GRWG Web Meeting

Topic: Planning a GSICS/CEOS-WGCV Workshop on SI-traceable reference instruments

Development of Chinese SI-traceable reference instruments and retrospective recalibration of historical satellite data

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Joint Project

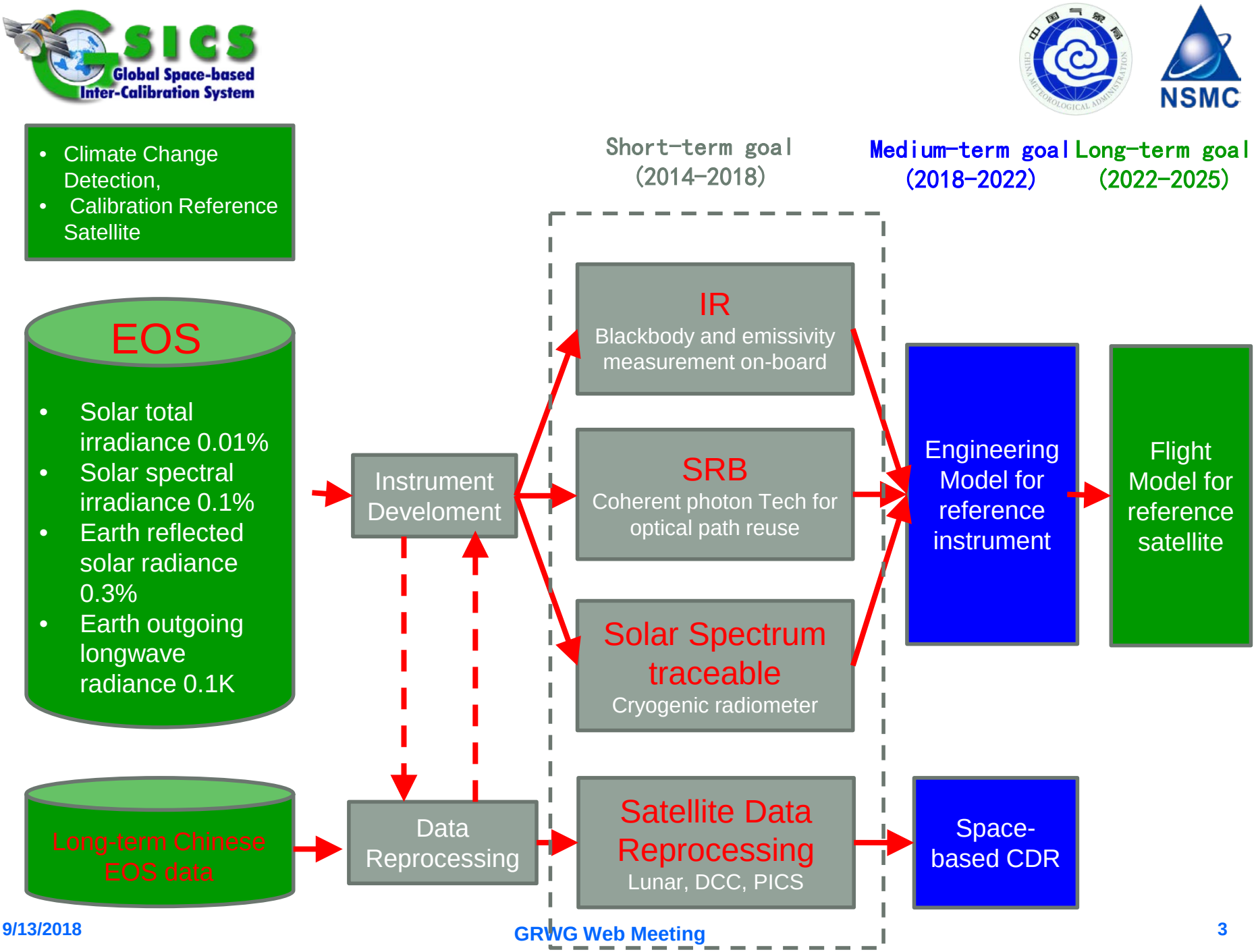
- National High Technology Research & Development Program of China (863 program) before 2018
- National Key R&D Program of China after 2018
- FY Polar Satellite Program

