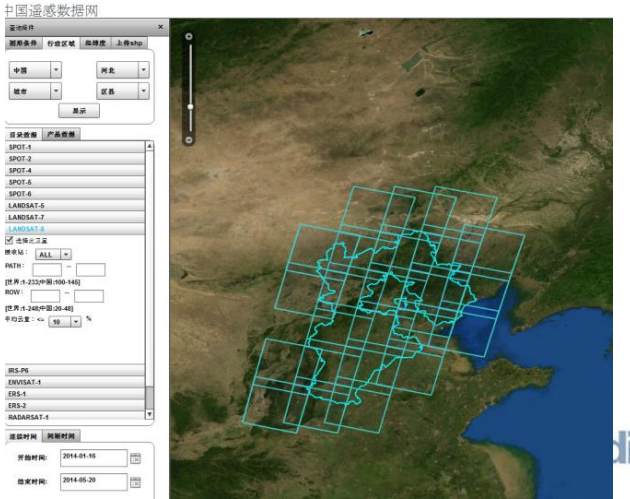
- Not easy for customers to acquire latest data promptly and directly
- Inconvenient for routine monitoring
- High costs

  Data center ref:

  CHINA: RADI, CRESDA,

  INT: EDC/USGS, ESRIN/ESA,

  RESTEC/JAPAN, GISTDA/THAILAND



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Concept of Virtual Ground Station

No ground station infrastructure needed (e.g., antenna).

Partners get full path satellite data (Jpeg) in near real time through internet.

Based on data provider's ground station system, high bandwidth data transfer net, good computation capacity

Benefits:

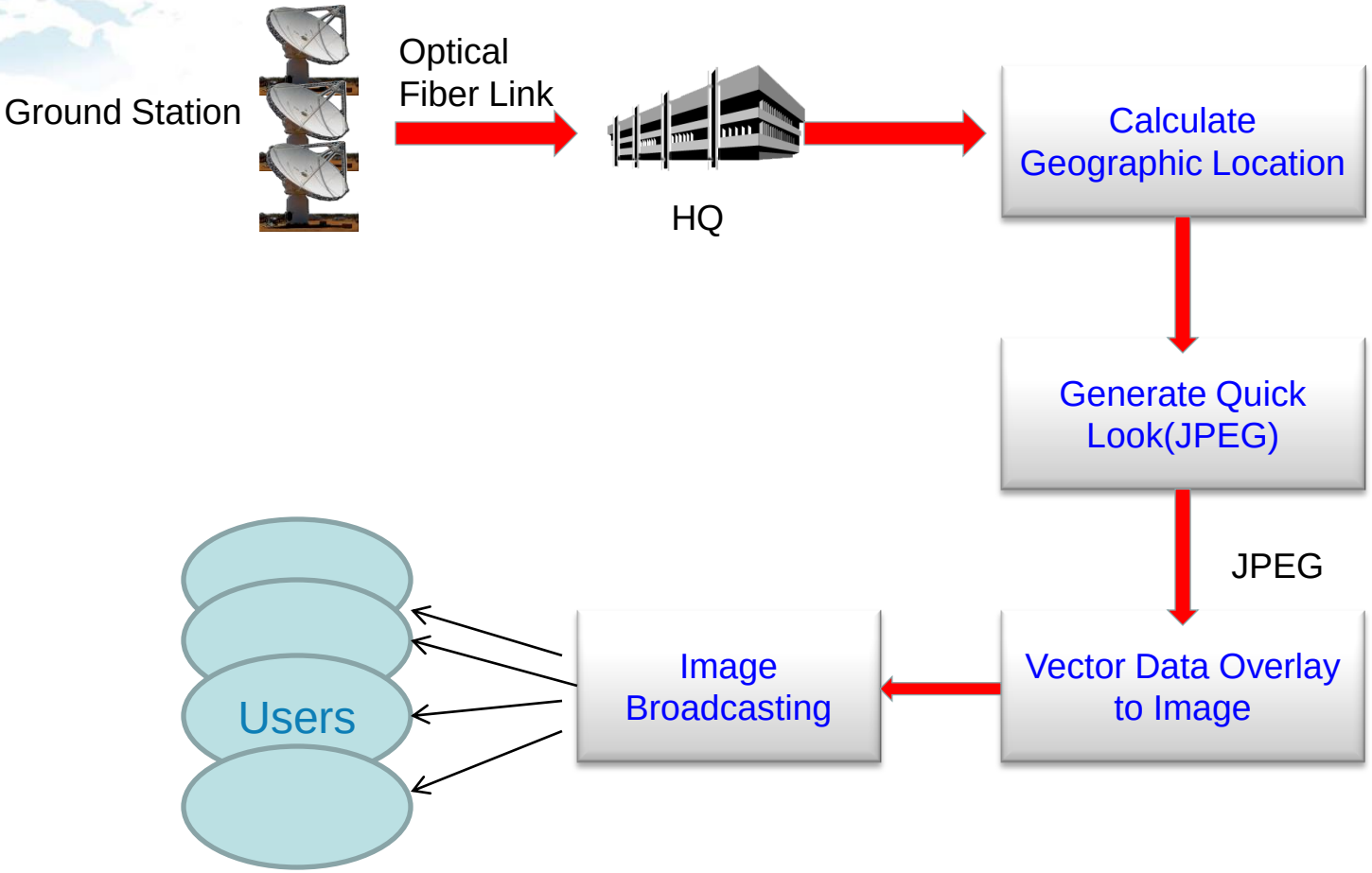
- To demonstrate remote sensing imaging process to the public
- To help users quickly access remote sensing image
  (full resolution, in near real-time)
- To distribute satellite data to a larger user community
- To lower the cost by providing bulk data
  (users pay by service months/years and get all covering images)

Specially useful for daily monitoring and detection of sudden changes (fire spot, water area, etc.)

(Image from VGS is in JPEG. Further applications may need uncompressed data from traditional data service)

