



PRELIMINARY EVALUATING OF FY-3D IN-ORBIT PERFORMANCE

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NATIONAL SATELLITE METEOROLOGICAL CENTER

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2018 GSICS SHANGHAI





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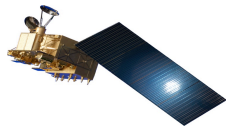


1 Introduction

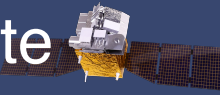
2 Optical Instruments

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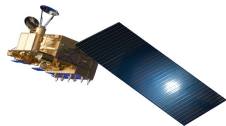
1.0 Introduction~The FY-3D Satellite



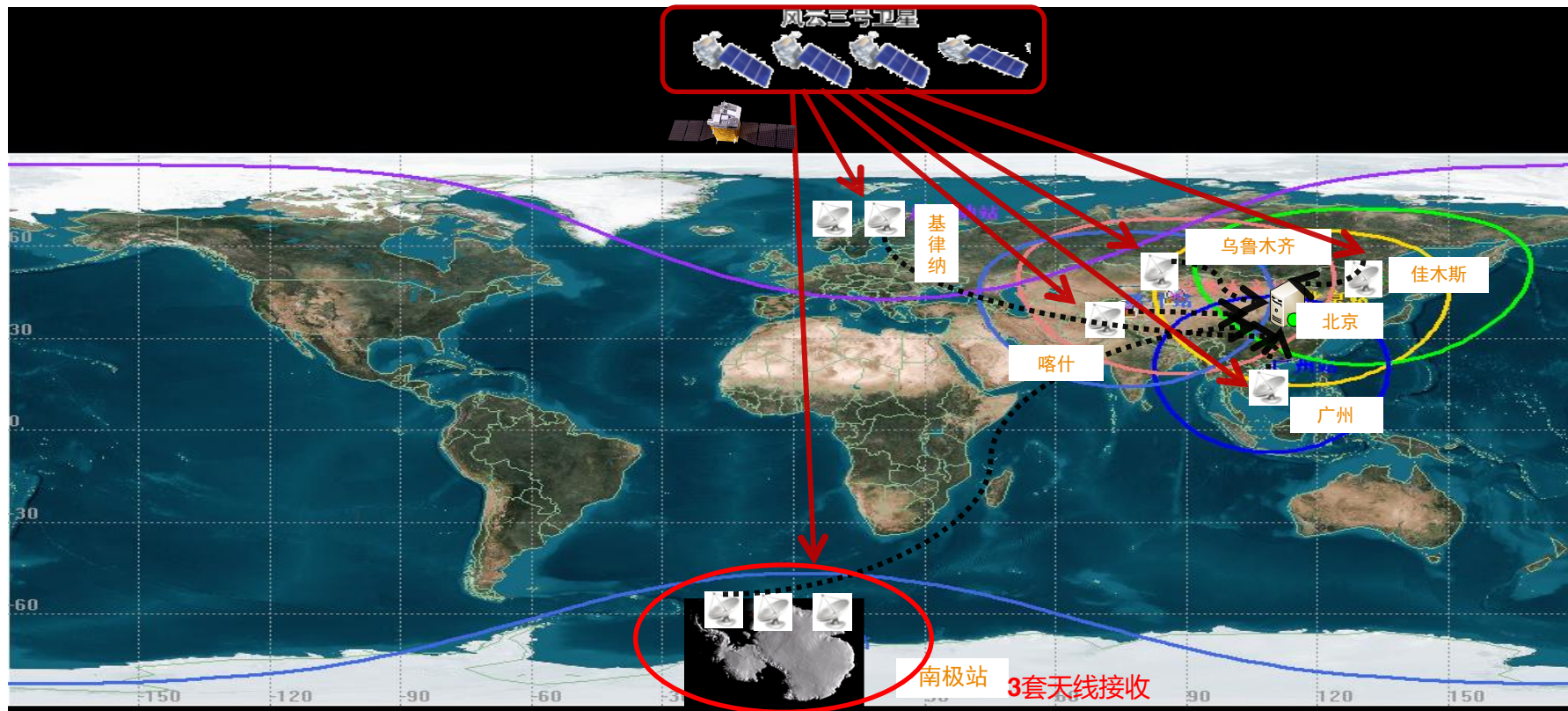
- ❑ FY-3D was successfully launched into orbit from Taiyuan Base in Shanxi Province of China on 15 November 2017 with an altitude of 830.5 km above the Earth surface, an inclination angle of 98.75° and a 13:45 local time ascending node.
- ❑ As the fourth satellite of China's second-generation polar orbit meteorological satellite, FY-3D has achieved comprehensive space based measurement of geophysical parameters of Earth system with global, all-weather, high spectral, three-dimensional.
- ❑ According to telemetry information, the satellite platform is in normal status and the remote sensing instrument is in normal status.

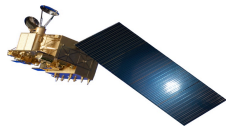




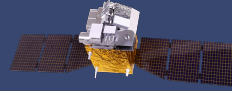


1.2 Groundstation distribution of FY-3 Satellites



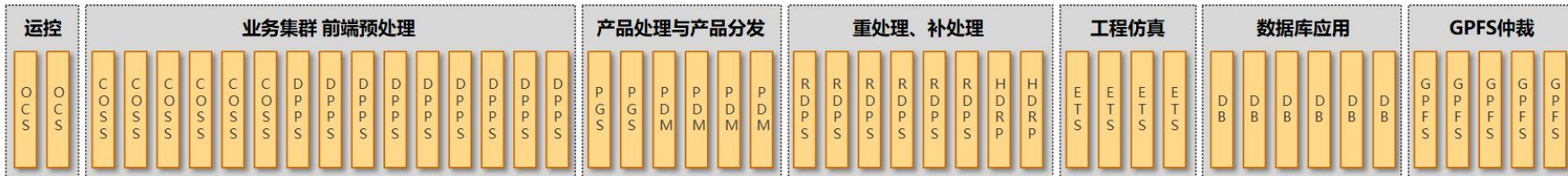


Computer Resource Pool of FY-3 Ground Segment

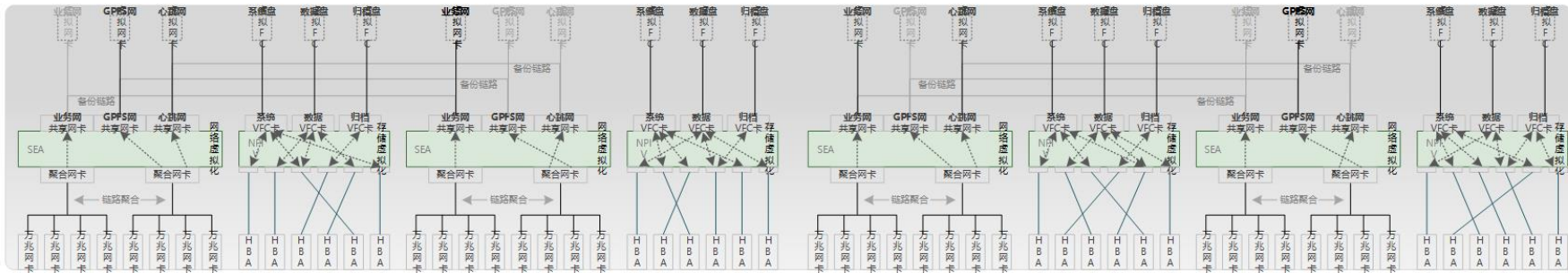


AIX OCS 2*AIX
 AIX COSS 6*AIX
 AIX DPPS 8*AIX
 AIX PGS 2*AIX
 AIX PDM 4*AIX
 AIX RDPS 6*AIX
 AIX HDRP 2*AIX
 AIX ETS 4*AIX
 AIX DB 6*AIX
 AIX GPFS 4*AIX

虚拟机



虚拟化软件

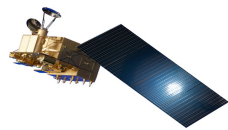


IT支撑平台

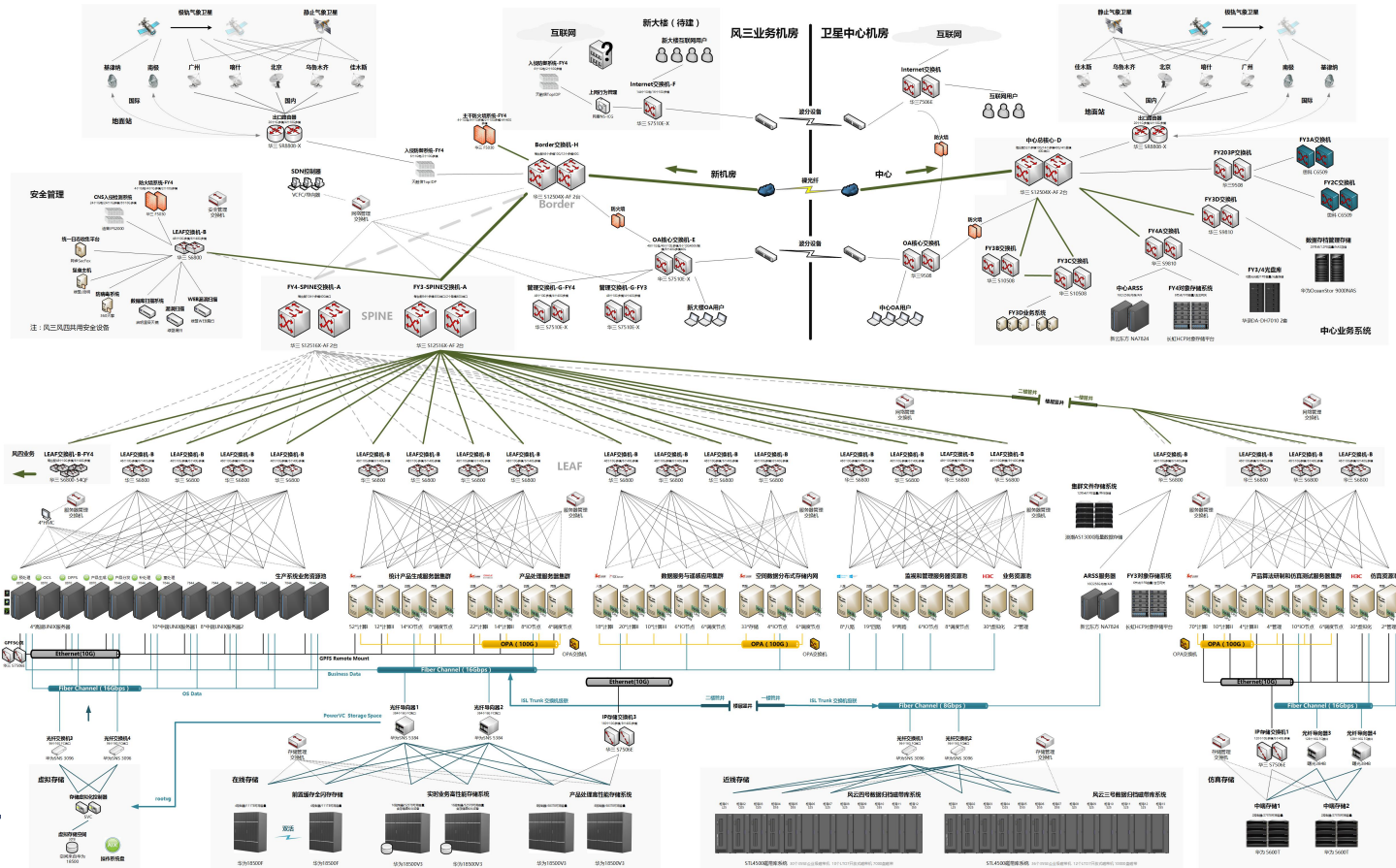
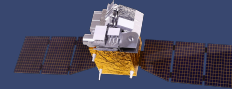


