

GeoXO Instruments

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GeoXO Progress

- Phase A efforts complete
 - Phase A Instrument and Spacecraft studies completed June 2023
 - Results informed implementation phase requirements
- Phase B-E Implementation starting
 - L3Harris selected to develop Imager in March 2023
 - Ball (now BAE) selected to develop Sounder in September 2023 and ACX May 2024
 - Source evaluation underway for remaining instruments and spacecraft, with contracts to be awarded by September 2024
- Planning Mission Definition Review in late 2024 and KDP-B in February 2025



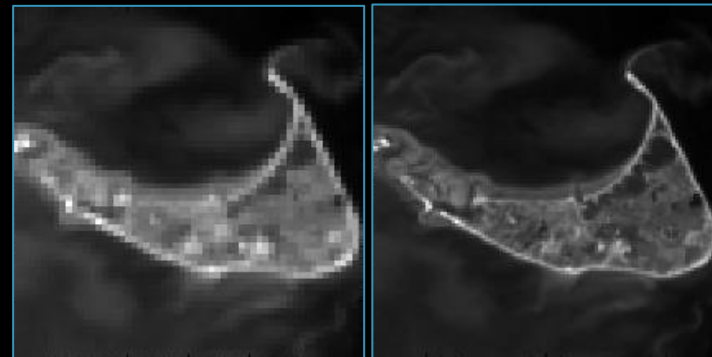
GOES-R ABI versus GeoXO Imager (GXI)

ABI CONFIGURATION			
Wavelength (μm)	Band	GSD	
VNIR	0.47	Band 1	1 km
	0.64	Band 2	0.5 km
	0.865	Band 3	1 km
	1.378	Band 4	2 km
	1.61	Band 5	1 km
	2.25	Band 6	2 km
MWIR	3.9	Band 7	2 km
	6.185	Band 8	2 km
	6.95	Band 9	2 km
	7.34	Band 10	2 km
	8.50	Band 11	2 km
LWIR	9.61	Band 12	2 km
	10.35	Band 13	2 km
	11.20	Band 14	2 km
	12.30	Band 15	2 km
	13.30	Band 16	2 km

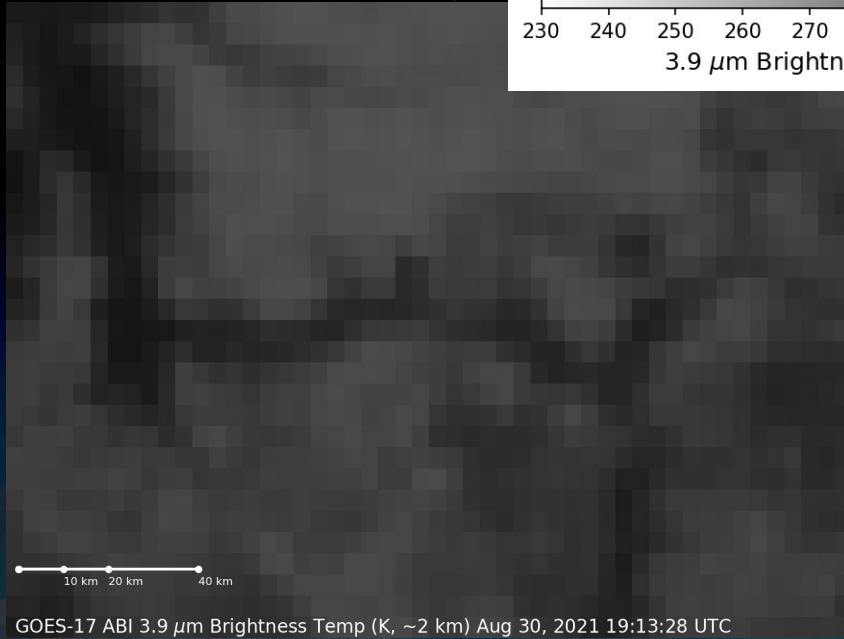
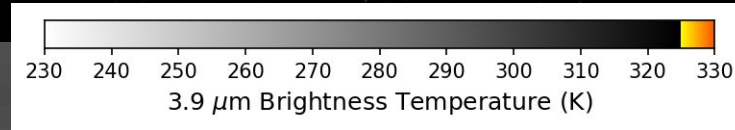