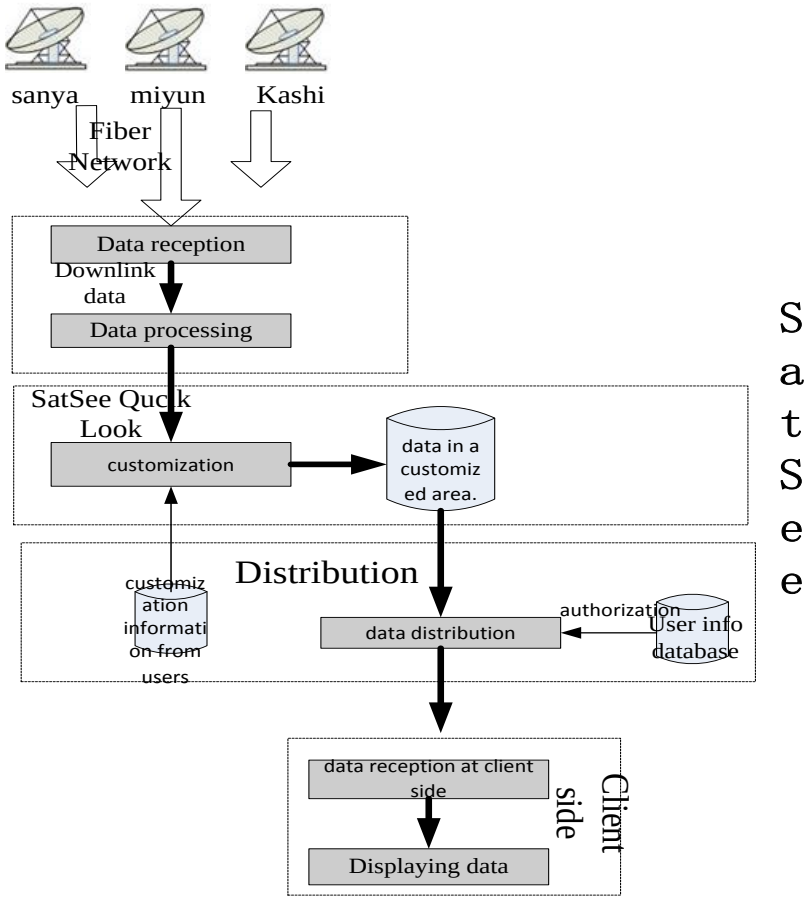
Concept of Virtual Ground Station

Process of VGS (©SatSee) Data Service



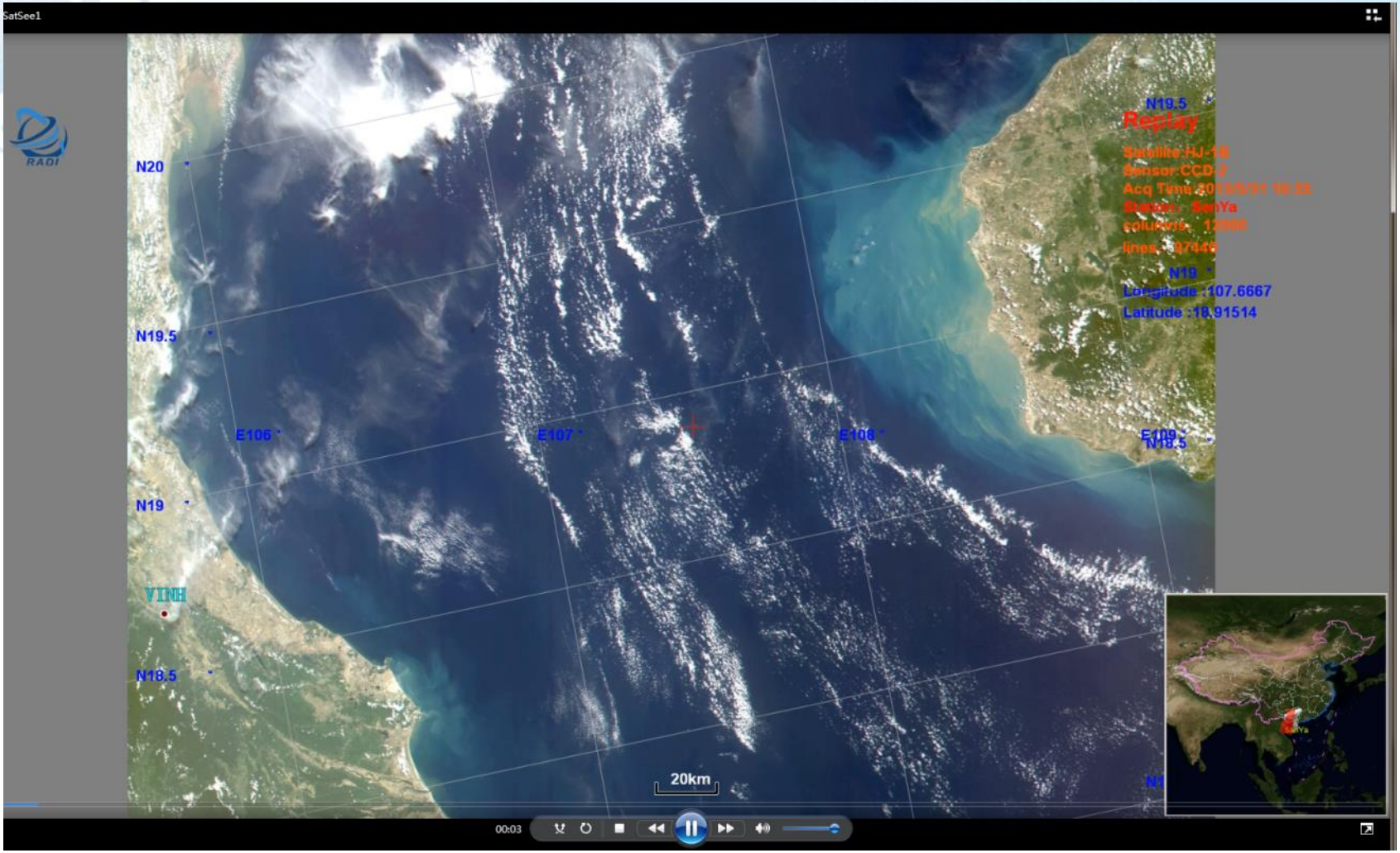
Concept of Virtual Ground Station

System Component



System Structure

Concept of Virtual Ground Station



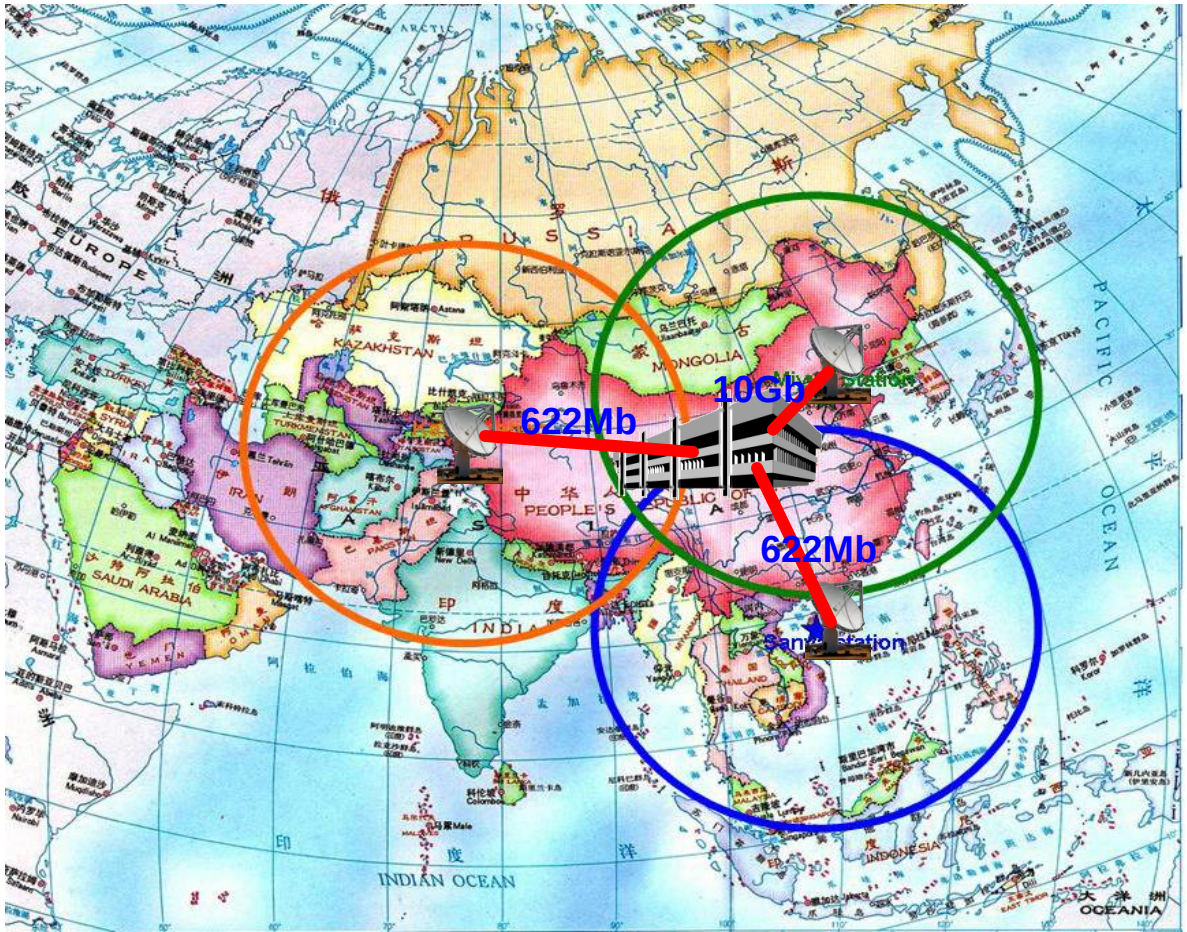
SatSee1.wmv

Image provided and displayed in client monitor

Supporting Facilities in RADI

Three reception stations cover all China and 70% of Asia land.

Dedicated optical fiber link with high-bandwidth (622M, 622M and 10G between receiving stations and RADI headquarter)



密云站 Miyun Receiving Station

喀什站 Kashi Receiving Station

三亚站 Sanya Receiving Station

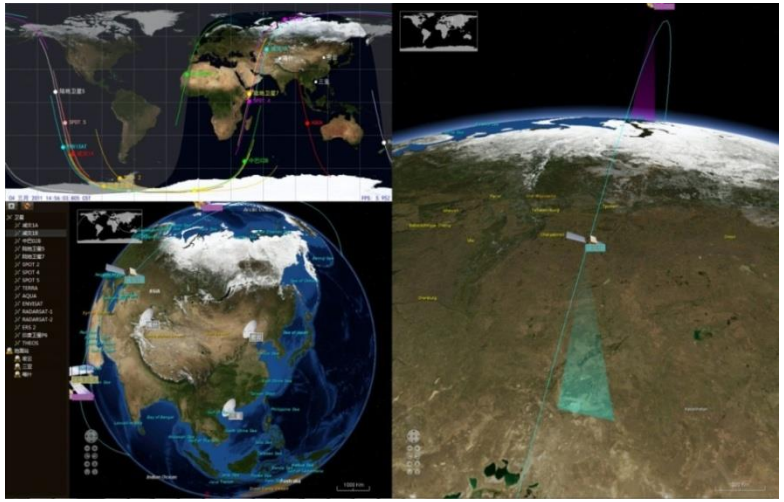
Supporting Facilities in RADI

Rich Satellite Resources Available

Satellites received now

	Satellite	Number
Domestic	**ZY02C**	**1**
	ZY-3(01,02)	**2**
	HJ-1A/1B ,HJ-1C	**3**
	SJ-9A/B	**2**
	Cbers-04	**1**
	GF-1/2/3	**3**
International	**Landsat-8**	**1**
	RADARSAT2	**1**
	SPOT5,SPOT6	**2**
	Pleiades-1A/1B	**2**
Total		**18**

More satellites = More frequent coverage



(HJ-1A and HJ-1B and Landsat-8 = Imaging an area in less than every two days)

Supporting Facilities in RADI

High Computing Capacity

Powerful Image Processing Capacity

RADI Headquarter in Beijing

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Features of SatSee

1. Distributing quicklook images of satellite remote sensing data in real time.

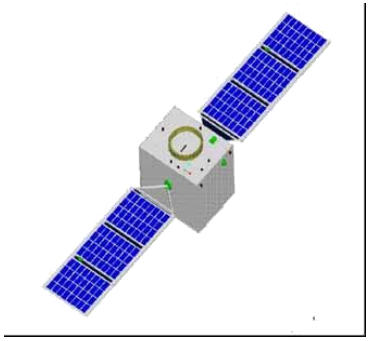
2. Currently available satellite data are Chinese HJ-1A, HJ-1B, ZY-3, GF-1, FY-2 and USA Landsat-8, ESA /VITO Proba-V. More satellites will be added to the list

3. Supporting full path or ROI export.
4. Supporting Jpeg and Geotiff image export format.

© SatSee is the software supporting VGS service

Features of SatSee

Satellite	Revisit (day)	Sensor	Resolution (m)	Swath (km)
HJ-1A	4	CCD1	30	360
		CCD2	30	360
HJ-1B	4	CCD1	30	360
		CCD2	30	360
GF-1	4	CCD	16	800
Landsat-8	16	OLI	30/15	185
PROBA-V	5		300	500