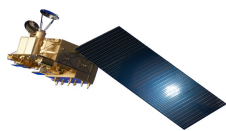
硬件管理平台 HMC

云管理平台 PowerVC

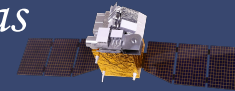


IT Infrastructure of FY-3 Ground Segment

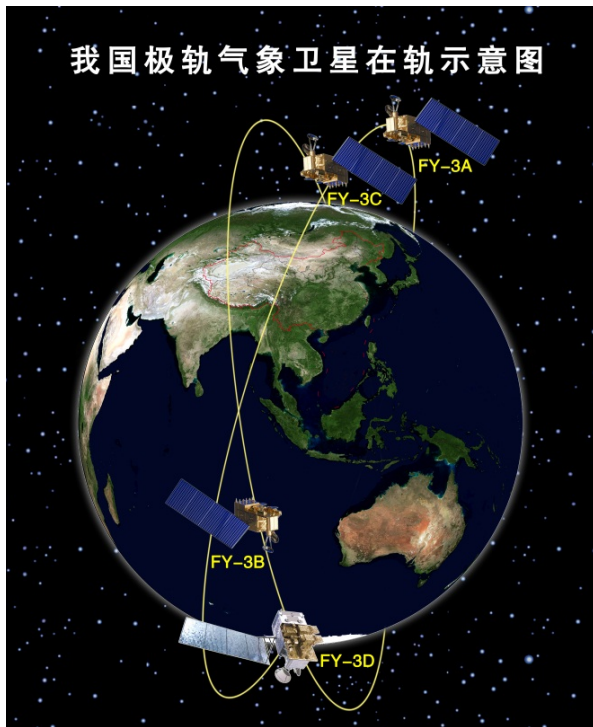




The Observation Capability of FY-3 Satellite Has been Improved Step by Step

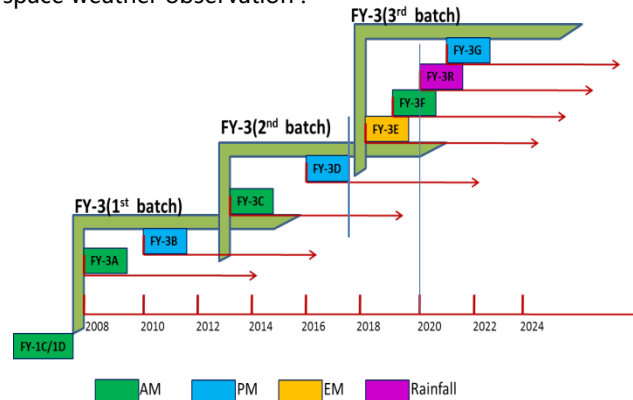


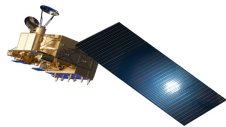
我国极轨气象卫星在轨示意图



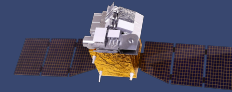
Instrument	FY-3A/3B	FY-3C	FY-3D
MERSI	√	√	√(II)
MWTS	√	√(II)	√(II)
MWHS	√	√(II)	√(II)
MWRI	√	√	√
GNOS		√	√
HIRAS			√
GAS			√
WAI			√
IPM			√
SEM	√	√	√
VIRR	√	√	
IRAS	√	√	
SIM	√	√(II)	
ERM	√	√	
SBUS	√	√	
TOU	√	√	

- As the two R&D satellites of second generation of the polar orbit meteorology satellite, FY-3A and FY-3B completed the upgrading, realizing the combining observation ability of the morning and afternoon orbit.
- As the first operational satellite of second generation of polar orbit meteorological satellites, morning orbital satellite, FY-3C has realized the atmospheric vertical instruments upgrade to ascend, increased the occultation observation ability, completed the transition from R&D to the operational service.
- As the second operational satellite, afternoon orbital satellite, FY-3D entered the era of high spectral observation, and the instrument performance and quantitative level were greatly improved, with the capability of greenhouse gas and space weather observation.



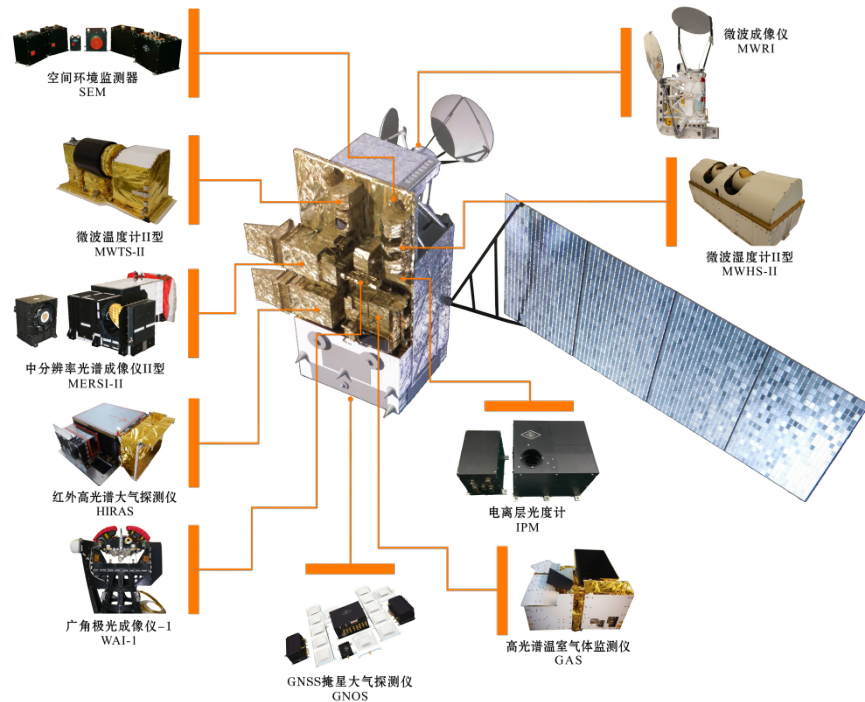


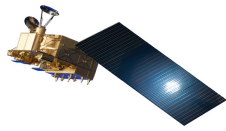
1.3 Instruments of FY-3D



- FY-3D is equipped with 10 advanced remote sensing instruments, including 4 new development, 1 improvement and 5 inheritance. Infrared high spectral atmospheric sounding instrument, near-infrared high spectral greenhouse gas monitor, wide-angle aurora imager and ionospheric photometer are new development payloads for the first time.
- FY-3D loading of ten of the remote sensing instrument, which measurement channels in total more than 7000, will greatly improve the atmospherical thermodynamic parameters, greenhouse gases, aerosols, atmospheric electric field, magnetic field, high-energy particle detection ability, improve our country in global numerical weather prediction, the response to climate change and ecological environment monitoring, space weather forecast and the comprehensive ability and level of disaster prevention and mitigation, etc.

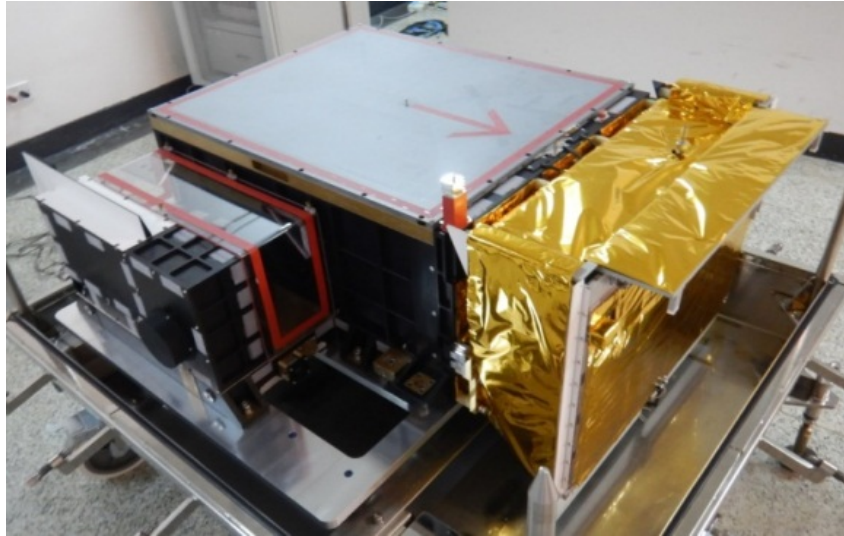
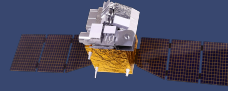
风云三号极轨气象卫星
FY-3 Polar-orbiting Meteorological Satellite





