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Recent Progress of Earth Observation Satellites and CAL/VAL Activities in China

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Outline

I. **Recent Progresses of EO Satellites Missions in China**

II. **CAL/VAL activities of Satellite Sensors**

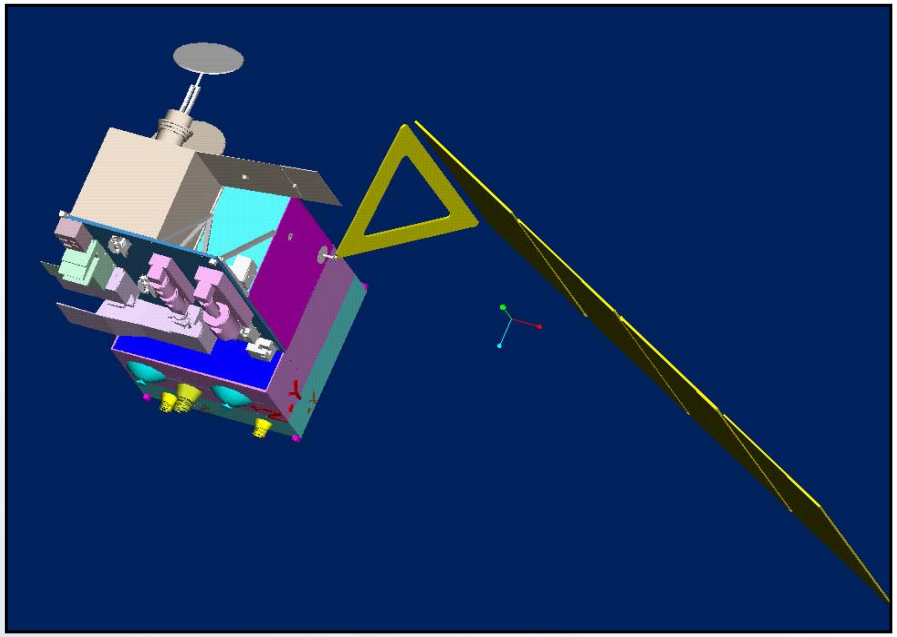
-------Some of the results in this report are provided by Dr. Songyan GU of NSMC/CMA and Dr. Junwu TANG of NSOAS/SOA.

I. Recent Progresses of EO Satellites Missions in China

- **Recent progress of China's earth observation programs**
  - **FY-3**
  - **FY-4**
  - **HY-2**
  - **HJ-1 A/B/C**

FY-3

- China's new generation polar-orbit meteorological satellite.
- FY-3A was successfully launched on May 27, 2008 from Taiyuan Launch Site in northern China.
- In-orbit payload test and performance validation undergoing.



Payloads onboard on FY-3A

Abbreviation	*Instrument Full Name*
VIRR	Visible and InfraRed Radiometer
IRAS	InfraRed Atmospheric Sounder
MWTS	MicroWave Temperature Sounder
MWHS	MicroWave Humidity Sounder
MERSI	MEdium Resolution Spectral Imager
SBUS	Solar Backscatter Ultraviolet Sounder
TOU	Total Ozone Unit
MWRI	Microwave Radiation Imager
SIM	Solar Irradiation Monitor
ERM	Earth Radiation Measurement
SEM	Space Environment Monitor

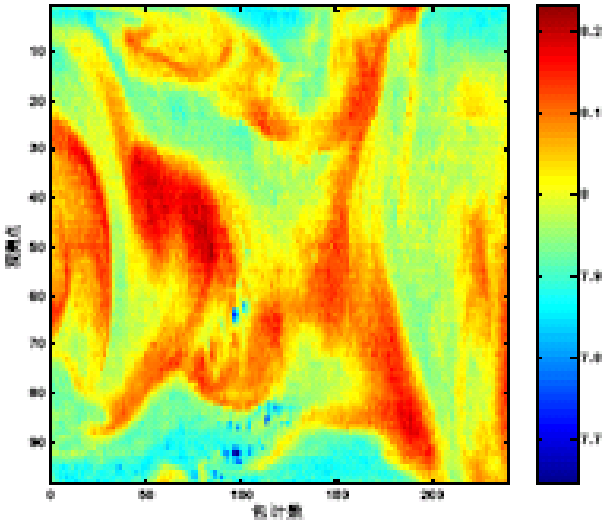
Specifications of FY-3 Payloads

Name of Instrument	Number of Channels	Spectral range	Field of Views /line	Spatial Resoluation at Sub point (km)
VIRR	10	0.43 – 12.5 μ m	2048	1.1
IRAS	26	0.69 – 15.5 μ m	56	17
MWTS	4	50 – 57 GHz	15	50/75
MWHS	5	150 – 183 GHz	90	15
MERSI	20	0.41 – 12.5 μ m	2048/8192	1.1/250
SBUS	12	252 – 380 nm	240	70/10
TOU	6	309 – 361 nm	31	50
MWRI	6	10.65 – 150 GHz	240	15-70

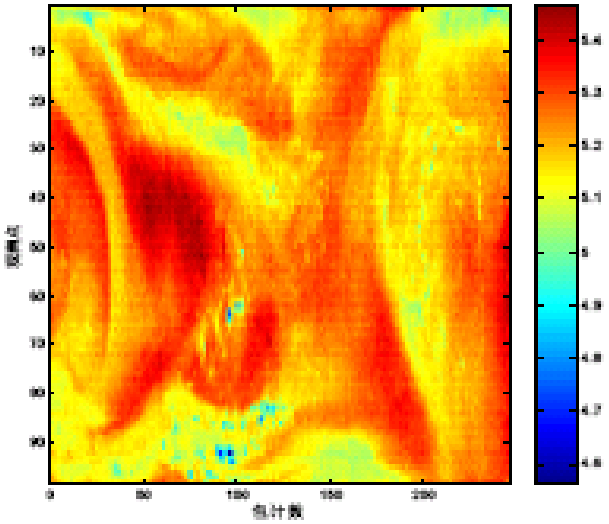
Microwave Sensors of FY-3A

Instrument	No of Channels	Frequency Range	Pixels per scan	Nadir Resolution (km)	Purpose
MWTS	4	50 – 57 GHz	15	50-75	Atmospheric Temperature Contour
MWHS	5	150 – 183 GHz	98	15	Vapor contour, surface properties
MWRI	12	10.65 – 150 GHz	240	15-70	Rain rate, cloud water content, vapor volume, etc

First Image of MWHS/FY-3A



183G 第一通道



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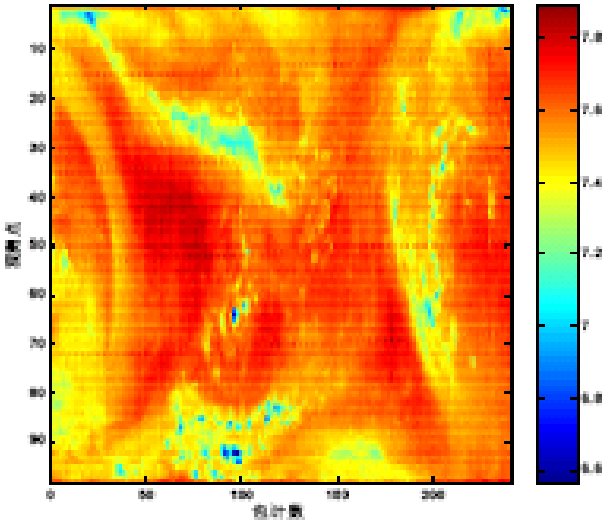
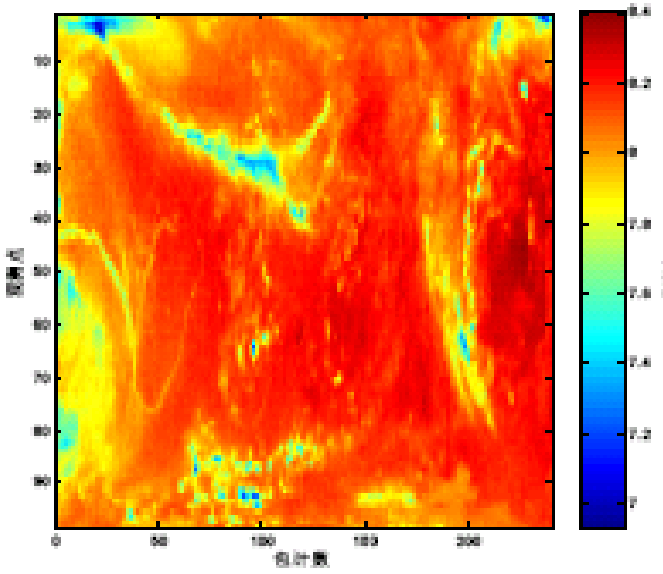
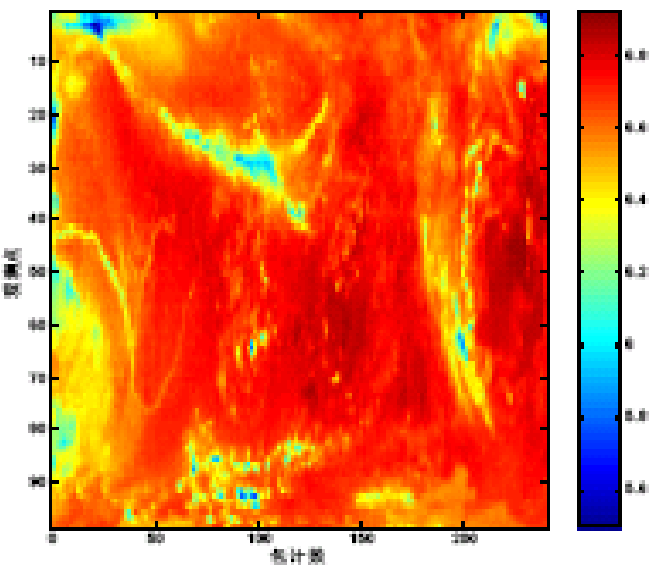


183G 第三通道



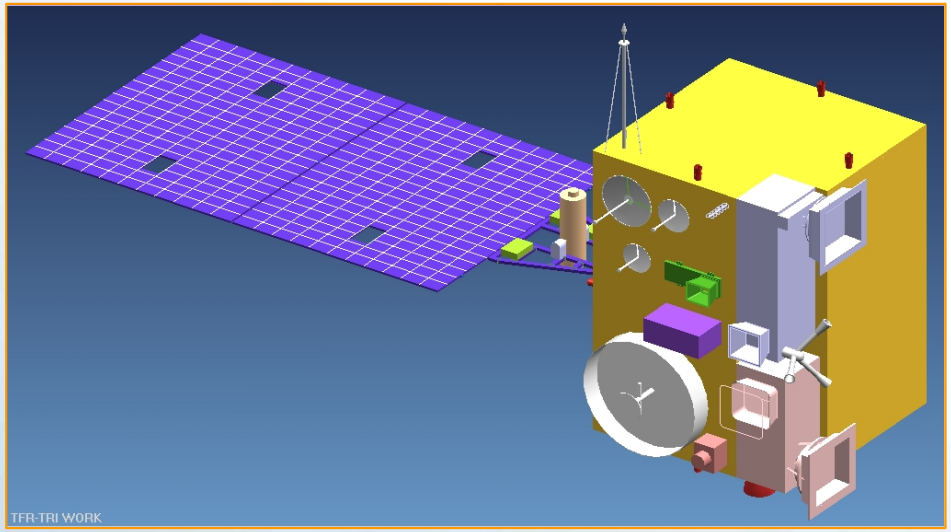
150G 第一通道



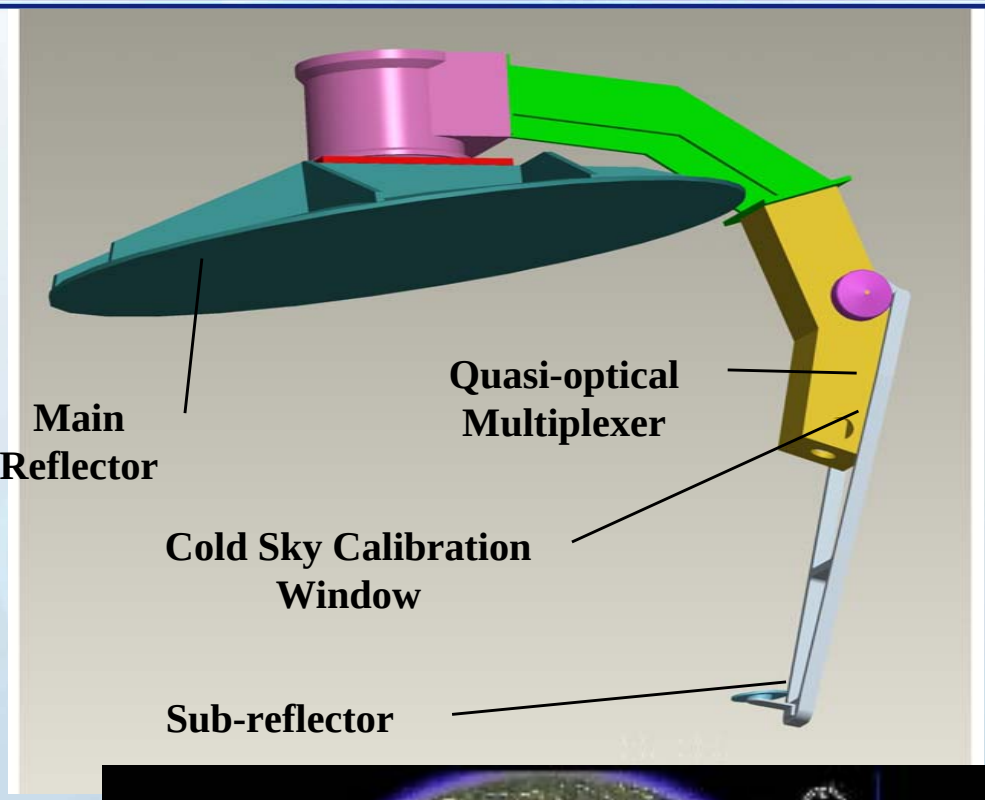
150G 第二通道

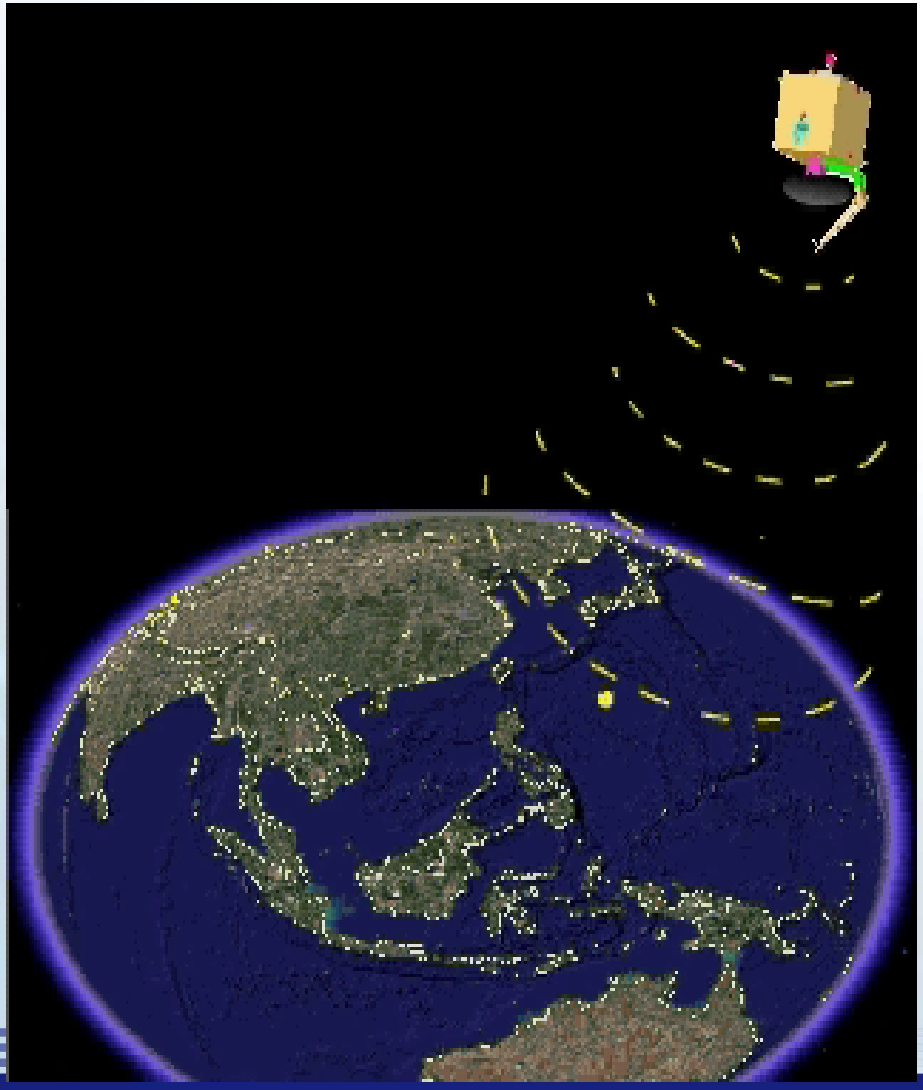
FY-4

- China's new generation geostationary orbit meteorological satellite.
- FY-4 will have the optical version (FY-4O) and microwave (FY-4M) satellite.
- Development of sensors for FY-4M started.
  - Microwave sensor with real aperture antenna;
  - Microwave sensor with synthetic aperture technique.



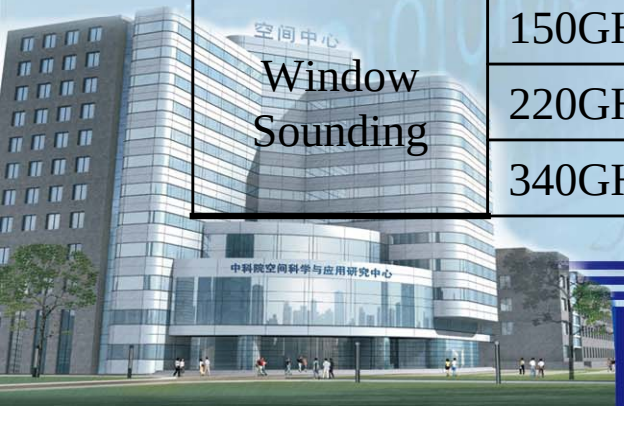
Microwave Sensor with Real Aperture Antenna





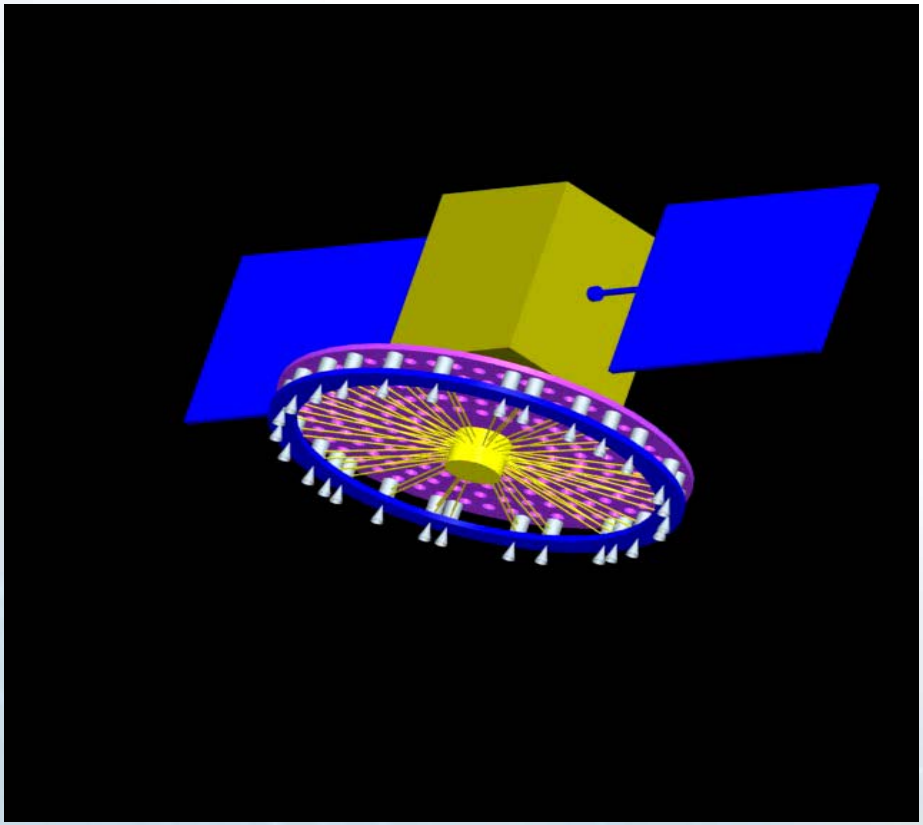
Main specifications

	Frequency（GHz）	Bandwidth（MHz）	Sensitivity（K）	Antenna Aperture（m）	Nadir Spatial Resolution（km）
Temperature Sounding	118.750±0.2, 0.4, 0.7, 1.1, 1.5, 2.1, 3.0, 5.0	100～2000	<1	3	37
	424.763±0.15, 0.3, 0.6, 1.0, 1.5, 4.0	100～1000			10
Water Vapour Sounding	183.310±0.3, 0.9, 1.65, 3.0, 5.0, 7.0, 17.0	300～4000			24
	380.197±0.4, 1.5, 4.0, 9.0, 18.0	200～2000			12
Window Sounding	150GHz	1000			29
	220GHz	2000			20
	340GHz	1000			13



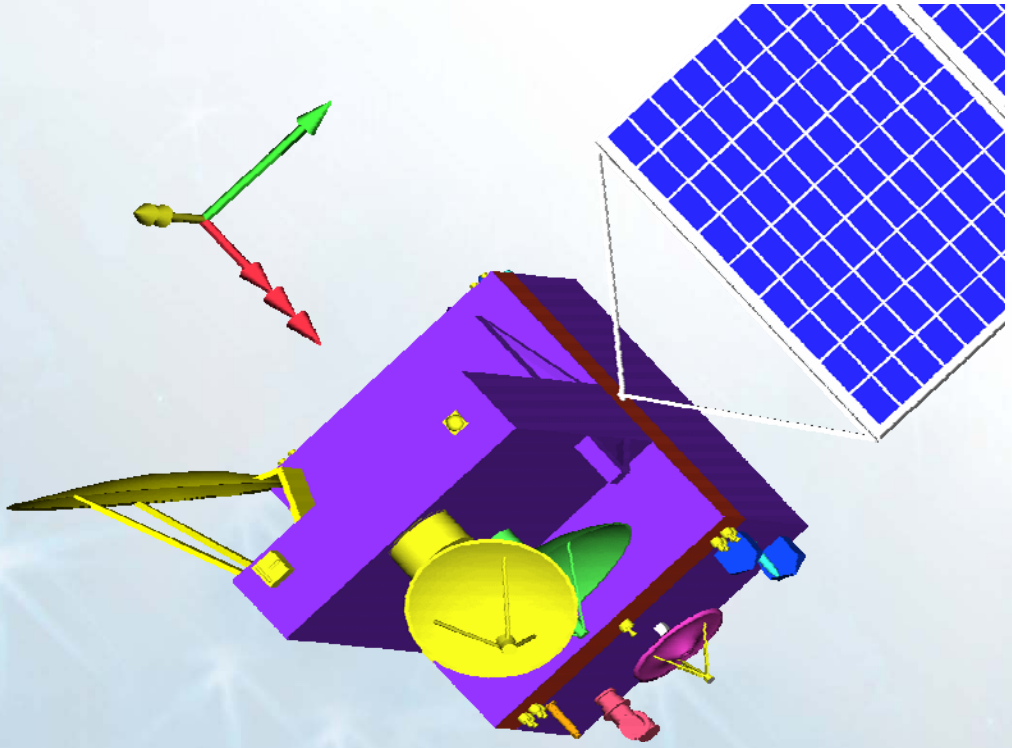
Synthetic aperture microwave sensor

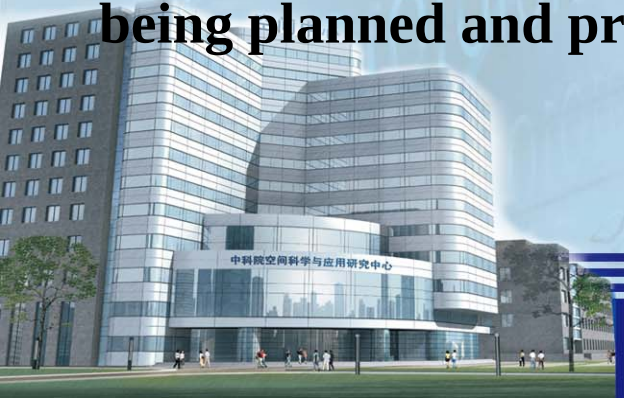
- **Prototype of synthetic aperture microwave sensor begin to be developed by supporting from China's High-Tech R & D Program (863 program). (to be completed by 2010)**
- **A clock scanning scheme is developed to reduce the number of receiving elements for required visiblity function (u-v) coverage.**
- **Specifications:**
  - **Frequency: 50～60GHz;**
  - **No. of Channels: 8-12;**
  - **Calibration Accuracy: 1.5K**
  - **Surface resolution: 50km**
  - **Imaging Interval: 5min**
  - **Coverage: 3000 x 3000km**
  - **Mass: 280kg**



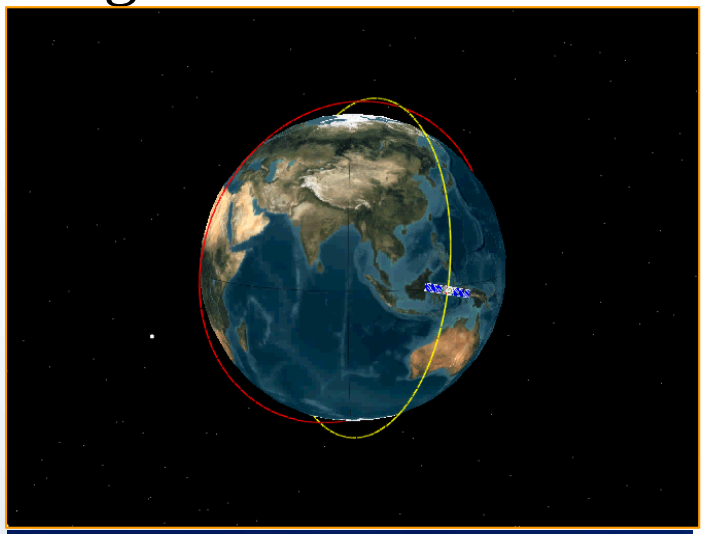
HY-2 Ocean Dynamic Environment Measurement Satellite

- **Main payload are microwave sensors:**
  - **Dual frequency (Ku, C) radar altimeter and 3-channel nadir-looking microwave radiometer for atmospheric correction;**
  - **Ku-band radar scatterometer;**
  - **Multi-frequency microwave imager (6.6GHz-37GHz)**
- **Engineering model started to build in 2008;**
- **Expected to be launched around 2010;**
- **Returned Signal simulator is being developed for prelaunch calibration;**
- **After launch CAL/VAL campaign is being planned and prepared.**

