



The Status and Development of China's greenhouse gas monitoring satellite missions

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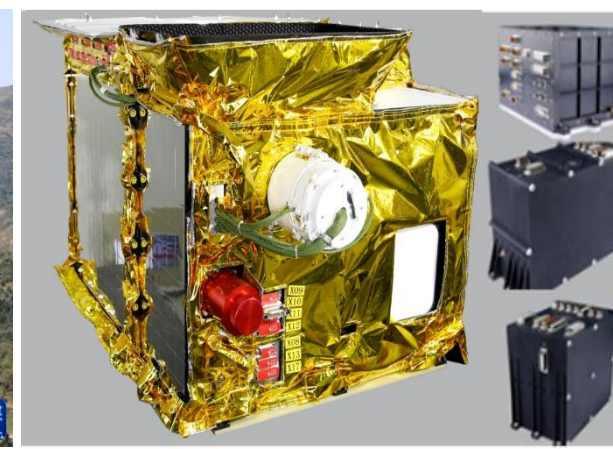
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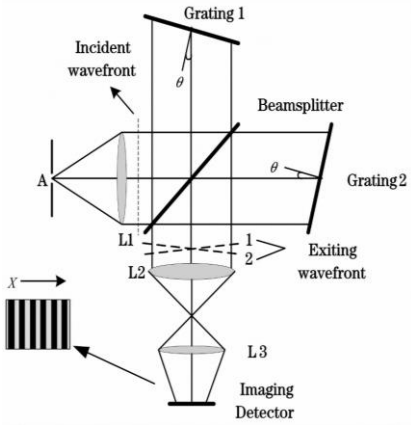
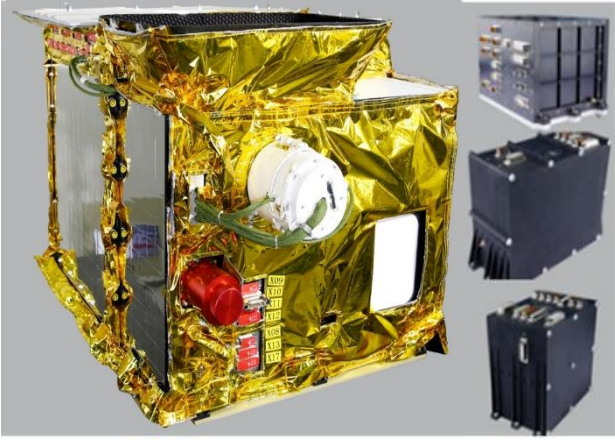
Status and Development of China's greenhouse gas monitoring satellite missions

Mission	GHG Gas	Instrummet tech	Feature
GF-5/GF-5 01	CO2, CH4	SHS, Imager	Multiple-tech
DQ-1	CO2	Lidar	Active
FY-3H	CO2, CH4	Grating spectrometer	100 km swath
DQ-2	CO2, CH4	Lidar, Grating spectrometer	Active & passive
TanSat-2	CO2, CH4	Grating spectrometer	3k swath & pollution



GF-5 satellite mission

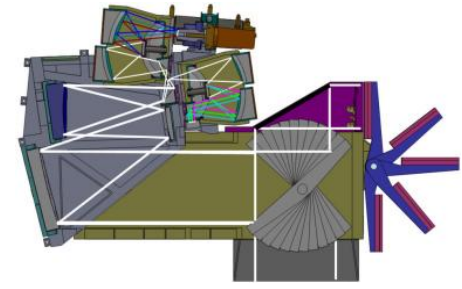
Greenhouse gas Monitoring Instruments (GMI-01/02)



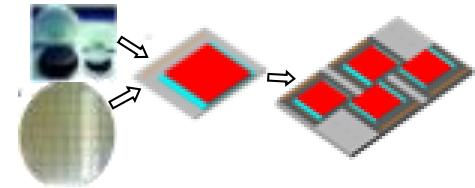
- Spatial Heterodyne Spectroscopy**
- No moving parts (Obtaining all optical difference path data simultaneously) ;
 - High spectral resolution (The structure is still compact);
 - Suitable for arbitrary spectra band ;
 - High throughput.