2.1 Optical instrument

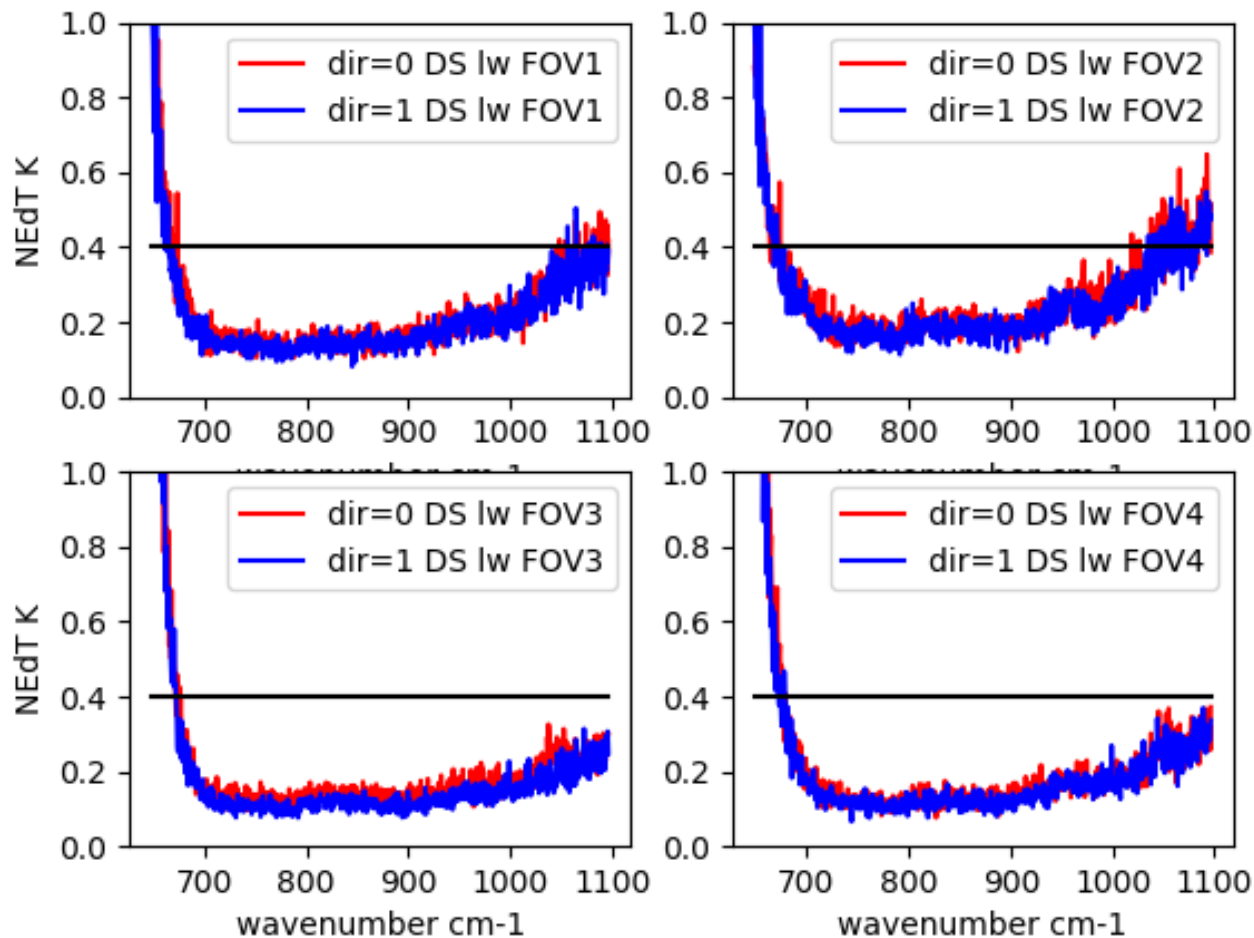
~New Instrument-HIRAS



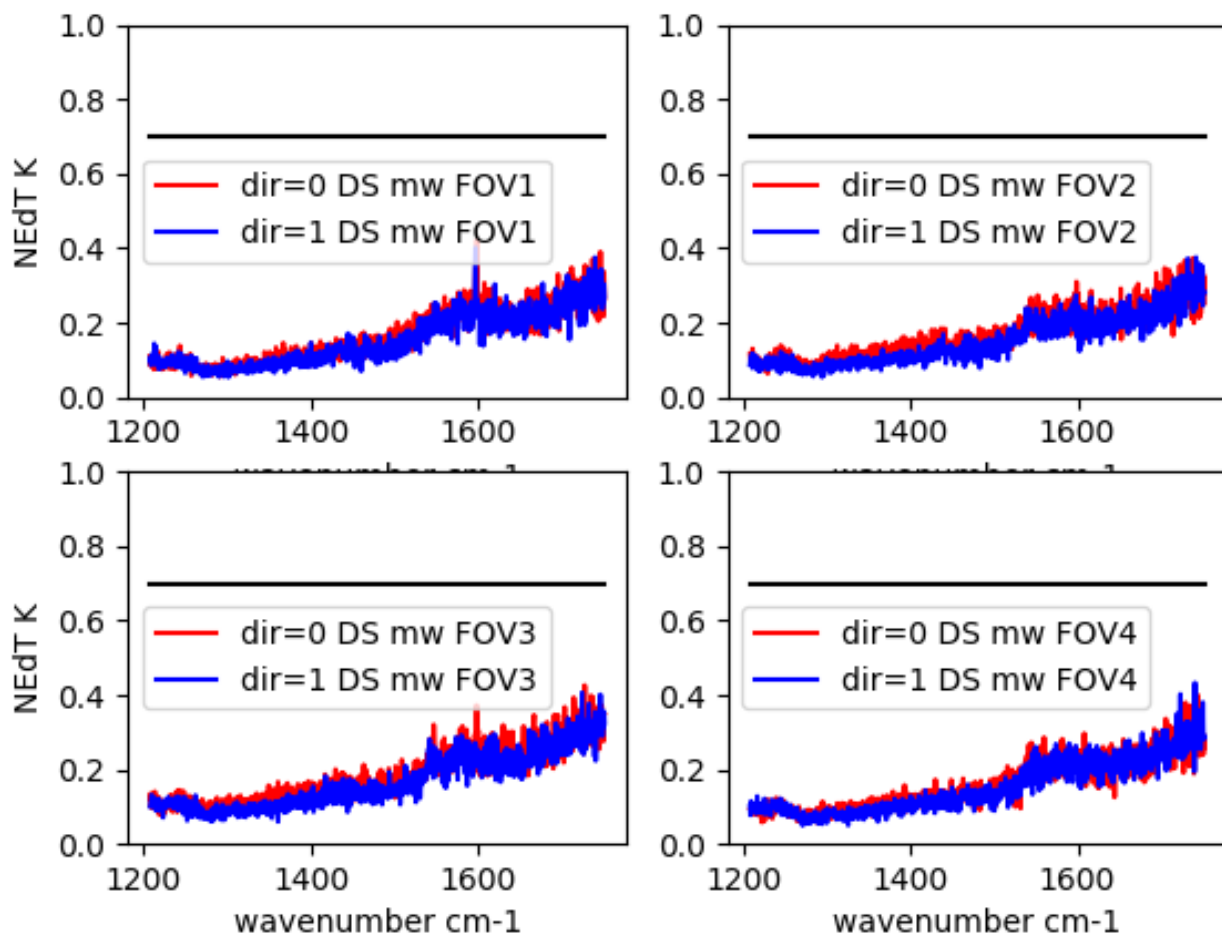
HIRAS (High spectral Infrared Atmospheric Sounding):

1. With 1370 channels to implement the Earth-atmosphere system infrared high spectral measurement in 3.92 to 15.38 μm , spectral resolution of up to 0.625 cm^{-1} , can be more accurately detected higher vertical resolution of atmospheric thermal structure;
2. It will be used for inversion higher accuracy of atmospheric temperature (accuracy of 0.5 K) and humidity profile (accuracy of 10%), through assimilation application in numerical weather prediction model, the data will greatly improve the accuracy of numerical weather prediction.

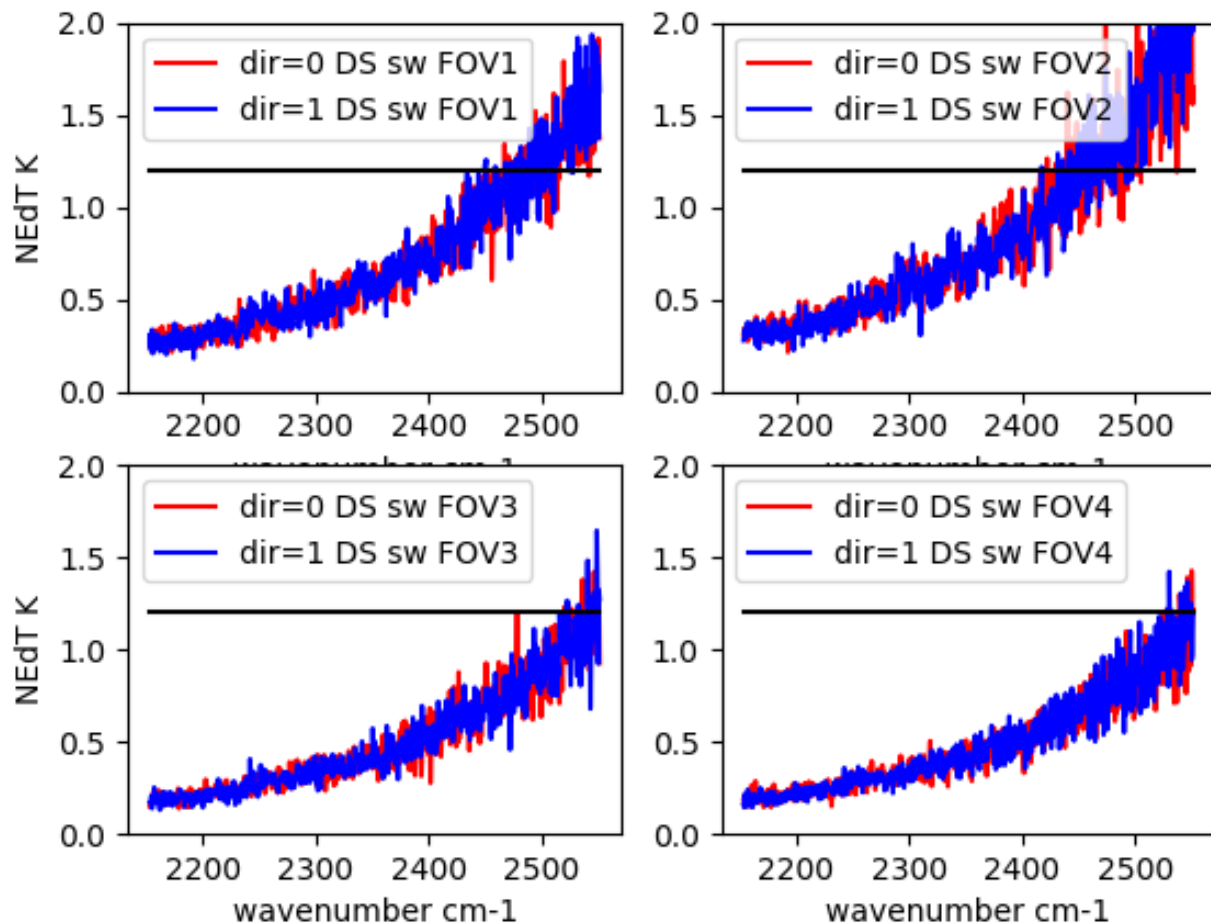
HIRAS: on orbit sensitivity of long wave band



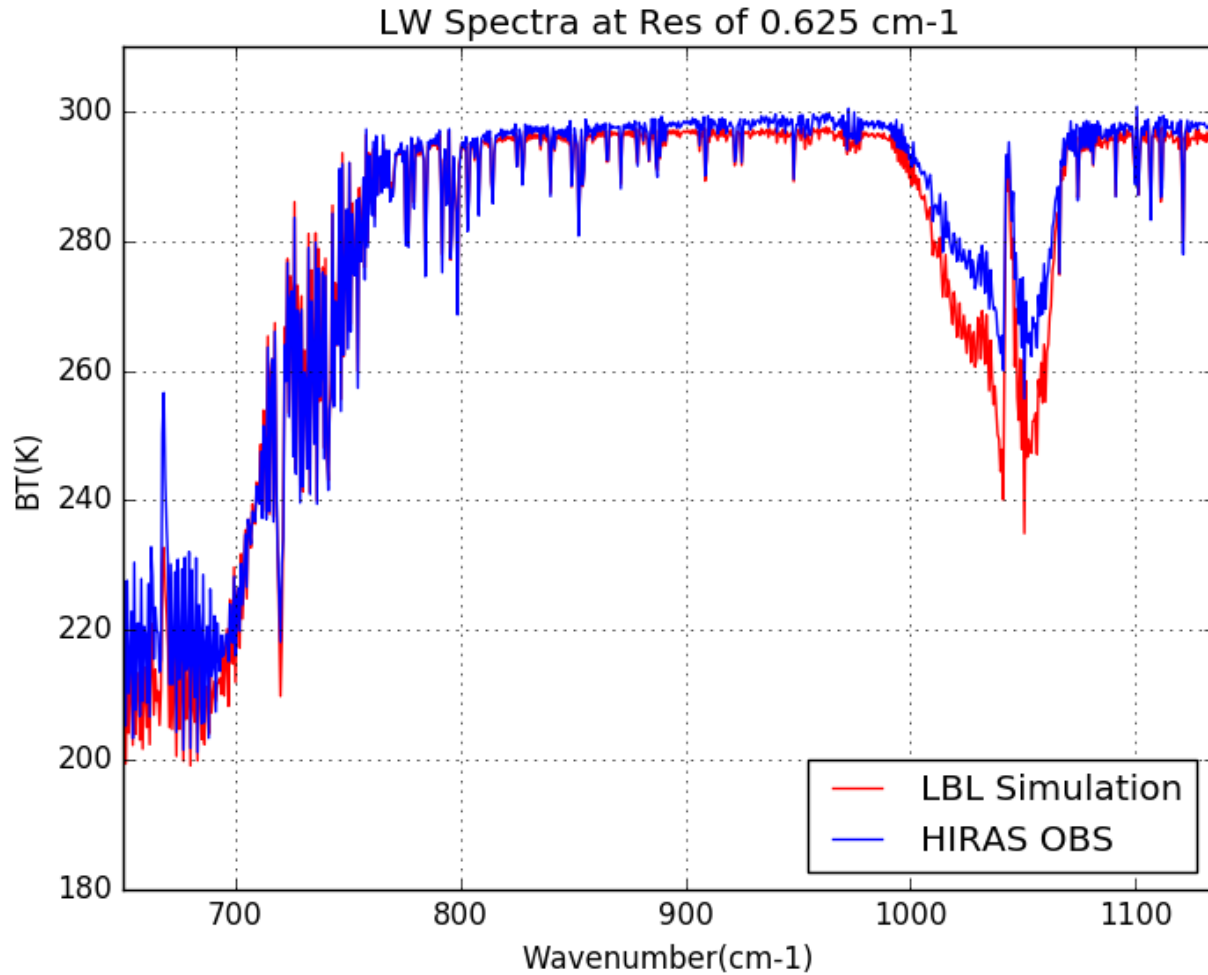
HIRAS: on orbit sensitivity of middle wave band