National Satellite Meteorological Center (NSMC), CMA

Academy of OPTO-Electronics (AOE), CAS

Shanghai Institute of Technical Physics (SITP), CAS

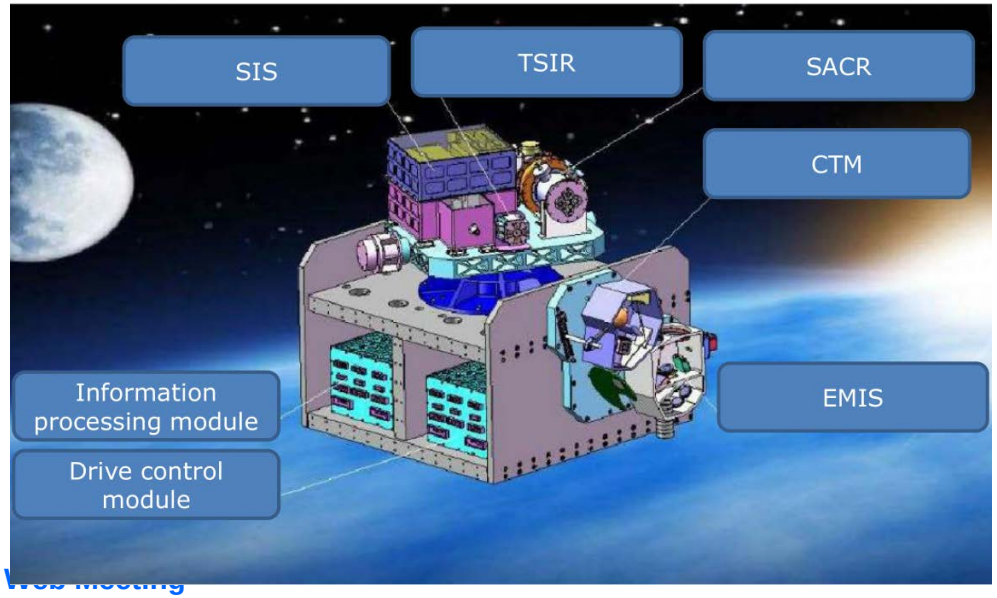
Anhui Institute of Optics and Fine Mechanics (AIOFM), CAS


Global Space-based Inter-Calibration System
NSMC
Climate Change Detection,
Calibration Reference Satellite
Short-term goal (2014-2018)
Medium-term goal (2018-2022)
Long-term goal (2022-2025)
EOS
Solar total irradiance 0.01%
Solar spectral irradiance 0.1%
Earth reflected solar radiance 0.3%
Earth outgoing longwave radiance 0.1K
Instrument Develoment
IR
Blackbody and emissivity measurement on-board
SRB
Coherent photon Tech for optical path reuse
Solar Spectrum traceable
Cryogenic radiometer
Engineering Model for reference instrument
Flight Model for reference satellite
Long-term Chinese EOS data
Data Reprocessing
Satellite Data Reprocessing
Lunar, DCC, PICS
Space-based CDR

1. Space-borne SI-traceable instruments in solar bands

This system consists of 7 components: Earth/moon imaging spectrometer (EMIS), Solar irradiance spectroradiometer (SIS), Total solar irradiance radiometer (TSIR), Space-borne absolute cryogenic radiometer (SACR), Comparison transfer module (CTM), information processing module, and drive control module.

- **Overall design technology of space-borne reference load in solar band**
- **Solar-earth-moon hyperspectral observation technique based on space cryogenic radiometer Correlation**
- **Photon self-calibrated solar absolute spectral irradiance observation technology Performance test and precision verification technology of the load principle prototype**

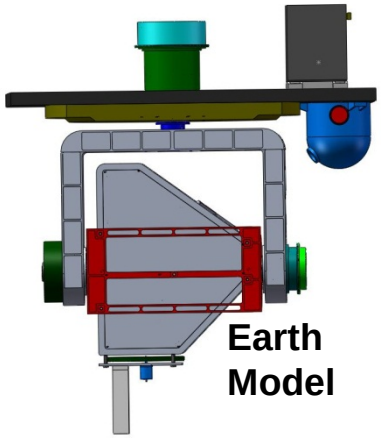


SI-traceable demo instrument development on FY-3RM rainfall mission (2020)