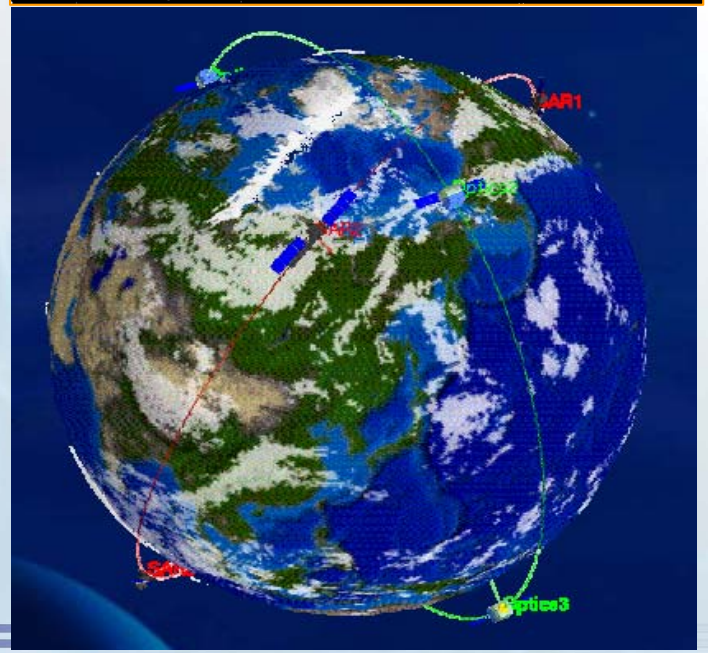




HJ Series Environment and Disaster Monitoring Constellation (EDMC)

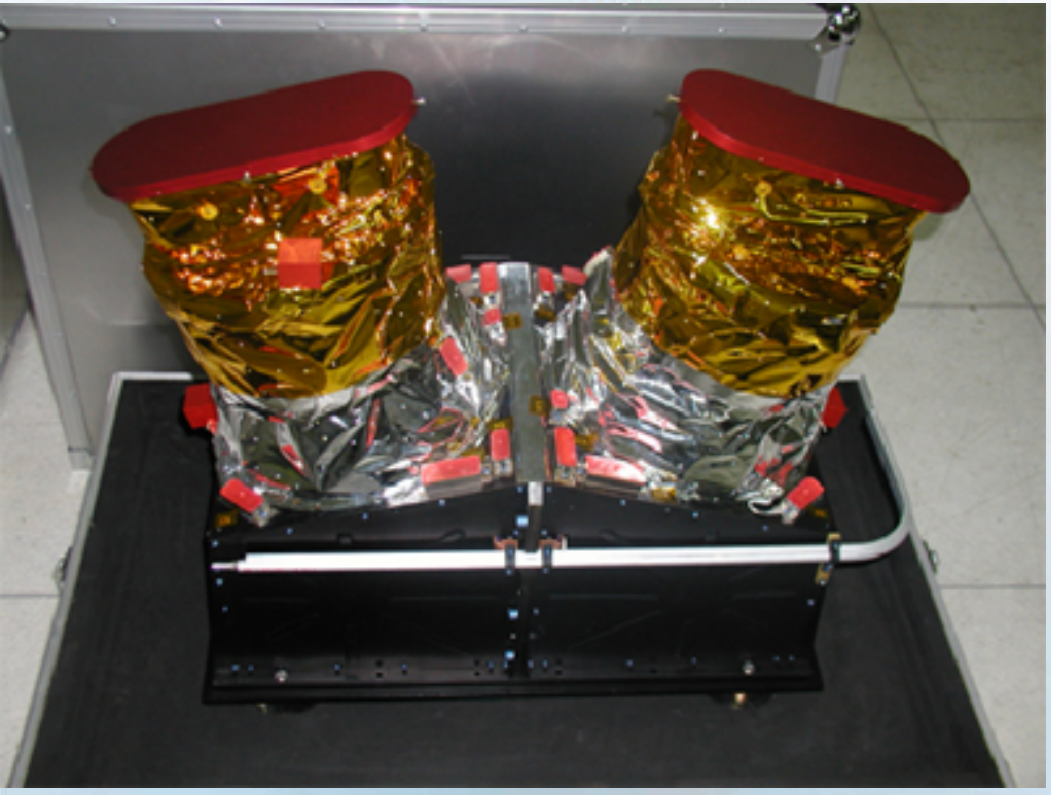


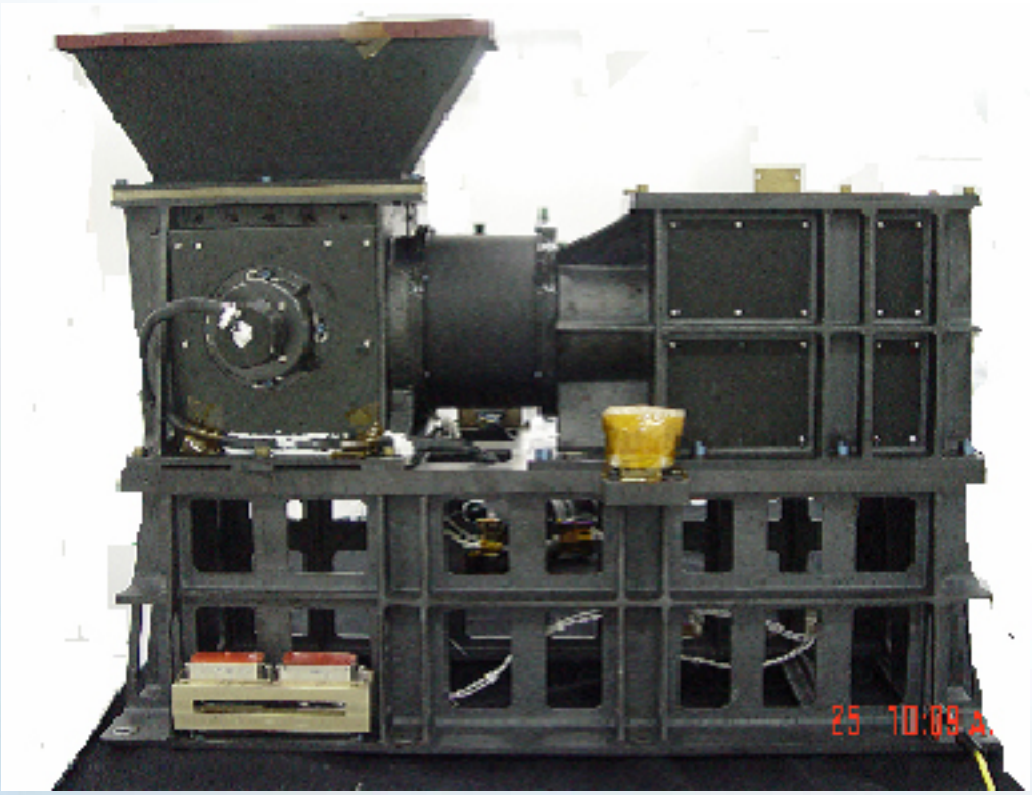
- **Phase 1: HJ-1A/B/C**
  - **3 satellites constellation**
  - **2 optical + 1 SAR**
  - **HJ-1A also contributes to the Asia Pacific Multilateral Small Satellite Program.**
- **Phase 2**
  - **8 satellites constellation**
  - **4 optical + 4 SAR**



Payloads of HJ-1A/B/C

Sat.	Payload	Band No.	Spectrum (μm)	Resolution (m)	Swath Width (km)	Repeat Cycle (day)
HJ-1A	CCD Camera	1	0.43-0.52	30	720	4
		2	0.52-0.60	30		
		3	0.63-0.69	30		
		4	0.76-0.9	30		
	hyper-spectral Image	—	0.45-0.95 (110-128 bands)	100	50	4-31, (Side-looking ±30°)
HJ-1B	CCD Camera	1	0.43-0.52	30	720	4
		2	0.52-0.60	30		
		3	0.63-0.69	30		
		4	0.76-0.9	30		
	IRMSS	5	0.75-1.10	150 (NIR)	720	4
		6	1.55-1.75			
		7	3.50-3.90			
		8	10.5-12.5	300 (10.5-12.5 μm)		
HJ-1-C	SAR	—	S Band	20 (4 Looks) 5 (1 Looks)	100	4-31





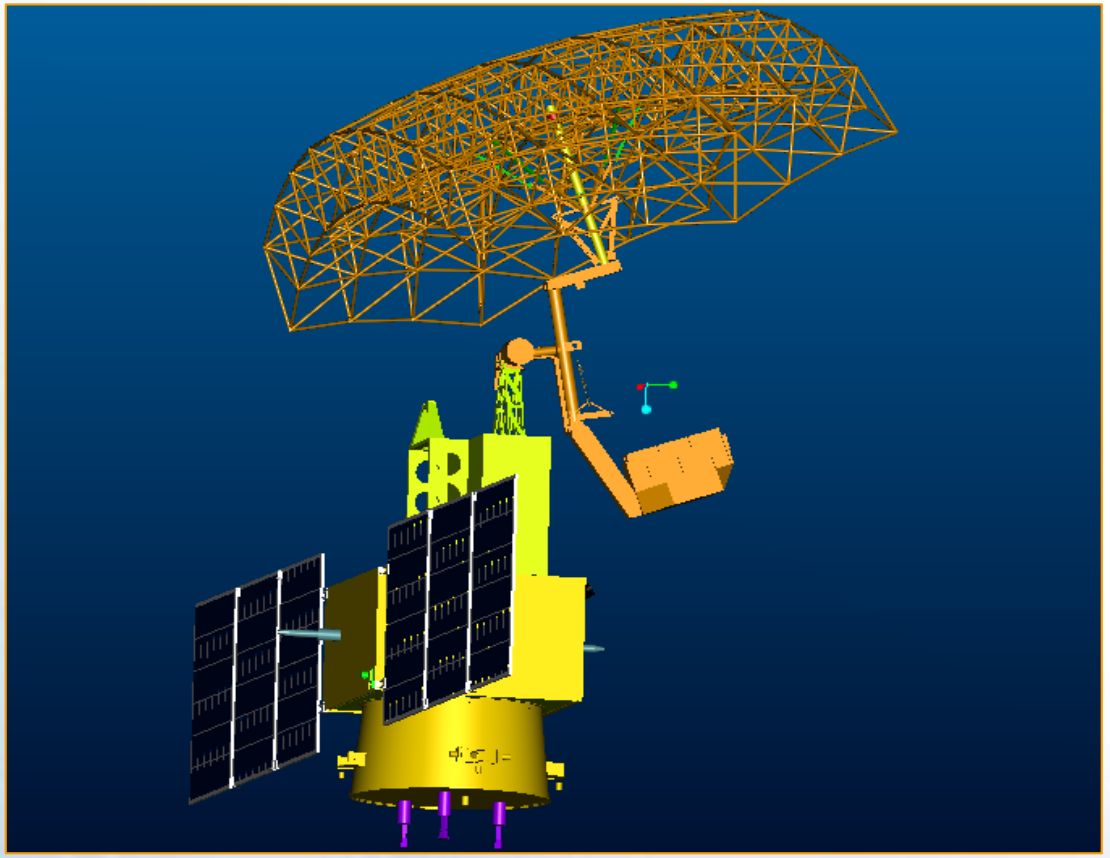
Wide Swath Multi-Spectral
CCD Camera

Fourier Transform
Hyper-spectral Imager

HJ-1-B卫星红外相机头部

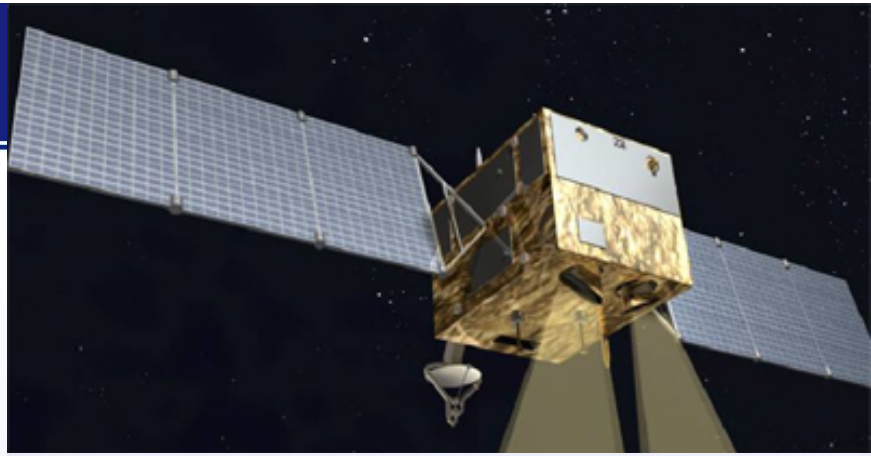
HJ-1-B卫星红外相机信息箱、制冷机控制箱

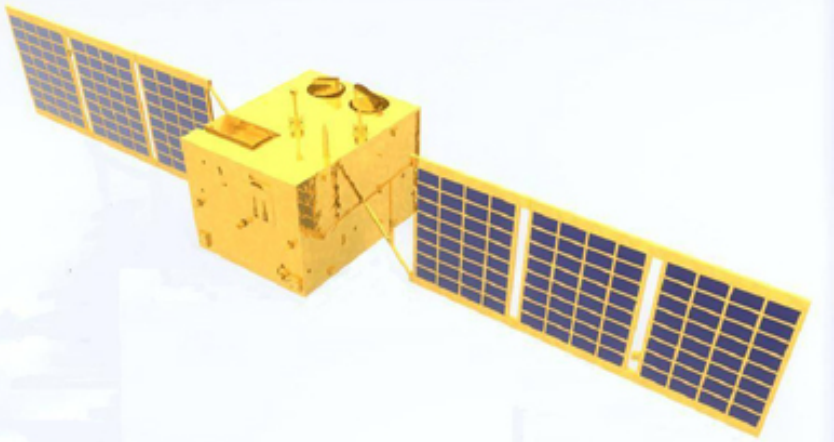
Infrared Camera

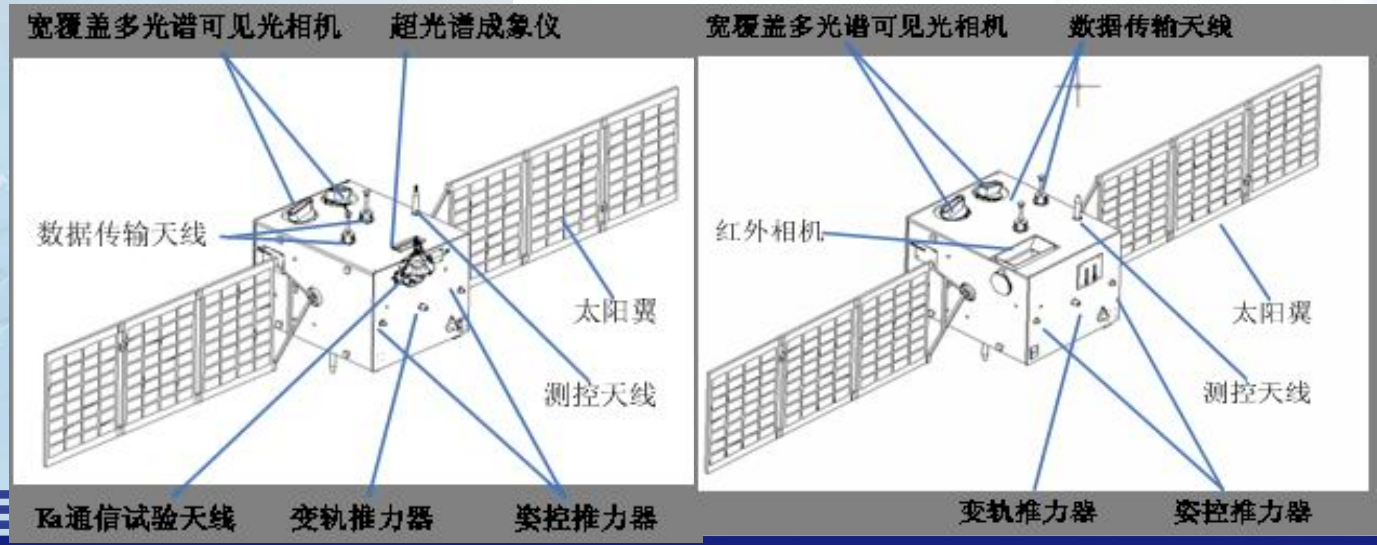


S-Band SAR of HJ-1C

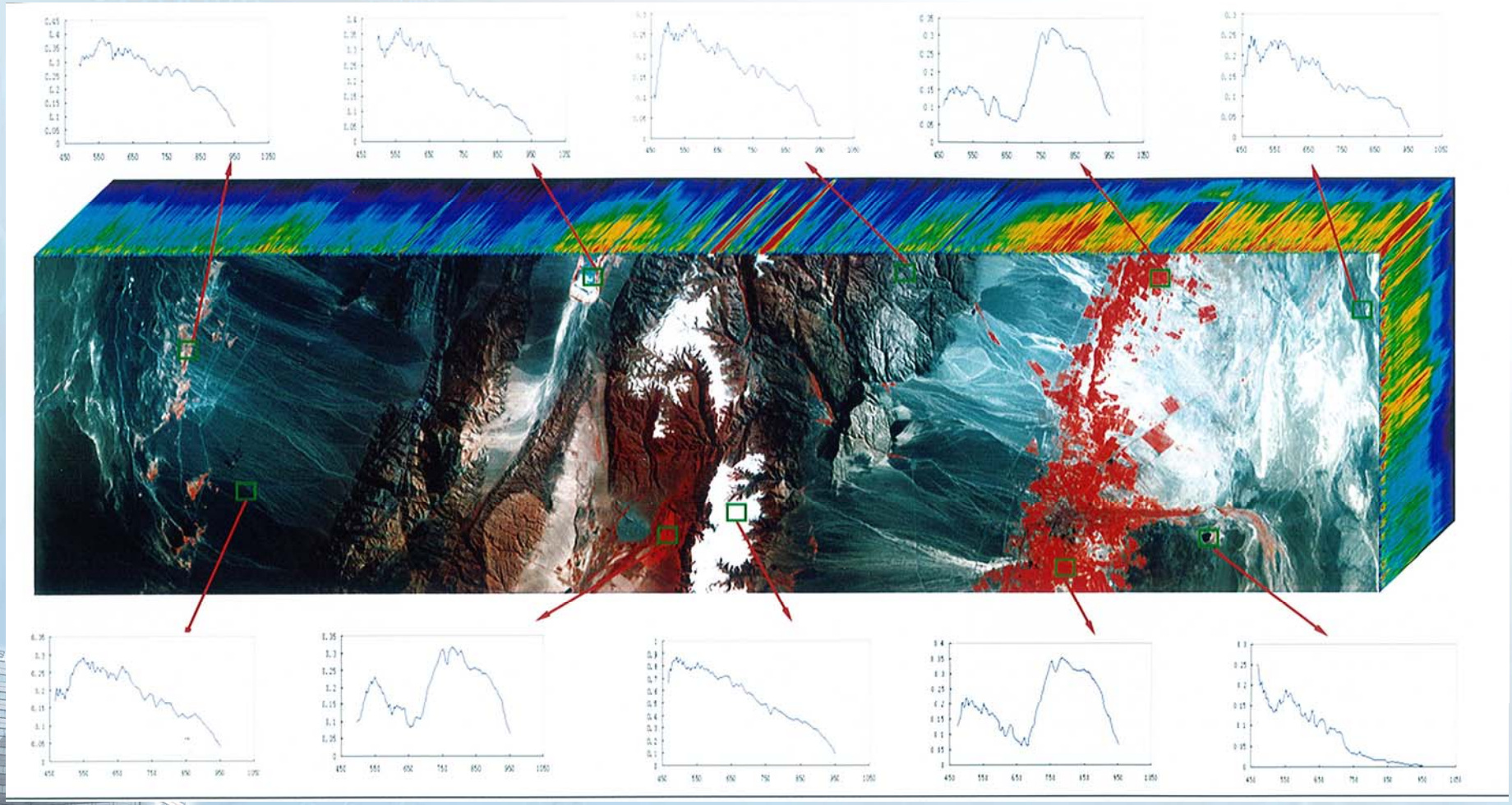
- **HY-1A/B are successfully launched by a single launcher from Taiyuan Launch Site on September 06, 2008.**
- **In-orbit payload test and performance validation just began.**
- **HY-1C is planned to be launched in 2009.**
- **Data will be distributed by CRESDA.**
- **Data application center belongs to the Chinese Ministry of Environment Protection and the National Commission of Disaster Reduction.**

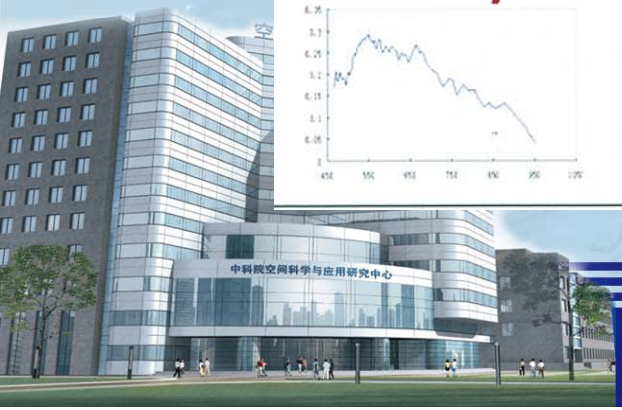






1st image of hyper-spectral Imager of HY-1A





II. CAL/VAL Activities for Satellite Sensors

- **Before launch calibration**
  - **FY-3**
  - **CE-1**
  - **HY-2**
- **After launch CAL/VAL**
  - **HY-1B**
  - **FY-3A**
  - **CRSS-1**

Before Launch Calibration

FY-3

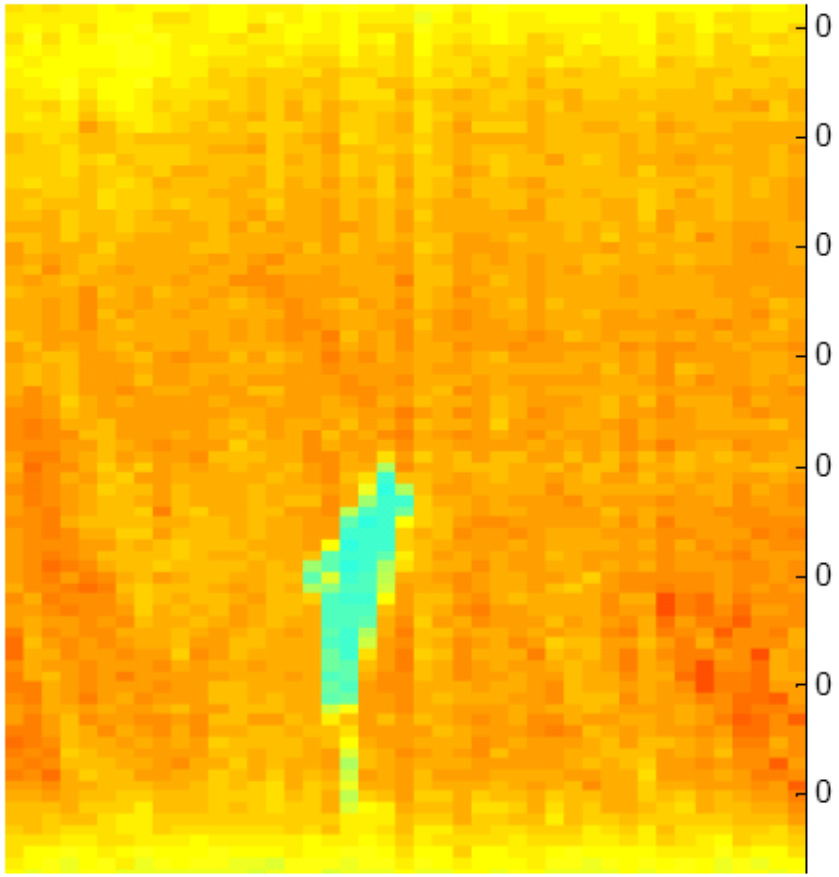
- **Before launch airborne campaign had completed to validate the instrument performance;**
  - **Dunhuang**
    - **Comparison with optical emissions**
  - **Qinghai Lake**
    - **To validate the sensor performance**
  - **Pu'er (Simao), Yuan Province**
    - **To validate the possibility for after launch validation**

Images of Qinghai Lake by MWHS and MERSI

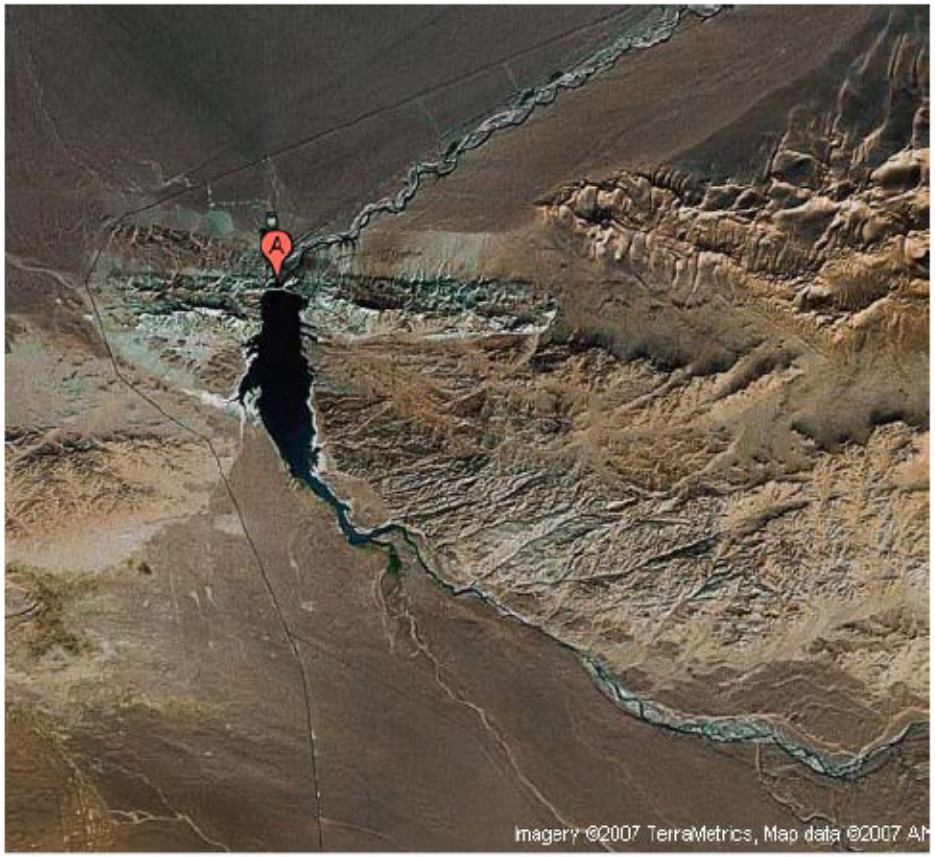
微波湿度计图像

中分辨率成像光谱仪图像(用于对比)