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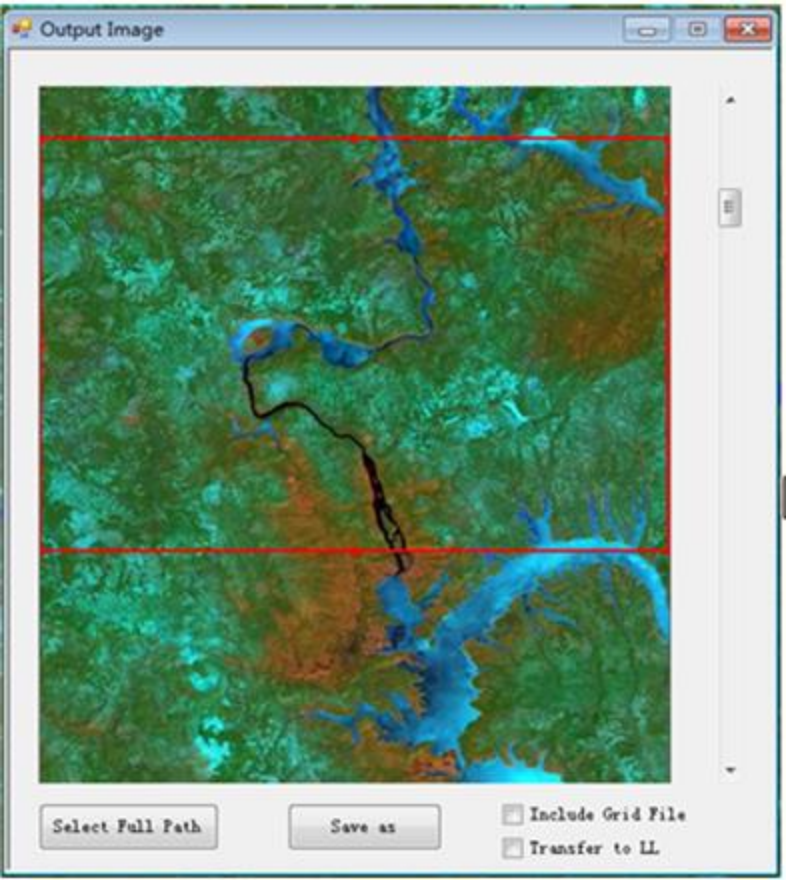

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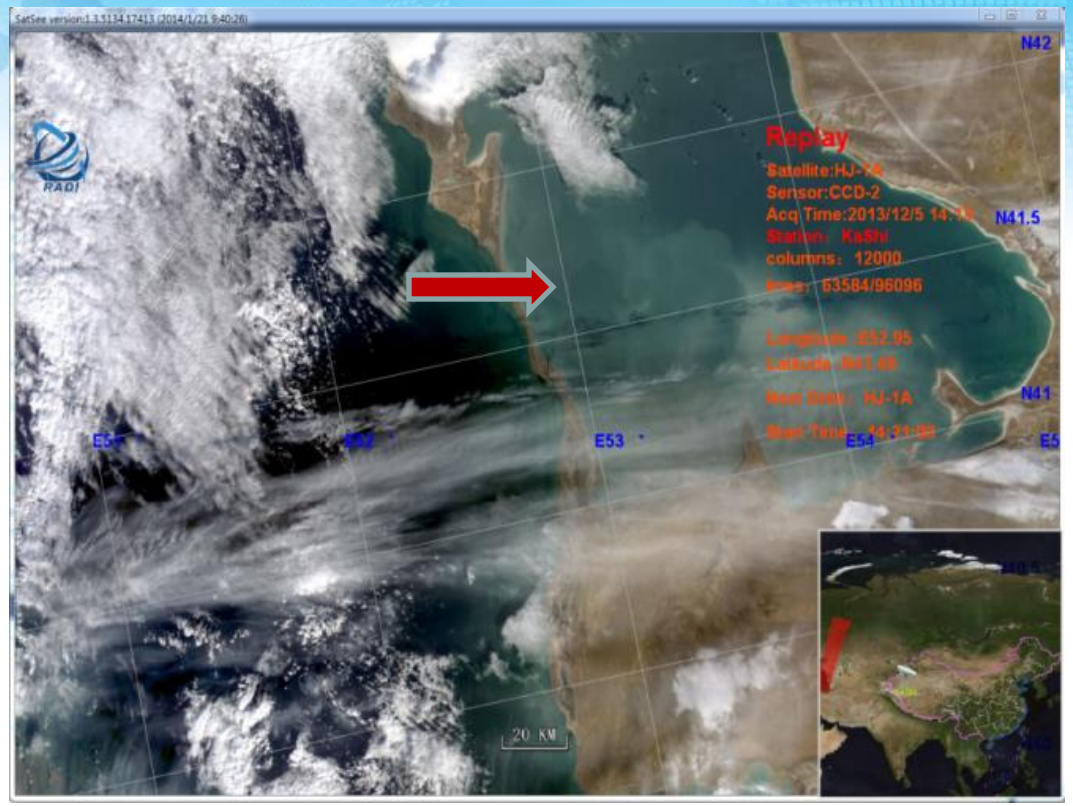
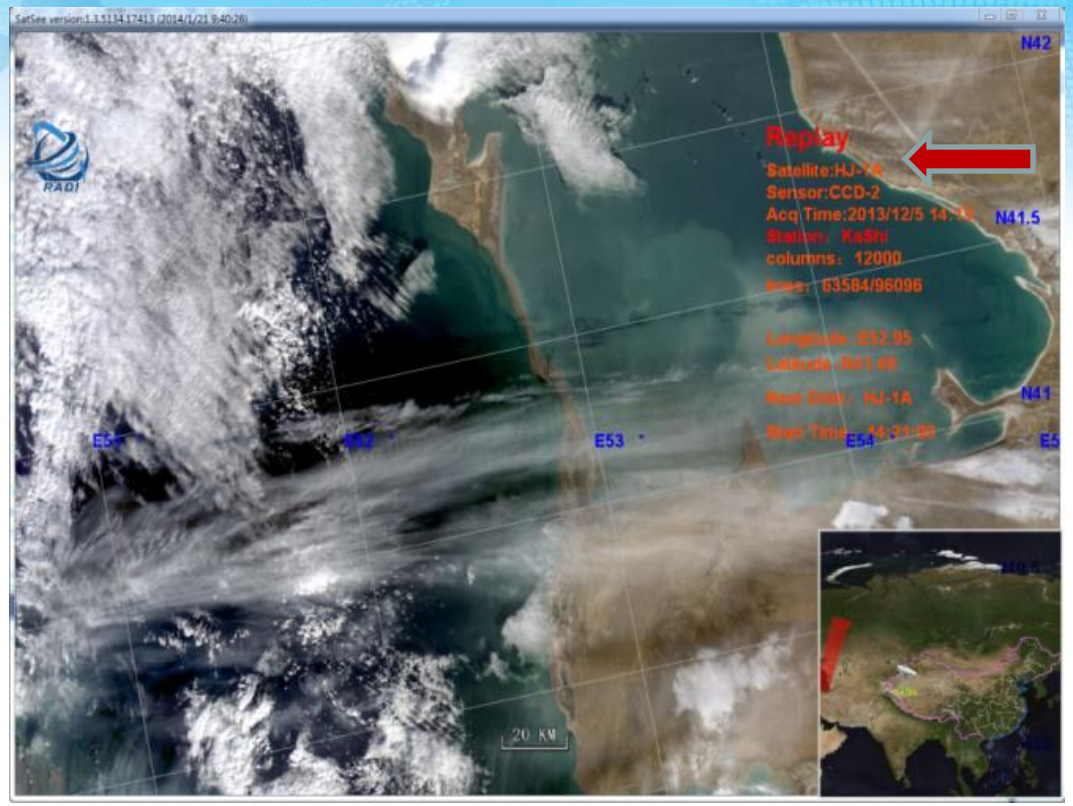
→ Jpeg/Geotiff

Features of SatSee

5. Providing satellite data in full resolution. For users with low-bandwidth network, © SatSee can reduce the resolution by re-sampling.



6. Overlay images with vector data such as lines of longitude and latitude and points of administrative names.
7. Satellite information is showed in the upper right corner of screen.
8. Searching satellite data by key words, such as satellite name, sensor name, and city name.
9. Satellite reception schedule.
10. Image zooming and panning functions.



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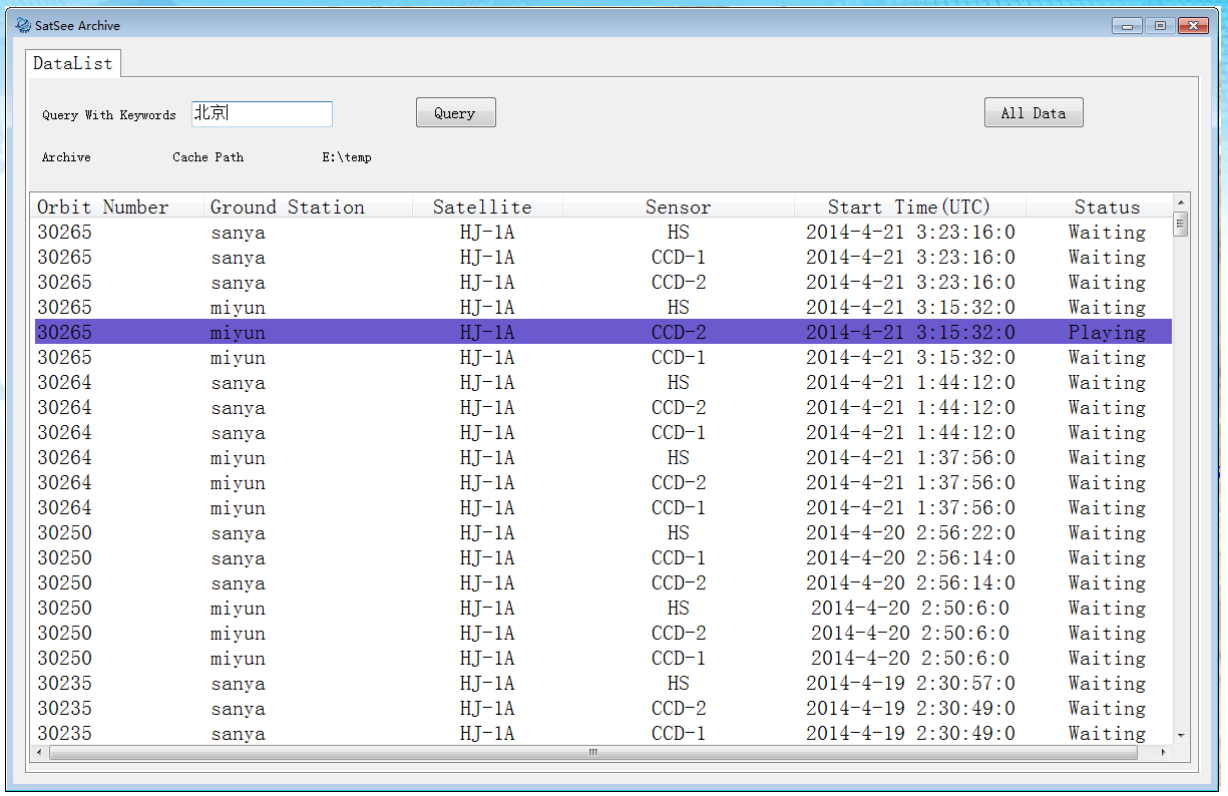