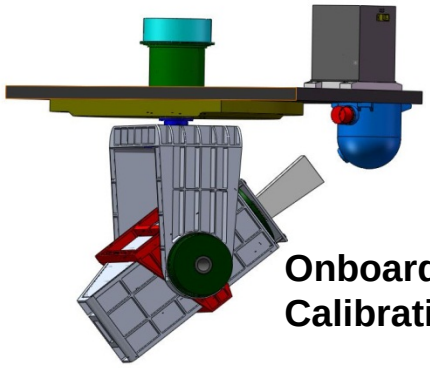
LeSIRB-Lunar and Earth Spectral Imager Radiometry Benchmark

Mission Goal: Demonstration of SI traceability instrument and experiment for inter-calibration between current Fengyun satellite optical imagers to improve calibration accuracy

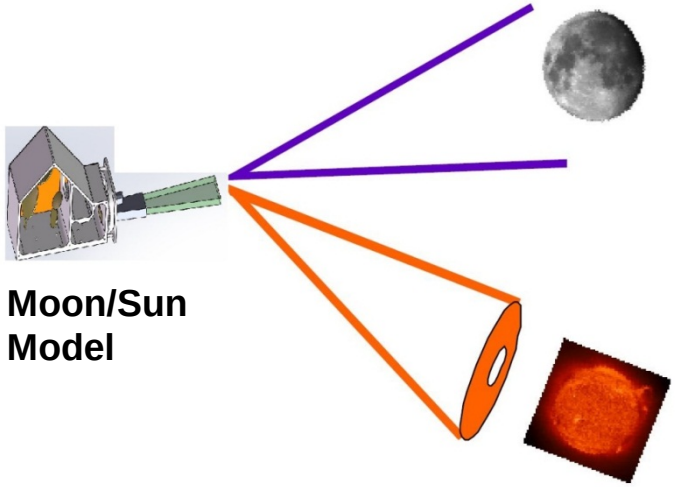
Parameter items	Specification	
Ground spatial resolution	250m	
Spectral resolution	4nm	
Spectral range	400nm~1060nm	
Ground Swath width	50Km	
S/N Ratio	>150	
Radiance Dynamic	Similar to MERSI-3	
MTF	>0.2@f/f_nyq=1.0	
Radiometric uncertainty	2%	
Spectral calibration	2nm	
Polarization sensitivity	<1%	
Observation Model	Earth/Lunar/Sun/Calibrator	