AHSI: Advanced HyperSpectral Imager

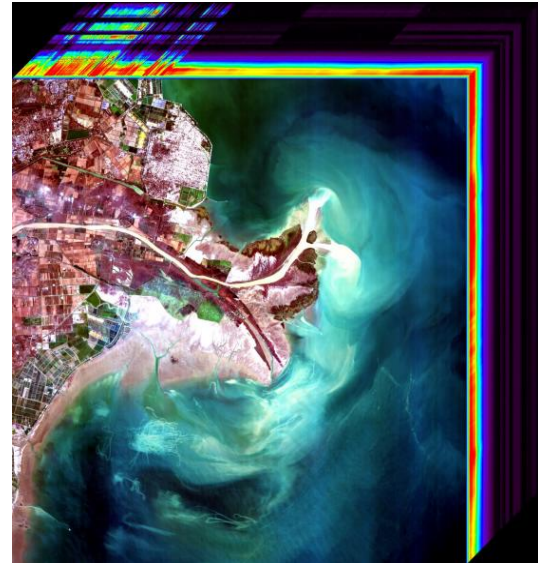
No.	Item	Specifications
1	Spectral range	0.4 μ m~2.5 μ m
2	Spatial resolution	30m
3	Swath	60km
4	Spectral resolution	VNIR: 5nm; SWIR: 10nm
5	Absolute radiometric calibration	<5%
6	Relative radiometric calibration	<3%
7	Spectral calibration	VNIR: 0.5nm; SWIR: 1nm
10	Quantization	12bits