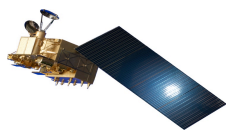


HIRAS: on orbit sensitivity of short wave band

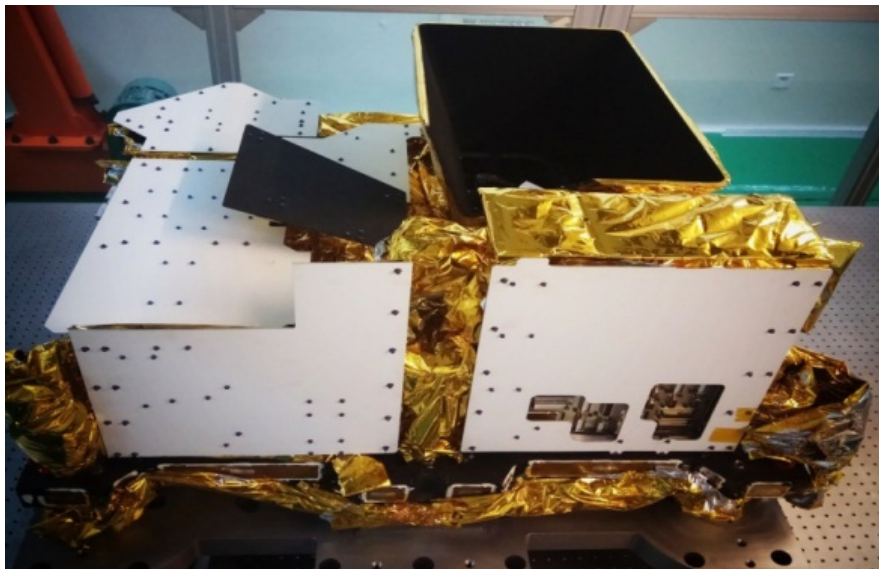
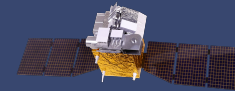


LBLRTM simulation and Observation of HIRAS long wave band

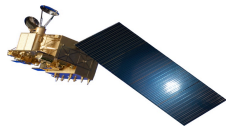




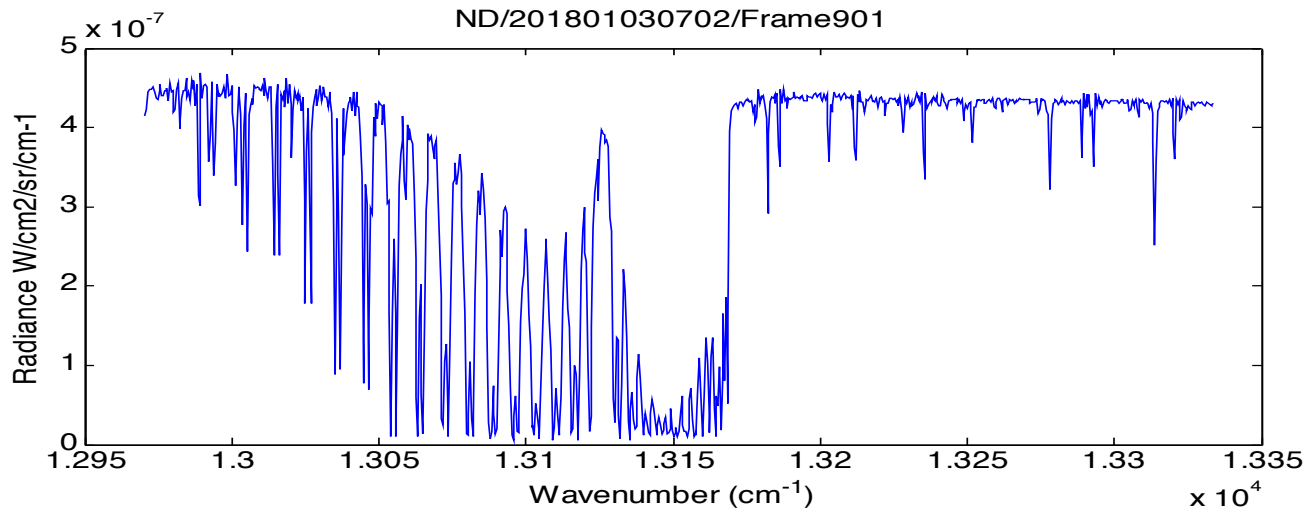
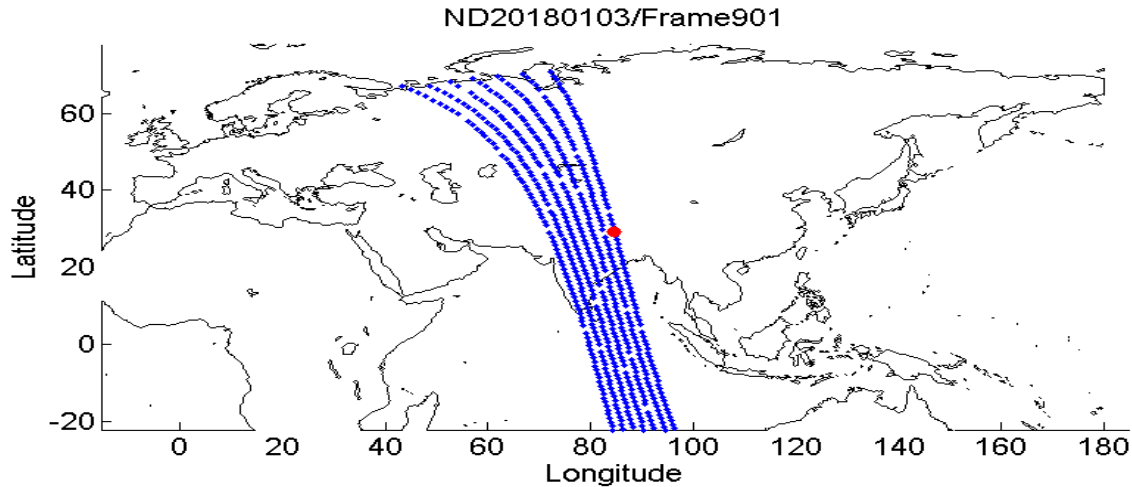
2.2 Optical instrument ~New Instrument-GAS



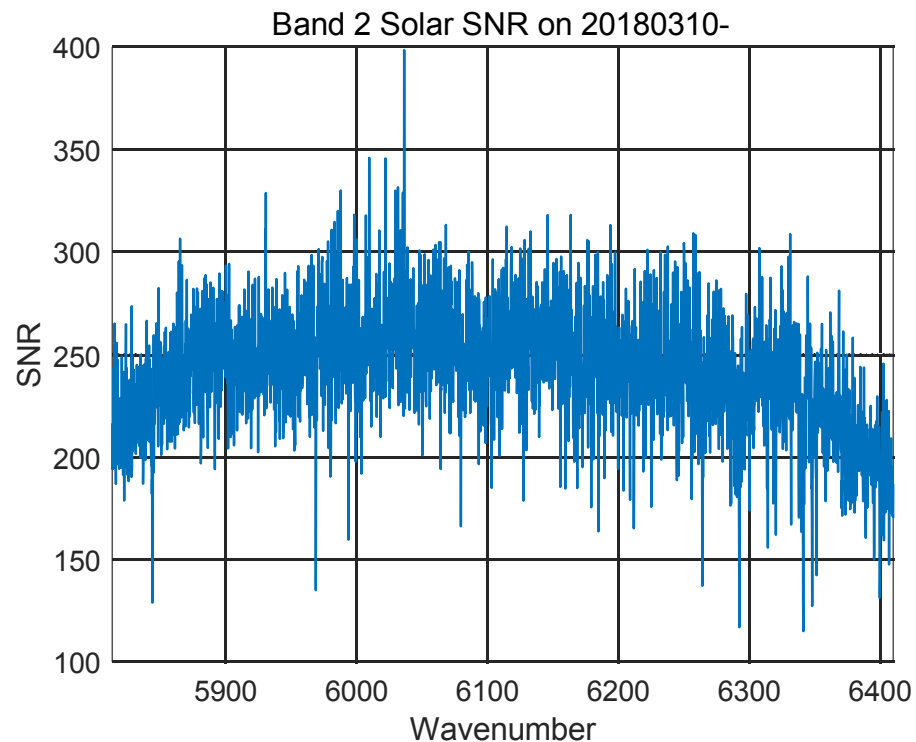
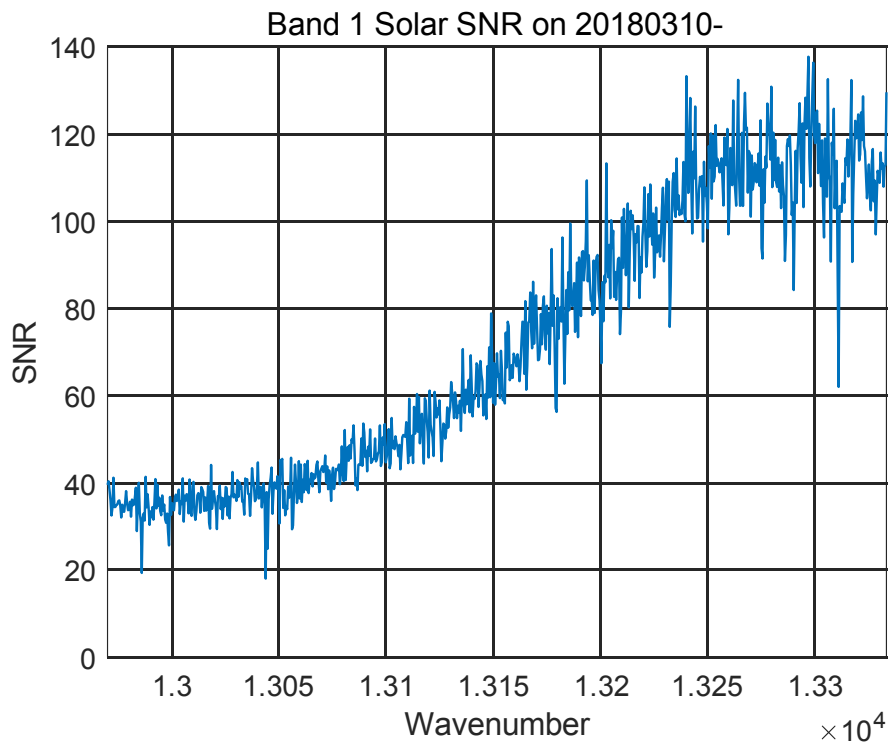
GAS (high spectral Greenhouse gAs Spectrometer):
Observation for global atmospheric greenhouse gases (CO₂, CH₄ etc.) concentration distribution of, understanding of greenhouse gases space, time change on regional and global scale, through assimilation with chemical transfer model, is expected to global climate change research, application and analysis of monitoring the global carbon source and sink.