Images of Dunhuang by MWHS and MERSI

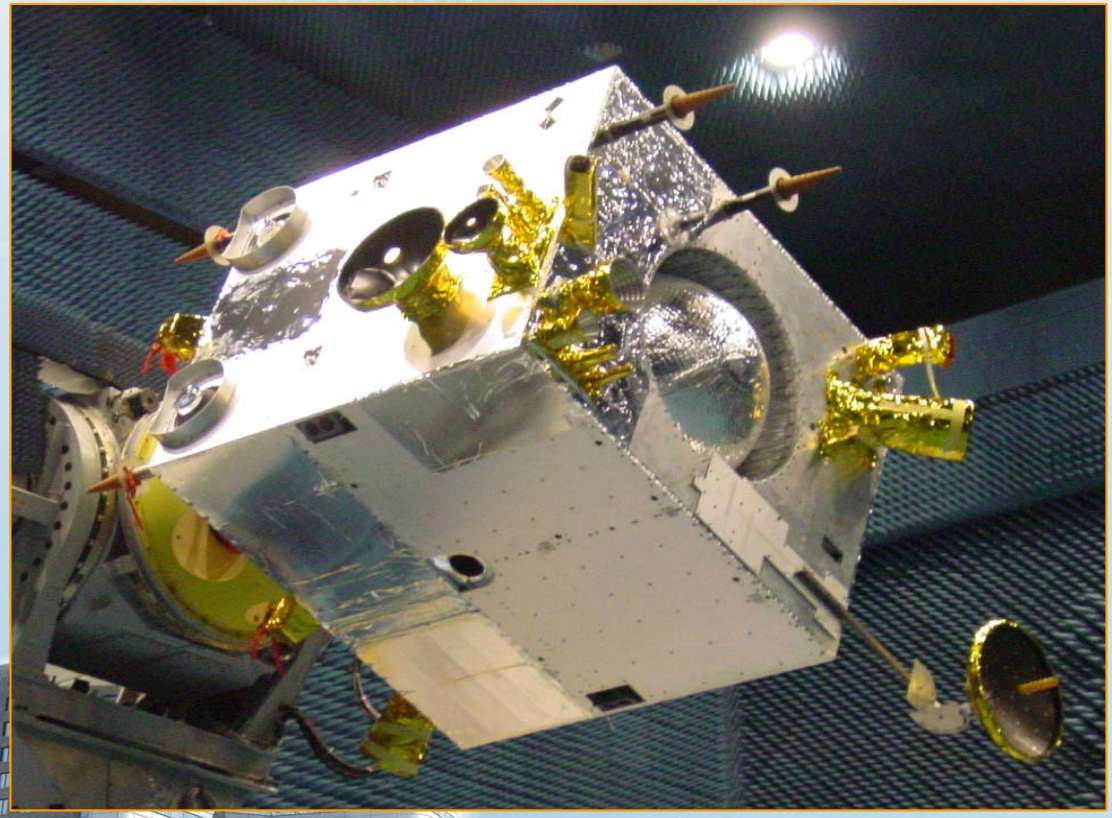


微波湿度计图像



中分辨率成像光谱仪图像(用于对比)

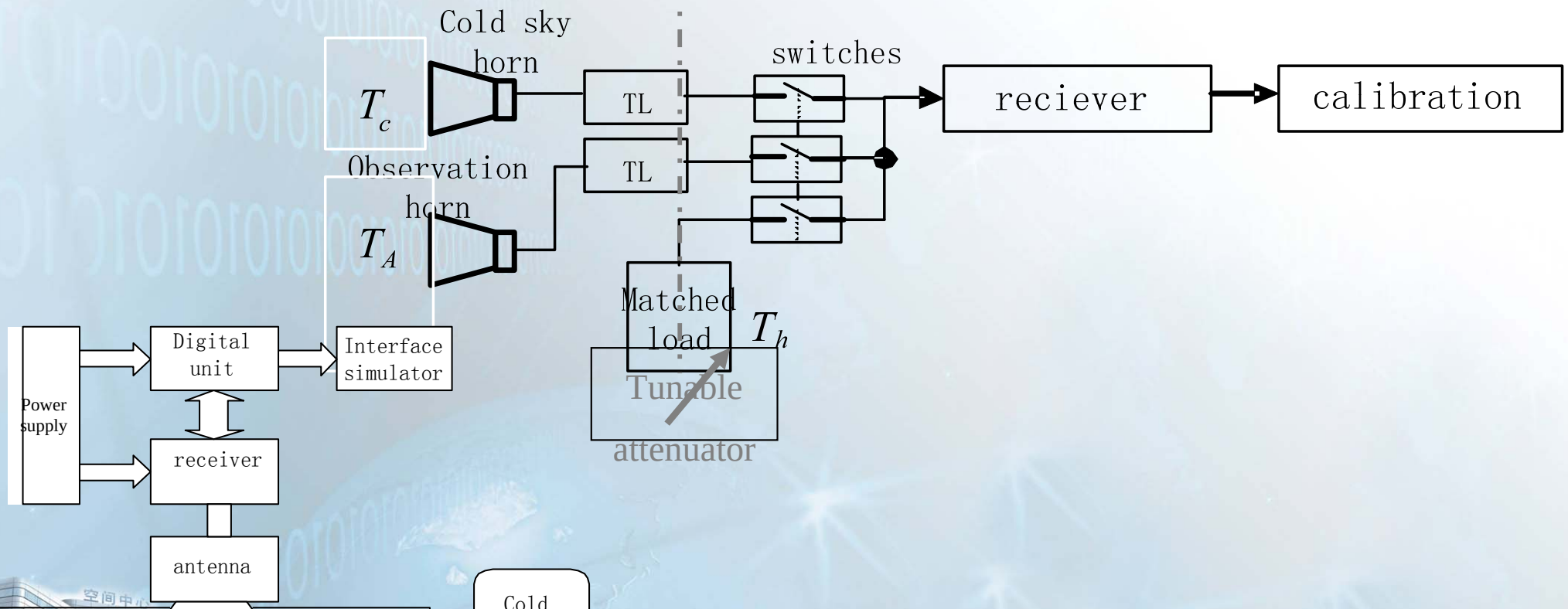
The CE-1 Microwave Sounder

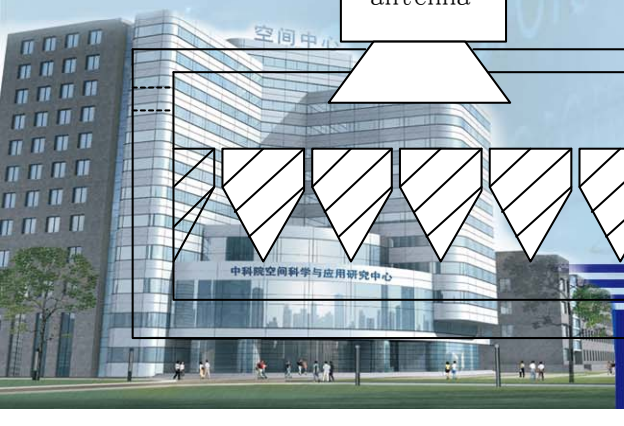


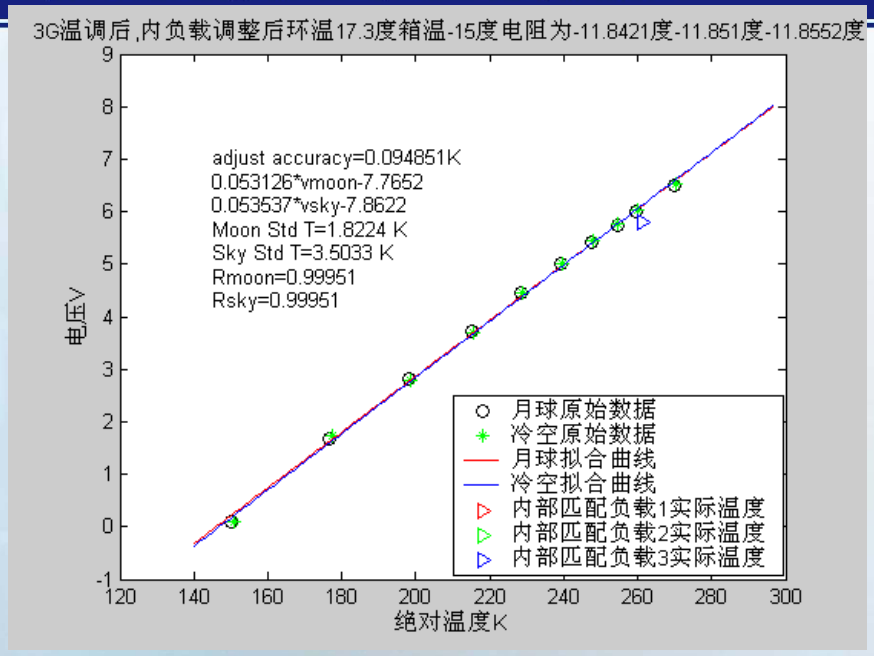
The System Specifications

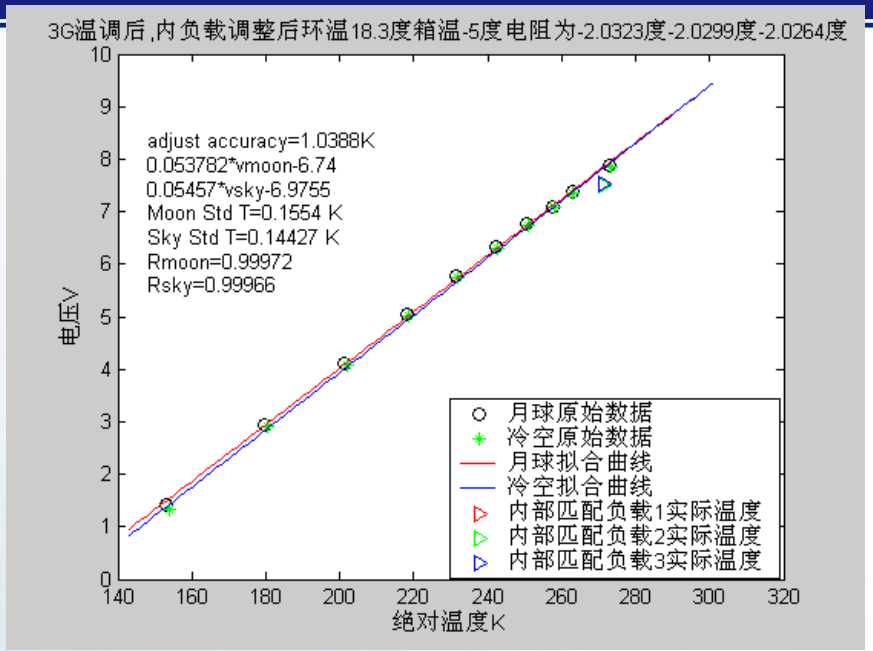
Frequency（GHz）	3.0	7.8	19.35	37
Bandwidth（MHz）	100	200	500	500
Integration （ms）	200	200	200	200
Sensitivity（K）	0.5	0.5	0.5	0.5
Linearity	0.99	0.99	0.99	0.99
Space Resolution（km）	56.0	35.0	35.0	35.0

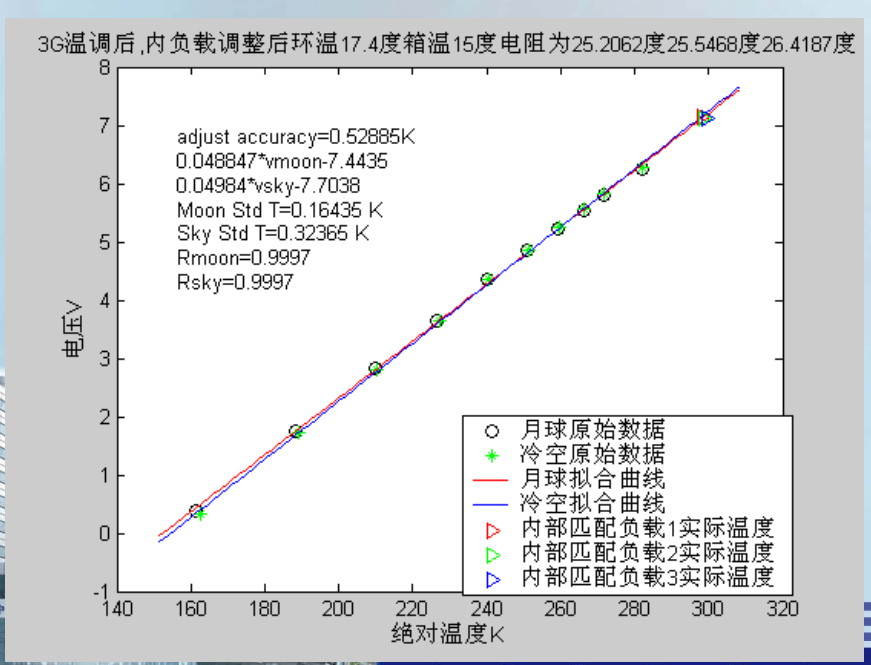
T/V CAL Experiment

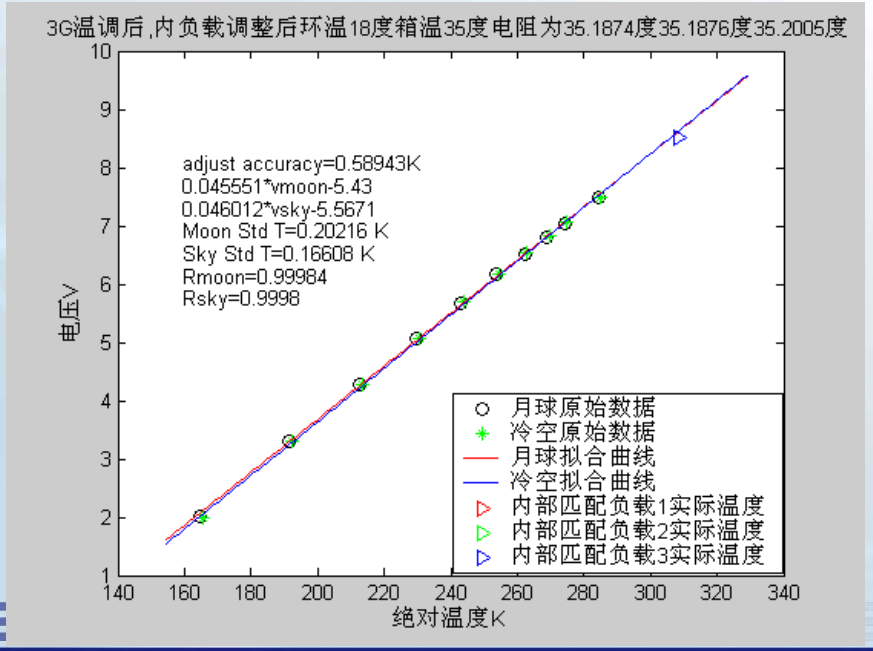


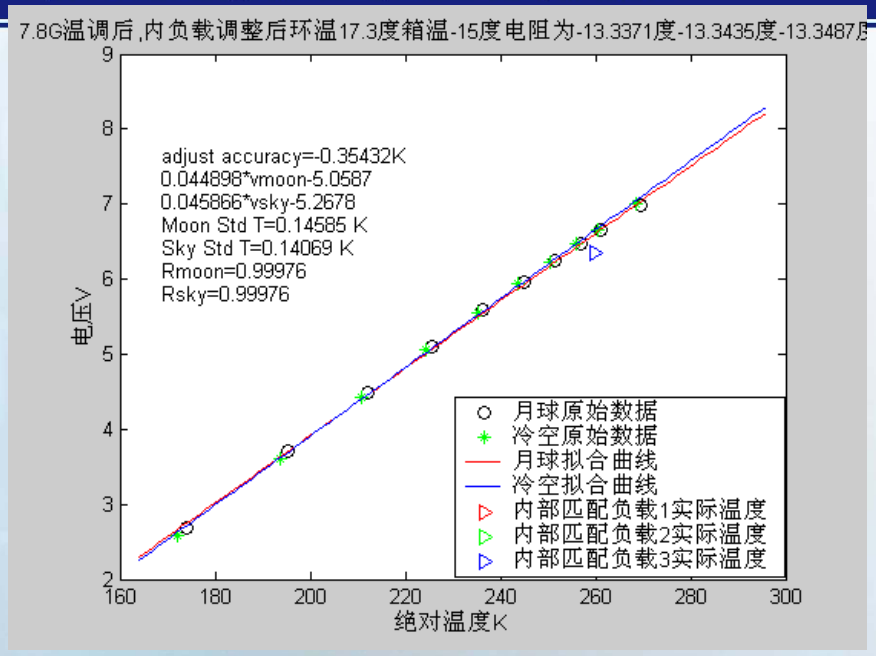


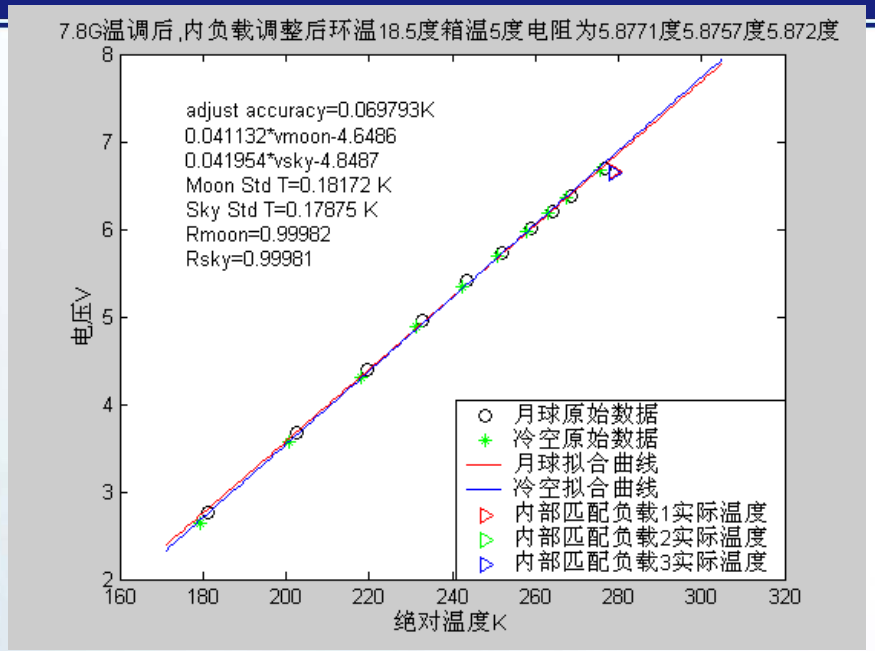

3G温调后,内负载调整后环温17.3度箱温-15度电阻为-11.8421度-11.851度-11.8552度
adjust accuracy=0.094851K
0.053126*vmoon-7.7652
0.053537*vsky-7.8622
Moon Std T=1.8224 K
Sky Std T=3.5033 K
Rmoon=0.99951
Rsky=0.99951
月球原始数据
冷空原始数据
月球拟合曲线
冷空拟合曲线
内部匹配负载1实际温度
内部匹配负载2实际温度
内部匹配负载3实际温度
电压V
绝对温度K

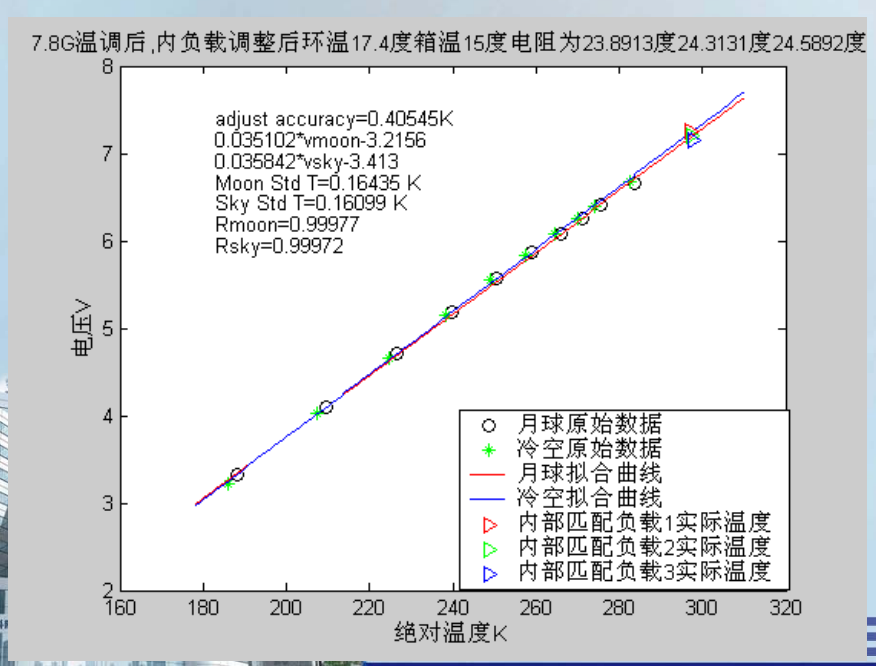

3G温调后,内负载调整后环温18.3度箱温-5度电阻为-2.0323度-2.0299度-2.0264度
adjust accuracy=1.0388K
0.053782*vmoon-6.74
0.05457*vsky-6.9755
Moon Std T=0.1554 K
Sky Std T=0.14427 K
Rmoon=0.99972
Rsky=0.99966
月球原始数据
冷空原始数据
月球拟合曲线
冷空拟合曲线
内部匹配负载1实际温度
内部匹配负载2实际温度
内部匹配负载3实际温度
电压V
绝对温度K

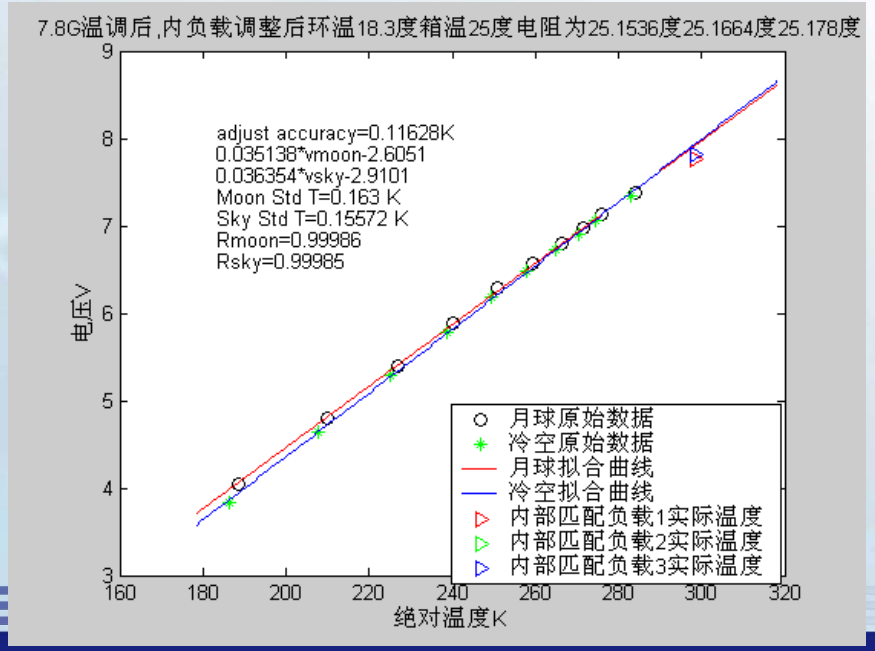

3G温调后,内负载调整后环温17.4度箱温15度电阻为25.2062度25.5468度26.4187度
adjust accuracy=0.52885K
0.048847*vmoon-7.4435
0.04984*vsky-7.7038
Moon Std T=0.16435 K
Sky Std T=0.32365 K
Rmoon=0.9997
Rsky=0.9997
月球原始数据
冷空原始数据
月球拟合曲线
冷空拟合曲线
内部匹配负载1实际温度
内部匹配负载2实际温度
内部匹配负载3实际温度
电压V
绝对温度K

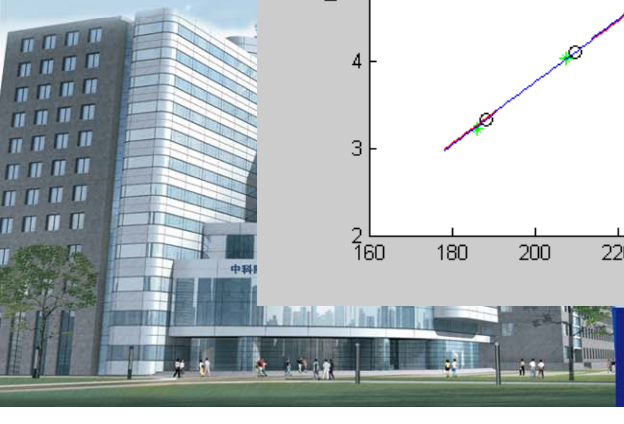

3G温调后,内负载调整后环温18度箱温35度电阻为35.1874度35.1876度35.2005度
adjust accuracy=0.58943K
0.045551*vmoon-5.43
0.046012*vsky-5.5671
Moon Std T=0.20216 K
Sky Std T=0.16608 K
Rmoon=0.99984
Rsky=0.9998
月球原始数据
冷空原始数据
月球拟合曲线
冷空拟合曲线
内部匹配负载1实际温度
内部匹配负载2实际温度
内部匹配负载3实际温度
电压V
绝对温度K

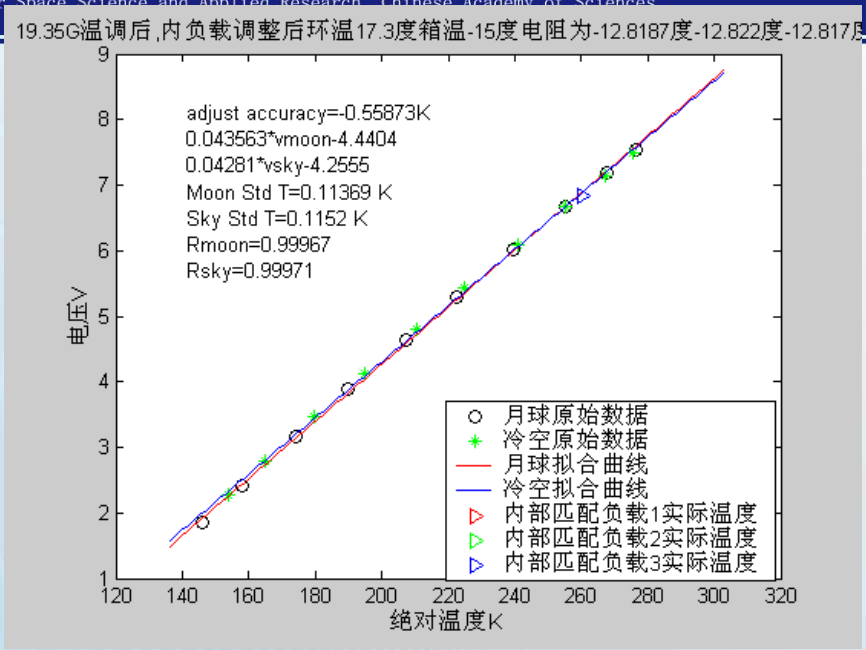

7.8G温调后,内负载调整后环温17.3度箱温-15度电阻为-13.3371度-13.3435度-13.3487度
adjust accuracy=-0.35432K
0.044898*vmoon-5.0587
0.045866*vsky-5.2678
Moon Std T=0.14585 K
Sky Std T=0.14069 K
Rmoon=0.99976
Rsky=0.99976
月球原始数据
冷空原始数据
月球拟合曲线
冷空拟合曲线
内部匹配负载1实际温度
内部匹配负载2实际温度
内部匹配负载3实际温度
电压V
绝对温度K