GXI CONFIGURATION			
Wavelength (μm)	Band	GSD	
VNIR	0.47	Band 1	0.5 km
	0.64	Band 2	0.25 km
	0.865	Band 3	0.5 km
	0.91	Band 4	1 km
	1.378	Band 5	2 km
	1.61	Band 6	1 km
MWIR	2.25	Band 7	1 km
	3.9	Band 8	1 km
	5.15	Band 9	1 km
	6.185	Band 10	2 km
	6.95	Band 11	1 km
	7.34	Band 12	2 km
LWIR	8.50	Band 13	2 km
	9.61	Band 14	2 km
	10.35	Band 15	1 km
	11.20	Band 16	2 km
	12.30	Band 17	2 km
	13.30	Band 18	2 km

Nantucket Island at ABI 0.5km vs GXI 0.25km Resolution



Improved resolution of the 3.9 μm channel



Observed GOES-17 ABI 3.9 μm channel from 8/30/2021 from the Meso sector over Idaho from 1913 – 2039 UTC



Simulated 3.9 μm 1 km resolution band from GXI for the same times as the ABI loop. It's based on VIIRS passes at 1913 (SNPP), 1959 (N20), and 2050 UTC (SNPP).

LMX Specs

GOES-East GLM 1/9/24

Severe weather sweeps across the Southeastern United States.

Parameter	Performance Requirement
Geographic coverage	84%
Ground sample distance (nadir)	8 km
Spectral Band	777.4 nm
Frame Rate	500 Hz
Data Latency	10 sec
SNR (daytime)	4
Navigation error	84 urad
Event detection	70%
False events	5%



**MODIS – 1 km
resolution**

GeoXO Ocean Color Sensor (OCX)



OCX – 0.3 km GSD

- OCX will provide hyperspectral observations from $.35-1.02\mu\text{m}$ over USA's coastal and great lakes regions multiple times per day.
- Will also be an excellent instrument also for land, clouds, and aerosol

GeoXO IR Hyperspectral Sounder (GXS)