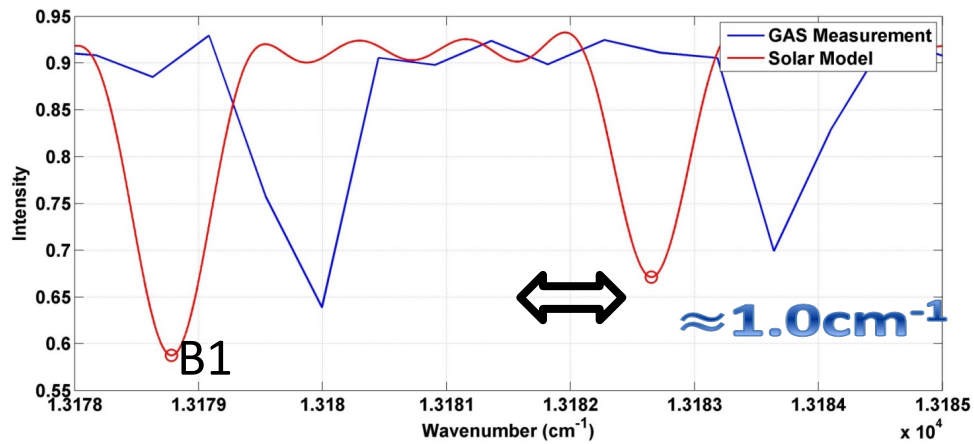
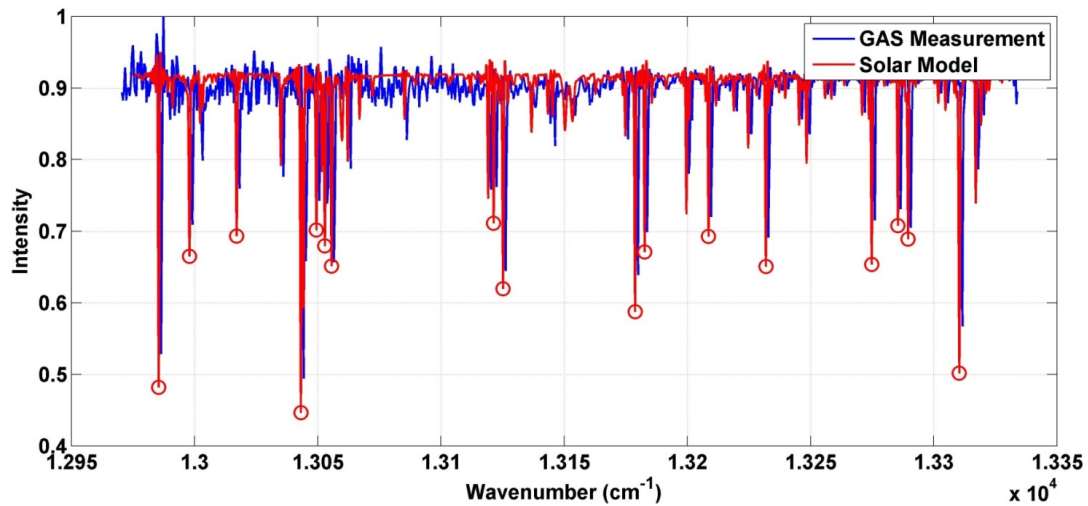
Nadir model observational spectrum of oxygen A band

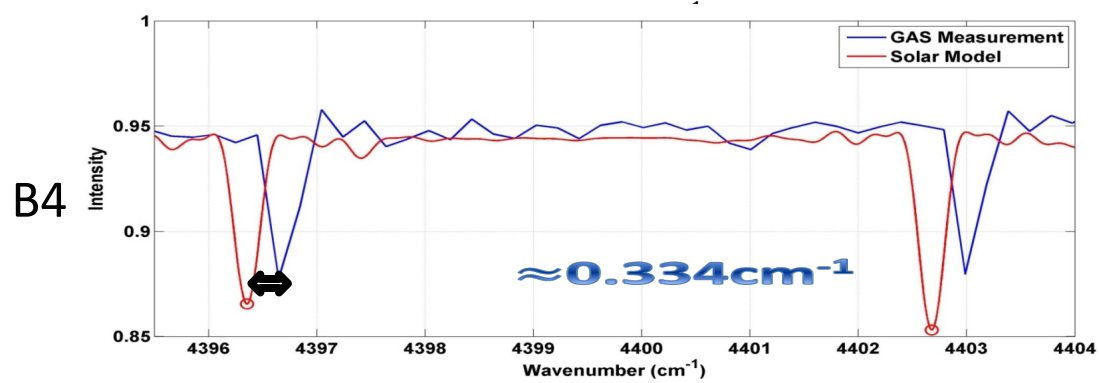
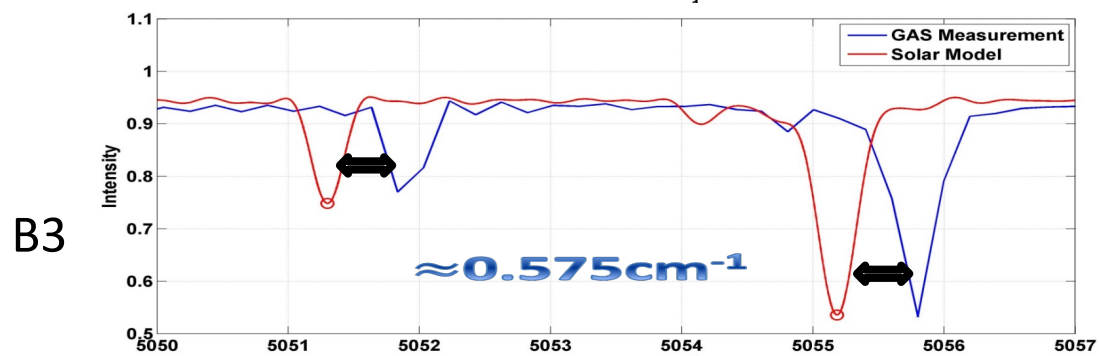
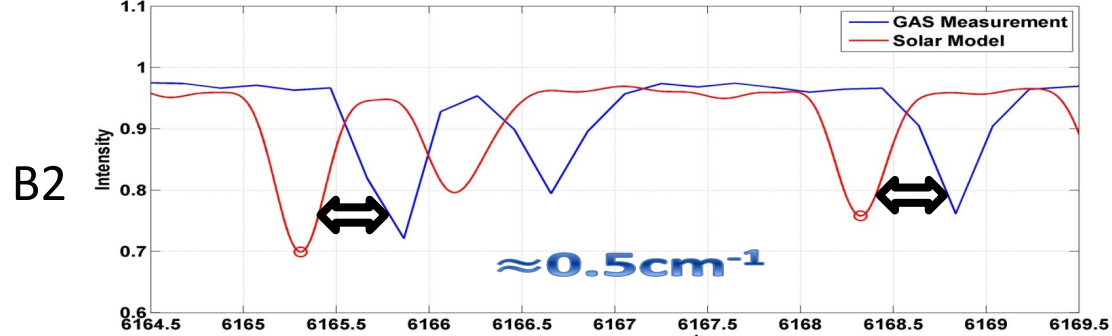


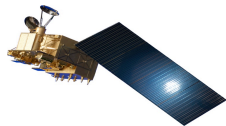
Signal to Noise Ratio



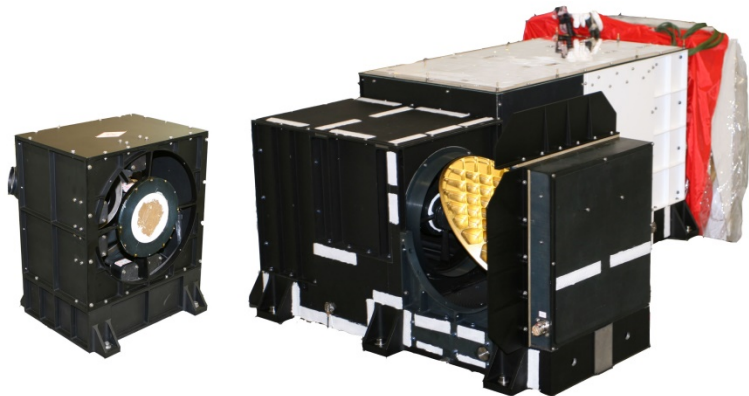
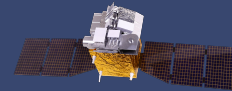
Spectral Calibration







2.3 MERSI-II

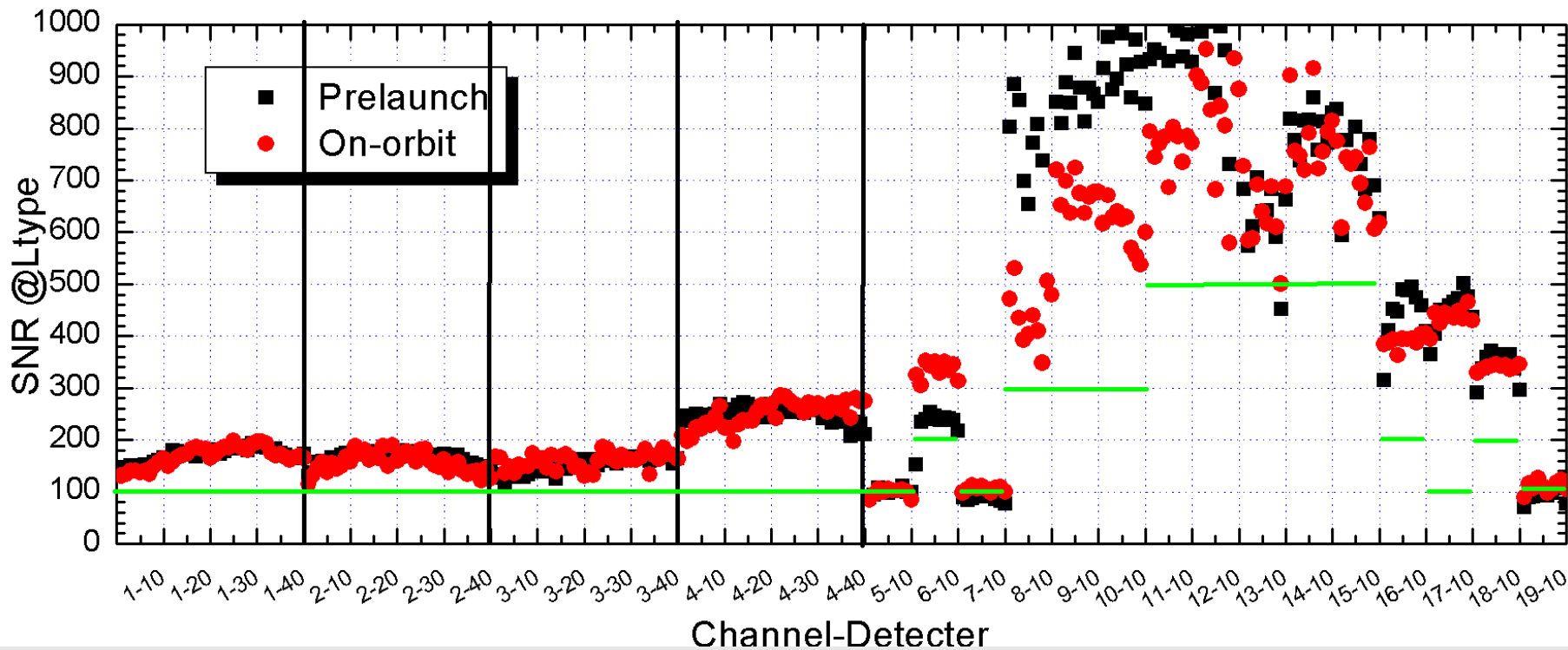


Improved Instrument

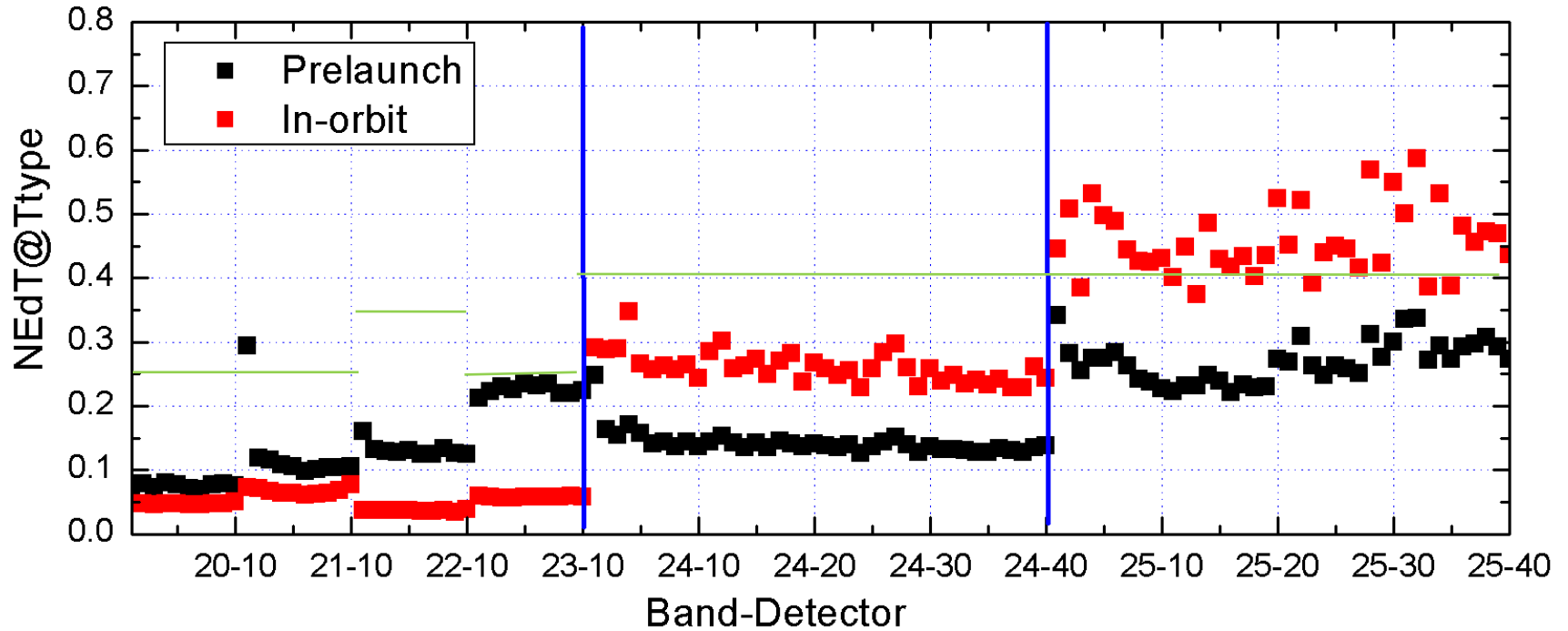
MERSI-II(MEDium Resolution Spectral Imager-II):