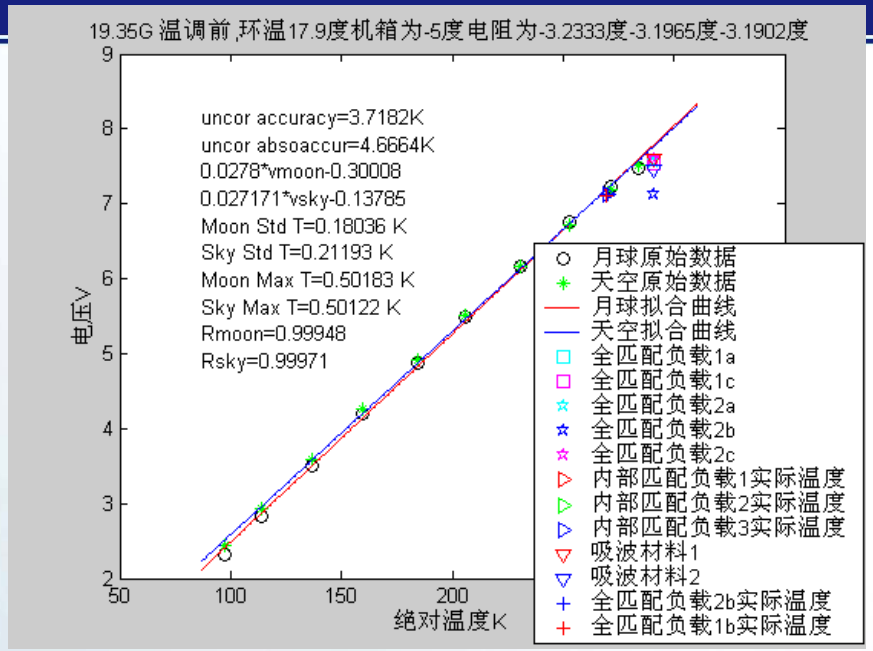

7.8G温调后,内负载调整后环温18.5度箱温5度电阻为5.8771度5.8757度5.872度
adjust accuracy=0.069793K
0.041132*vmoon-4.6486
0.041954*vsky-4.8487
Moon Std T=0.18172 K
Sky Std T=0.17875 K
Rmoon=0.99982
Rsky=0.99981
月球原始数据
冷空原始数据
月球拟合曲线
冷空拟合曲线
内部匹配负载1实际温度
内部匹配负载2实际温度
内部匹配负载3实际温度
电压V
绝对温度K

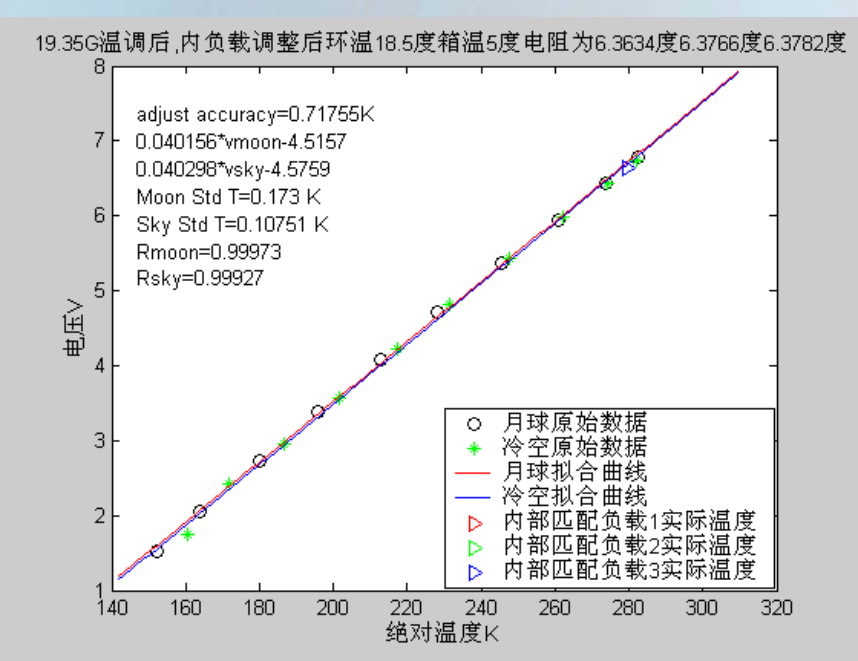

7.8G温调后,内负载调整后环温17.4度箱温15度电阻为23.8913度24.3131度24.5892度
adjust accuracy=0.40545K
0.035102*vmoon-3.2156
0.035842*vsky-3.413
Moon Std T=0.16435 K
Sky Std T=0.16099 K
Rmoon=0.99977
Rsky=0.99972
月球原始数据
冷空原始数据
月球拟合曲线
冷空拟合曲线
内部匹配负载1实际温度
内部匹配负载2实际温度
内部匹配负载3实际温度
电压V
绝对温度K

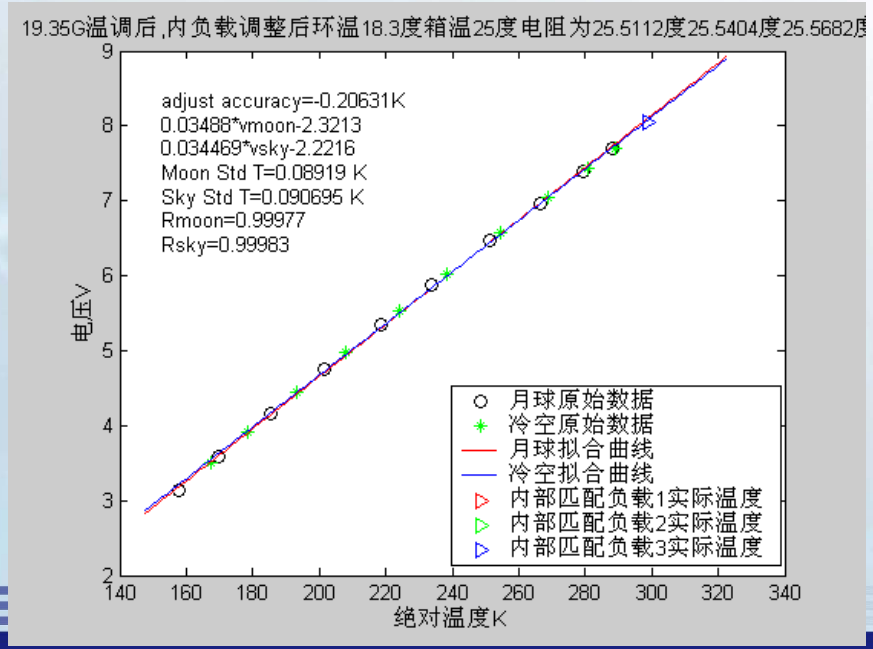

7.8G温调后,内负载调整后环温18.3度箱温25度电阻为25.1536度25.1664度25.178度
adjust accuracy=0.11628K
0.035138*vmoon-2.6051
0.036354*vsky-2.9101
Moon Std T=0.163 K
Sky Std T=0.15572 K
Rmoon=0.99986
Rsky=0.99985
月球原始数据
冷空原始数据
月球拟合曲线
冷空拟合曲线
内部匹配负载1实际温度
内部匹配负载2实际温度
内部匹配负载3实际温度
电压V
绝对温度K

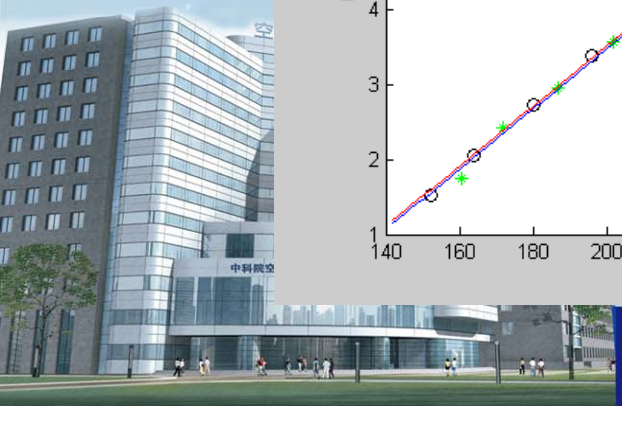


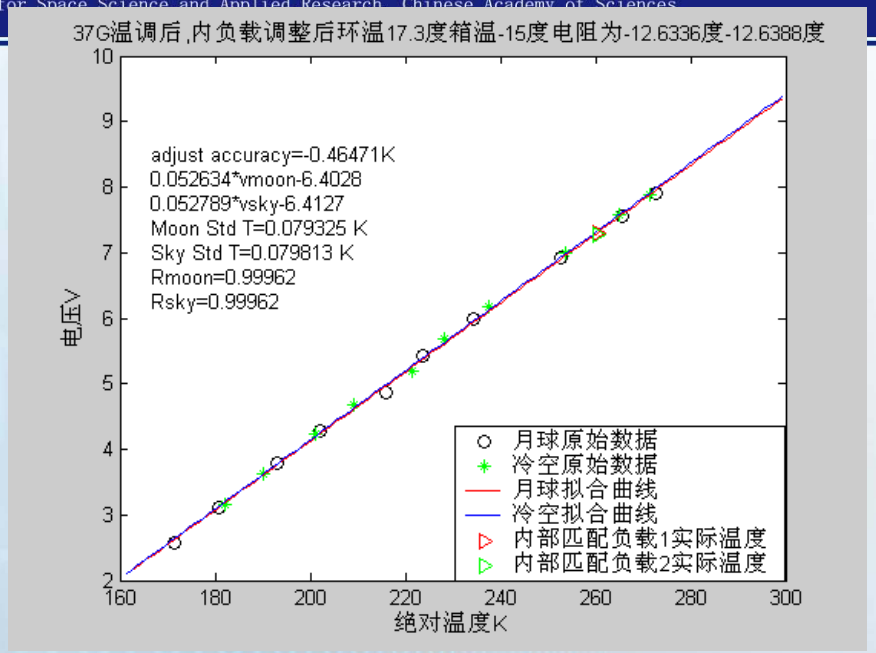

19.35G温调后,内负载调整后环温17.3度箱温-15度电阻为-12.8187度-12.822度-12.817度
adjust accuracy=-0.55873K
0.043563*vmoon-4.4404
0.04281*vsky-4.2555
Moon Std T=0.11369 K
Sky Std T=0.1152 K
Rmoon=0.99967
Rsky=0.99971
电压V
绝对温度K
月球原始数据
冷空原始数据
月球拟合曲线
冷空拟合曲线
内部匹配负载1实际温度
内部匹配负载2实际温度
内部匹配负载3实际温度

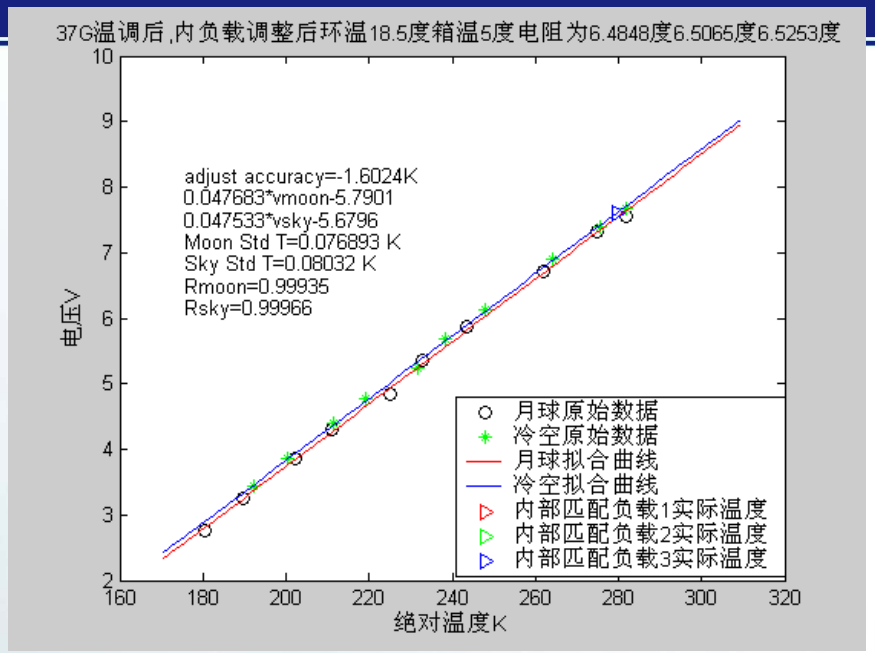

19.35G 温调前,环温17.9度机箱为-5度电阻为-3.2333度-3.1965度-3.1902度
uncor accuracy=3.7182K
uncor absoaccur=4.6664K
0.0278*vmoon-0.30008
0.027171*vsky-0.13785
Moon Std T=0.18036 K
Sky Std T=0.21193 K
Moon Max T=0.50183 K
Sky Max T=0.50122 K
Rmoon=0.99948
Rsky=0.99971
电压V
绝对温度K
月球原始数据
天空原始数据
月球拟合曲线
天空拟合曲线
全匹配负载1a
全匹配负载1c
全匹配负载2a
全匹配负载2b
全匹配负载2c
内部匹配负载1实际温度
内部匹配负载2实际温度
内部匹配负载3实际温度
吸波材料1
吸波材料2
全匹配负载2b实际温度
全匹配负载1b实际温度

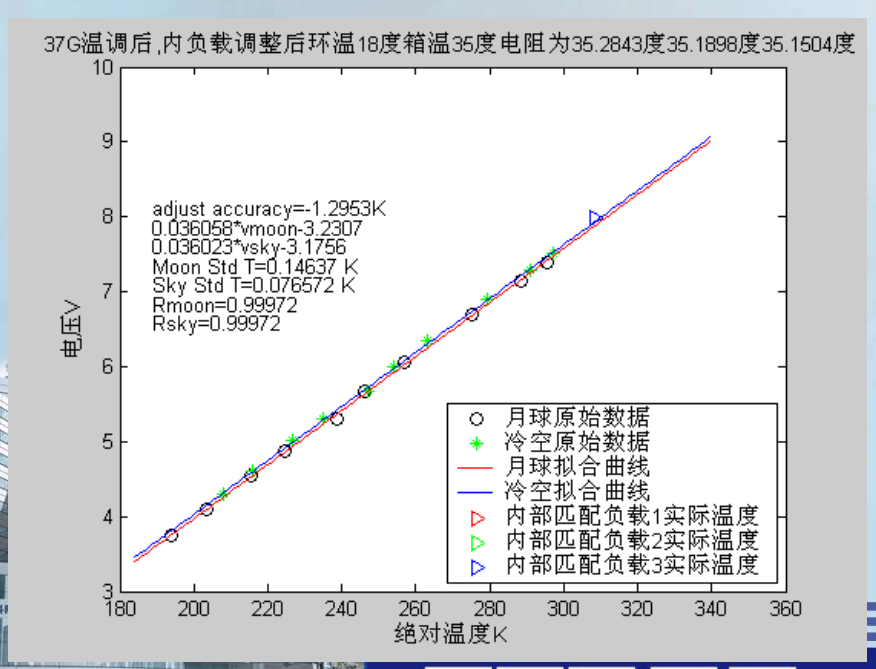

19.35G温调后,内负载调整后环温18.5度箱温5度电阻为6.3634度6.3766度6.3782度
adjust accuracy=0.71755K
0.040156*vmoon-4.5157
0.040298*vsky-4.5759
Moon Std T=0.173 K
Sky Std T=0.10751 K
Rmoon=0.99973
Rsky=0.99927
电压V
绝对温度K
月球原始数据
冷空原始数据
月球拟合曲线
冷空拟合曲线
内部匹配负载1实际温度
内部匹配负载2实际温度
内部匹配负载3实际温度

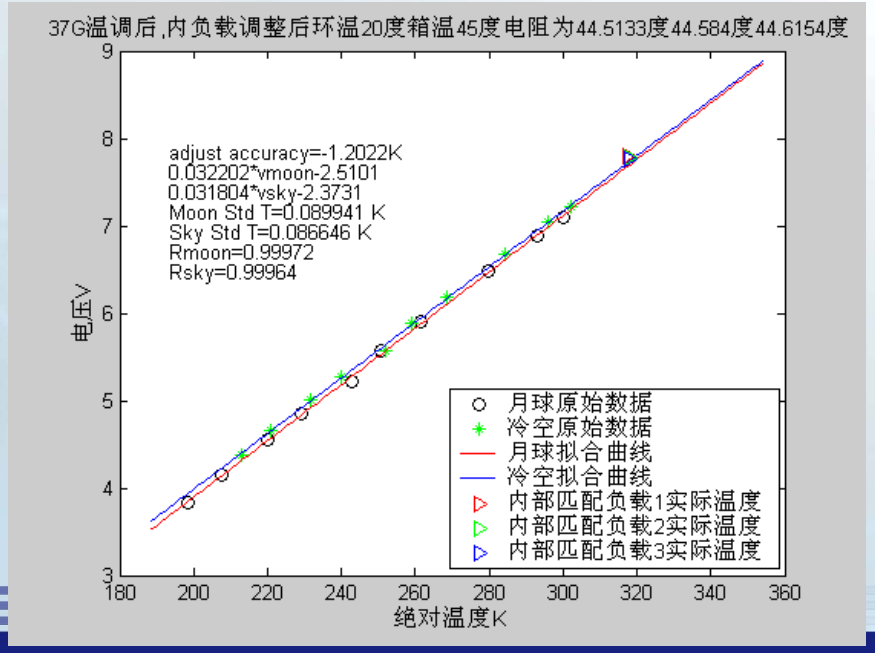

19.35G温调后,内负载调整后环温18.3度箱温25度电阻为25.5112度25.5404度25.5682度
adjust accuracy=-0.20631K
0.03488*vmoon-2.3213
0.034469*vsky-2.2216
Moon Std T=0.08919 K
Sky Std T=0.090695 K
Rmoon=0.99977
Rsky=0.99983
电压V
绝对温度K
月球原始数据
冷空原始数据
月球拟合曲线
冷空拟合曲线
内部匹配负载1实际温度
内部匹配负载2实际温度
内部匹配负载3实际温度

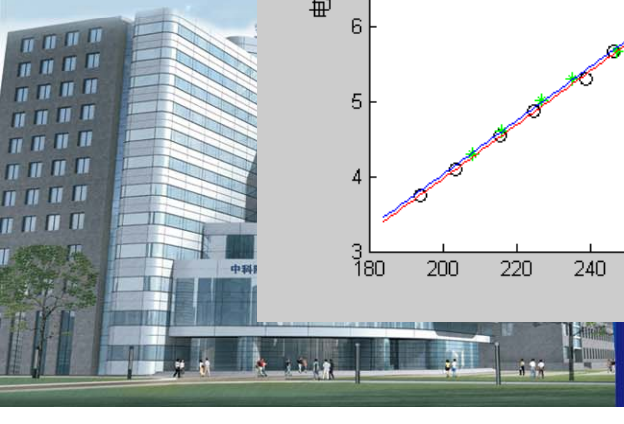



37G温调后,内负载调整后环温17.3度箱温-15度电阻为-12.6336度-12.6388度
adjust accuracy=-0.46471K
0.052634*vmoon-6.4028
0.052789*vsky-6.4127
Moon Std T=0.079325 K
Sky Std T=0.079813 K
Rmoon=0.99962
Rsky=0.99962
月球原始数据
冷空原始数据
月球拟合曲线
冷空拟合曲线
内部匹配负载1实际温度
内部匹配负载2实际温度
电压V
绝对温度K


37G温调后,内负载调整后环温18.5度箱温5度电阻为6.4848度6.5065度6.5253度
adjust accuracy=-1.6024K
0.047683*vmoon-5.7901
0.047533*vsky-5.6796
Moon Std T=0.076893 K
Sky Std T=0.08032 K
Rmoon=0.99935
Rsky=0.99966
月球原始数据
冷空原始数据
月球拟合曲线
冷空拟合曲线
内部匹配负载1实际温度
内部匹配负载2实际温度
内部匹配负载3实际温度
电压V
绝对温度K


37G温调后,内负载调整后环温18度箱温35度电阻为35.2843度35.1898度35.1504度
adjust accuracy=-1.2953K
0.036058*vmoon-3.2307
0.036023*vsky-3.1756
Moon Std T=0.14637 K
Sky Std T=0.076572 K
Rmoon=0.99972
Rsky=0.99972
月球原始数据
冷空原始数据
月球拟合曲线
冷空拟合曲线
内部匹配负载1实际温度
内部匹配负载2实际温度
内部匹配负载3实际温度
电压V
绝对温度K

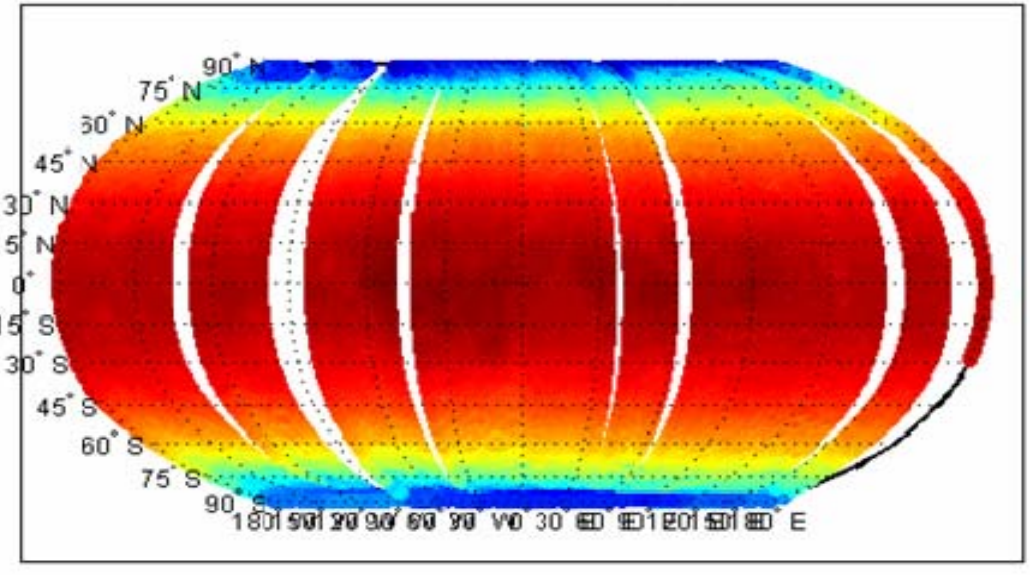

37G温调后,内负载调整后环温20度箱温45度电阻为44.5133度44.584度44.6154度
adjust accuracy=-1.2022K
0.032202*vmoon-2.5101
0.031804*vsky-2.3731
Moon Std T=0.089941 K
Sky Std T=0.086646 K
Rmoon=0.99972
Rsky=0.99964
月球原始数据
冷空原始数据
月球拟合曲线
冷空拟合曲线
内部匹配负载1实际温度
内部匹配负载2实际温度
内部匹配负载3实际温度
电压V
绝对温度K



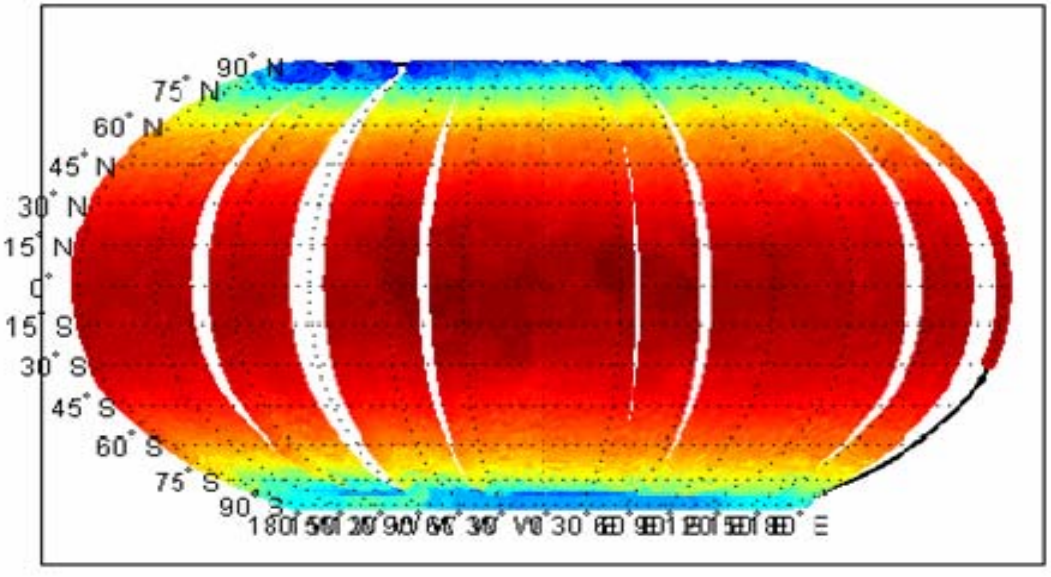
Performance Achieved

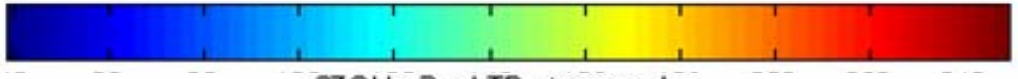
Frequency（GHz）	**3.0**	**7.8**	**19.35**	**37**
Sensitivity（K）	**0.4**	**0.3**	**0.1**	**0.2**
Linearity	**0.9999**	**0.9995**	**0.9998**	**0.9997**
T_A Accuracy（K）	**0.9K**	**0.9K**	**1.2K**	**1.3K**