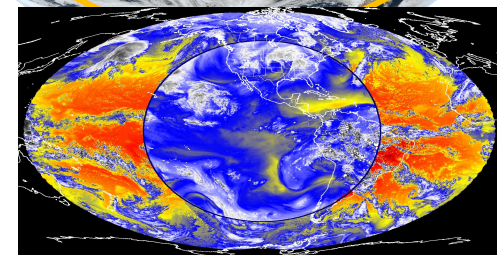
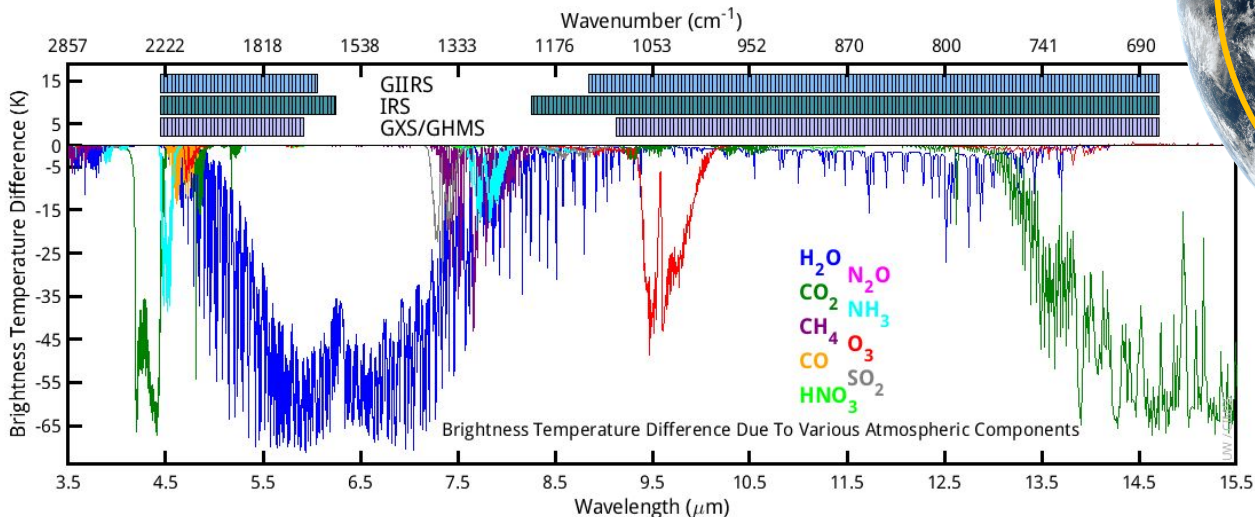
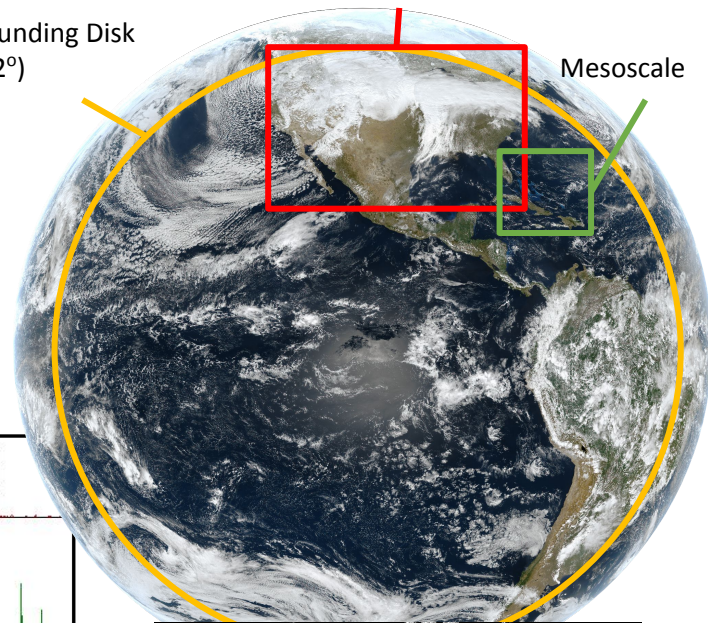