TMA optics



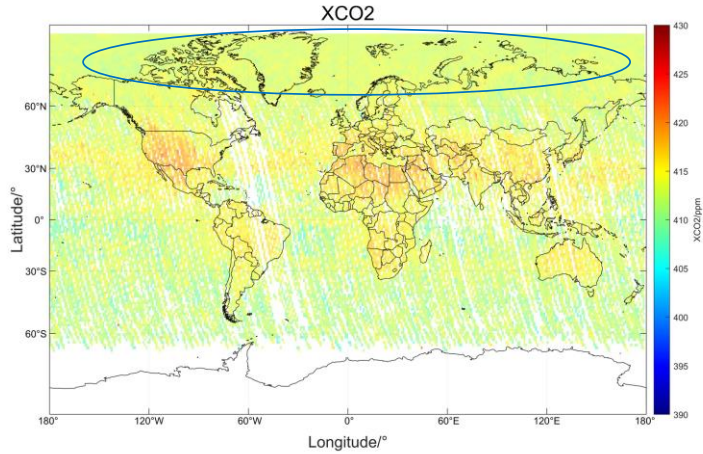
The SWIR sensor



DQ-1: Mission of ACDL, XCO₂ accuracy->1ppm

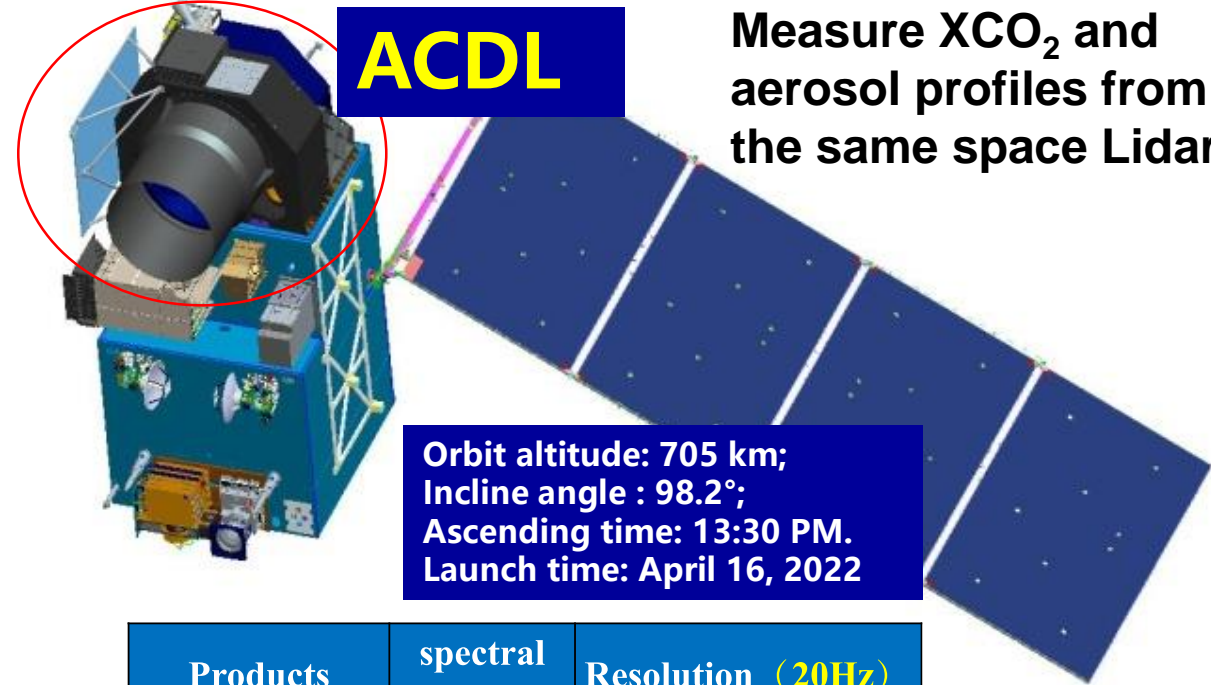
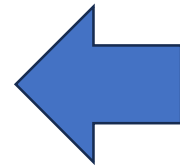
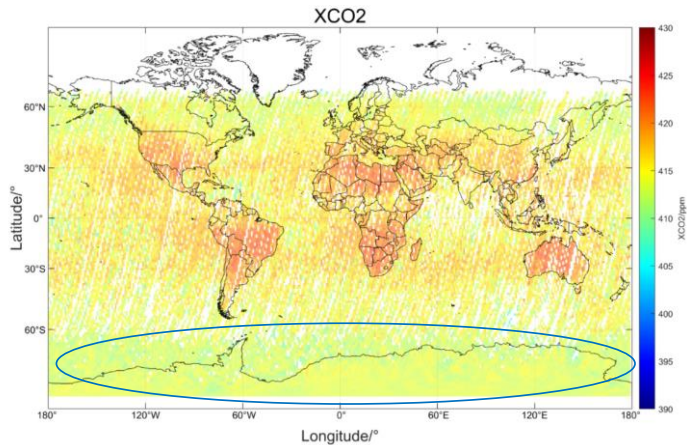
XCO₂ on daytime