Earth Model



Onboard Calibration



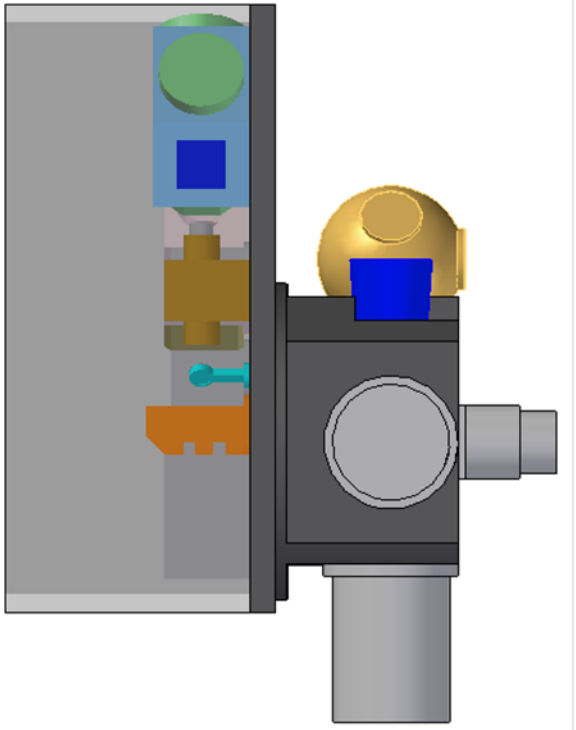
Moon/Sun Model

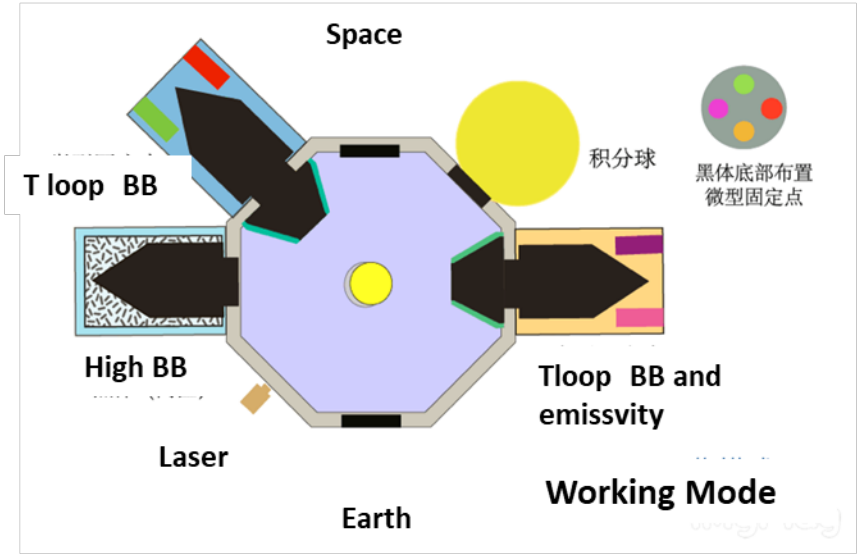
2. SI tracable IR Instrument

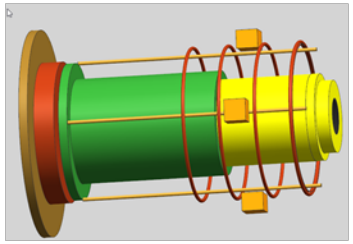
- Fourier interferometer
- IR telescope system
- Cooled MCT detector
- Absolute Radiance blackbody

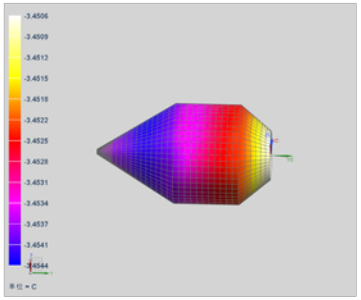
SI-traceable Blackbody:

- ITS-90 standard
- Standard Pt thermometers
- Thermal isolated Cavity
- Phase Change Cells
- Emissivity measured
- Heat pipe
- TEC controlled



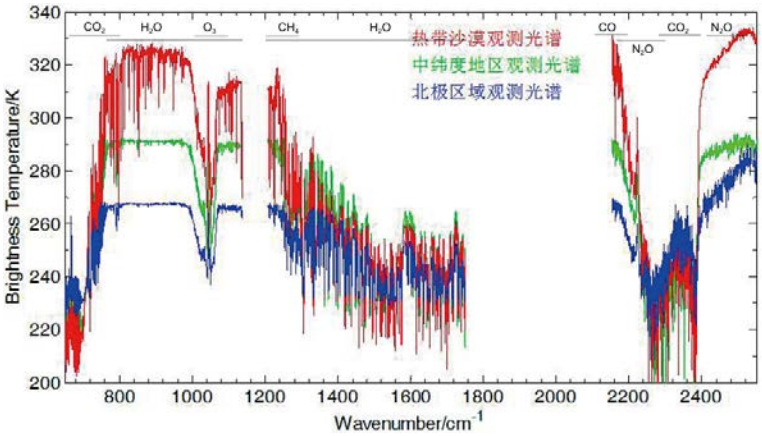






Uniformity 0.004K at 270K;
Uniformity 0.007K at 350K;