3GHz Real TB at moon day

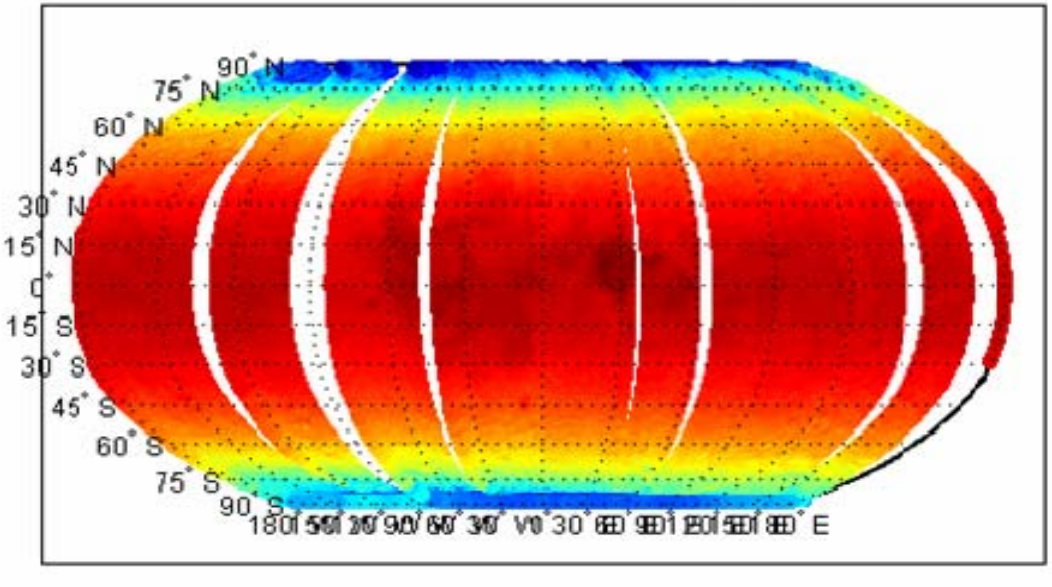


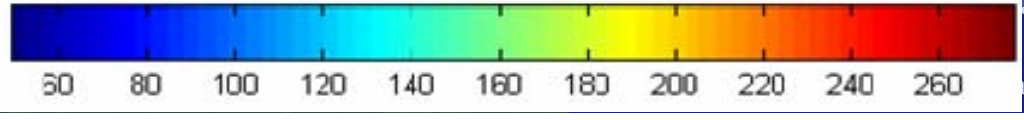
7.8GHz Real TB at moon day



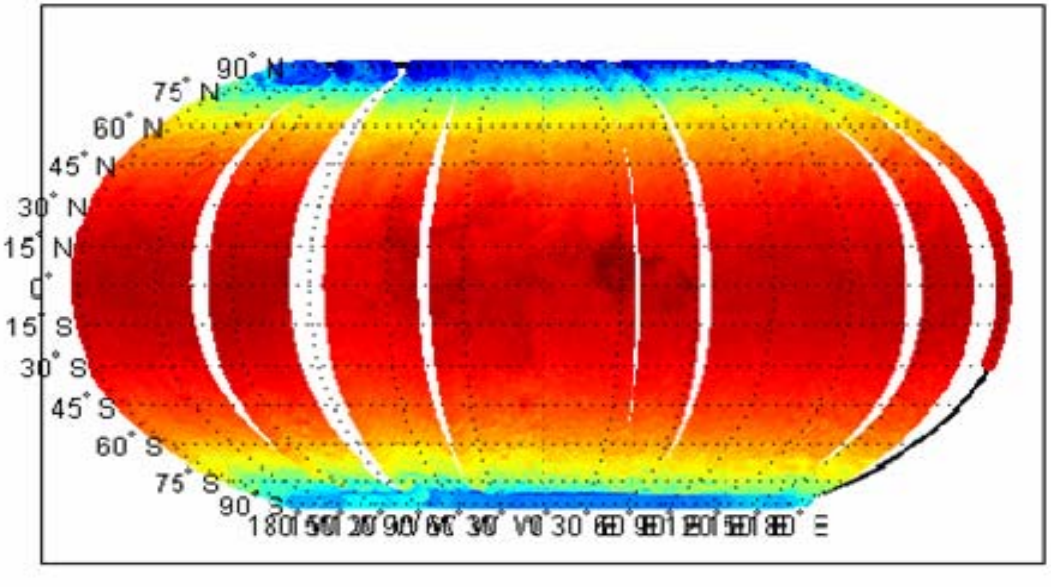


19.35GHz Real TB at moon day

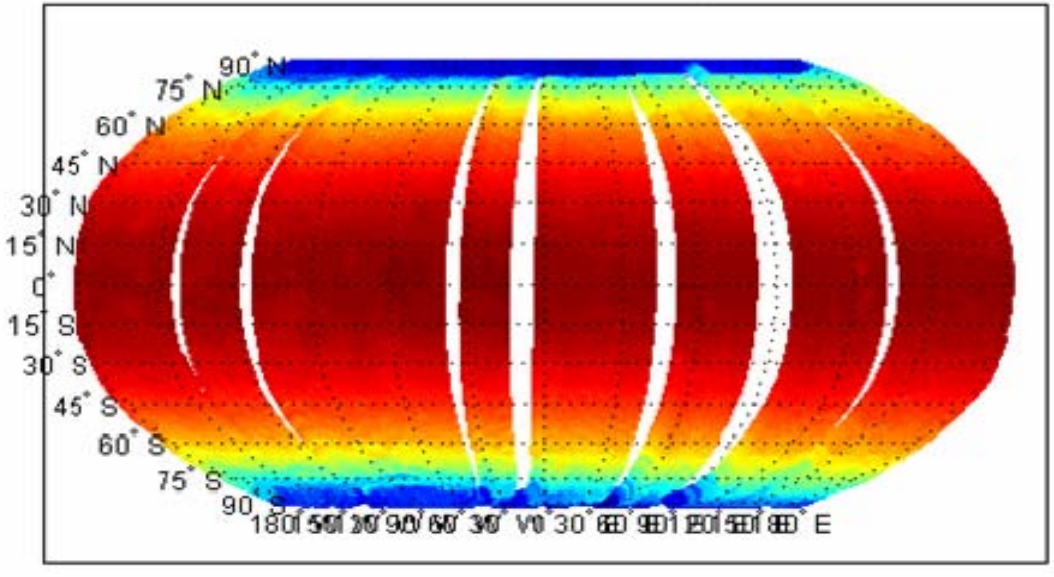


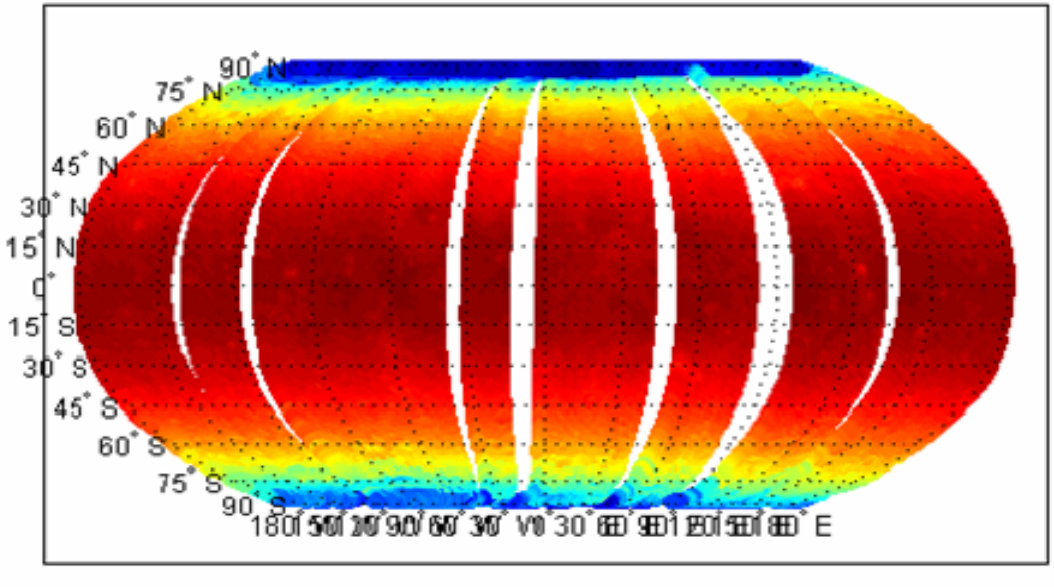


37GHz Real TB at moon day

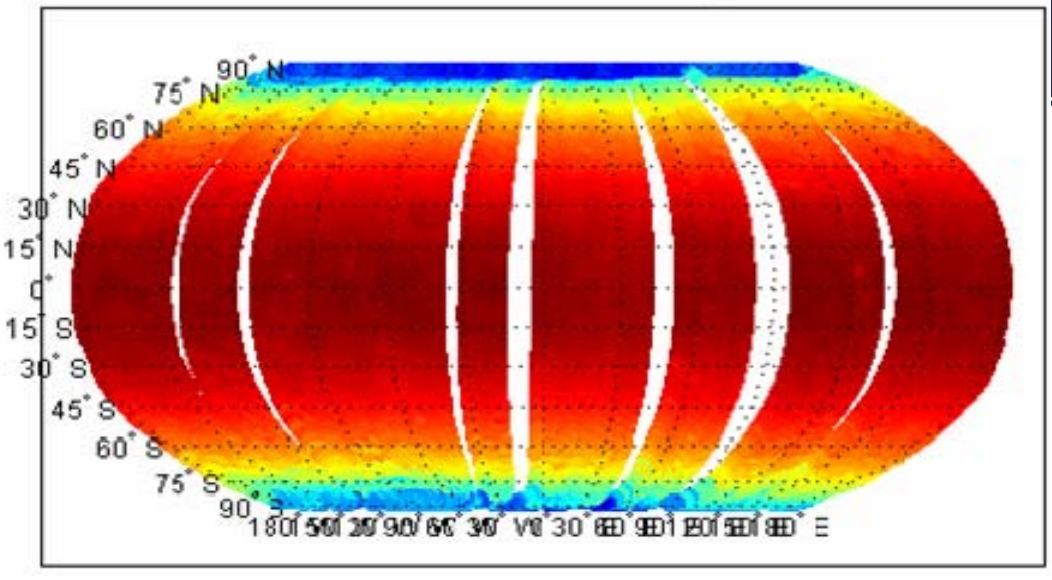


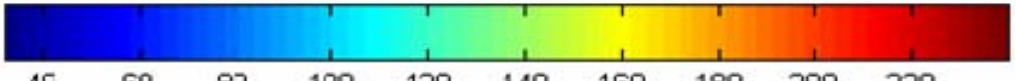
3GHz Real TB at moon night

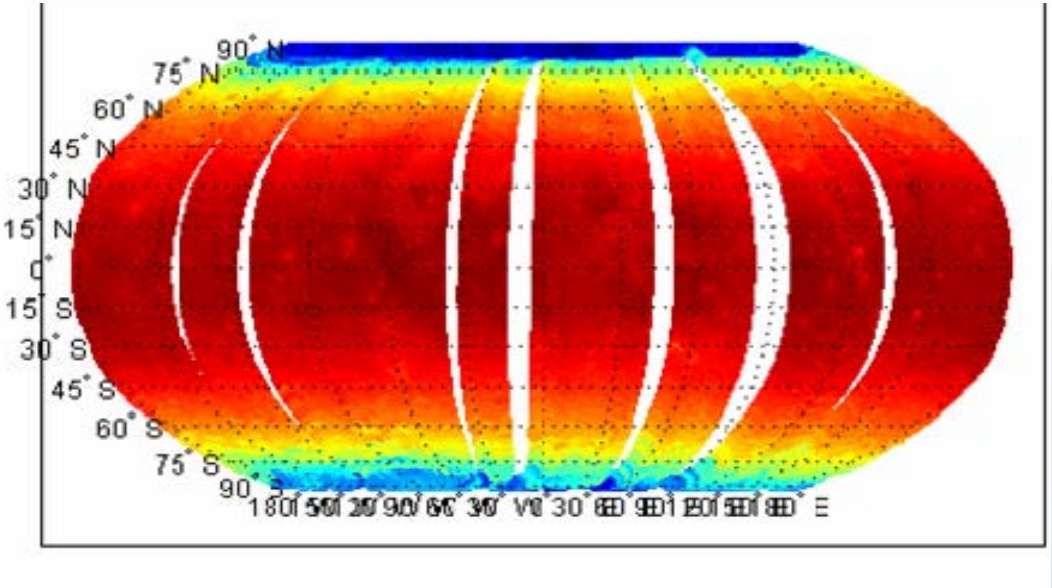


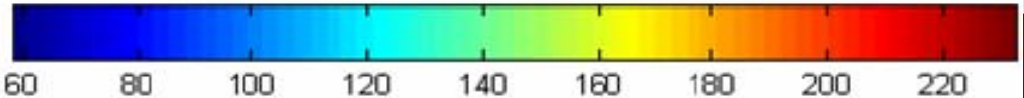


7.8GHz Real TB at mcon night



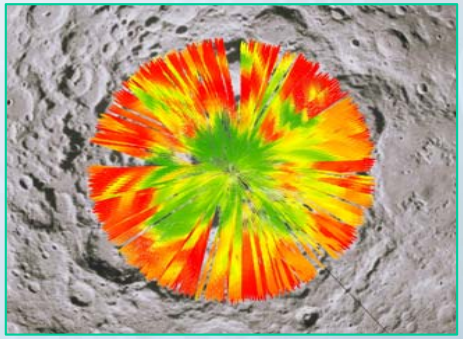




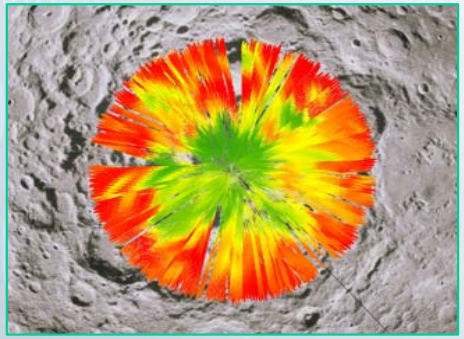


nd Appl

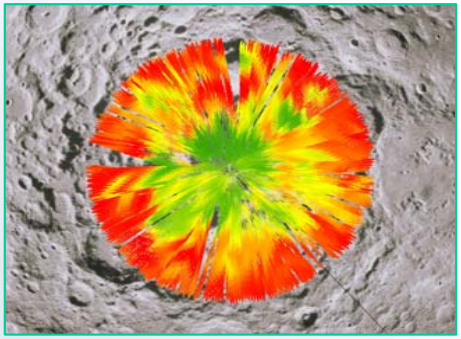
Tb of Lunar Pole



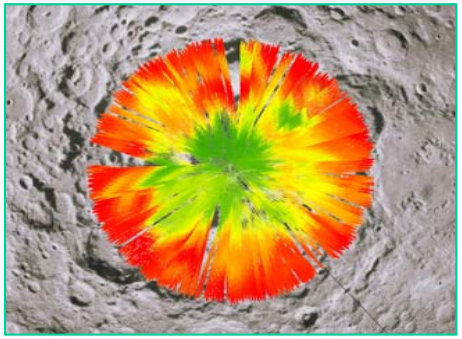
South pole 37GHz



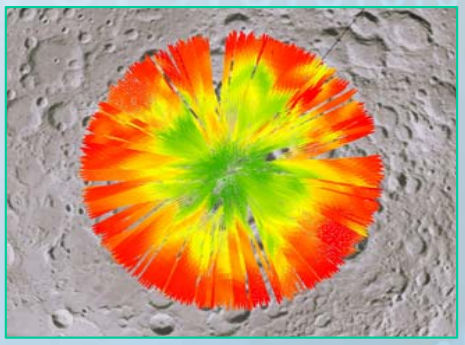
South pole 19GHz



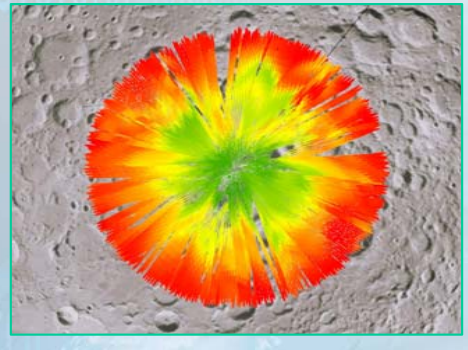
South pole 7GHz



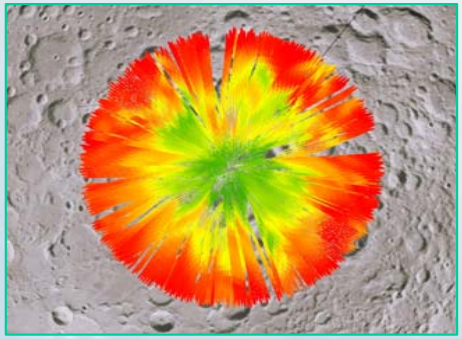
South pole 3GHz



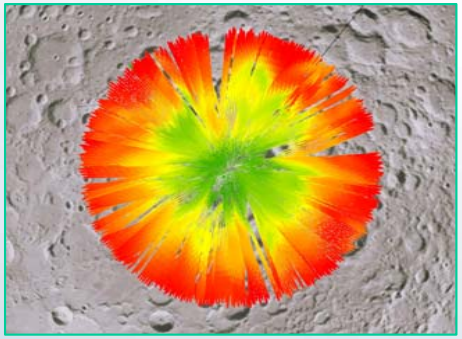
North pole 37GHz



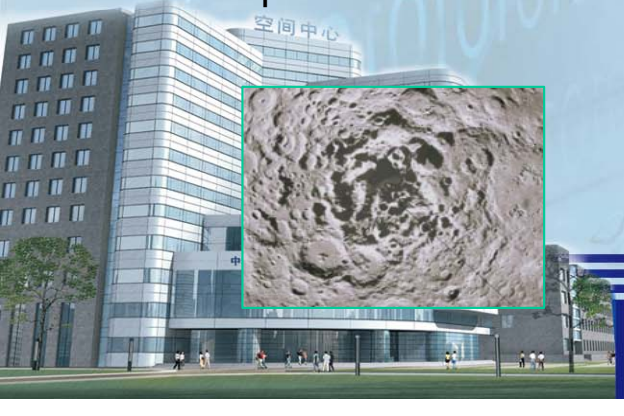
North pole 19GHz



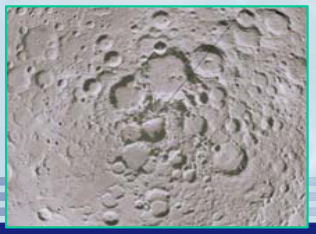
North pole 7GHz



North pole 3GHz



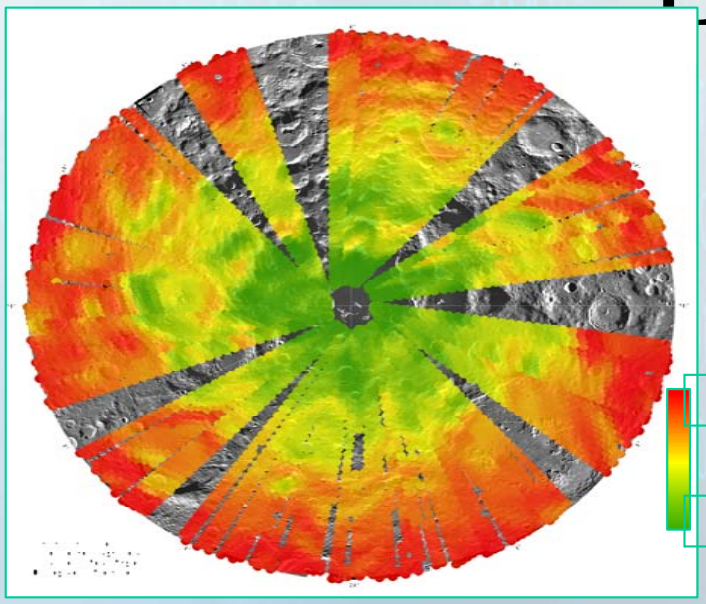
Latitude >80 deg (South) or > 80 deg (North)
Including all data in day and night

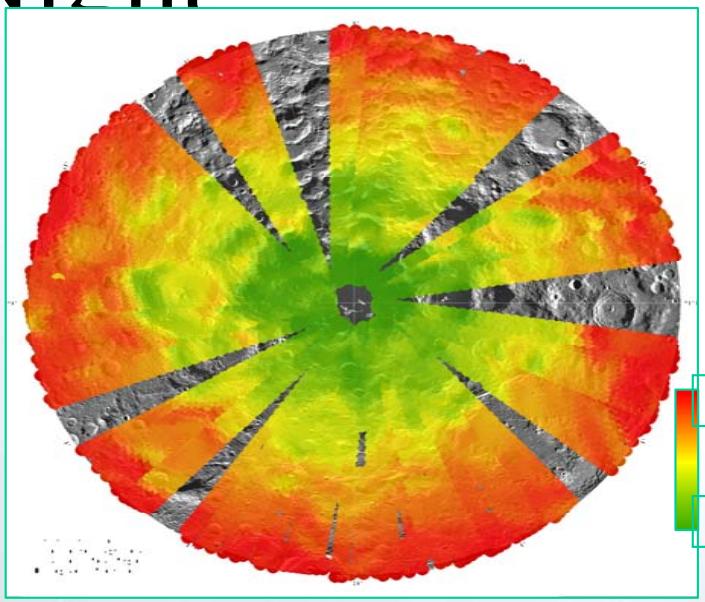


Within 70S
Night

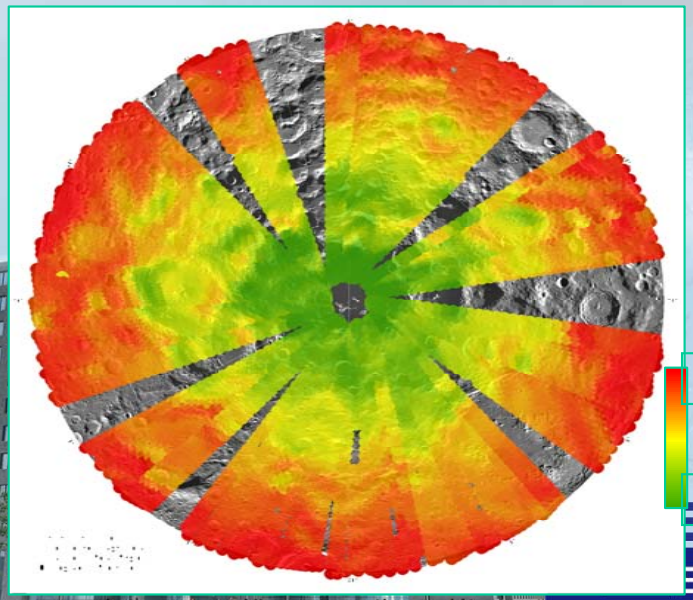
Lunar Pole Night

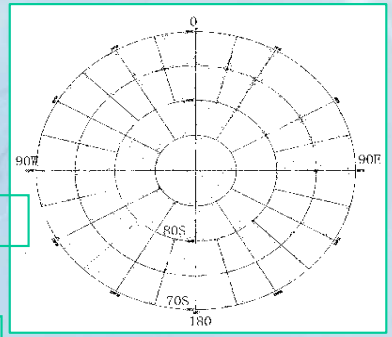
37GHz	19GHz
7GHz	3GHz

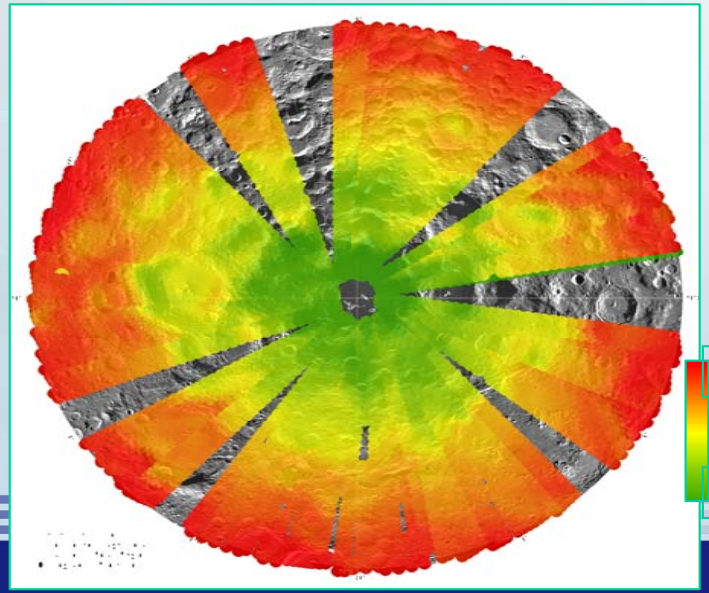




The Microwave radiometry data is overlayed on Clementine uncontroled masaic image.
The data is acquired during 2007.12.4-12.30. Only night data are used. No data area is drawn as blank area in the map.