Orbit Number	Ground Station	Satellite	Sensor	Start Time(UTC)	Status
30265	sanya	HJ-1A	HS	2014-4-21 3:23:16:0	Waiting
30265	sanya	HJ-1A	CCD-1	2014-4-21 3:23:16:0	Waiting
30265	sanya	HJ-1A	CCD-2	2014-4-21 3:23:16:0	Waiting
30265	miyun	HJ-1A	HS	2014-4-21 3:15:32:0	Waiting
30265	miyun	HJ-1A	CCD-2	2014-4-21 3:15:32:0	Playing
30265	miyun	HJ-1A	CCD-1	2014-4-21 3:15:32:0	Waiting
30264	sanya	HJ-1A	HS	2014-4-21 1:44:12:0	Waiting
30264	sanya	HJ-1A	CCD-2	2014-4-21 1:44:12:0	Waiting
30264	sanya	HJ-1A	CCD-1	2014-4-21 1:44:12:0	Waiting
30264	miyun	HJ-1A	HS	2014-4-21 1:37:56:0	Waiting
30264	miyun	HJ-1A	CCD-2	2014-4-21 1:37:56:0	Waiting
30264	miyun	HJ-1A	CCD-1	2014-4-21 1:37:56:0	Waiting
30250	sanya	HJ-1A	HS	2014-4-20 2:56:22:0	Waiting
30250	sanya	HJ-1A	CCD-1	2014-4-20 2:56:14:0	Waiting
30250	sanya	HJ-1A	CCD-2	2014-4-20 2:56:14:0	Waiting
30250	miyun	HJ-1A	HS	2014-4-20 2:50:6:0	Waiting
30250	miyun	HJ-1A	CCD-2	2014-4-20 2:50:6:0	Waiting
30250	miyun	HJ-1A	CCD-1	2014-4-20 2:50:6:0	Waiting
30235	sanya	HJ-1A	HS	2014-4-19 2:30:57:0	Waiting
30235	sanya	HJ-1A	CCD-2	2014-4-19 2:30:49:0	Waiting
30235	sanya	HJ-1A	CCD-1	2014-4-19 2:30:49:0	Waiting

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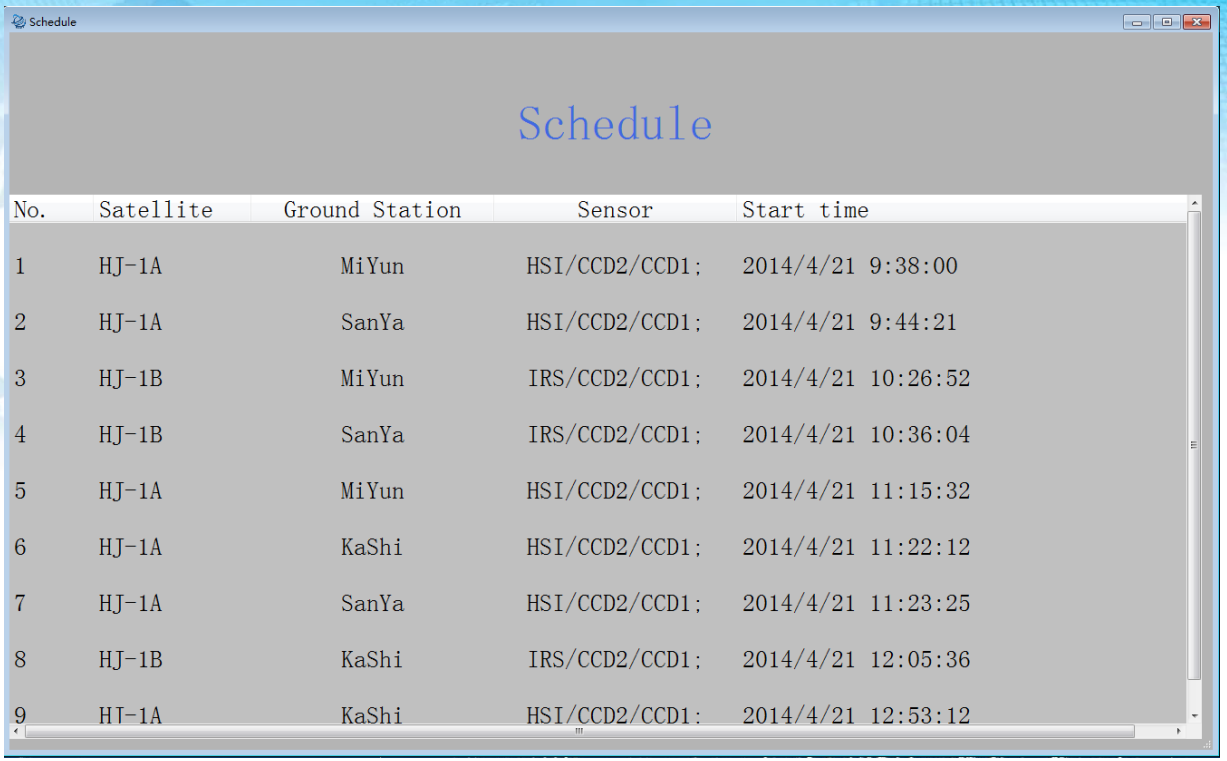

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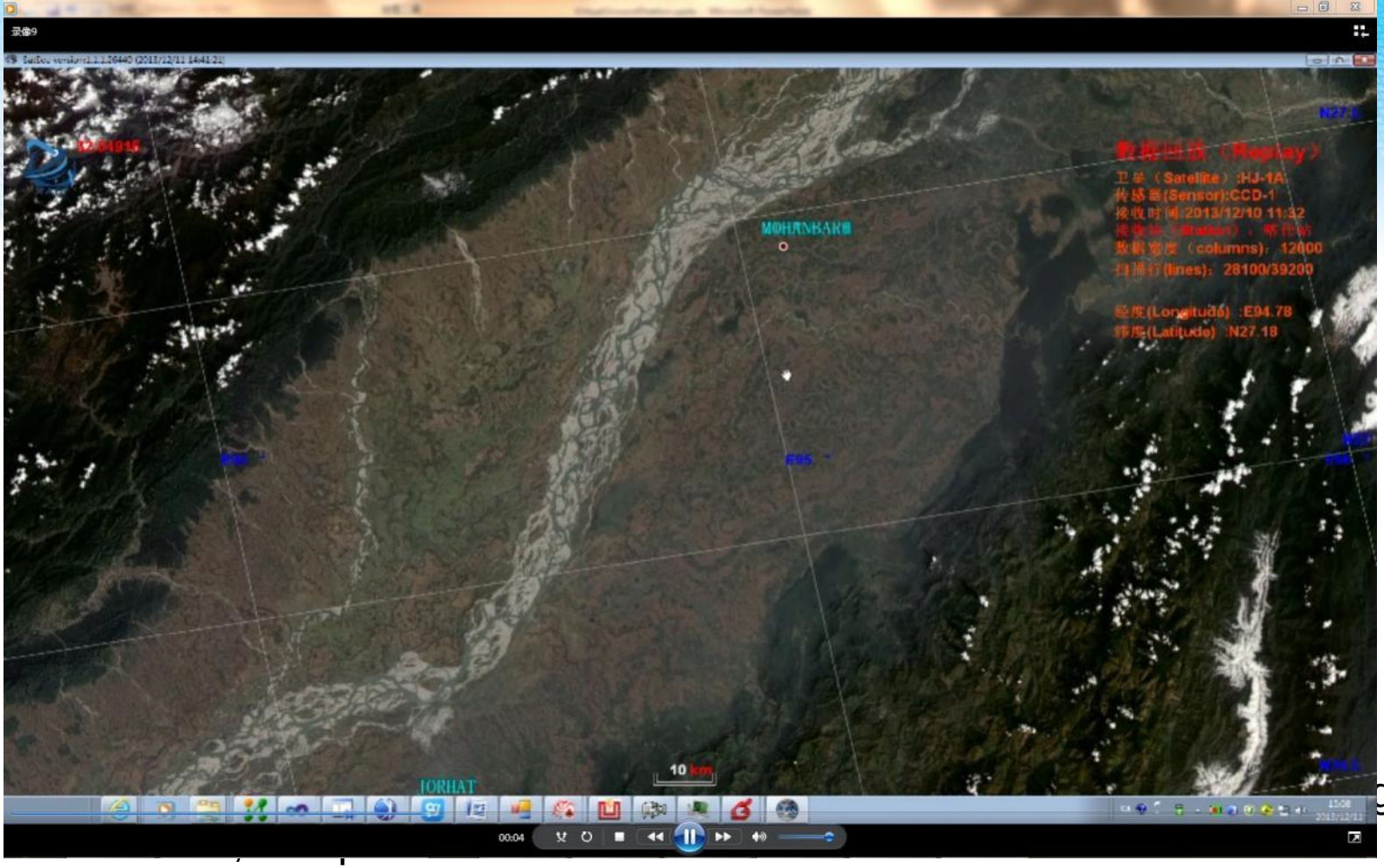

gitude and

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© SatSee System Requirement

No	Device name	Model number	Configuration requirements
	CPU	Core i7	Core Quad-Core I7-3770 3.4G 8M Cache
	Memory	4GB	DDRIII1600 4GB
	Graphics Card	Independent Graphics Card	ROM 1GB, NVIDIA or ATI Chip, Vertical Screen with ATI chip Graphics Card, HDMI or DVI interface
	Hard Drive	SATA Hard drive	1TB
	Network Adapter	Intel	1GB Network Adapter
	Wireless Keyboard and Mouse		Bluetooth Wireless Keyboard and Mouse
	Graphics Device Interface		

PC operating system requirements:

Windows 7 Professional or above.