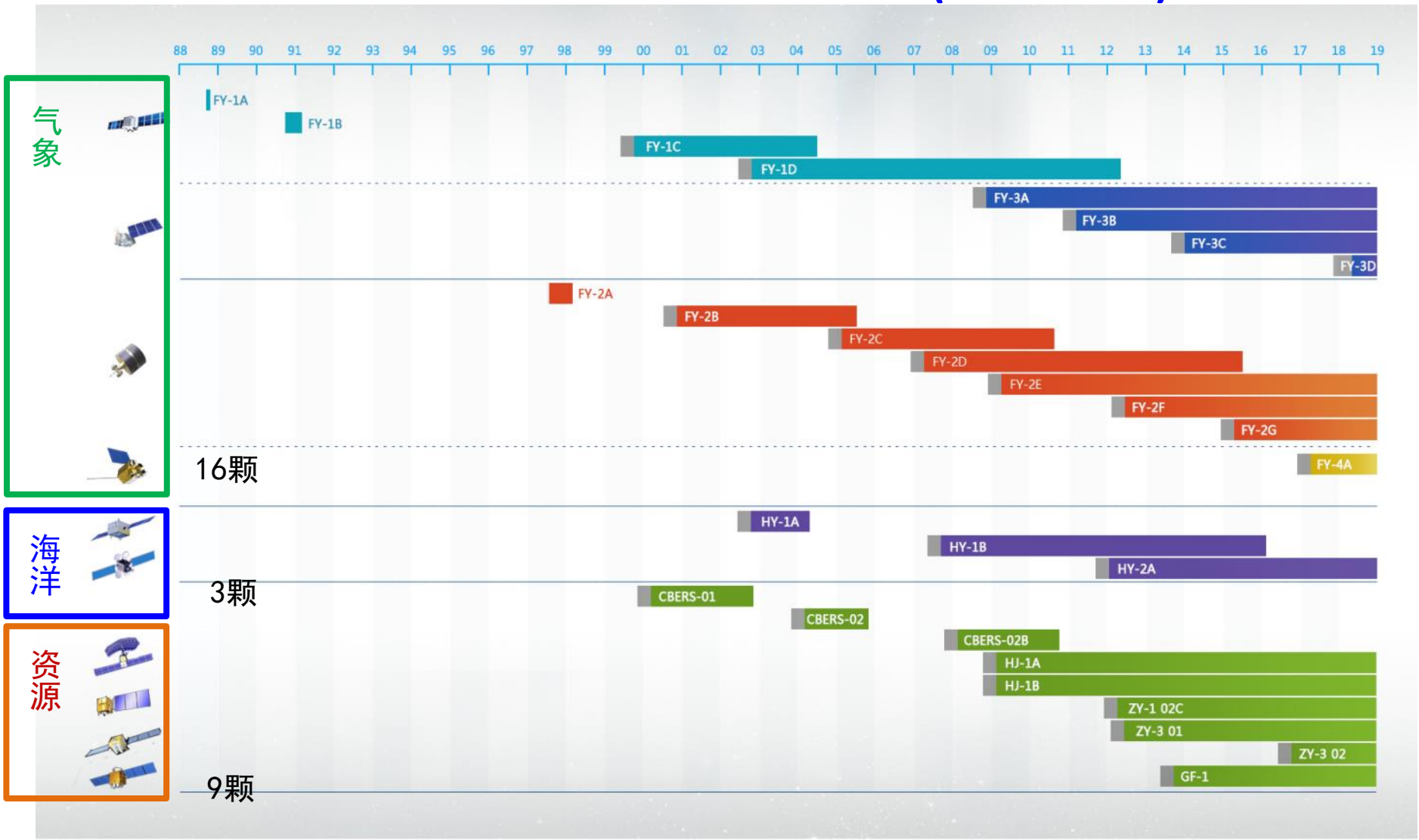
On-orbit FTS instruments



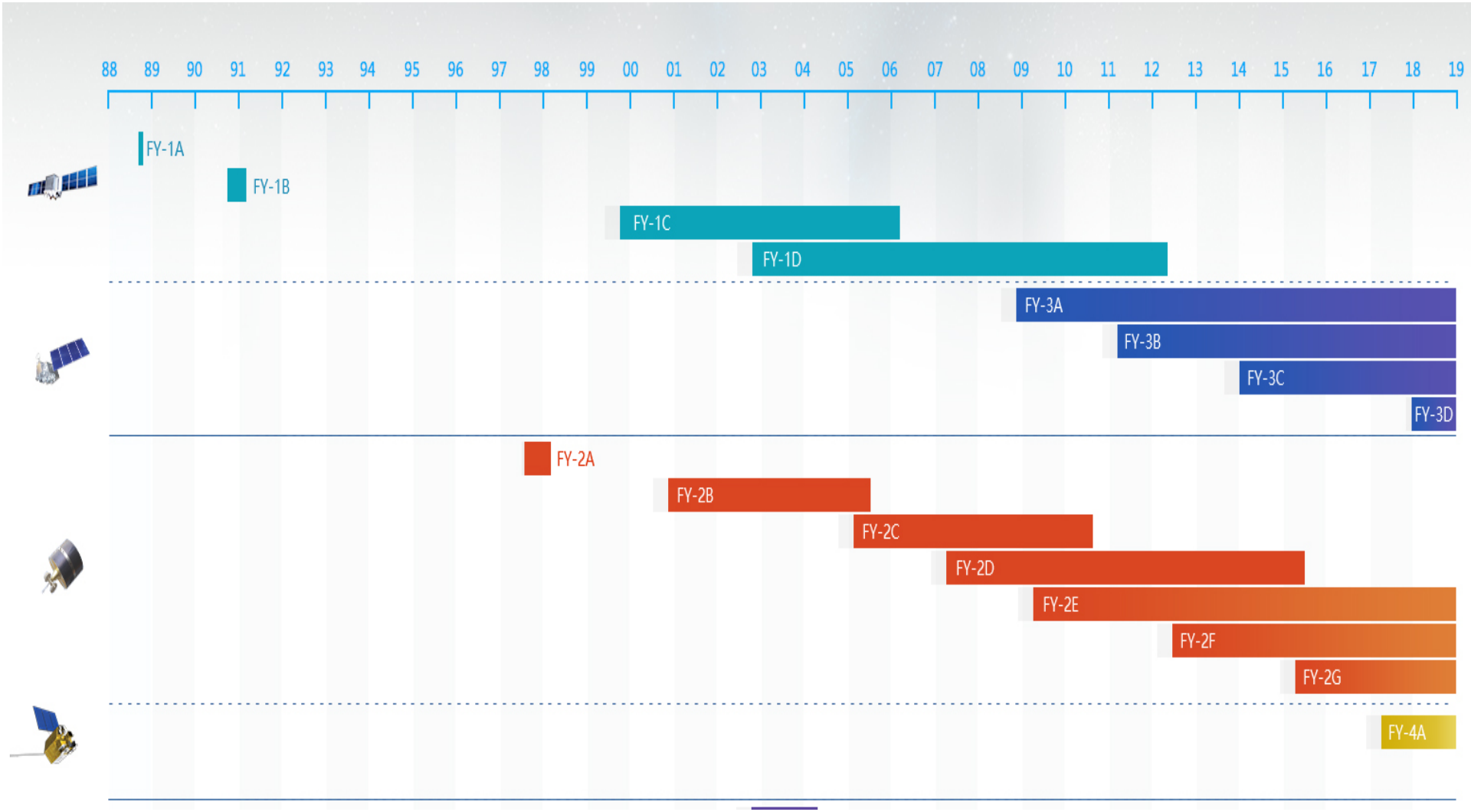
FY-3/HIRAS 0.2-0.7K

FY-4/GIIRS 0.5-1K

# of 30 years'
Chinese historical Satellite data (2018-2022)

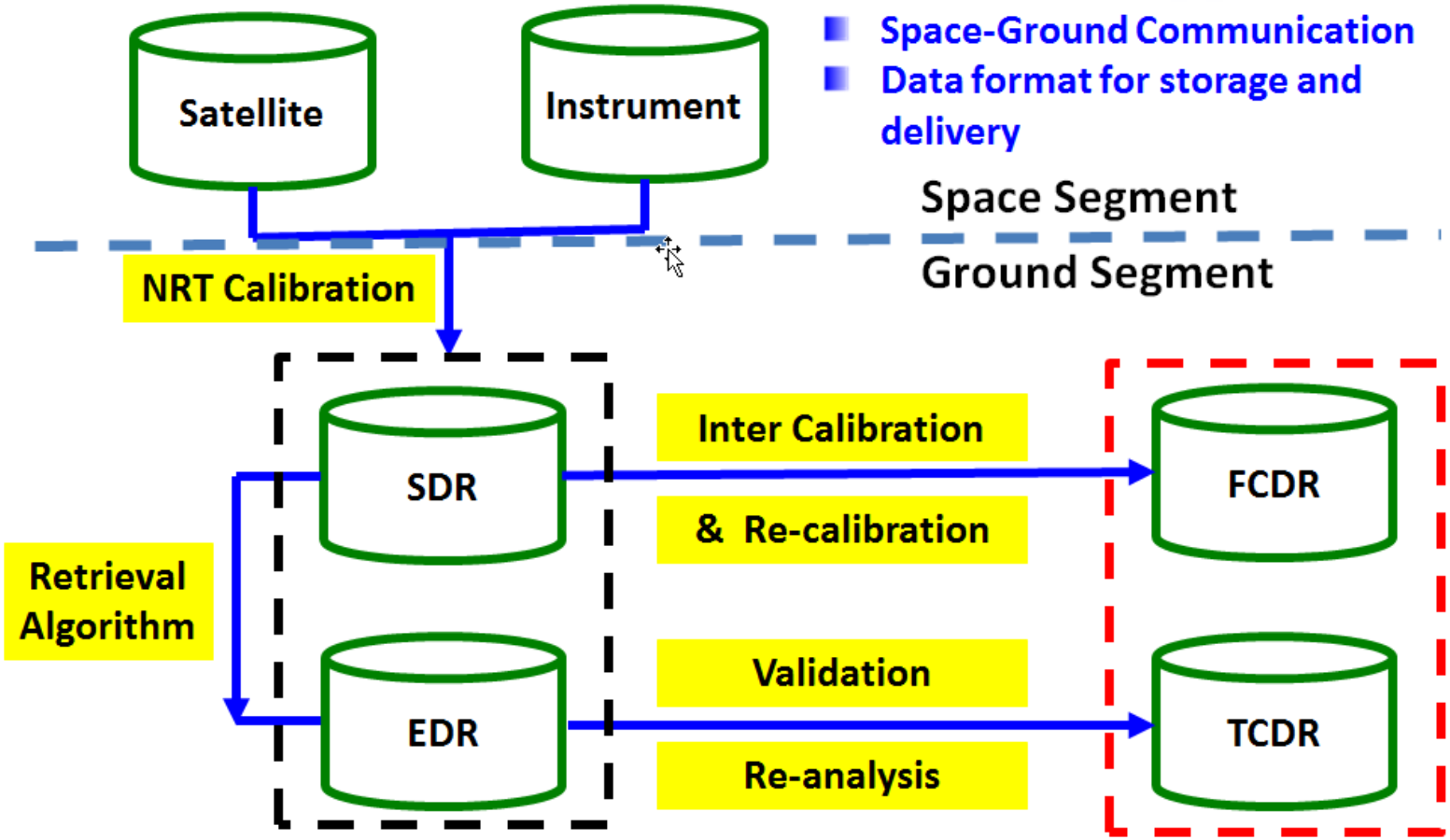


Fengyun Meteorological Satellites



Components for EO

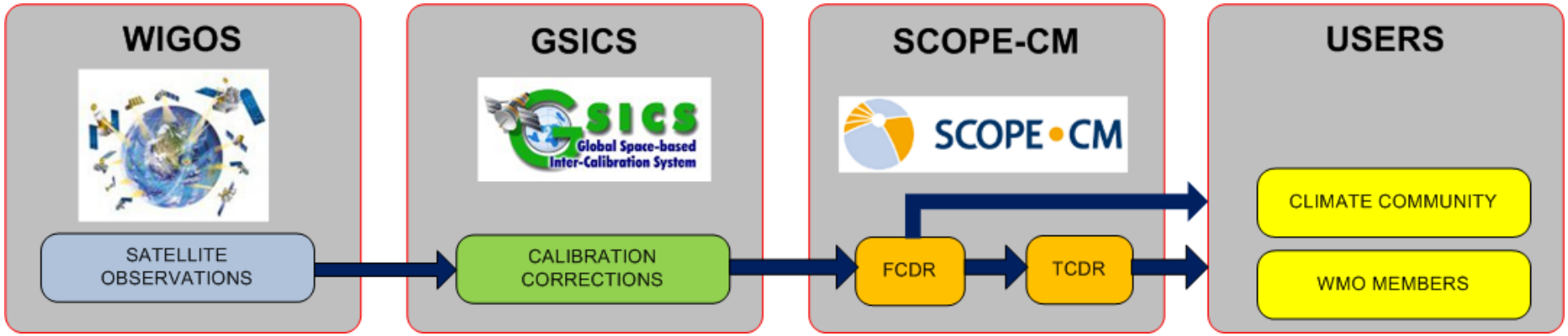
CGMS



- Space-Ground Communication
- Data format for storage and delivery

- Sensor-dependent, weather and environmental usage
- Sensor-dependent or sensor-independent, climate usage

The role of GSICS in Retrospective Recalibration



Second Joint GSICS/IVOS Lunar Calibration Workshop – China 2017

GSICS 2018 Annual Meeting

Summarization

- To improve the quality and accuracy of Chinese remote sensing satellites, Related projects in China have been initiated since 2015 and move into the second phase for the SI-traceable instruments development and retrospective recalibration of history satellite data
- Requirement and traceability chain of Space-based Benchmark , technical possibility, Risk/Cost are evaluated by the remote sensing scientists, space mission maker, instrument venders and data users.
- International SI-traceable hyperspectral reference instrument workshop may be very useful to push this concept into quicker implementation within WMO/GSICS and CEOS/WGCV members


Together
For Better
谢
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