HY-2

- **Full-wave simulator is being built for before launch calibration and performance assessments;**
- **After launch CAL/VAL has been planned (cf. Dr. Tang's presentation):**
  - **In-situ instruments started to build and the platform-based system will be integrated by the end of 2008;**
    - **C\X\Ku band radar scatterometer;**
    - **C~Ka band microwave radiometer;**

After Launch CAL/VAL or Test

Calibration of HY-1B

- **The HY-1B satellite, launched on April 11, 2007, is the 2nd ocean observation satellite of China, for Ocean Color and Temperature sensing.**
- **HY-1B two optical sensors: COCTS & CZI.**
  - **COCTS is 1km ocean color and temperature sensor;**
  - **CZI is 250m ocean color sensor with fluorescence ability.**

HY-1A CZI bands & detecting objectives

Band (micro m	*Main detecting object*
0.42-0.50	*Ocean color, pollutant, sea ice*
0.52-0.60	*Sediment, Pollutant, sea ice*
0.61-0.69	*Sediment, Vegetation, Soil、*
0.76-0.89	*Soil, Vegetation, Atmospheric correction, land/ocean/cloud boundary*

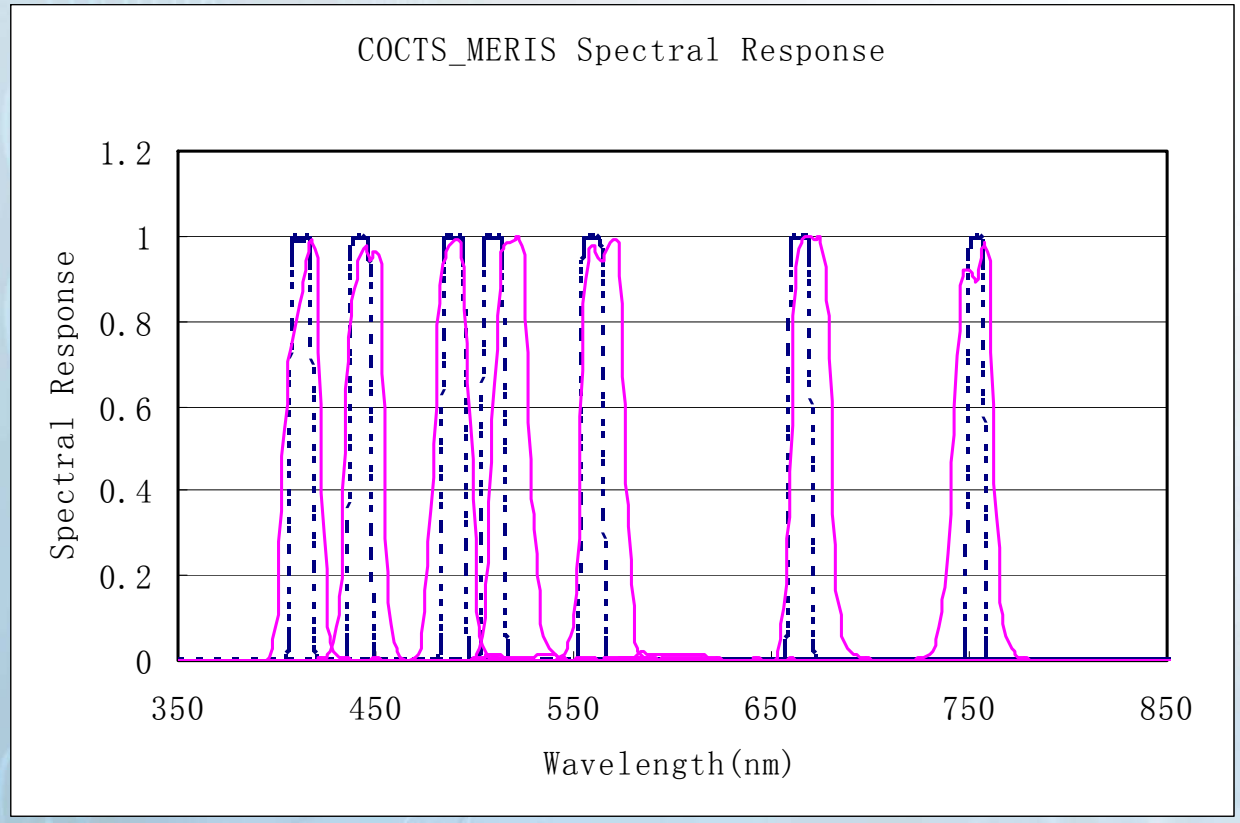
Resolution: 240m

Pixels per line: 2048

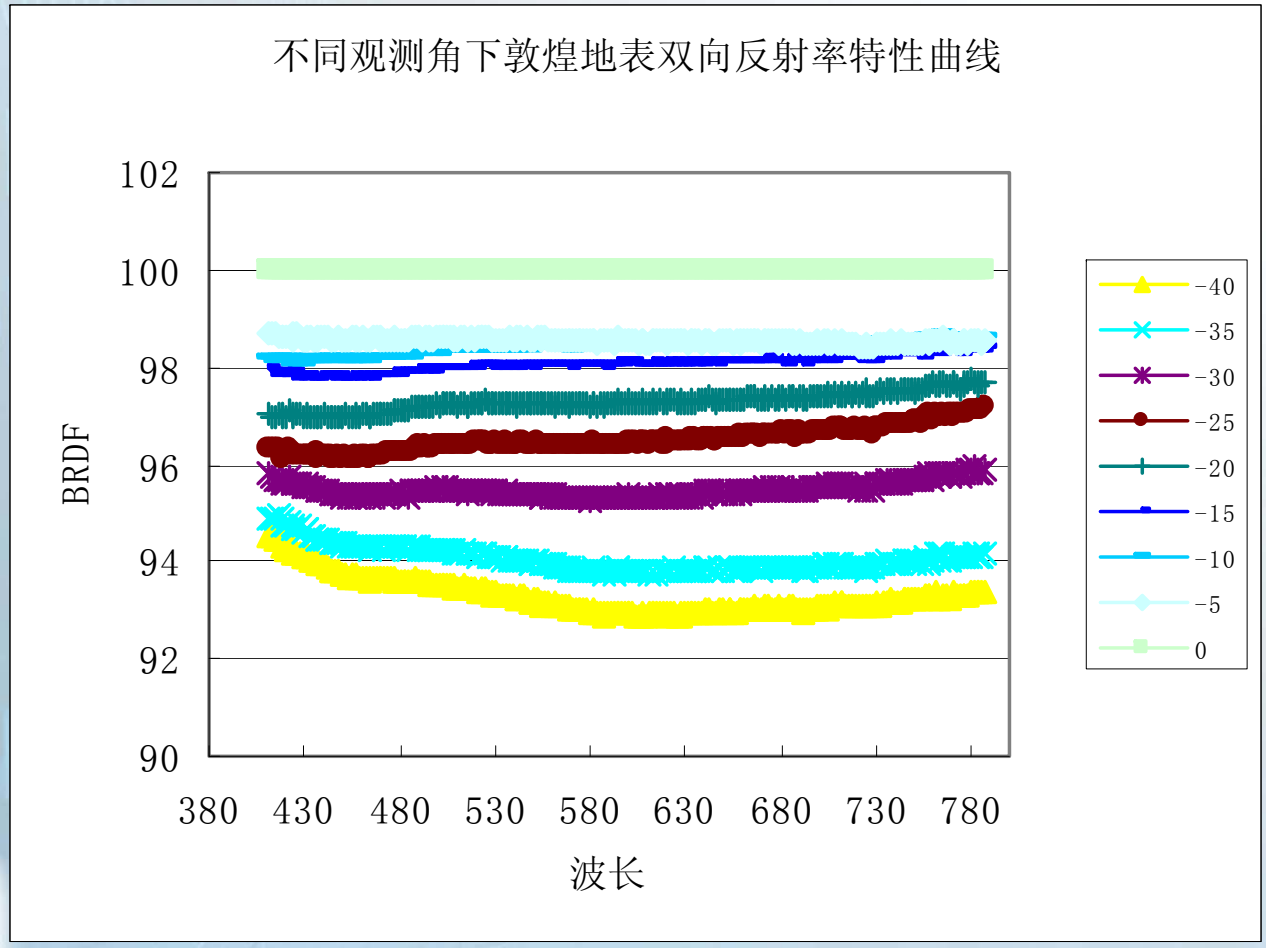
HY-1B CZI bands

Band	*Detecting objects*
443±10nm	*Chl-a, pollutant*
565±10nm	*Sediment, Chl-a, Pollutant*
665±10nm	*Flouroscence, Sediment*
685±10nm	*Flouroscence, Sediment*

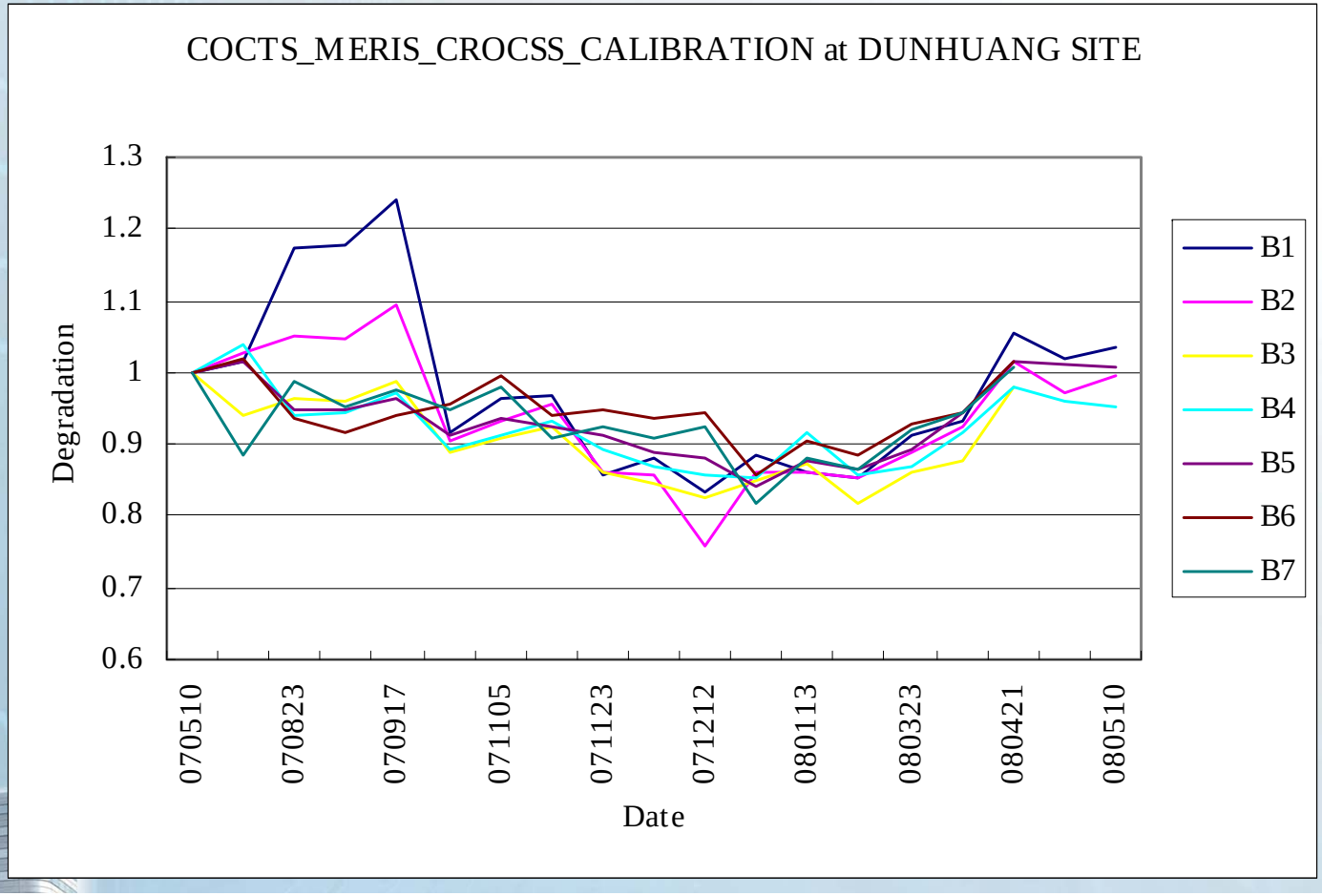
inter-calibration of COCTS and MERIS over Dunhuang desert



Corrected for the BRDF effect of Dunhuang calibration site



longterm degradation trend of COCTS sensor by inter-calibration with MERIS



Note: the big variation is due to the stray-light problem of COCTS, caused by bright targets, such as cloud patches.

COCTS Inter-calibration with SeaWiFS

	Inter-cal. Coef.	Vicarious-cal. Ceof.	Relative Error
CH1	0.012053	0.013245	0.0942
CH2	0.012117	0.013440	0.1035
CH3	0.011135	0.012457	0.1121
CH4	0.011899	0.013336	0.1139
CH5	0.010632	0.011899	0.1125
CH6	0.010116	0.014779	0.3746
CH7	0.006363	0.005046	-0.2308
CH8	0.002887	0.002589	-0.1090

CZI inter-calibration with SeaWiFS

	Inter-cal. Coef.	Vicarious-cal. Ceof.	Relative Error
CH1	0.938427	1.088483	-0.14806
CH2	0.930297	1.146134	-0.20789
CH3	0.801431	0.852915	-0.06224
CH4	0.844641	0.918589	-0.08388

System Calibration with Optic Buoy data.

Date:2007.08.14-27;

Location: 114017.3777'N, 22003.7558'

band(nm)	412	443	490	520	565	670
MOBY	0.318719	0.251036	0.313416	0.387057	0.671167	0.164646
COCTS	0.325797	0.250704	0.320979	0.391884	0.678944	0.163003
SysCal.Coef.	0.879002	0.881002	0.927001	0.994	0.943001	1.126999

Vicarious Calibration over Land and Ocean

- **Dunhuang Site, twice after launch.**
- **South China Sea, East China Sea.**

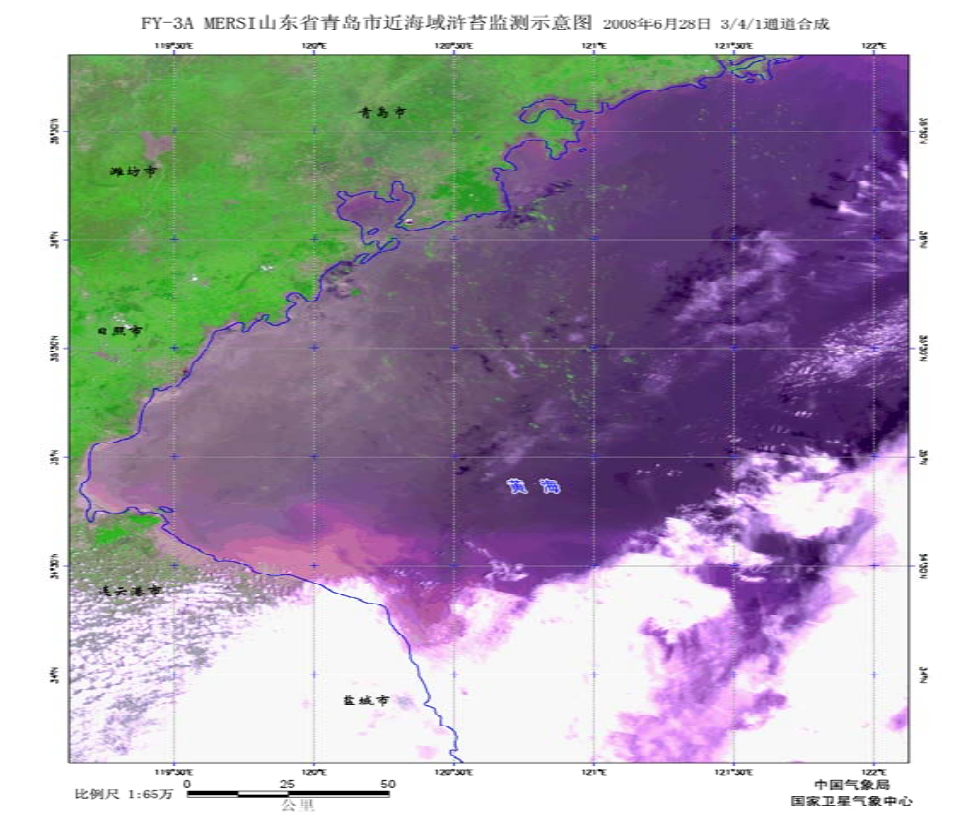
IR calibration over Qinghai Lake
Date : 2008-09-01~ 09-12,

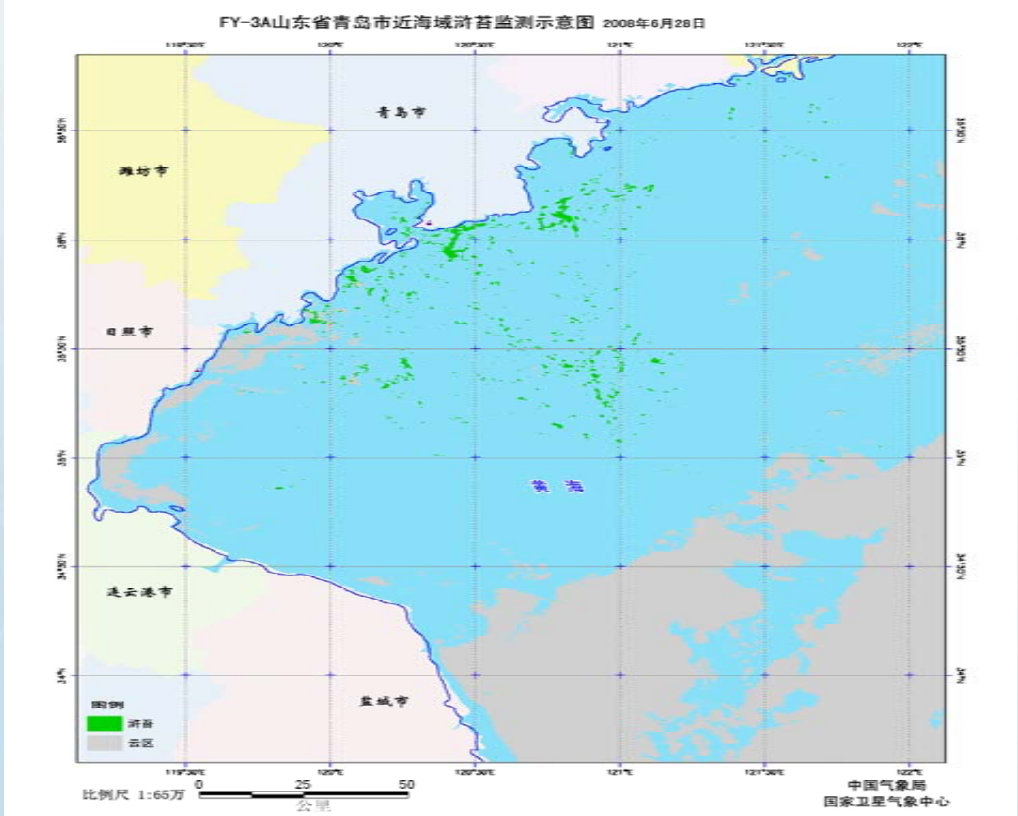
- Buoy and cruising bulk temperature and skin temperature with CE312 radiometers.
- Atmospheric profiles with GPS balloon.
- Data processing is under way.

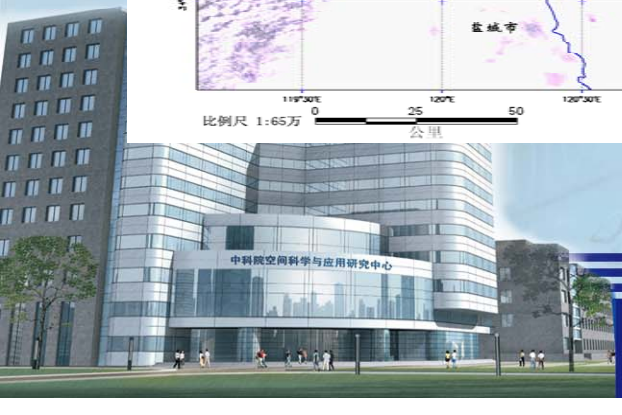
Preliminary Results of FY-3A

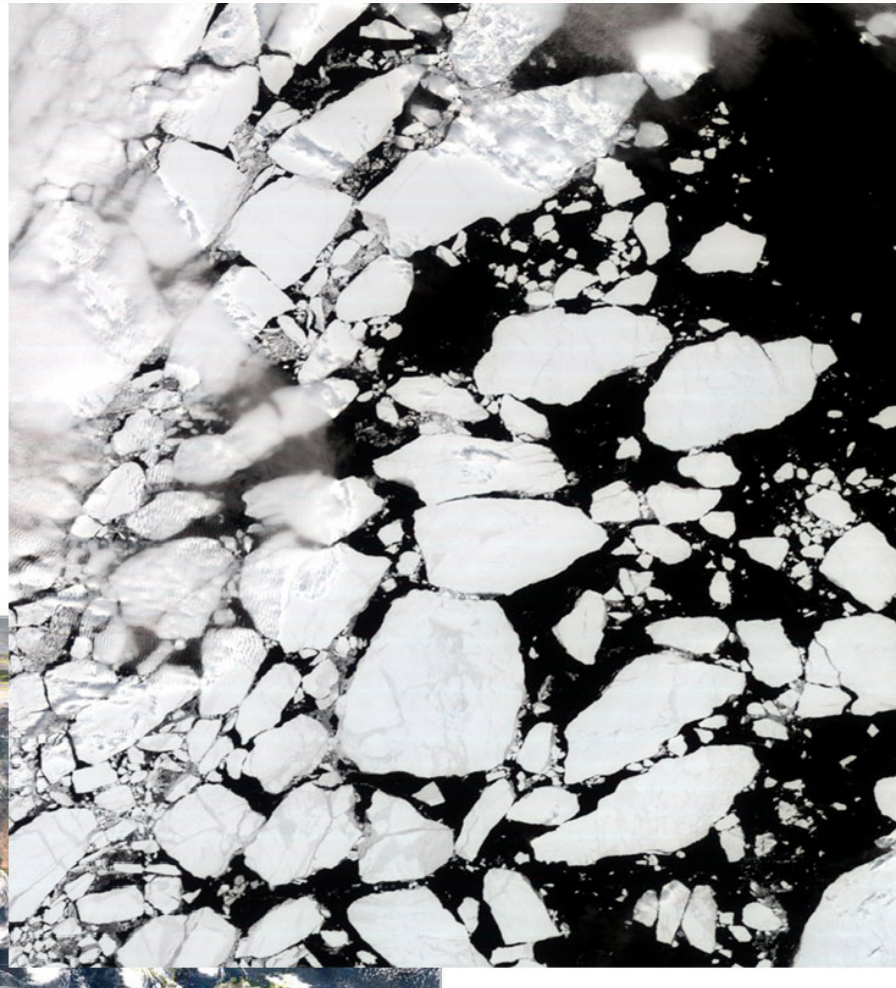
- **On-board calibration methdology of FY-3A payloads**
  - **MERSI, VIRR, IRAS, are with the capability of in-orbit real-time two-point calibration;**
  - **MWHS, MWTS and MWRI has the capability of real-time calibration by looking of on-board blackbody and the cold-sky alternatively;**
  - **SBUS/TOU, ERM/SIM also have capability of on-board calibration.**
- **Preliminary after launch calibration and inter-comparison had been done;**
- **Further calibration and performance evaluation are ongoing.**

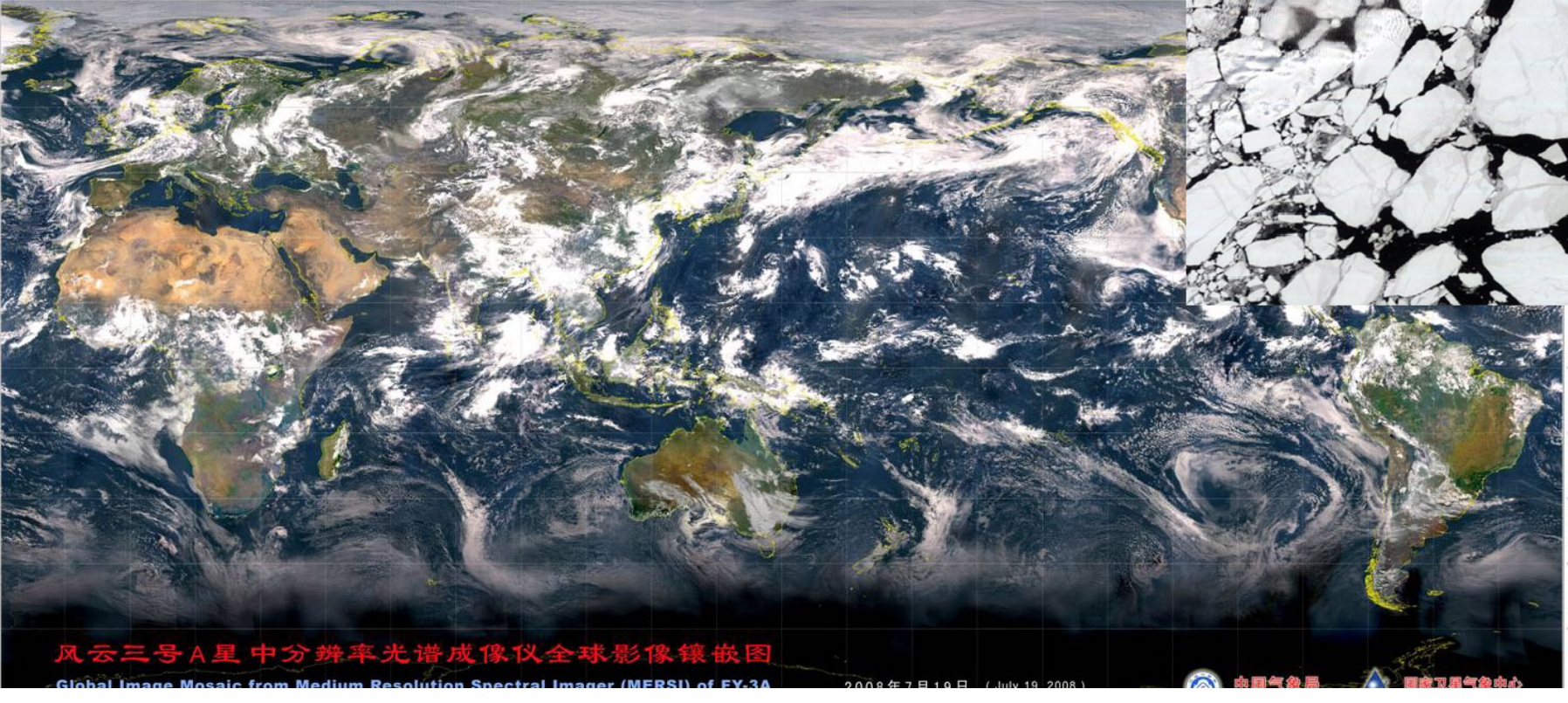
MERSI


FY-3A MERSI山东省青岛市近海域浒苔监测示意图 2008年6月28日 3/4/1通道合成
青岛市
潍坊市
日照市
黄海
连云港市
盐城市
比例尺 1:65万
0
25
50
公里
中国气象局
国家卫星气象中心


FY-3A山东省青岛市近海域浒苔监测示意图 2008年6月28日
青岛市
潍坊市
日照市
黄海
连云港市
盐城市
图例
浒苔
云区
比例尺 1:65万
0
25
50
公里
中国气象局
国家卫星气象中心


中科院空间科学与应用研究中心





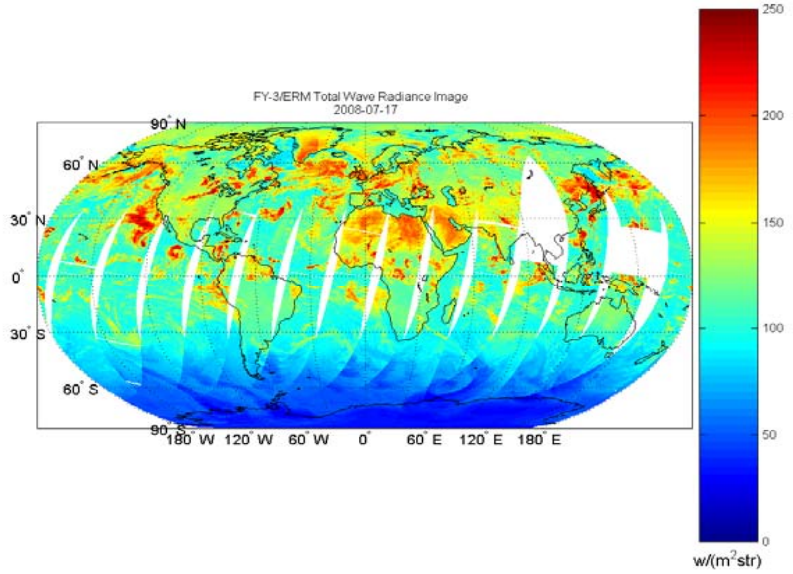
风云三号A星中分辨率光谱成像仪全球影像镶嵌图

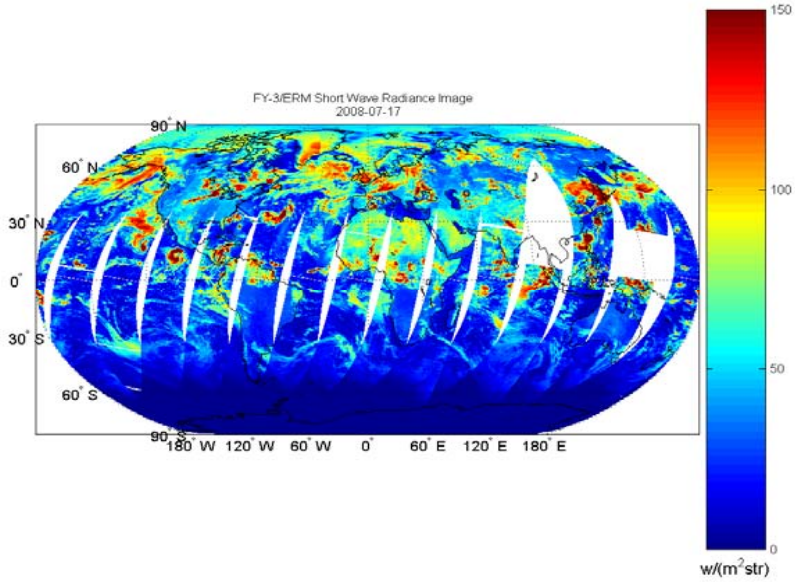
Global Image Mosaic from Medium Resolution Spectral Imager (MERSI) of FY-3A