July 2022 XCO₂



XCO₂ on nighttime

July 2022 XCO₂



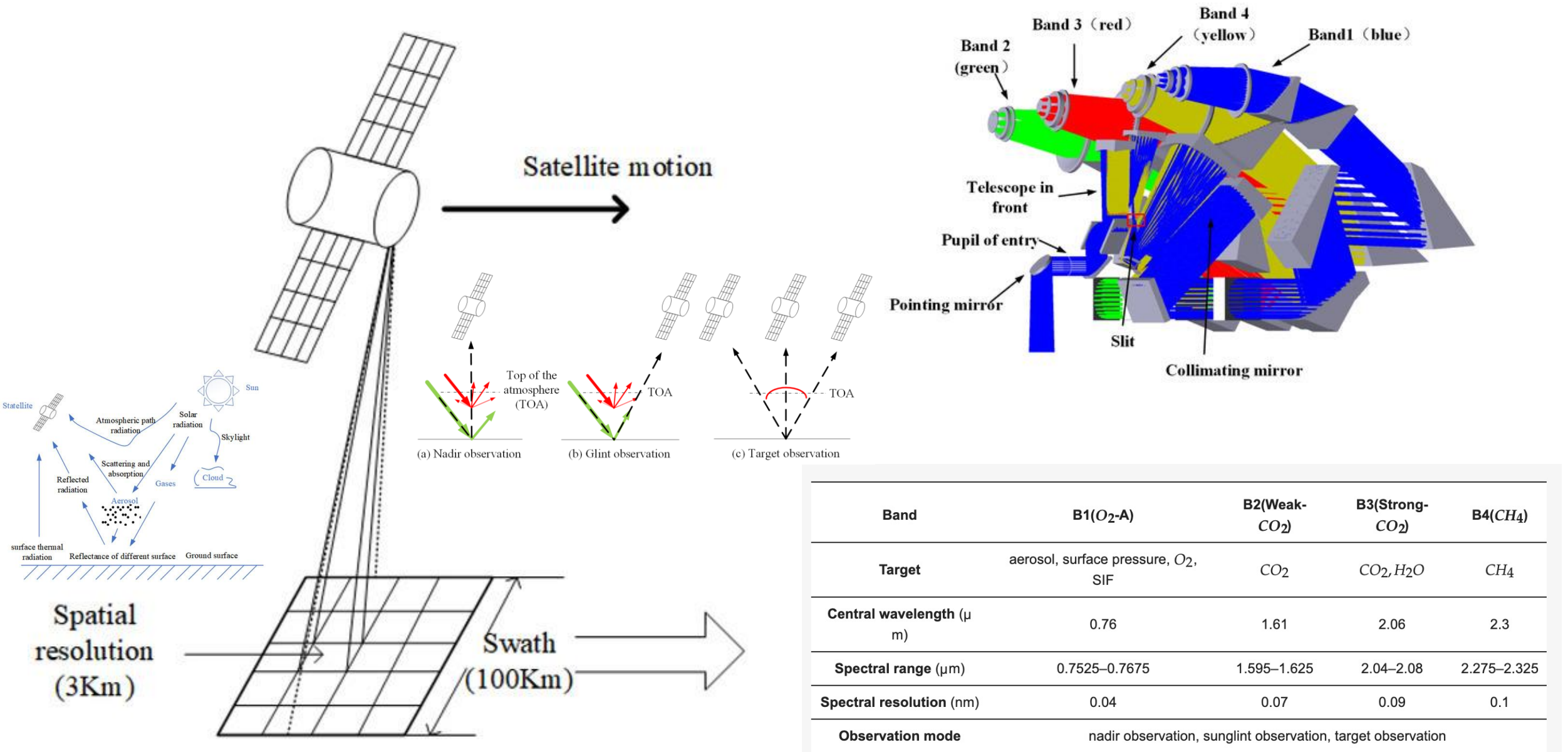
ACDL

Measure XCO₂ and aerosol profiles from the same space Lidar

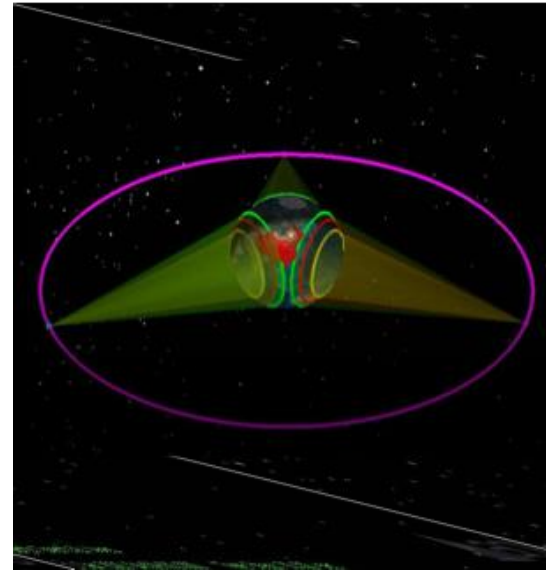
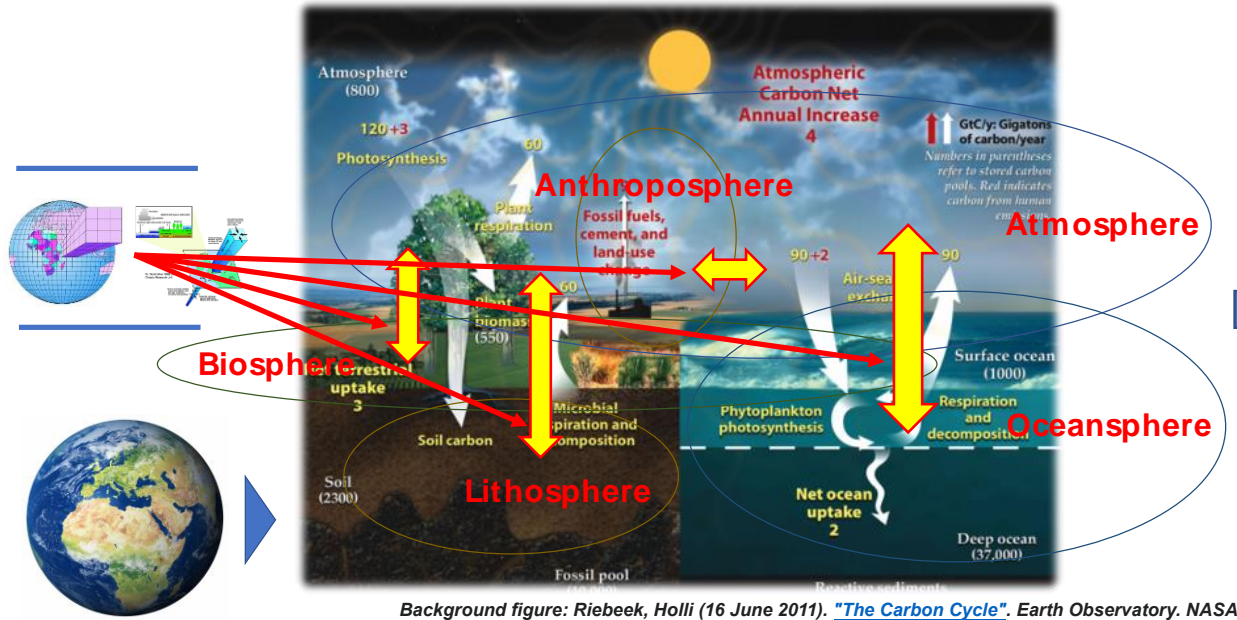
Orbit altitude: 705 km;
Incline angle : 98.2°;
Ascending time: 13:30 PM.
Launch time: April 16, 2022

Products	spectral range	Resolution (20Hz)
Aerosol extinction coefficient profile	532nm	Horizontal: 337.5m Vertical: 3m/24m
Aerosol mixing layer height	532nm 1064nm	Horizontal: 337.5m Vertical: 3m/24m
Genting height	532nm 1064nm	Horizontal: 337.5m Vertical: 3m/24m
CO ₂ Column concentration	1572nm	Horizontal: 337.5m

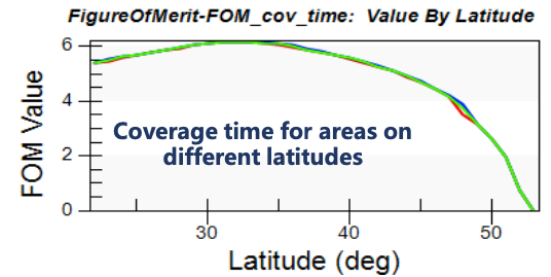
FY3H: Greenhouse-Gases Absorption Spectrometer-2