Superregion

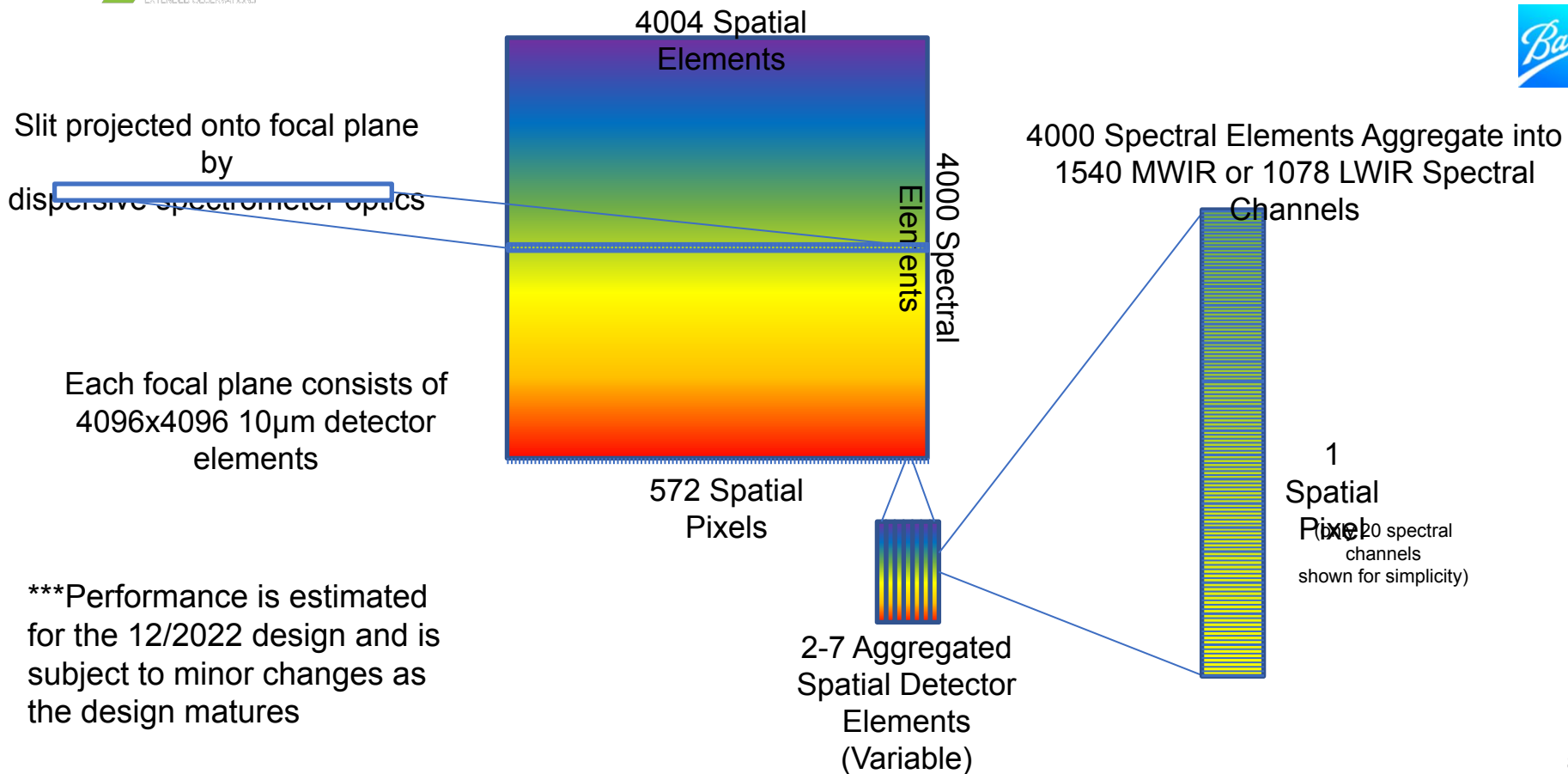
- GXS can scan the Sounding Disk < 30 minutes
 - Sounding Disk extends out to 62 deg of zenith angle.
- GXS can be commanded for custom task with regions
 - Mesoscale area is 1000 km x 1000 km
 - Super Regional area is 5000 km x 3000 km
- Pixel resolution requirement is 4 km at nadir
- Spectral resolution requirement is 0.625 cm^{-1}

Sounding Disk
(62°)

Mesoscale



GXS Coverage within the GXI coverage



***Performance is estimated for the 12/2022 design and is subject to minor changes as the design matures



ACX Driving Requirements



Parameters	ACX Performance and Operational Requirements Document (PORD)
Spatial resolution	5 x 5 km ² equivalent IFOV at nadir
Coverage area	A rectangle 8.0215° x 4.8129°, the equivalent at nadir of 5000 km E/W x 3000 km N/S, nominally centered at 30° N and 97° W
Revisit Period	60-minute revisit during daylight
Spectral characteristics	300 – 500 nm and 540 – 740 nm at 0.6 nm spectral resolution (FWHM) and 0.2 nm sampling
Dynamic Range	sufficient dynamic range for measurements between 0 and 110% albedo solar spectrum, without saturation
Polarization Sensitivity	< 5% at all viewing angles