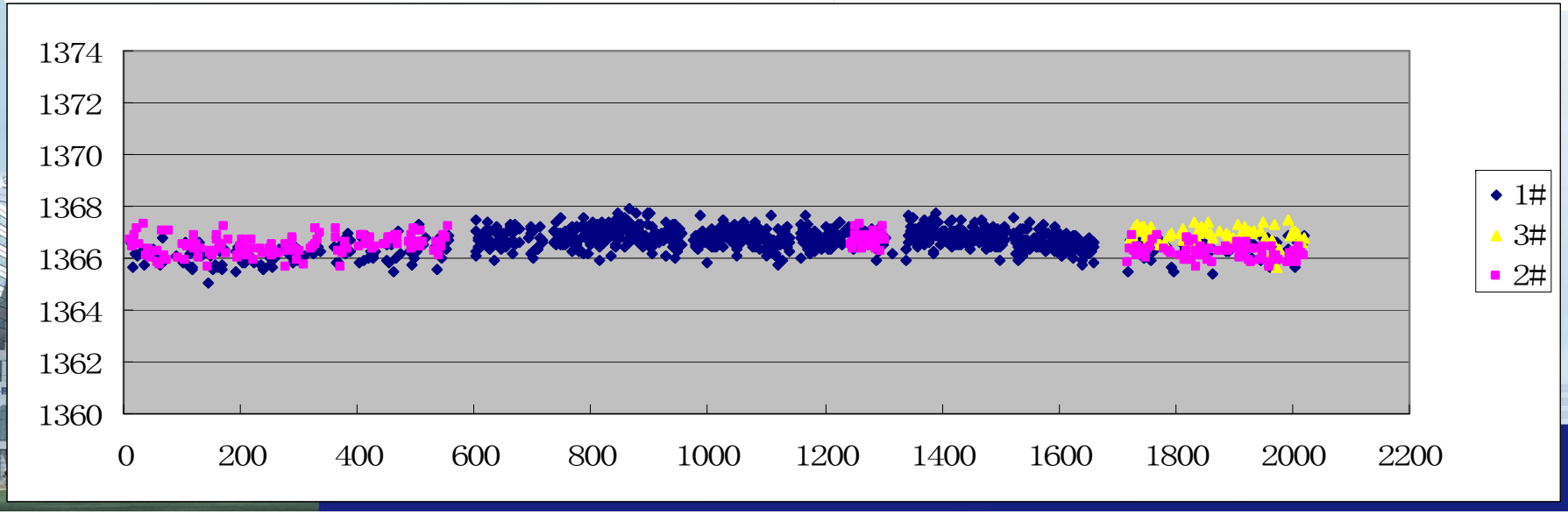
2008年7月19日 （July 19, 2008）

中国气象局 国家卫星气象中心

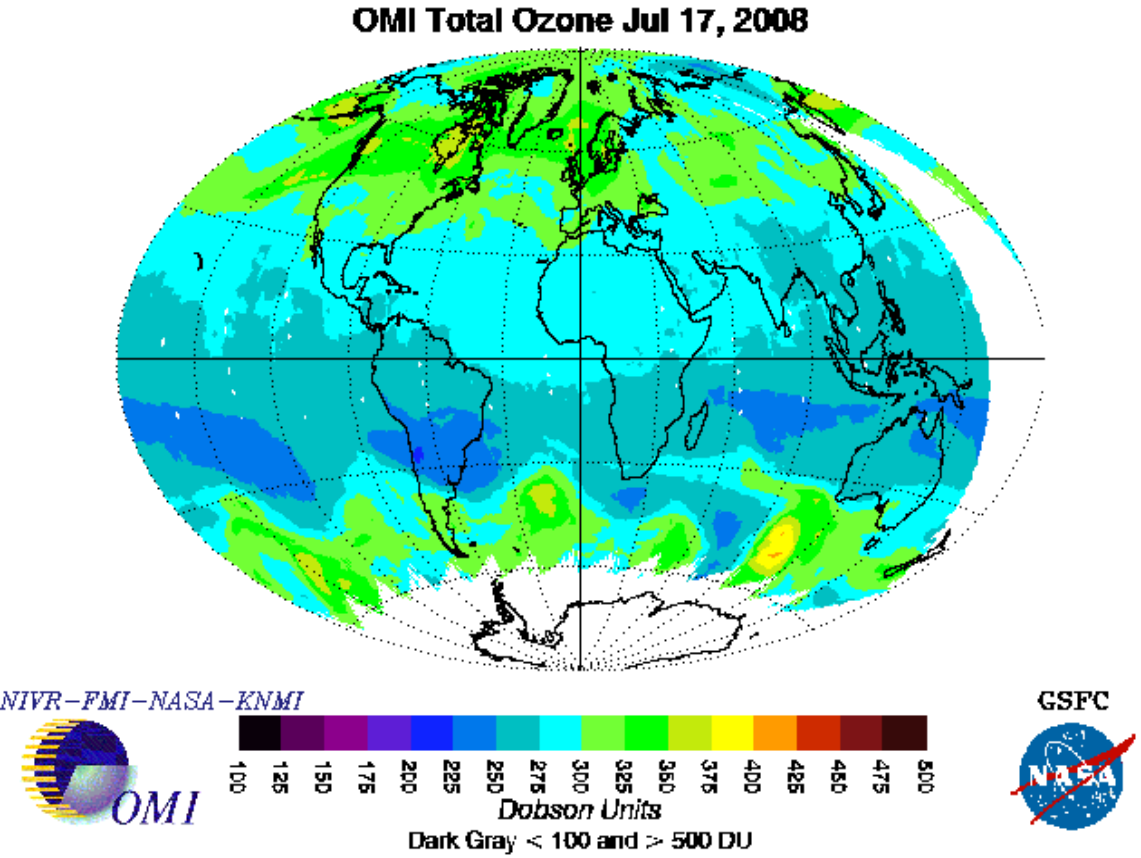
ERM/SIM

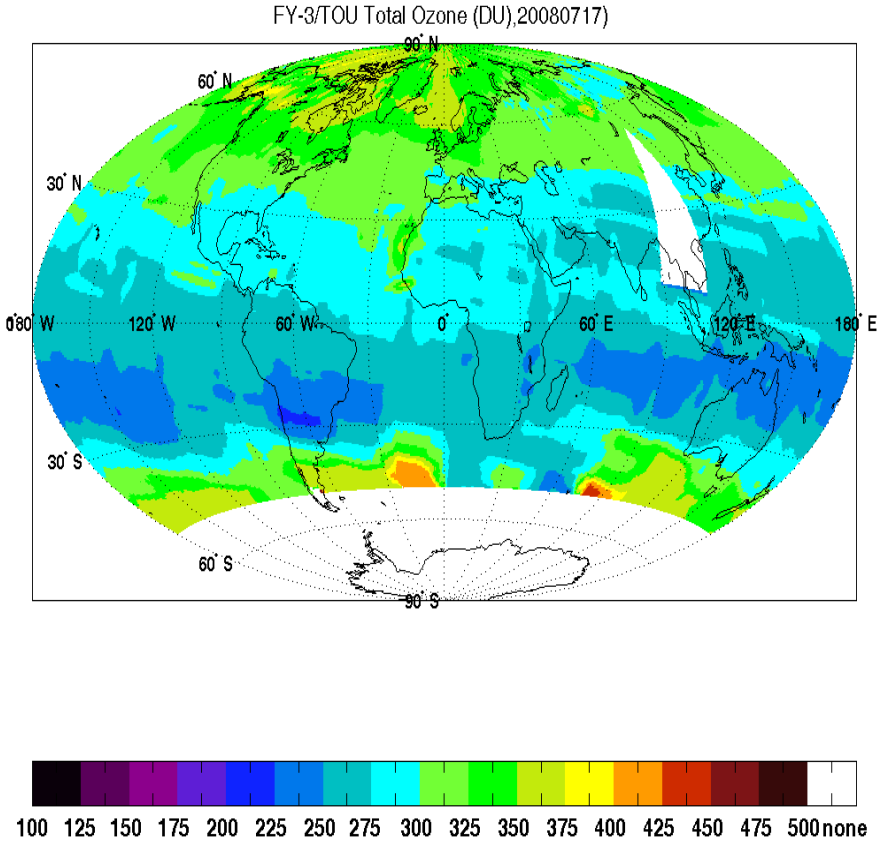

FY-3/ERM Total Wave Radiance Image
2008-07-17
90° N
60° N
30° N
0°
30° S
60° S
90° S
180° W 120° W 60° W 0° 60° E 120° E 180° E
250
200
150
100
50
0
w/(m²str)

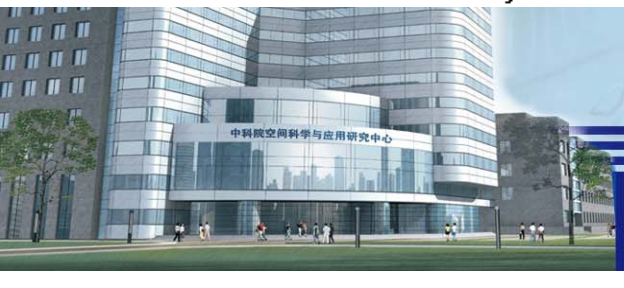

FY-3/ERM Short Wave Radiance Image
2008-07-17
90° N
60° N
30° N
0°
30° S
60° S
90° S
180° W 120° W 60° W 0° 60° E 120° E 180° E
150
100
50
0
w/(m²str)


1374
1372
1370
1368
1366
1364
1362
1360
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
1#
3#
2#

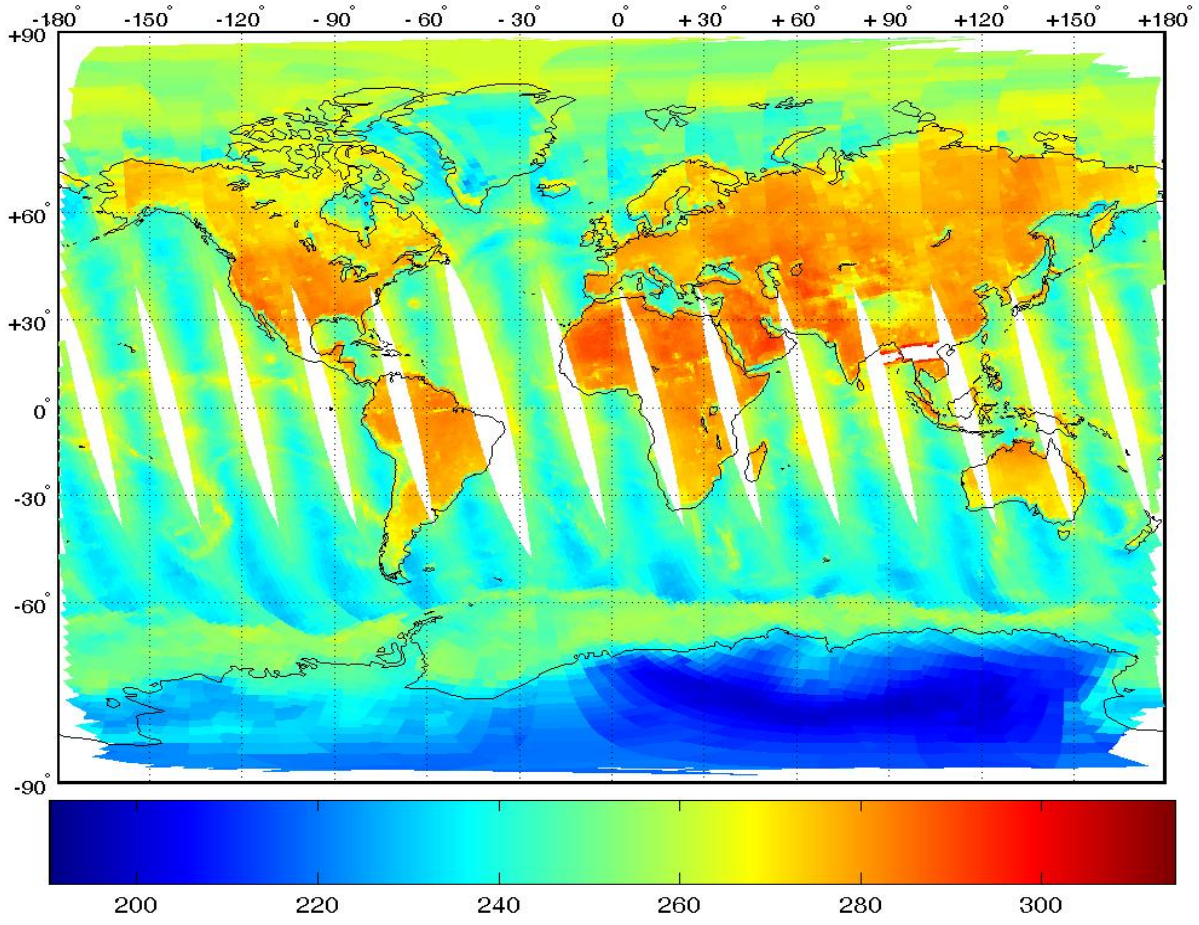
TOU/FY-3A vs OMI total Ozone（2008.07.17）



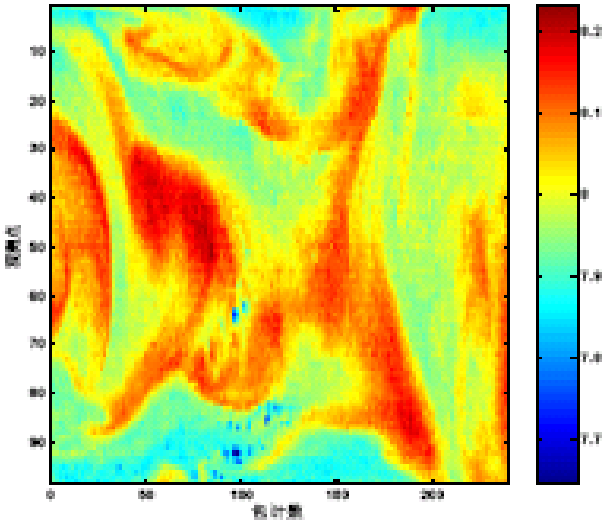




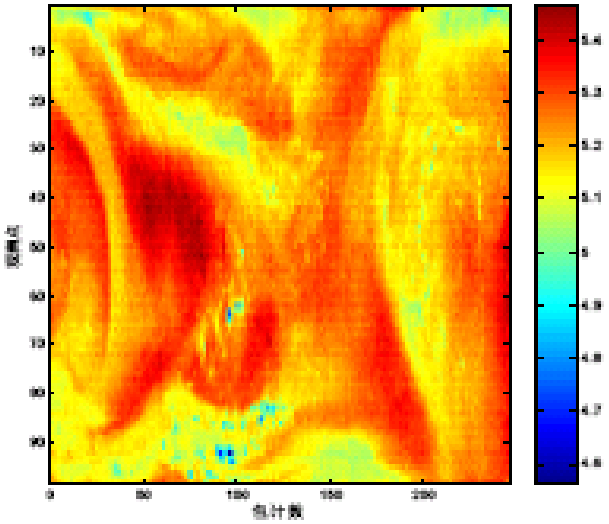
MWTS


-180° -150° -120° - 90° - 60° - 30° 0° + 30° + 60° + 90° +120° +150° +180°
+90°
+60°
+30°
0°
-30°
-60°
-90°
200 220 240 260 280 300

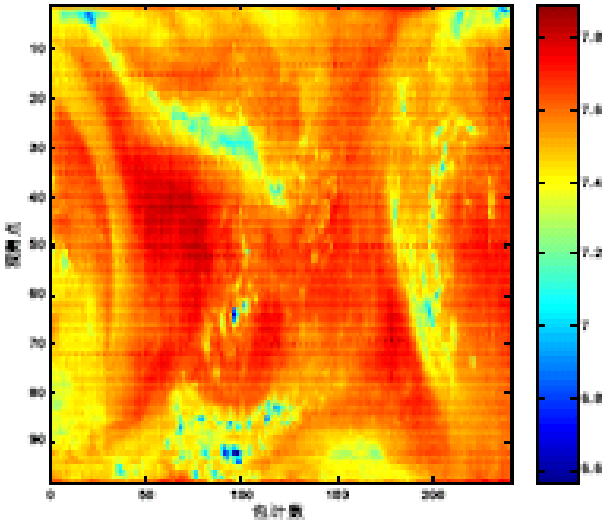
First Image of MWHS



183G 第一通道



183G 第二通道



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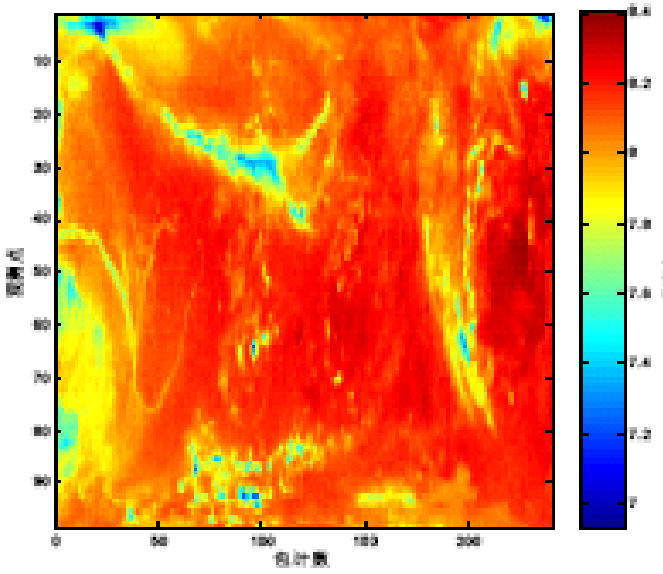
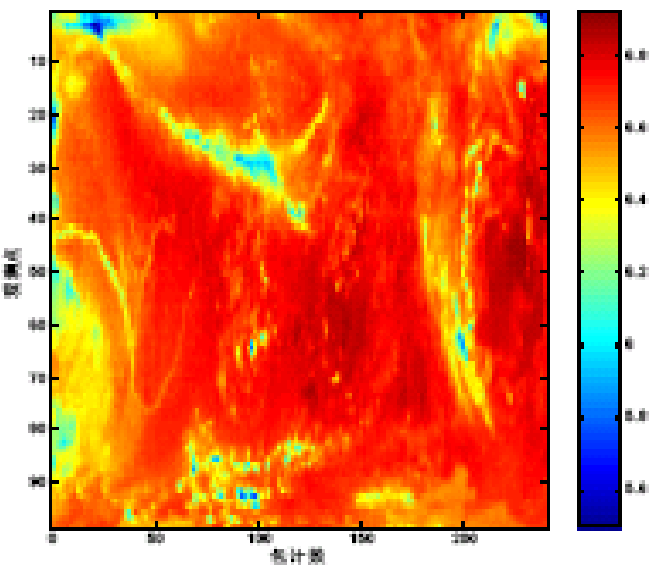
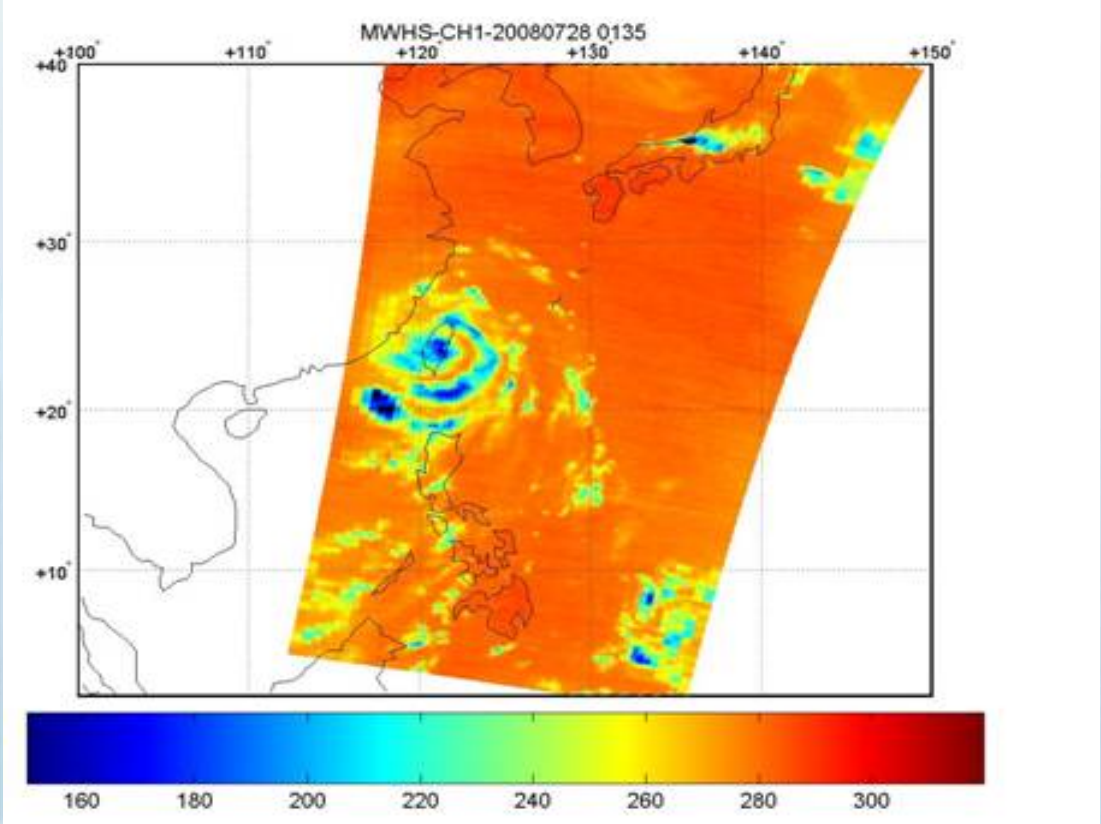


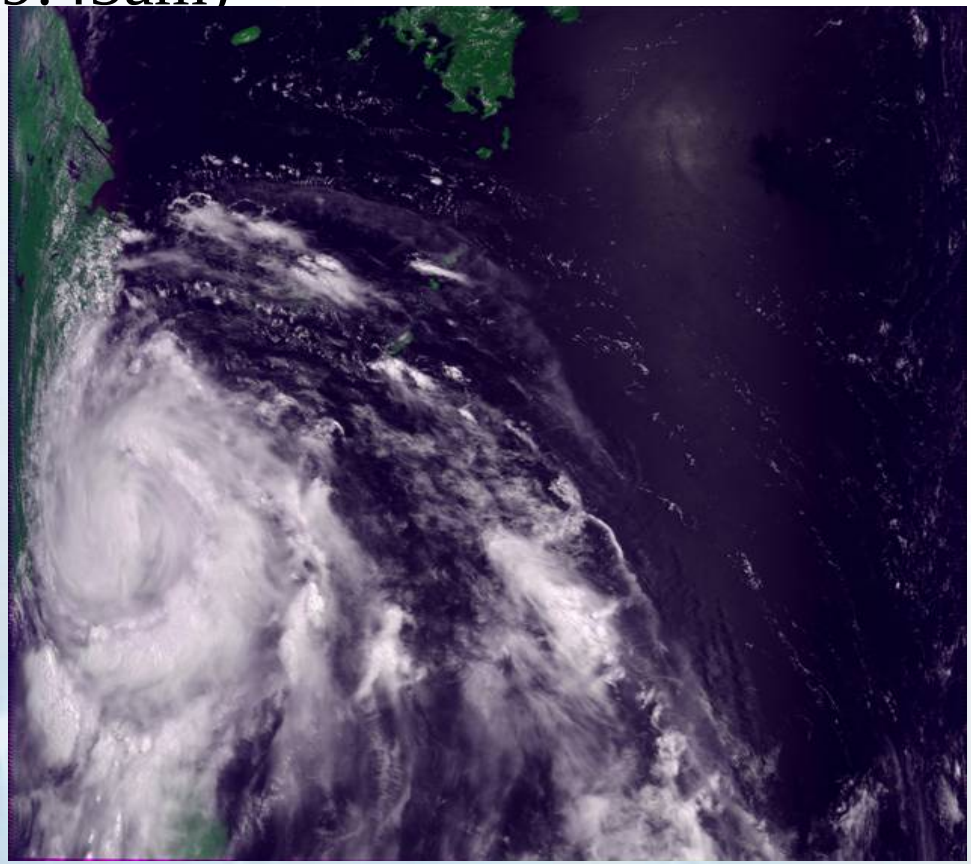
150G 第一通道



150G 第二通道

MWHS/FY-3A image of Typhoon Fung-Wong (2008.07.25, 9:45am)