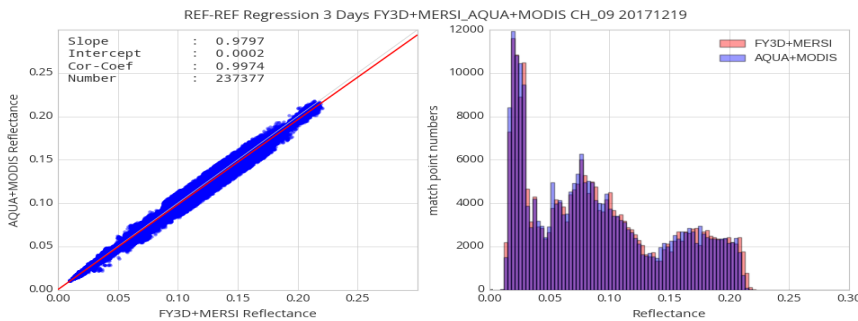
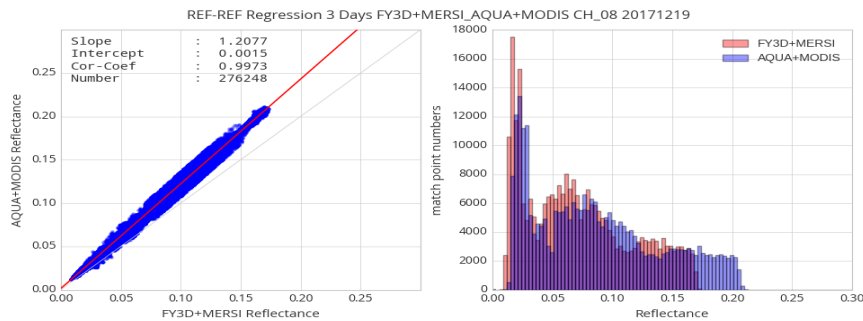
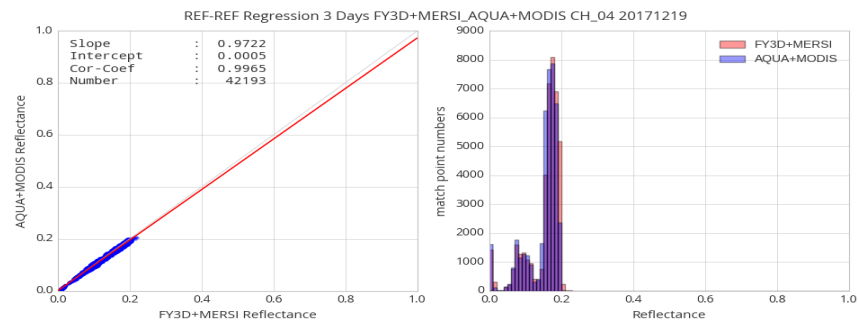
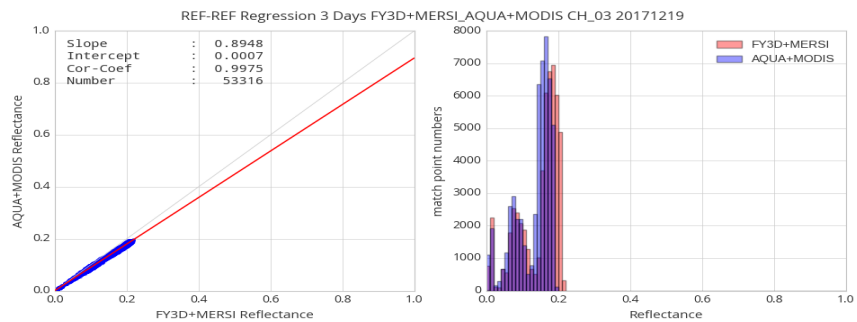
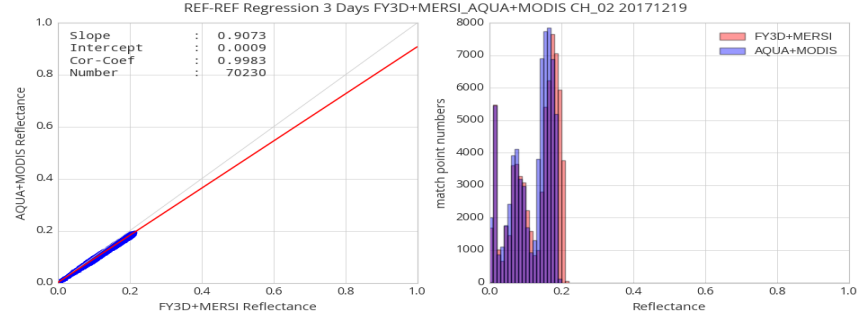
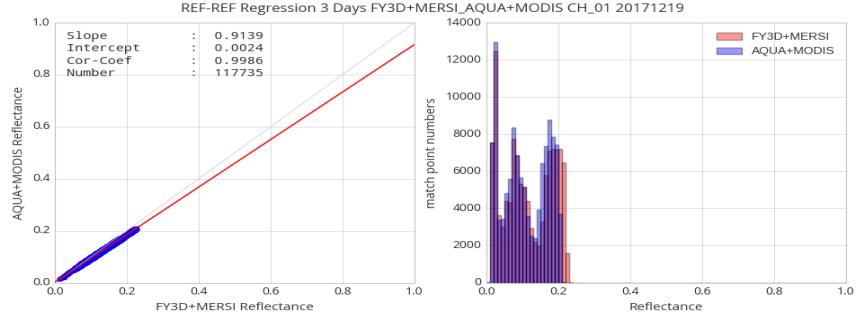
- 1.As a key optical imaging instrument, Its functionality is a merger of MERSI and VIRR two instrument on the before three FY-3 satellites.
- 2.It have the key upgrade instrument sensitivity and calibration accuracy, not only to obtain the global 250 m spatial resolution true color image, also can obtain 250 m resolution infrared split window observation data.
- 3.Through the multispectral continuous Earth observation realize atmospheric aerosol, water vapor, land and sea surface characteristics of high-precision quantitative inversion, and the results can be used in the global ecological environment, disaster monitoring and assessment.

Signal to Noise Ratio of Visual and near-infrared band



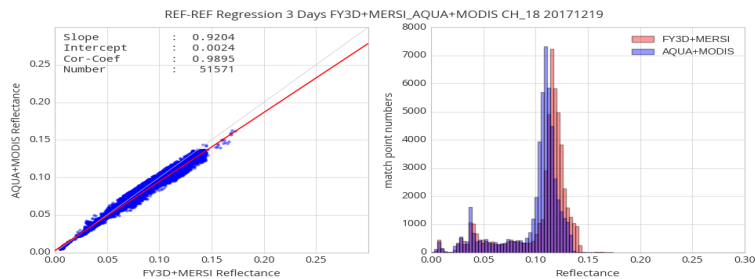
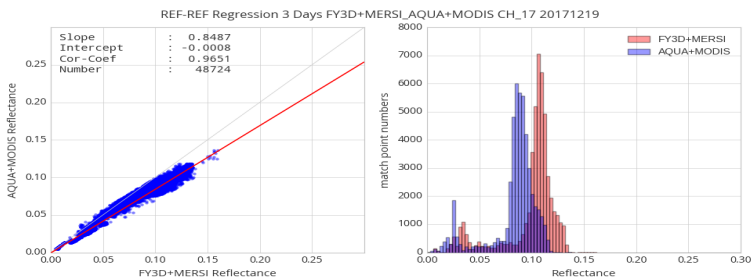
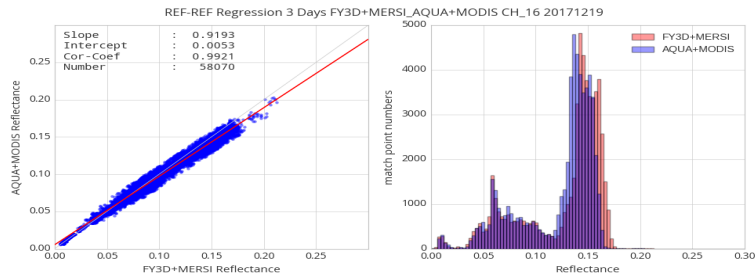
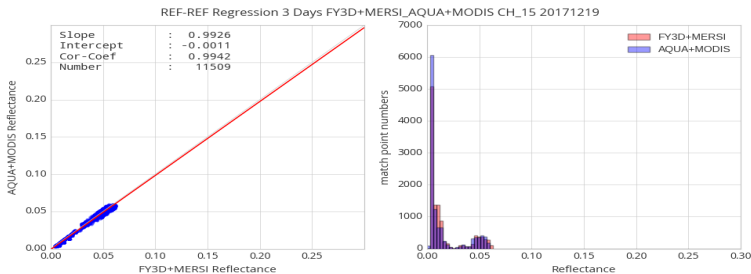
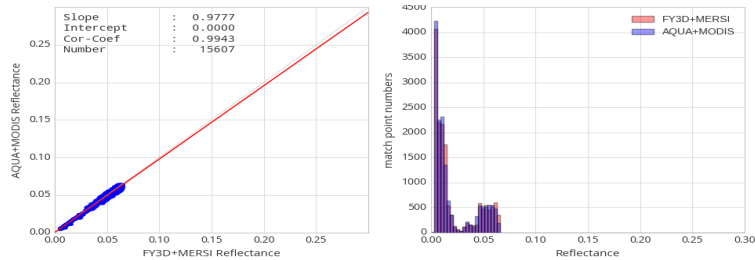
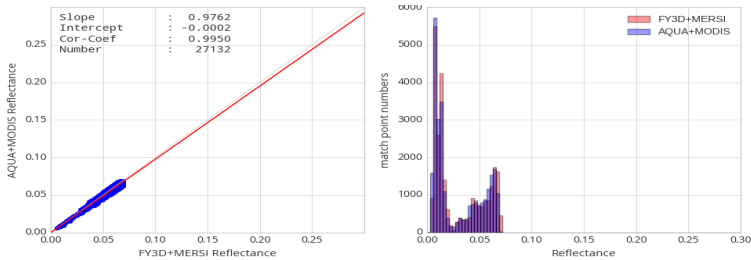
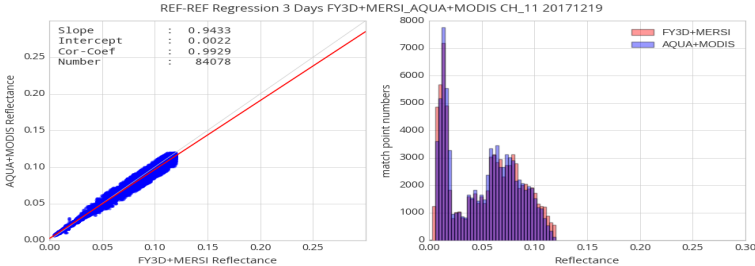
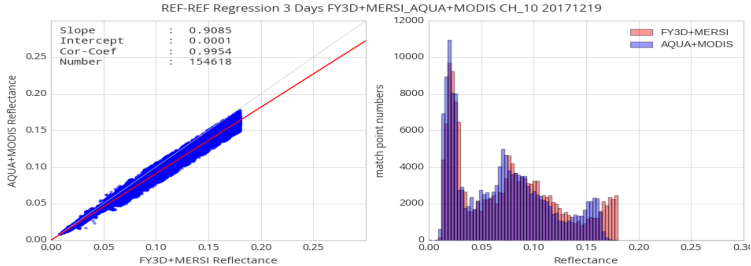
NEdT of mid and long wave band