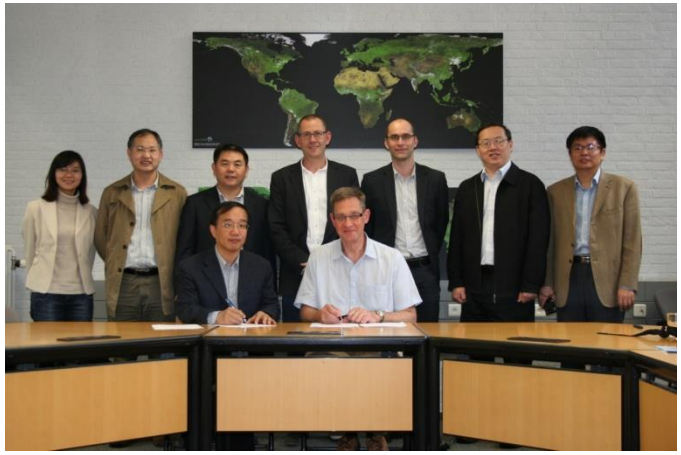
Network Configuration requirements:

10050 and 10051 port should be opened to ensure effective data transmission;

No less than 2Mb/s effective transmission rate between Beijing Data Broadcasting Server and client PC

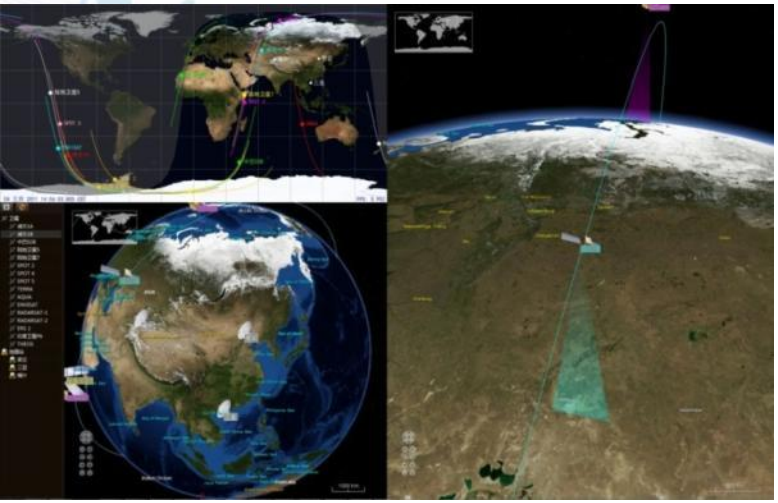
RADI Signs MOU with Kyrgyz for Cooperation on Satellite Quicklook Data

RADI Signs MOU with Belgium VITO for Cooperation on Satellite Quicklook Data



© SatSee

Active data providing, Leading-edge technology



7 Satellites in list，more will be added in 2017

Function：near real-time、full resolution、interactive、browse & roaming、user management

Virtual Ground Station Users and Partners

Deployed at:

National Academy of Kyrgyzstan
Belgium VITO
Cambodia APSARA
Mongolia RS center
Thailand GISTDA
Nepal Tribhuvan Uniiversity
高分卫星工程中心
National RS Center
Beijing University
北京师范大学
国土资源部航遥中心
Xinjiang RS Center
中电科海洋信息院
Hebei Province Mapping Bureau
国家海洋局南海工程与环境院
中科院上海技物所
江苏启东光电遥感中心
电科集团39所
中科数遥有限公司
北京视宝卫星图像有限公司
中国科学院遥感地球所奥运园区
中国科学院遥感地球所新技术园区
密云、三亚、喀什站

（Under discussion）
Australia NEOG
卫星减灾应用中心
水利部
厦门精图公司
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Further Development

Location Based Instant Satellite Image Service

International Journal of Digital Earth, 2014
http://dx.doi.org/10.1080/17538947.2014.942395

Taylor & Francis

RESEARCH ARTICLE

Location-based instant satellite image service: concept and system design

Jianbo Liu*, Jin Yang, Fu Chen, Qin Dai and Jing Zhang

Institute of Remote Sensing and Digital Earth, Chinese Academy of Sciences, Beijing, China

(*Received 9 June 2014; accepted 23 June 2014*)

This paper presents various limitations of the current remote sensing data distribution models and proposes a new concept called the location-based instant satellite image service for a new generation of remote sensing image distribution system. The essential feature of the service is that customers can subscribe to data based on the location of interest and satellite image data received by antenna will be distributed to customer's terminal devices instantly after imaging over the subscribed area. The workflow, architecture, and key technologies of the new generation data distribution system are described. The system is composed of four parts: data comprehensive processing component, data management component, product distribution component, and data display component. Based on this, a prototype system is developed, which demonstrates the promising service model with great potential for increased usage in many applications.

Keywords: remote sensing; data distribution model; location-based service; instant service

1. Introduction

In recent years, a growing number of remote sensing satellites have been launched into space. Meanwhile, the performance of the satellite payloads, such as spatial resolution, swath width, spectral ranges of bands, has greatly improved compared to the past. With these technological advancements, people can monitor natural phenomenon and human activities on the earth surface from space in a more frequent, accurate, and convenient way. Increasing availability of remotely sensed data has led to the development of many more remote sensing applications. However, the remote sensing data are still generally considered a scientific dataset used by specialist organizations and government agencies, not as popular as other data from global positioning system and communication satellites. In other words, its applications are not as broad enough. The primary reason is that the traditional distribution model is indirect, inconvenient, and inefficient. For years, professional users have been able to search and order the remote sensing image data with standard size scene using database technologies, but the workflow is too complicated for the public. For a manager of offshore drilling platform, their greatest concern is whether there is oil leakage around the platform. For a ranger, they care about whether or not there is a fire occurring in forests or there is illegal deforestation activity. For a reservoir manager, they need to know about the change of reservoir area. For the

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RS images be offered based on the location subscribed by users

RS images be offered instantly to users' computer or smart phone

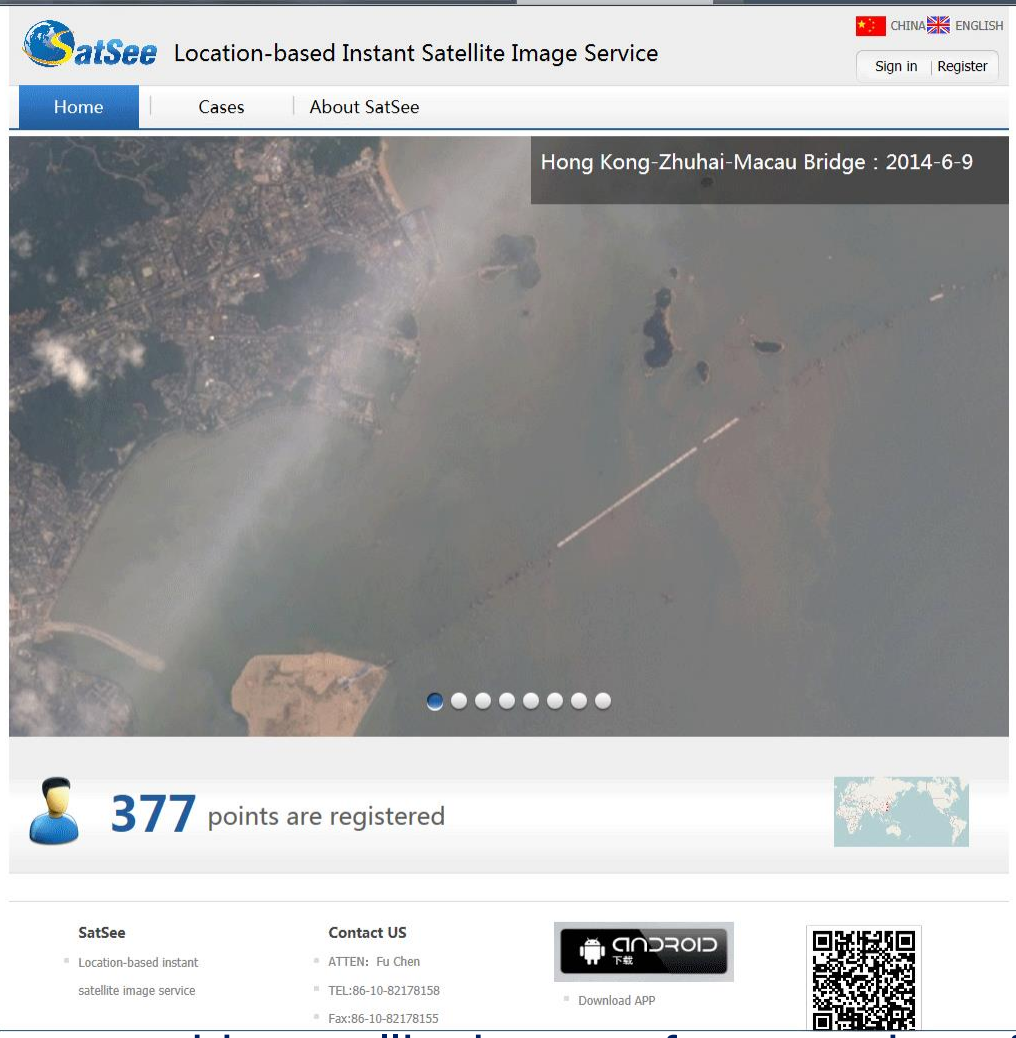
SatSee Focus

subscribed points. *Whenever satellites fly over a point, data will be sent to users' terminal of display*