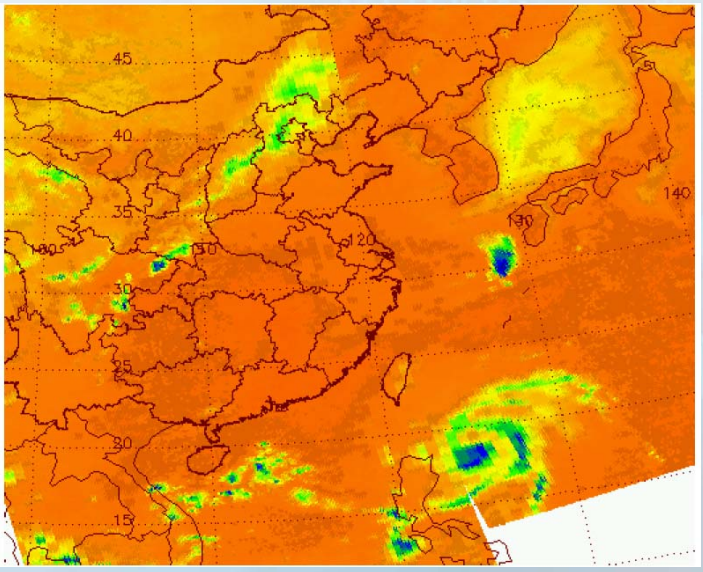




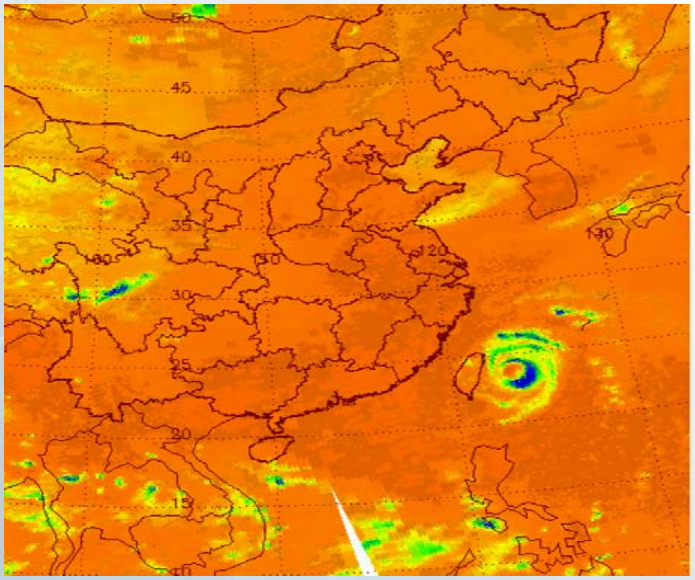
MWHS

MERSI

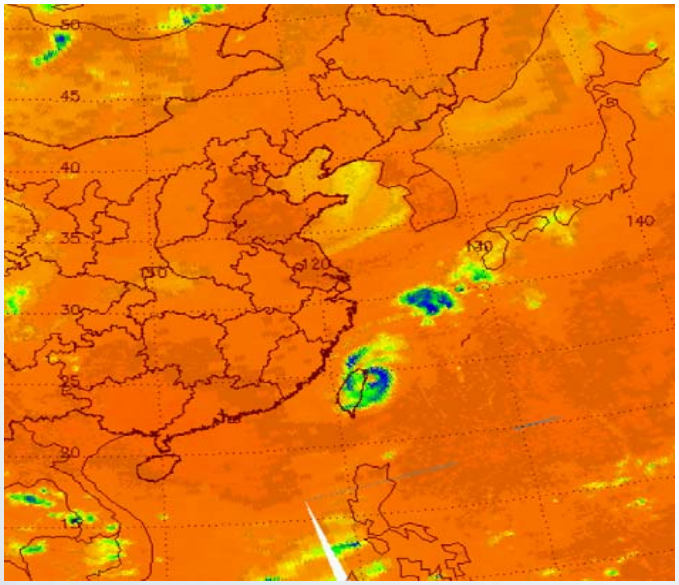
MWHS/FY-3A Tracking Typhoon Sinlake



2008.9.09 21:00pm

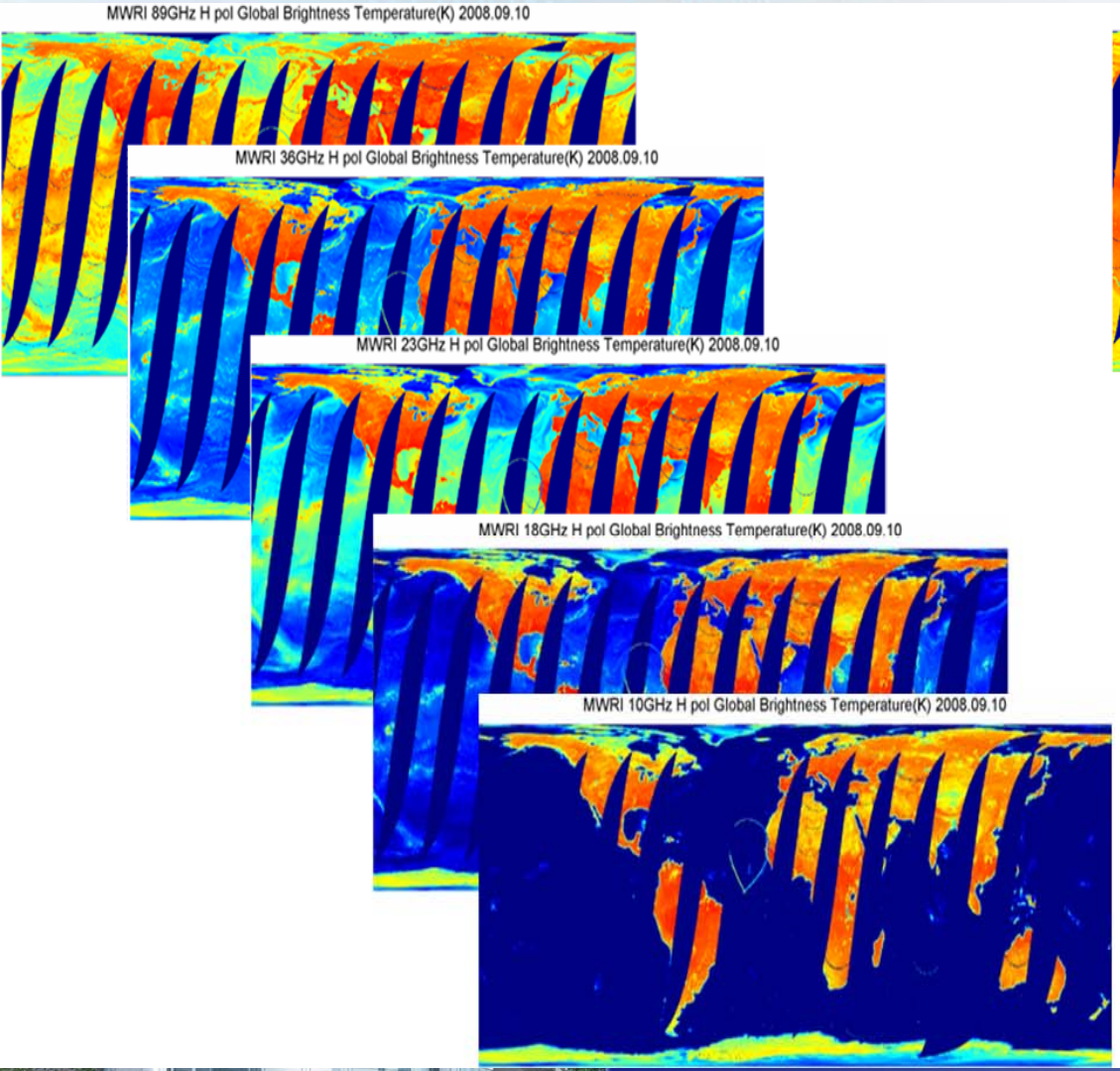


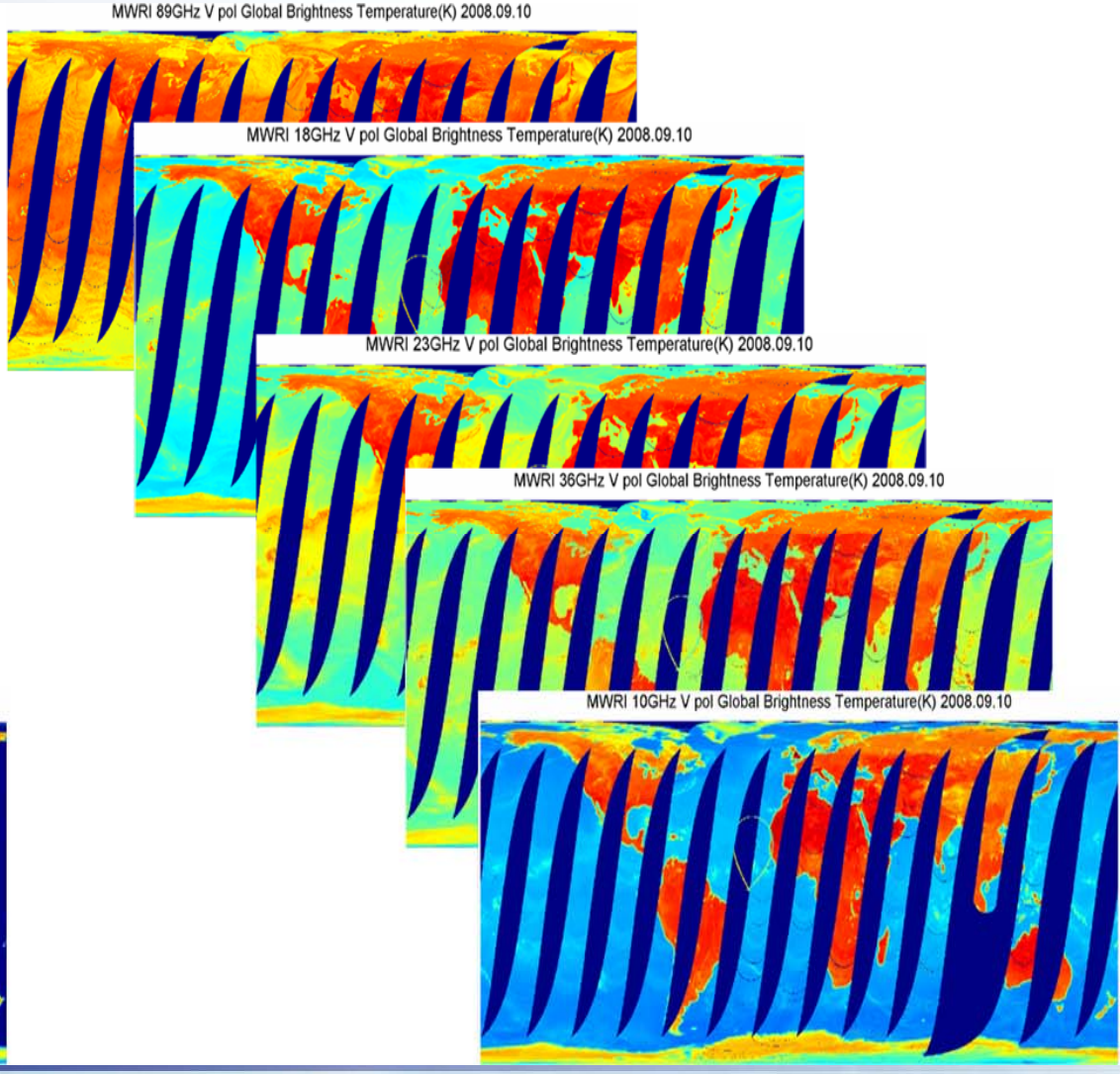
2008.9.12 21:00pm



2008.9.13 21:00pm

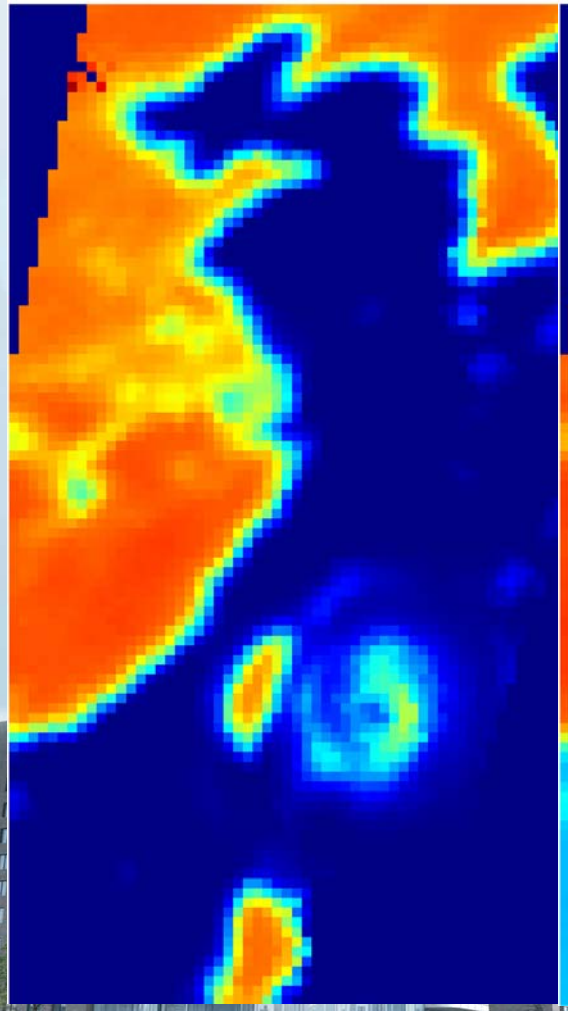
Global TB by MWRI (2008.09.10)



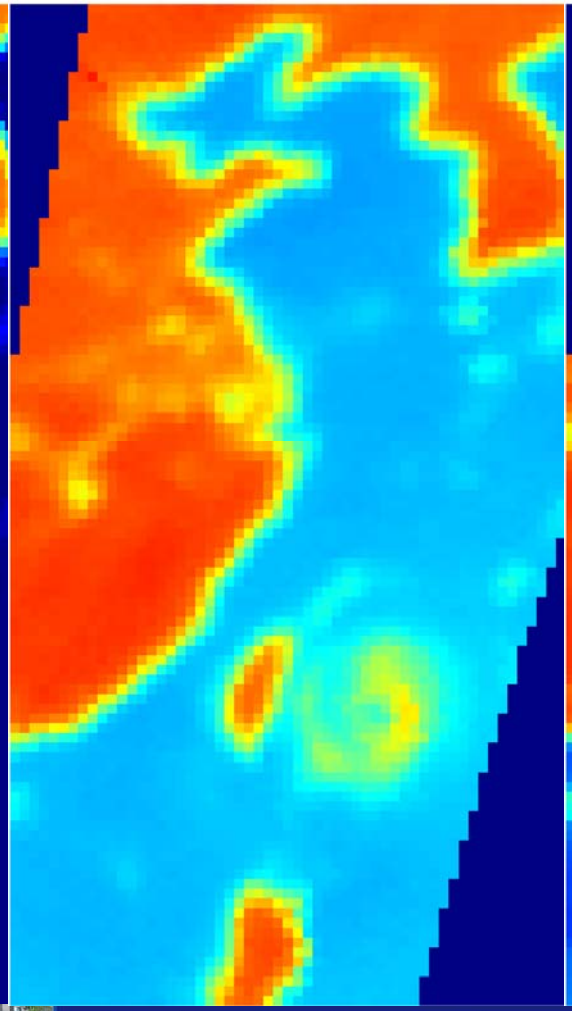


MWRI Monitoring of Typhoon Sinlake

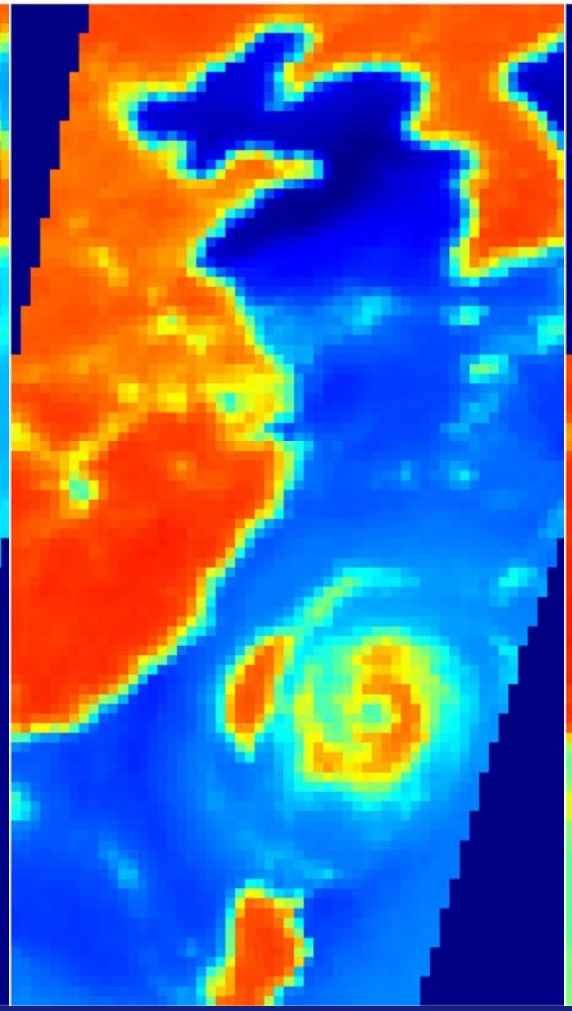
台风“森拉克”10h通道亮温



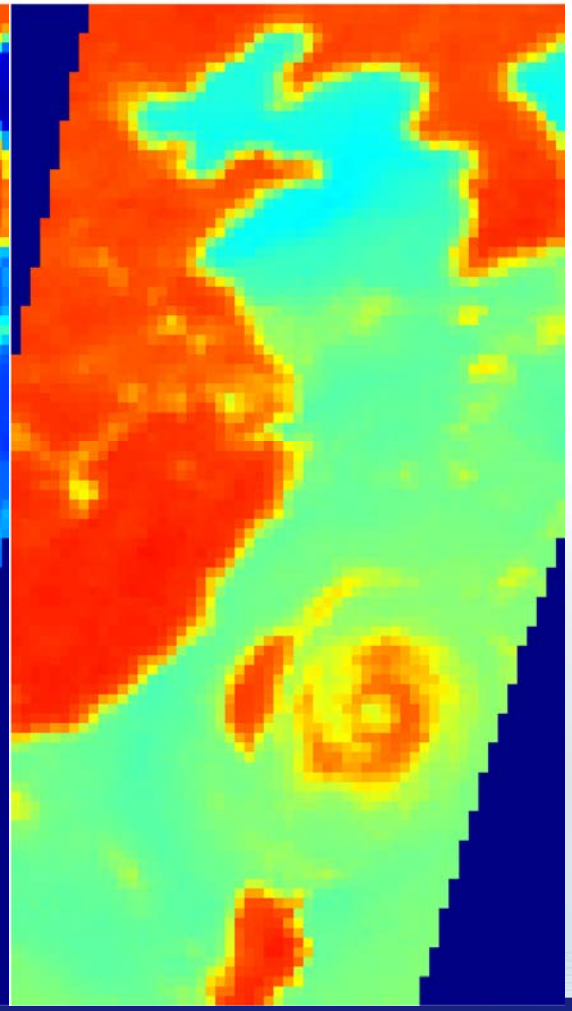
台风“森拉克”10v通道亮温



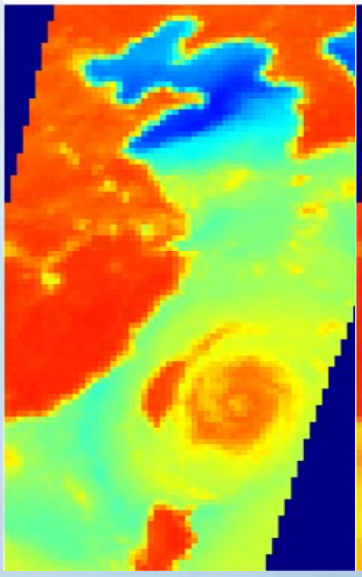
台风“森拉克”18h通道亮温



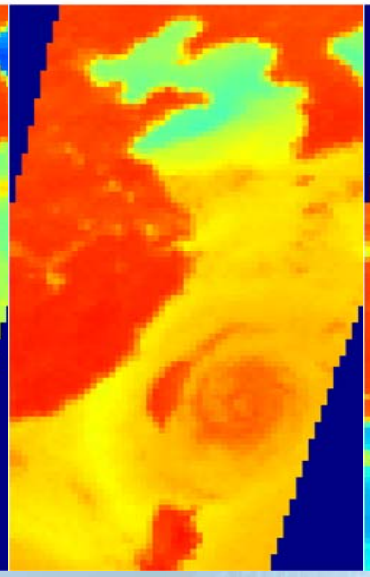
台风“森拉克”18v通道亮温



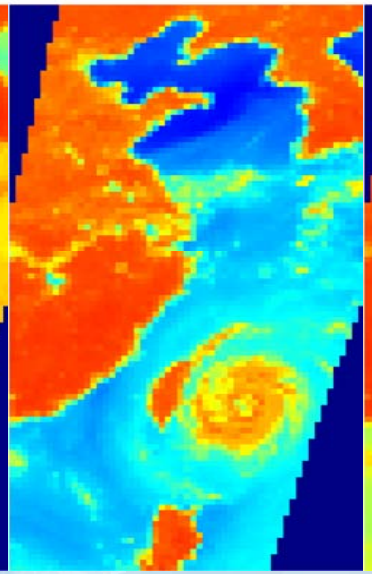
台风"森拉克"23h通道亮温



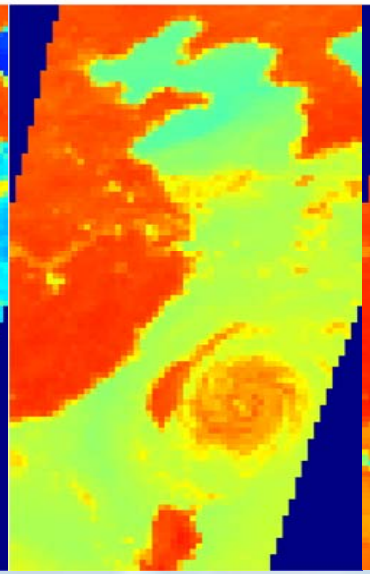
台风"森拉克"23v通道亮温



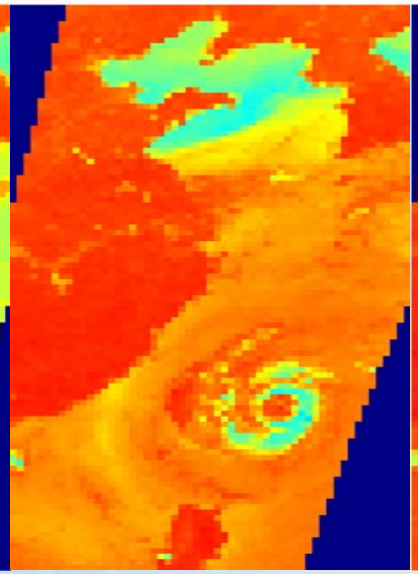
台风"森拉克"36h通道亮温



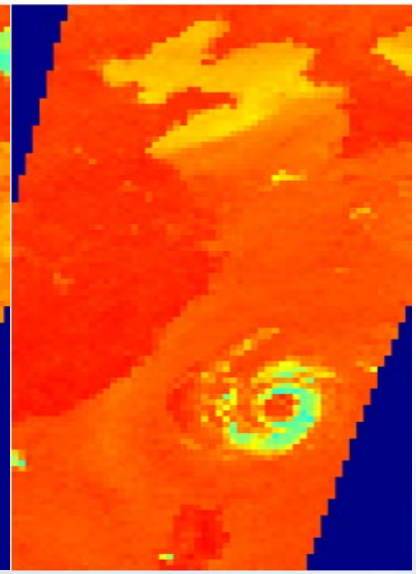
台风"森拉克"36v通道亮温



台风"森拉克"89h通道亮温



台风"森拉克"89v通道亮温



Basic parameters of L-SAR of CRSS-1

Radar Parameters	
Frequency	L-band
Swath width	50、100Km
Maximum Swath by scanning	≥575km
Data rate	266.67Mbps
Antenna Dimension	8.94m×3.4m

Calibration sites

Site 1

Area 1:

- Center（W64° 17'24", S4° 48'6"）
- Left Upper（W64° 47'24", S4° 18'06"）
- Right Upper（W63° 47'24", S4° 18'06"）
- Left Lower（W64° 47'24", S5° 18'06"）
- Right Lower（W63° 47'24", S5° 18'06 "）

Area 2:

- Center（W64° 35'6", S4° 17'24"）
- Left Upper（W65° 05'06", S3° 47'24"）
- Right Upper（W64° 05'06", S3° 47'24"）
- Left Lower（W65° 05'06", S4° 47'24"）
- Right Lower（W64° 05‘06“, S4° 47’24”）

Area 3:

- Center（W64° 58'54", S3° 36'18"）
- Left Upper（W65° 28'54", S3° 06'18"）
- Right Upper（W64° 28'54", S3° 06'18"）
- Left Lower（W65° 28'54", S4° 06'18"）
- Right Lower（W64° 28'54", S4° 06'18"）

Site 2:

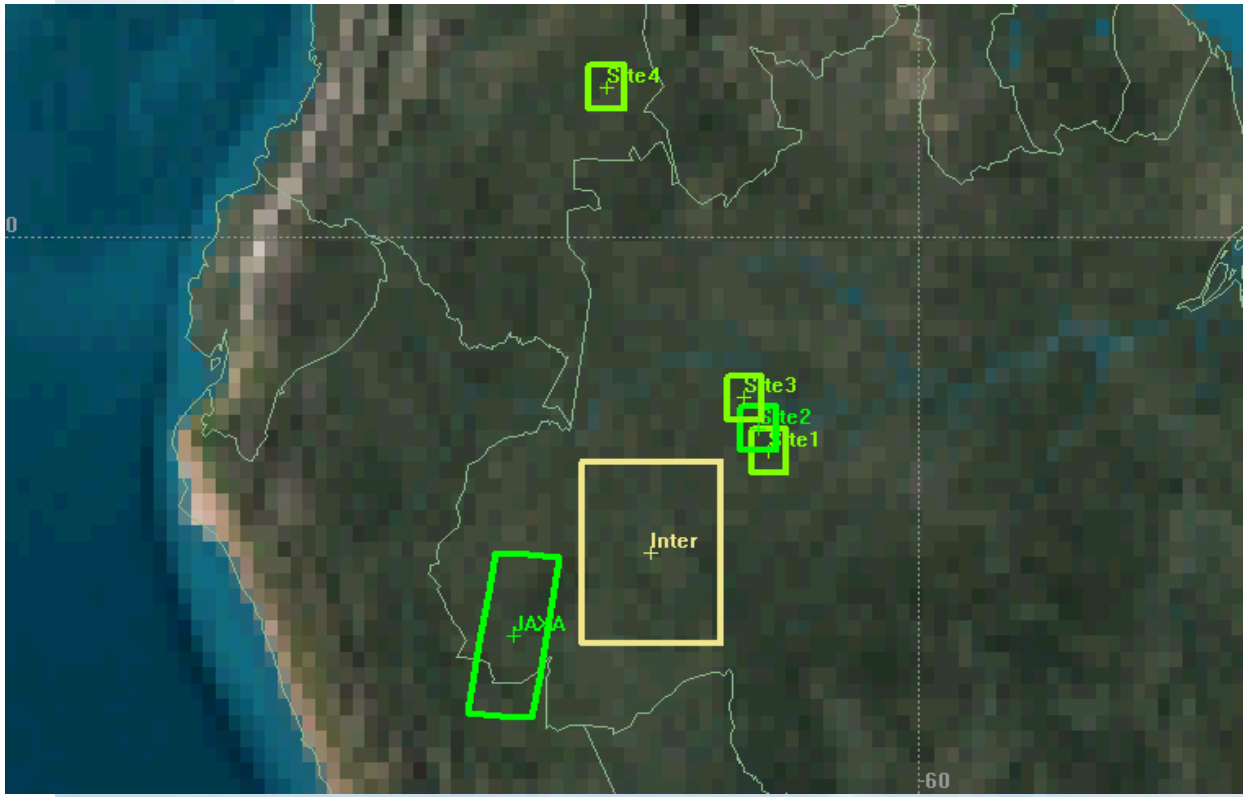
- Center（W68° 54'48", N3° 22'）
- Left Upper（W69° 24'48", N3° 52'）
- Right Upper（W68° 24'48", N3° 52'）
- Left Lower（W69° 24'48", N2° 52'）
- Right Lower（W68° 24'48", N2° 52'）

Site 3（JAXA site）:

- Center（W71° 34'42", S8° 52'05"）
- Left Upper（W72° 06'00", S7° 04'05"）
- Right Upper（W70° 15'54", S7° 10'55"）
- Left Lower（W72° 53'31", S10° 40'05"）
- Right Lower（W71° 03‘04“, S10° 47’10”）

Site 4（CEOS standard site）:

- Center（W67° 39'18", S7° 04'30"）
- Left Upper（W69° 38'24", S5° 01'48"）
- Right Upper（W65° 40'12", S5° 01'48"）
- Left Lower（W69° 38'24", S9° 07'12"）
- Right Lower（W65° 40'12", S9° 07'12"



Calibration results

- **Main objectives:**
  - **Evaluate of the antenna parameters.**
  - **Using an additional area (W78° S5° ~W73° S10°) with bigger dynamic range (>30dB) to evaluate the system dynamic range.**

- **Antenna pattern accuracy: <0.3dB(3σ);**
- **Beam alignment accuracy: <0.1° (3σ);**
- **-3dB beam width accuracy: <0.2° (3σ);**
- **System noise and SNR accuracy: <0.3dB(3σ);**
- **System dynamic range: >30dB;**
- **Beam alignment precision: <0.1° (3σ)。**

End!

Thanks !