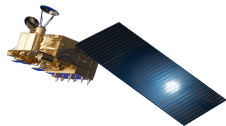




Radiometric calibration of visual and near infrared band comparing with Aqua/MODIS

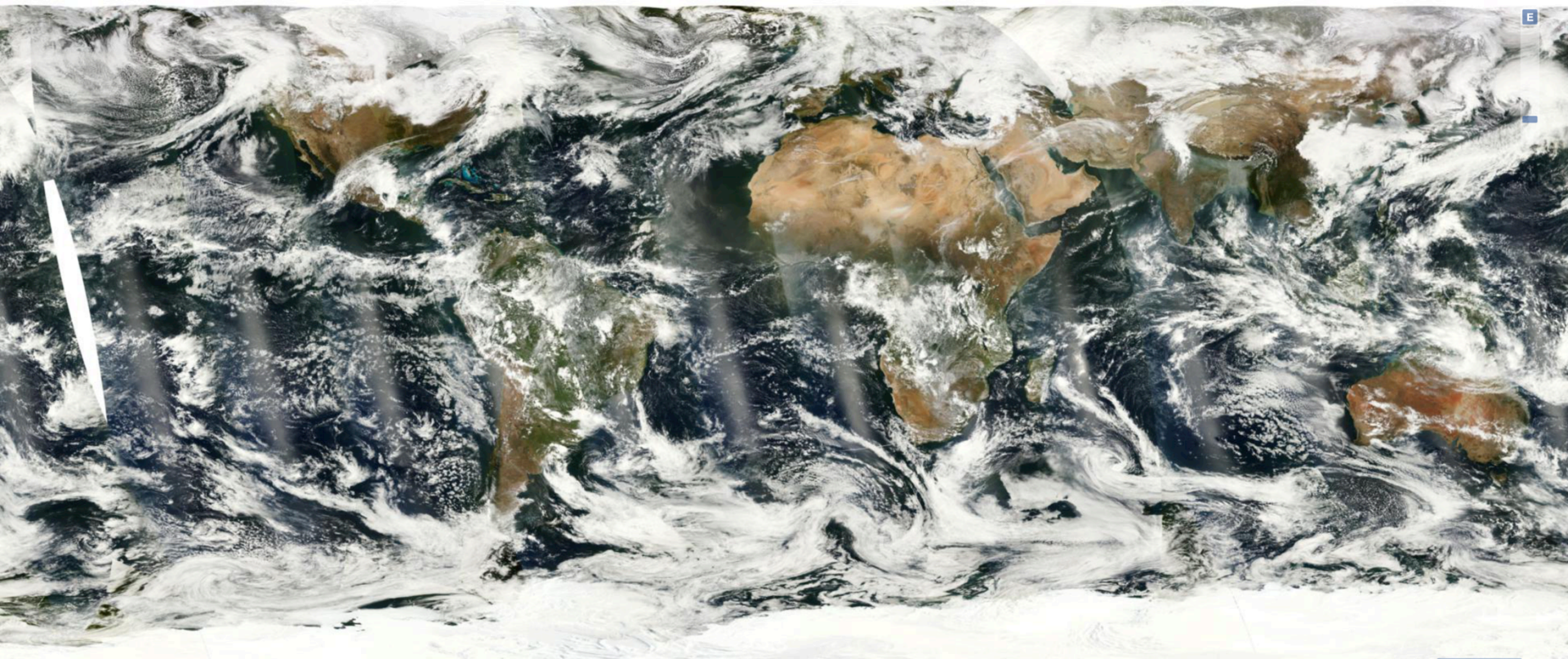
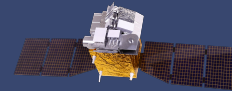
(20171201-03 three days samples)

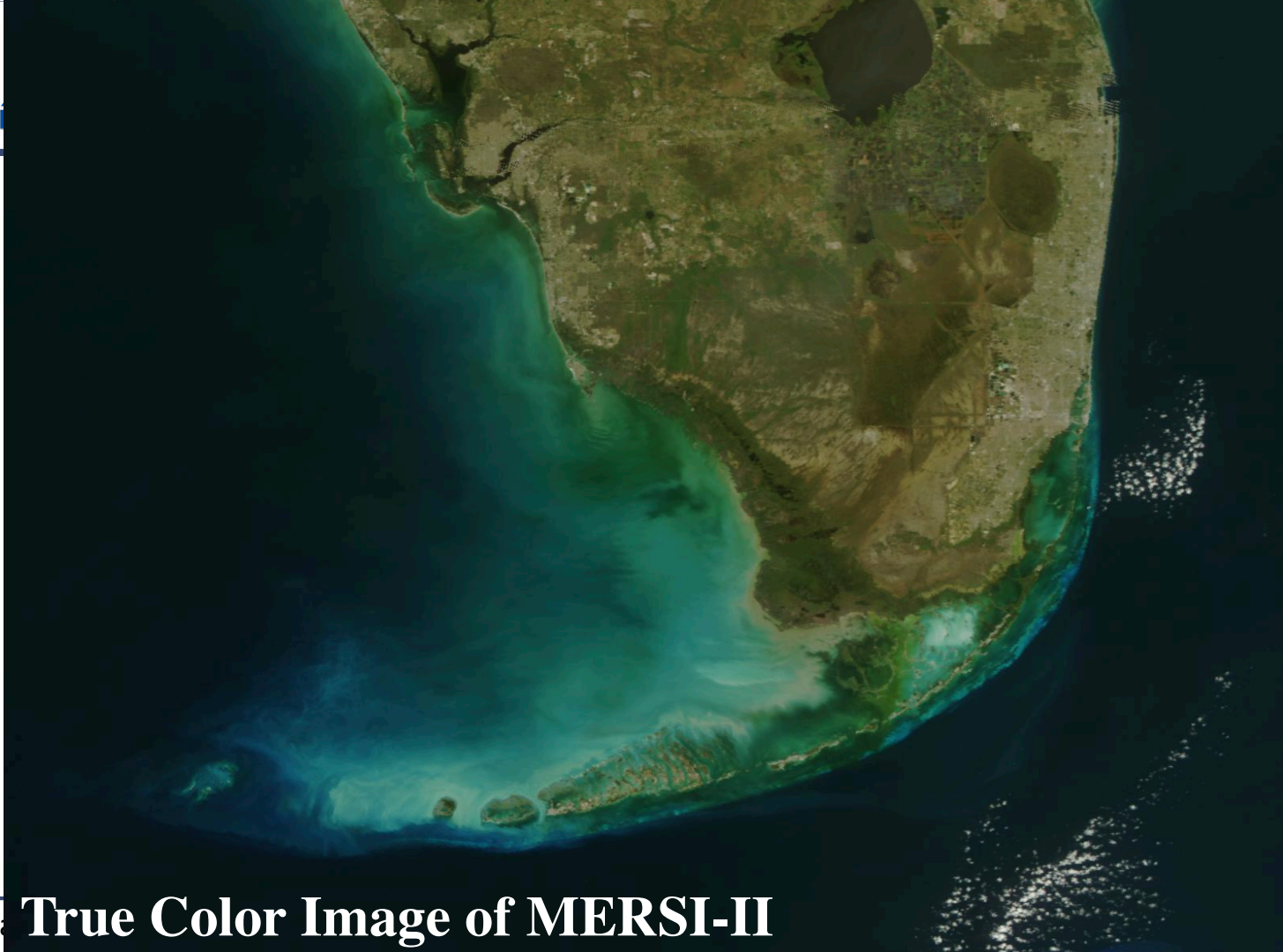
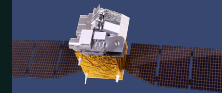




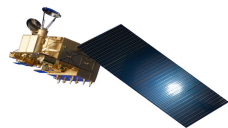
Global true color image(20180123)