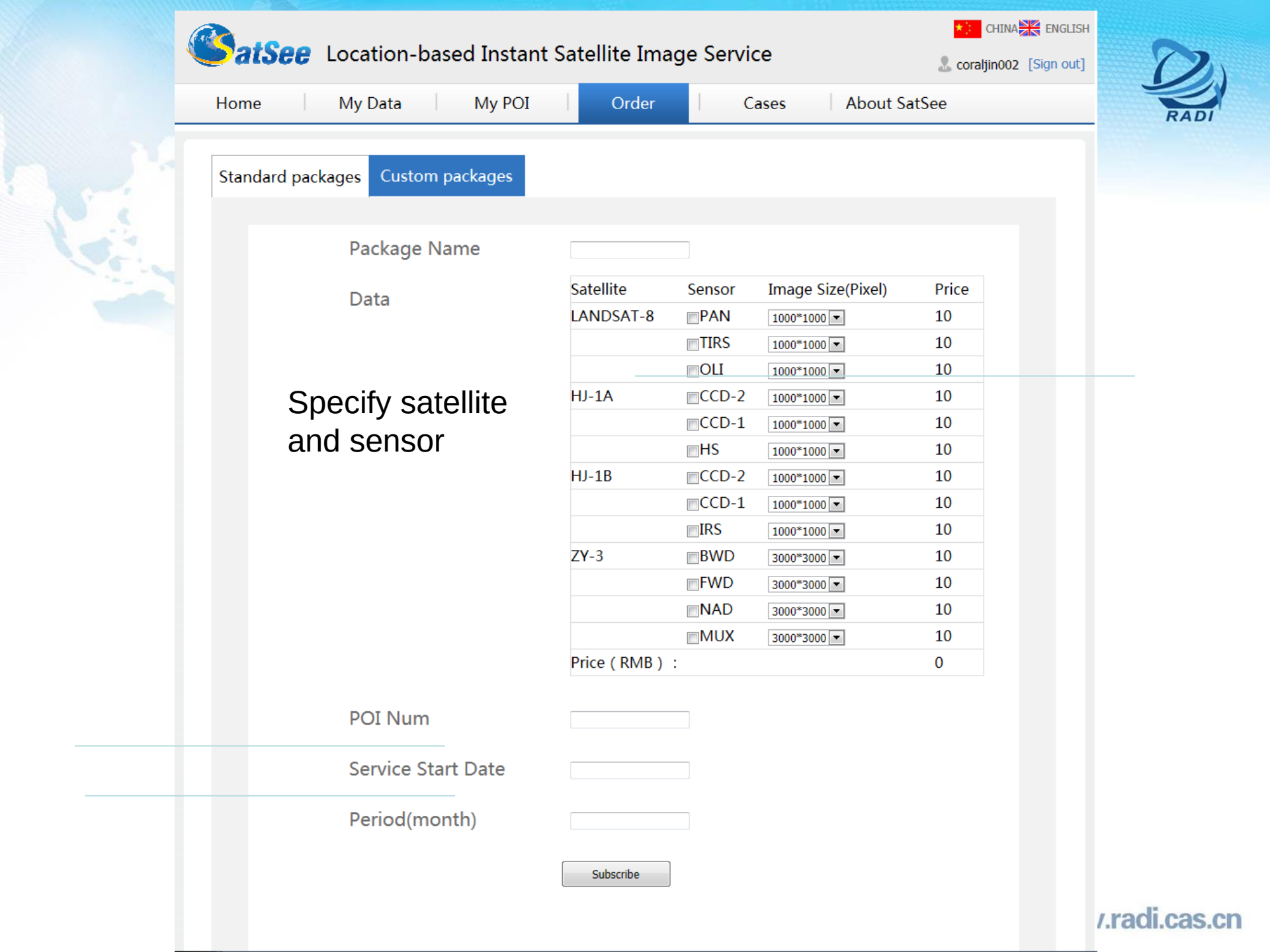
reference article please visit http://www.tandfonline.com/eprint/A3ECPWiB8CEjW3Uieg3V/full

To subscribe please visit http://satsee.radi.ac.cn

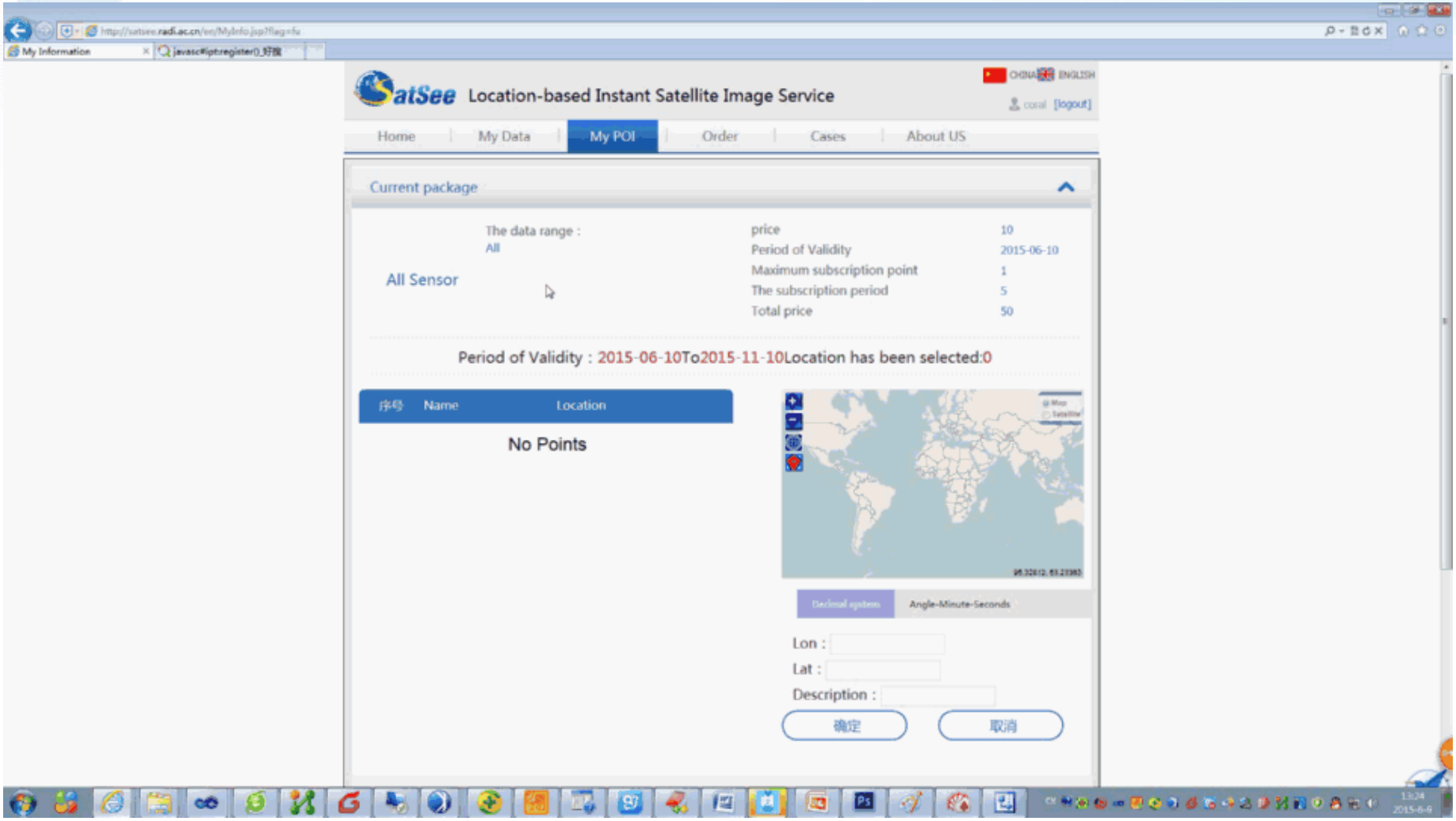
SatSee-Focus

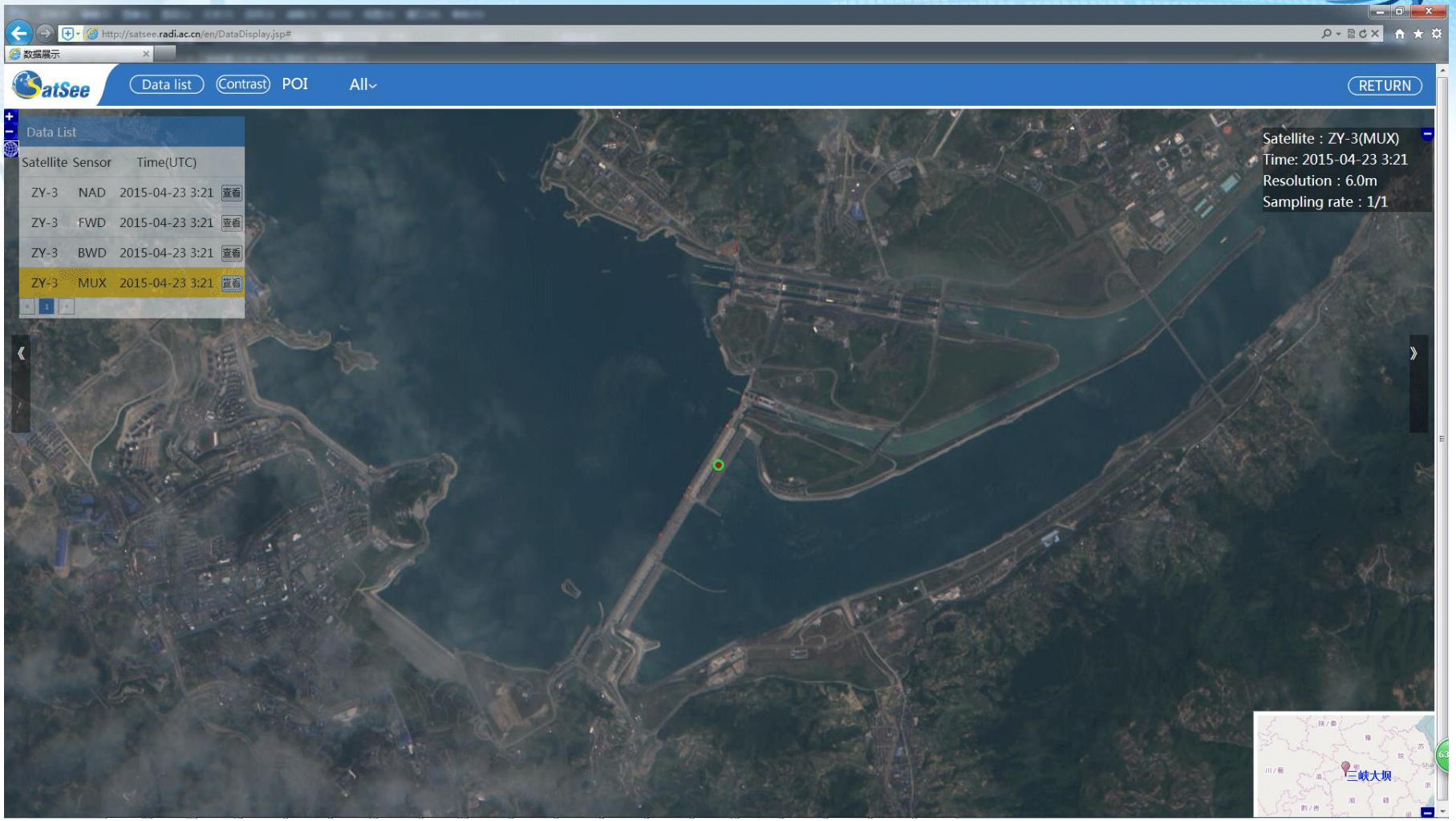


SatSee-Focus, provide satellite image of your region-of-interest in near real-time.