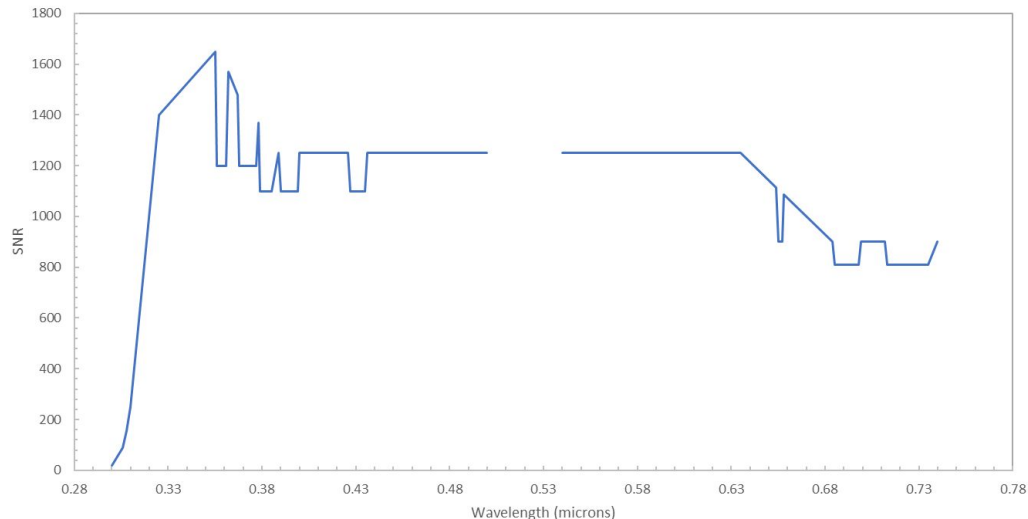
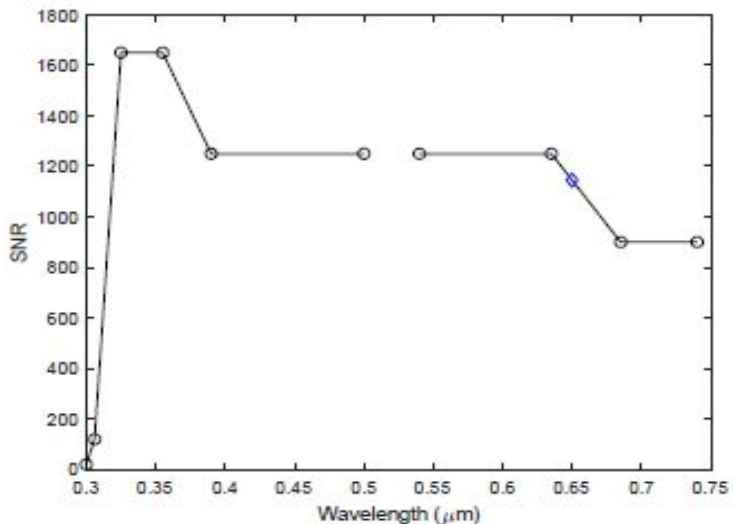
ACX SNR requirement – Performance and Operational Requirements Document (PORD)