~produced by operational system

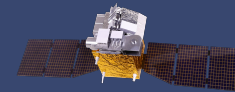




2018GSICS Sh True Color Image of MERSI-II



True Color Image of MERSI-II



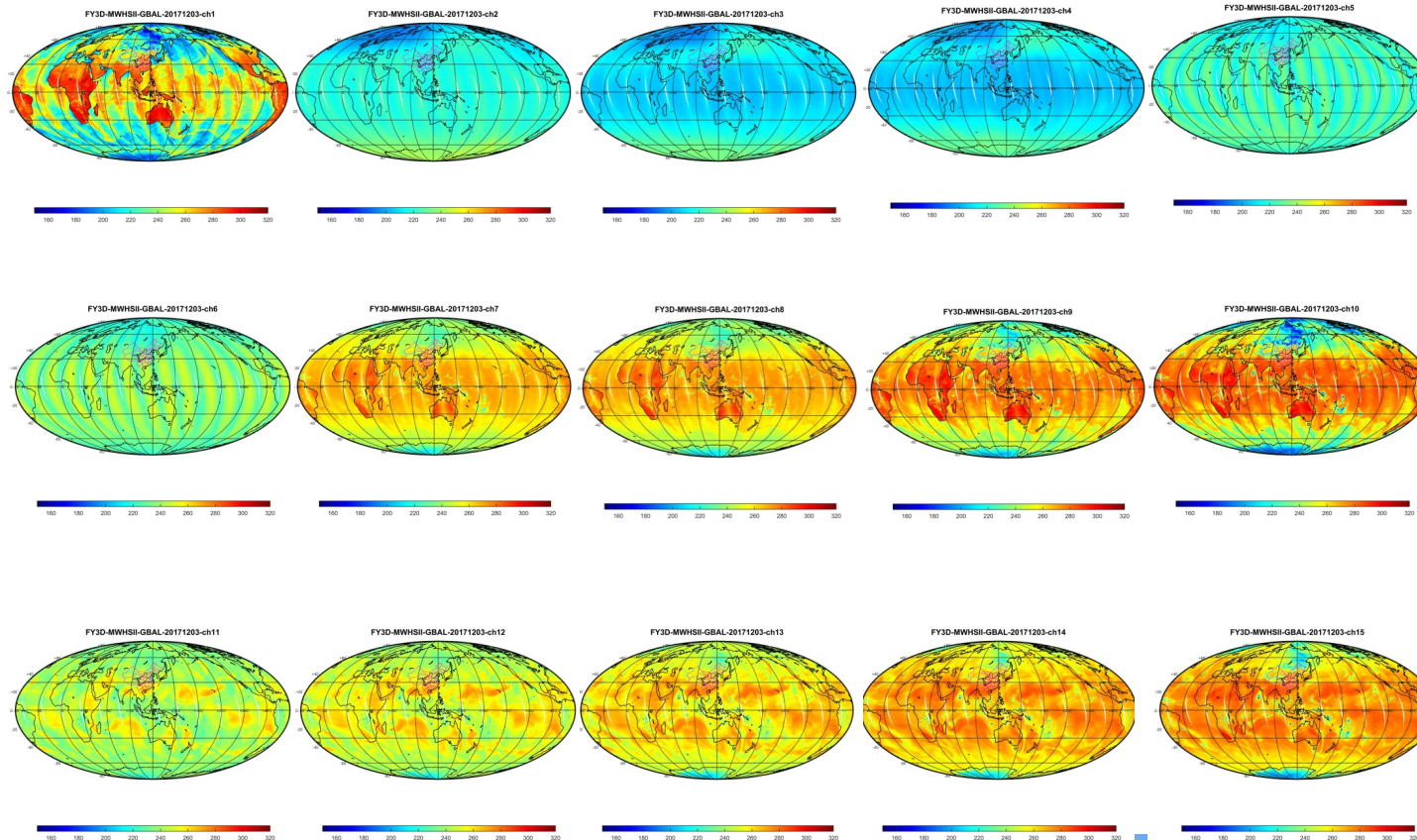
20 km
分辨率: 250M
891533



3.1 Microwave Instrument



~MWSII global bright temperature image

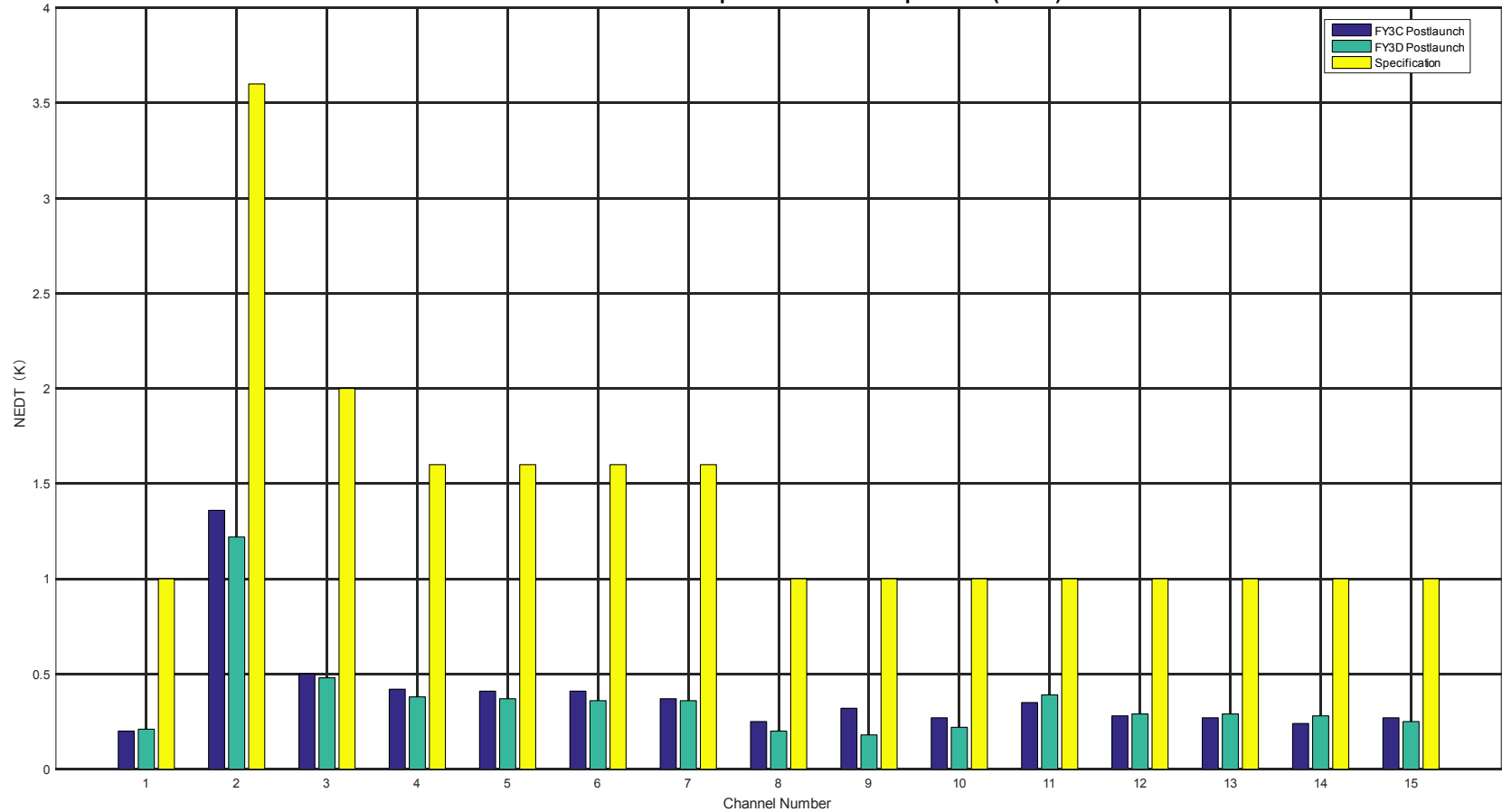




Sensitivity

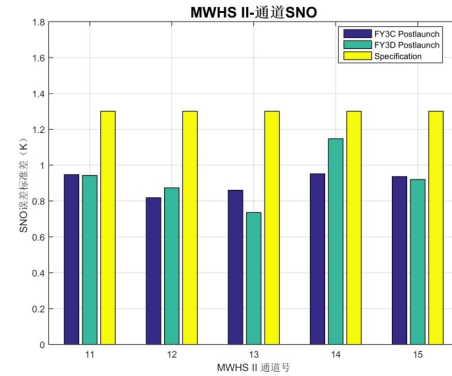
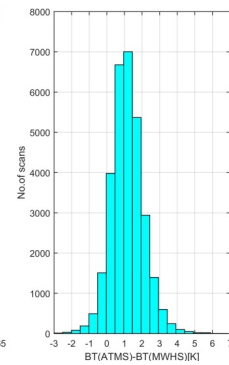
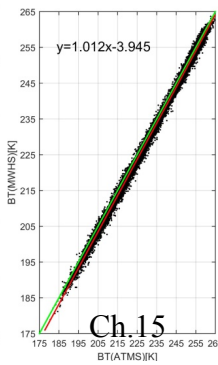
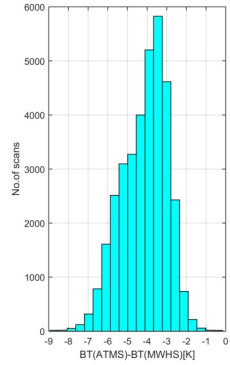
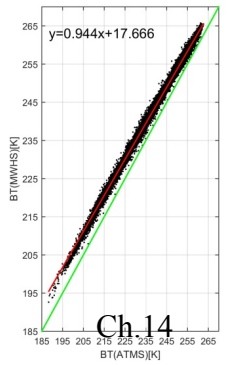
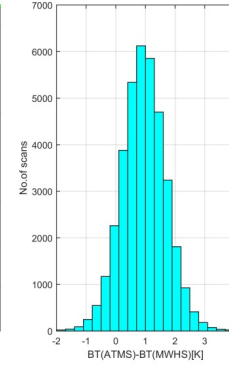
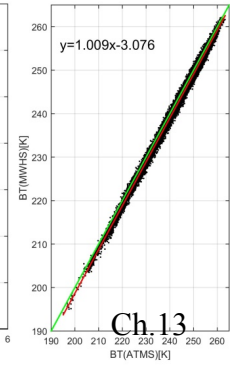
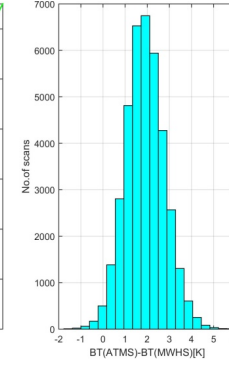
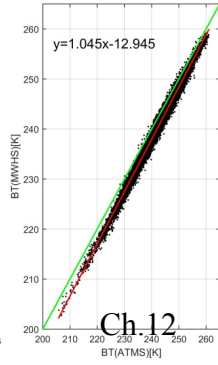
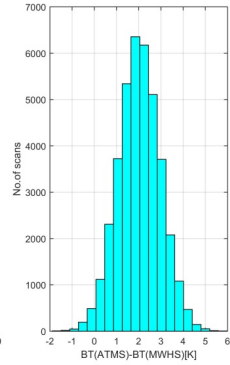
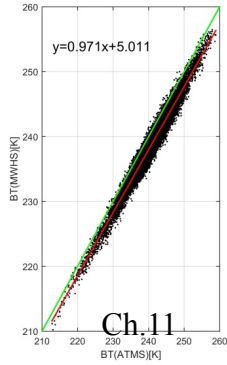


FY3D MWS II Noise Equivalent Delta Temperature (NEDT)





Cross Validation with ATMS

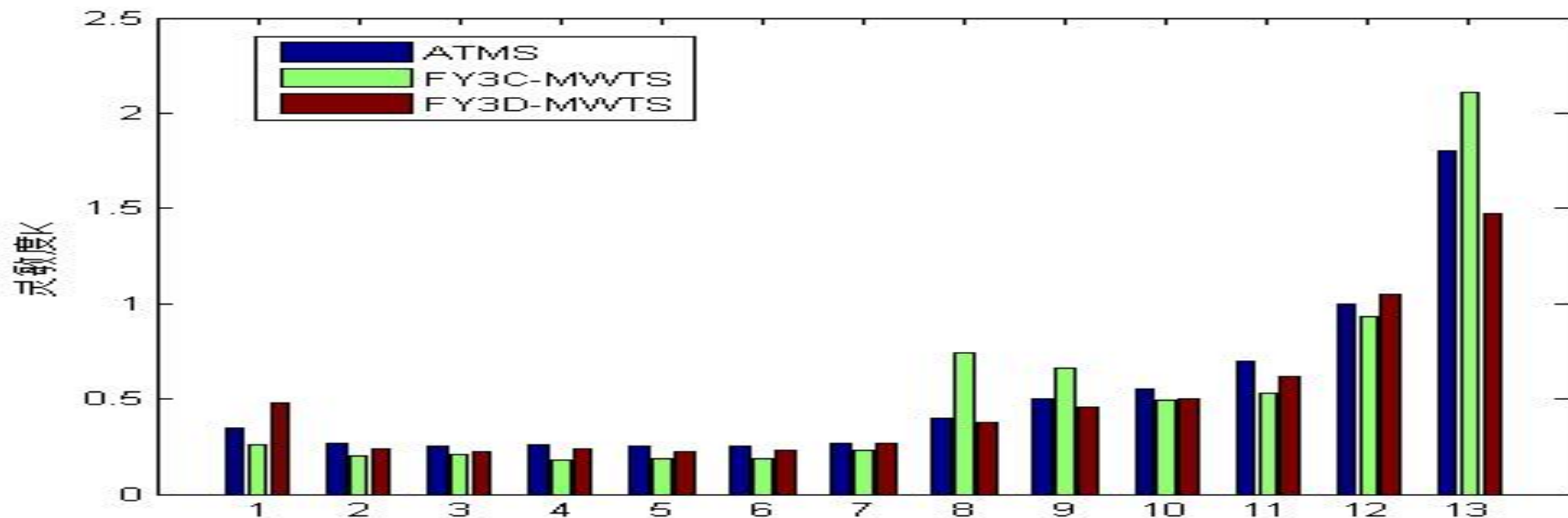


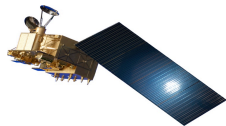


3.2 Microwave Instrument

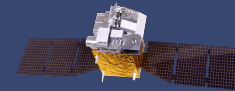


~MWTS Sensitivity





4 Summary



- 1. During the time since launch a team of subject matter experts from government, academia, and industry has been engaged in post launch FY-3D in-orbit check including platform functions and instruments calibration and validation activities.**
- 2. Up to now, the functional performance testing work of the satellite platform has been completed, all functions are normal, and the performance indicators meet the requirements.**
- 3. The preliminary round test of the function and performance of 10 remote sensing instruments has been completed. All instruments are functioning normally.**
- 4. FY-3D in-orbit testing will be completed in May 2018, and it is expected to release level 1 products for users through the Internet in June.**
- 5. Welcome global users to use FY-3D data.**



*Thank you
for your Attention!*