SatSee Location-based Instant Satellite Image Service
CHINA ENGLISH
coraljin002 [Sign out]
RADI
Home
My Data
My POI
Order
Cases
About SatSee
Standard packages
Custom packages
Package Name
Data
Satellite
Sensor
Image Size(Pixel)
Price
LANDSAT-8 PAN 1000*1000 10
TIRS 1000*1000 10
OLI 1000*1000 10
HJ-1A CCD-2 1000*1000 10
CCD-1 1000*1000 10
HS 1000*1000 10
HJ-1B CCD-2 1000*1000 10
CCD-1 1000*1000 10
IRS 1000*1000 10
ZY-3 BWD 3000*3000 10
FWD 3000*3000 10
NAD 3000*3000 10
MUX 3000*3000 10
Price (RMB) : 0
Specify satellite and sensor
POI Num
Service Start Date
Period(month)
Subscribe
.radi.cas.cn

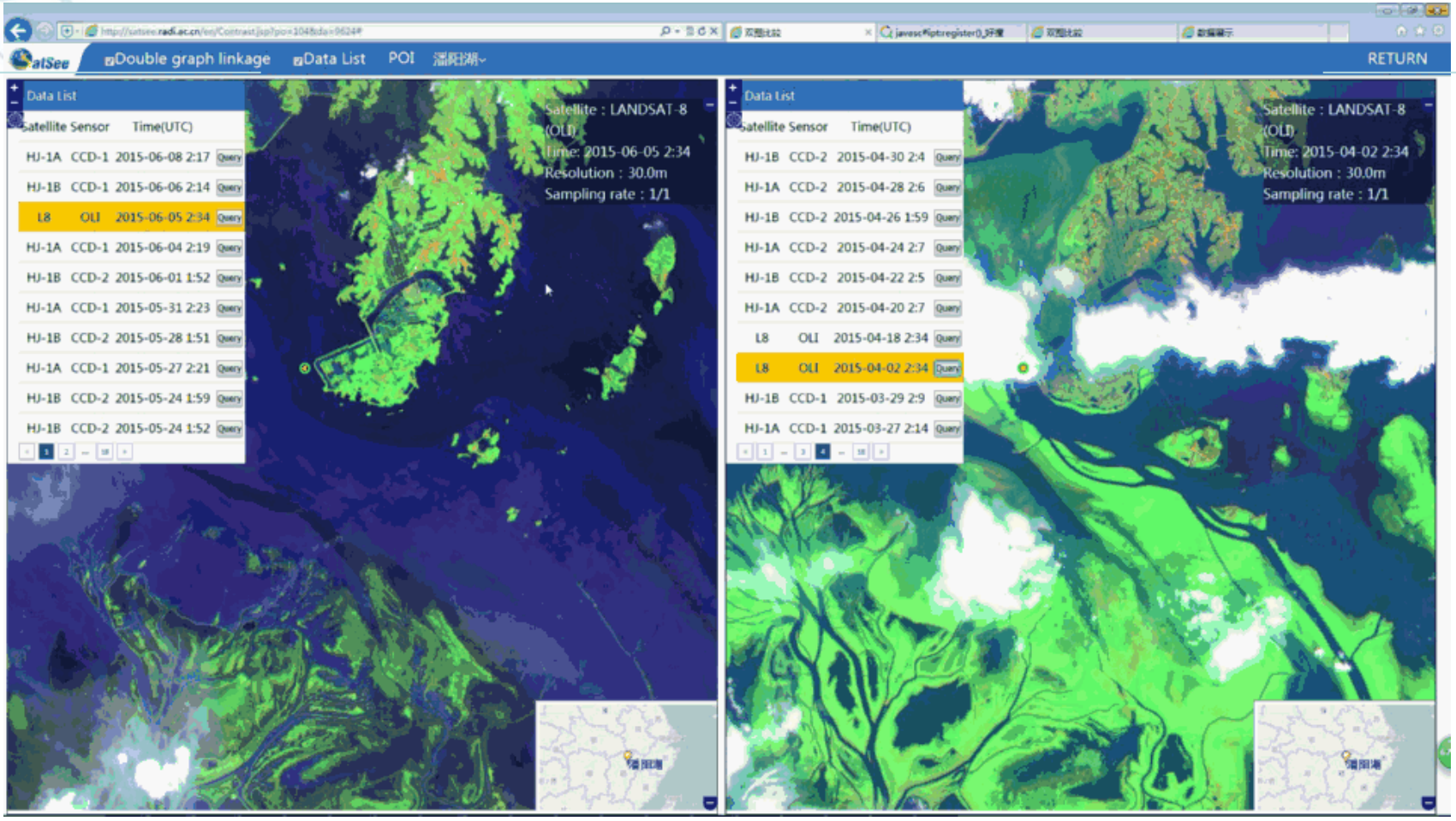
Set up POI(point of interest)