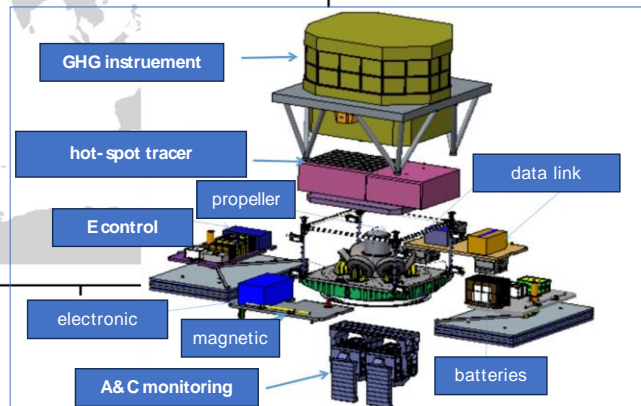
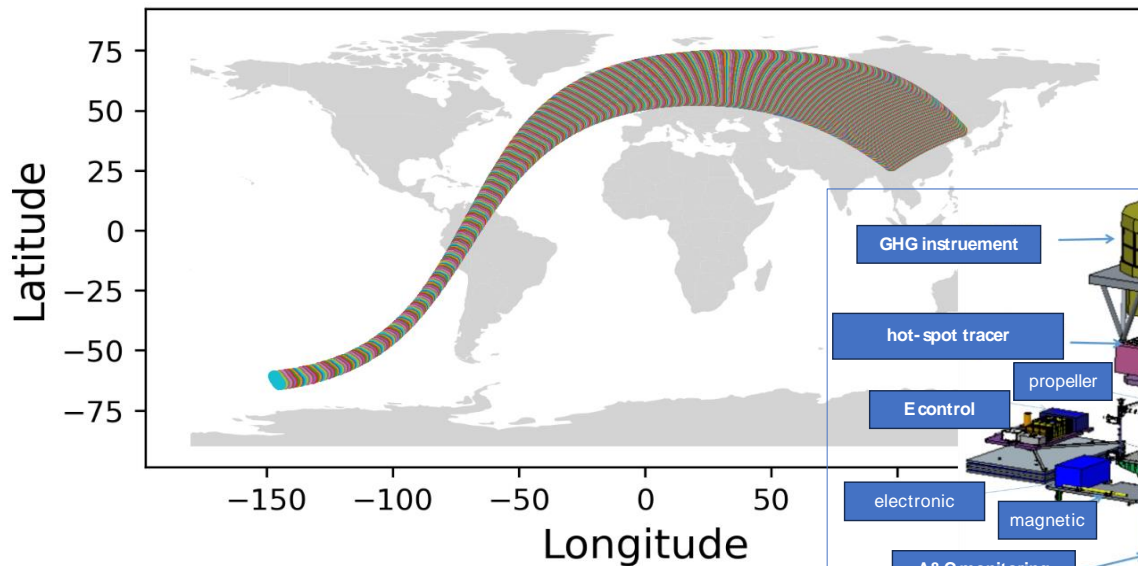
TanSat-2 mission total concept



MEO satellites option advantages in global coverage and revisit period



- **XCO₂: 1 ppm precision**
- **XCH₄: 8 ppb precision**



Bands	NO ₂ Band	O ₂ A Band	Weak CO ₂	Strong CO ₂
Geophysical P.	NO ₂	O ₂ , SIF	CO ₂ , CH ₄	CO ₂
Range /μm	0.4-0.49	0.747-0.773	1.590-1.675	1.990-2.095
Width /nm	90	26	85	105
SR /nm	0.6	0.12	0.3	0.35
SSI	3	3	3	3
TanSat SNR@Lref (photons/s/nm/cm ² /sr)	800@2.4E13	620@6.4E12	520@2.1E12	480@1.8E12
CO ₂ @Lref (photons/s/nm/cm ² /sr)	500@1.3E13	330@6.4E12	400@2.1E12	400@1.8E12

Outlooks

China has developed and will develop multiple satellite mission on GHG measurement, Those data will contribute a lot to global stocktakes, once the data quality is good enough,

- The data exchange and application coordinately internationally**
- welcome international scientist participate in more phase of China's future mission**
- validation programme will be interested to involve international scientist**

22 Dec. 2016



Thank you!