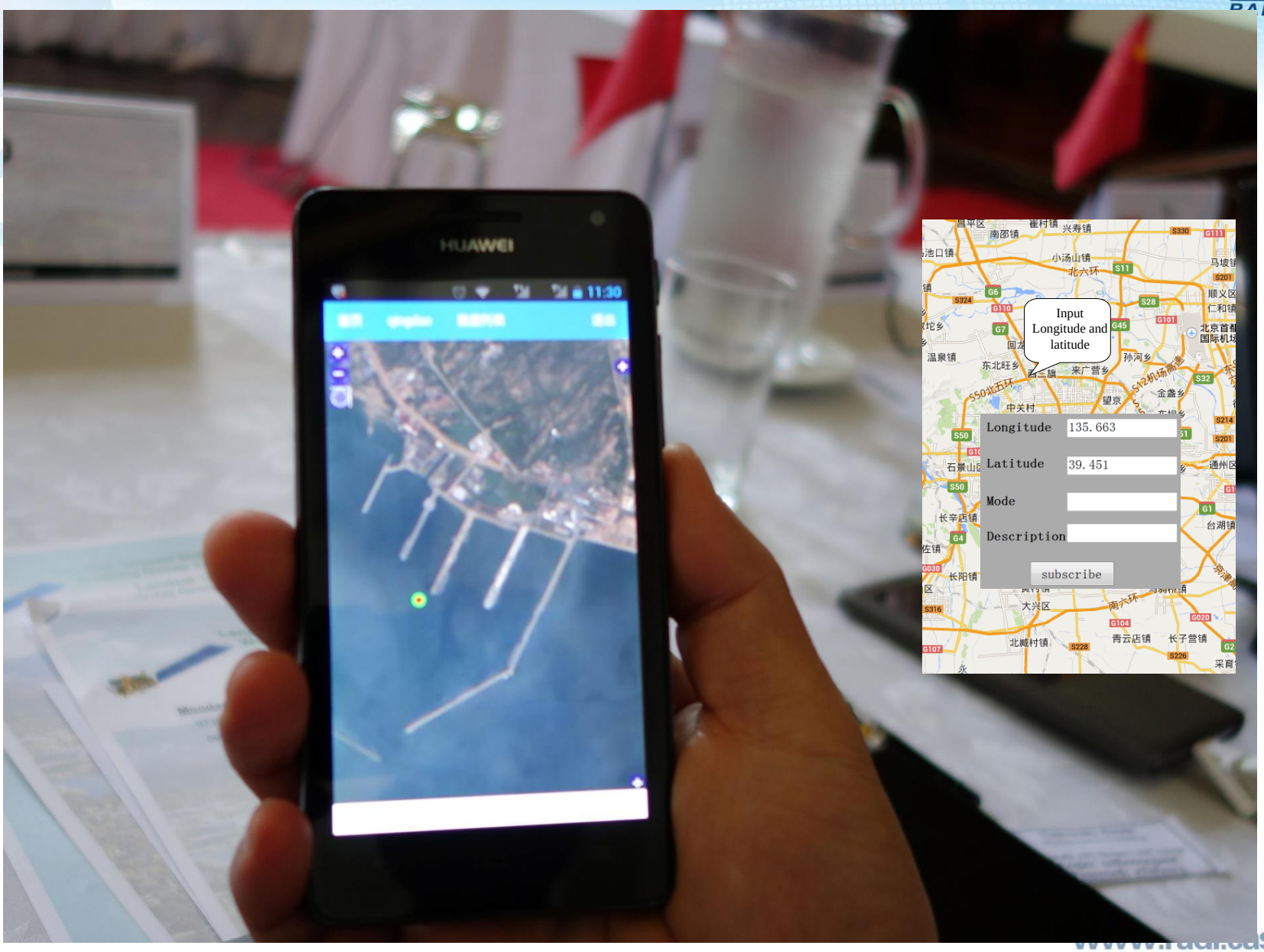




Example of A POI , Three Gorges Dam

Data Comparison

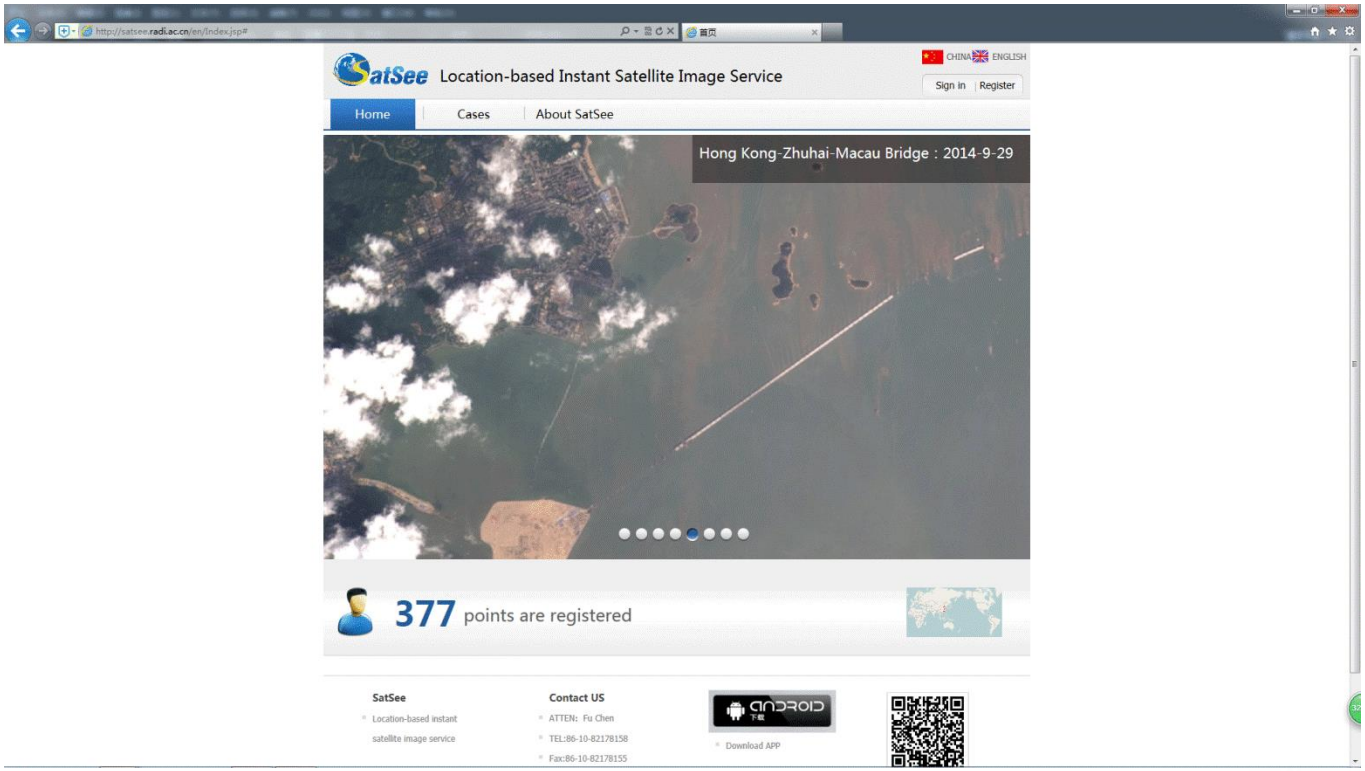




Further direction:

- Improving Quick look data accuracy.

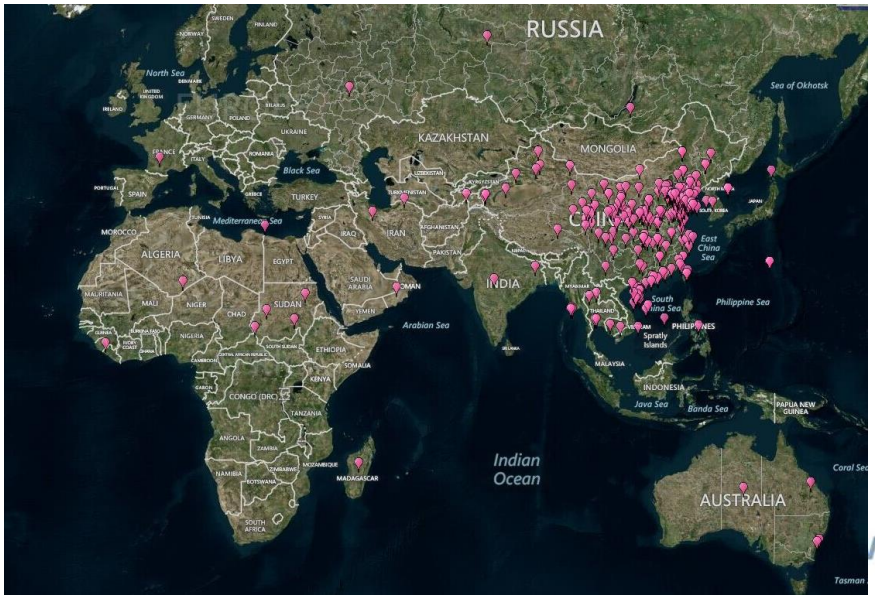
- Supporting the high level product data: The system can also provide high level product data such as ortho-rectification data for users who take care of data precision rather than data timeliness.



Further direction:

➢New algorithms applied for the system. The system can then support more advanced functions based on the new algorithms of data mining, fire detection for example.

➢Satellite programming based on the regions of interest: The costs of programming a satellite is quite expensive. However, once the points of interest from subscribers are clustered to an area, the satellite owners can actively capture the data of that area by satellite programming to improve the service quality.



Further Development

Joint Service / Creating A Service Alliance

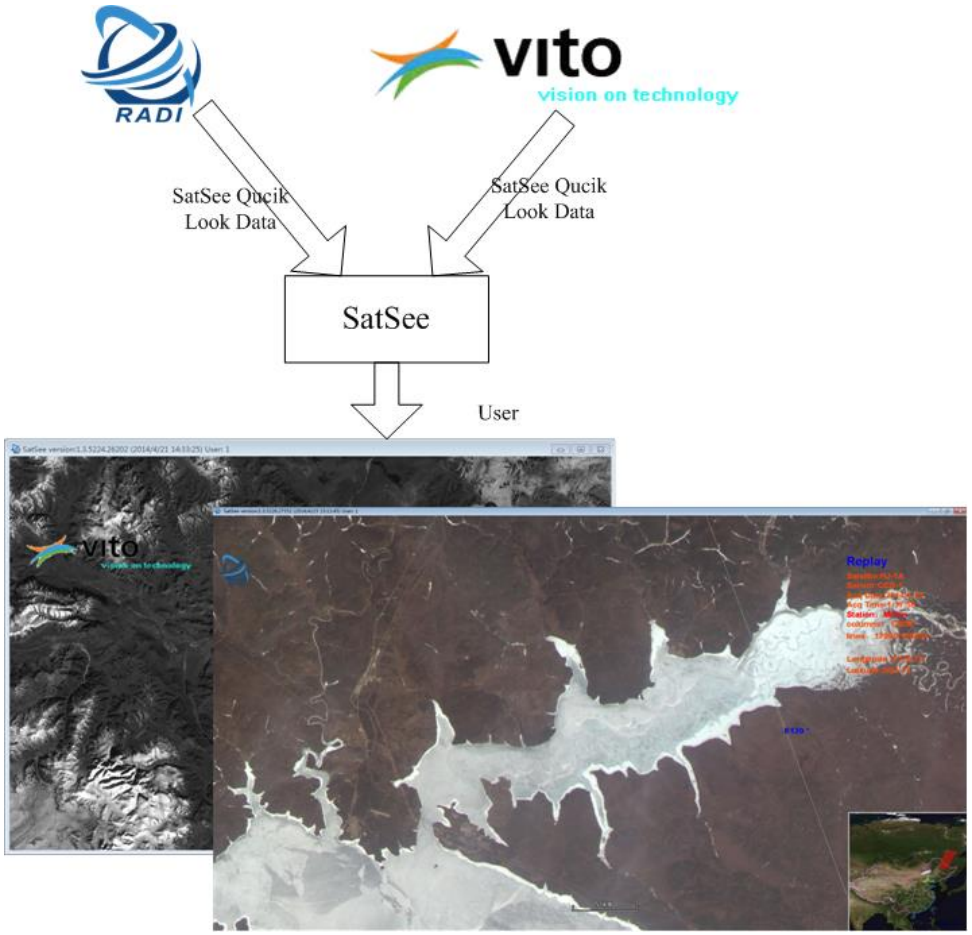
RS images be offered by multiple data owners

More satellites = Wider coverage + Shorter revisit time

Requirement: Formatting new data according to SatSee quicklook standard file defined by RADI

PROBA-VEGETATION
Sensor name
Ground station name
2014-01-01 05:22:08.000000
3
PROBAV_L1C_20140101_052208_2_V001_Band1.jpg
32,32
66.549524 60.278261, 67.889236 60.133208….
65.597344 57.859943, 66.848092 57.719989

Longitude and latitude every 32 pixel



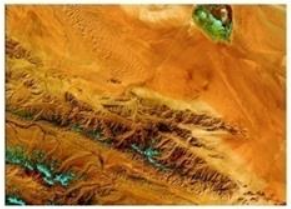
SatSee-Focus, by bringing image to the masses easily and quickly, may promote a new data service mode

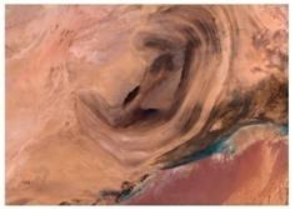
Software is in the process of developing. We expect feedback and suggestions.

Test site http://satsee.radi.ac.cn;
Reference article *http://www.tandfonline.com/eprint/A3ECPWiB8CEjW3Uieg3V/full*

Countries/regions within the circles have more data

Thanks!



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Chinese Academy of Sciences

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