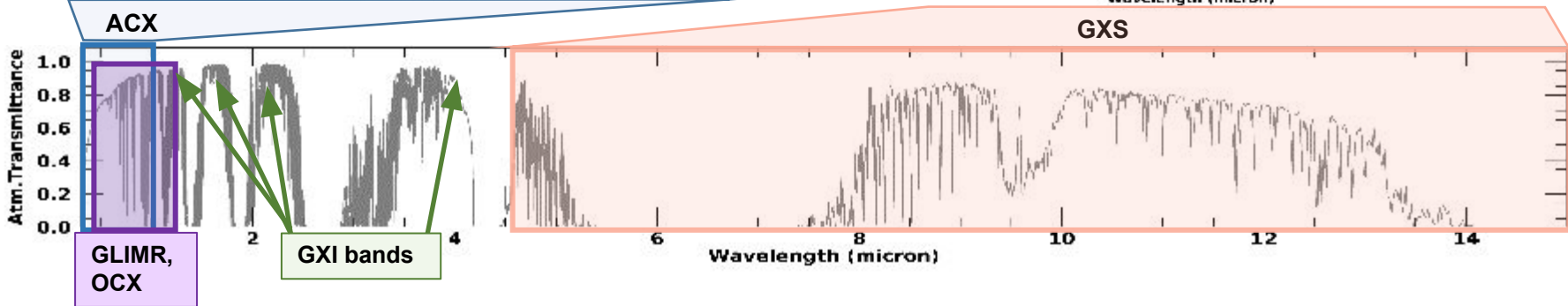
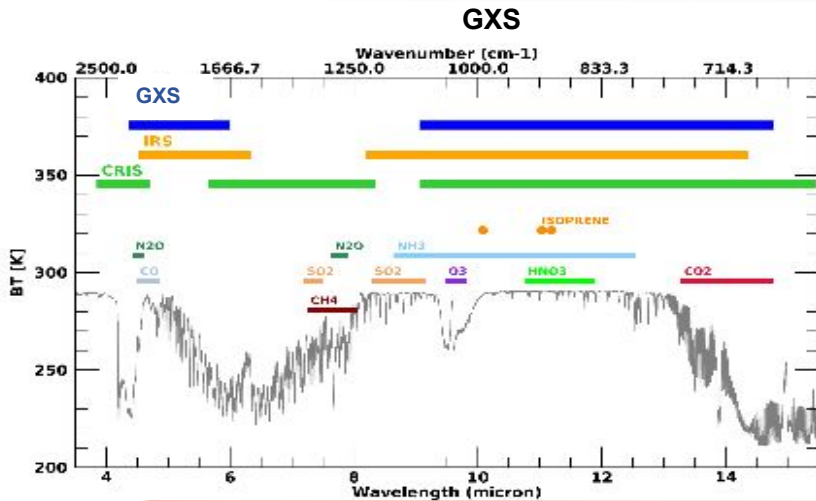
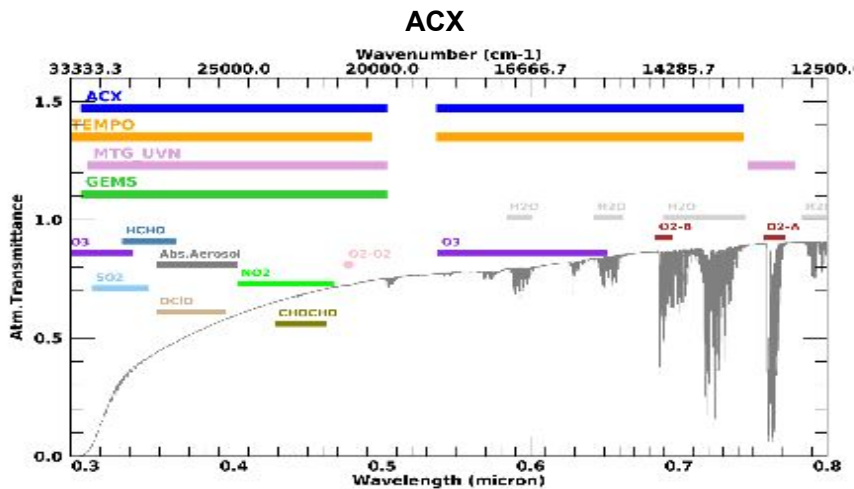


- Relief in the UV range and for deep features at absorption lines throughout
- ACX science team analysis fed into UV relaxation

Nominal Center Wavelength (um)	Minimum SNR Value
0.300	20
0.306	120
0.325	1650
0.355	1650

Nominal Center Wavelength (um)	Minimum PORD SNR Value
0.3	20
0.306	90
0.308	156
0.31	250
0.325	1400
0.355	1650







Thank You

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Extra Material



Sounding Full Disk Scan

Sounding Full Disk Scan 19.61 min + calibration + housekeeping = 29.02 mins
Scan Rate = 0.061 deg/s

Complete in 5 swaths

Scan width 3.48°

Total time < 30 mins

Execution Time = 29.02 mins

Includes:

Star Senses /Space Looks

Calibration

Housekeeping

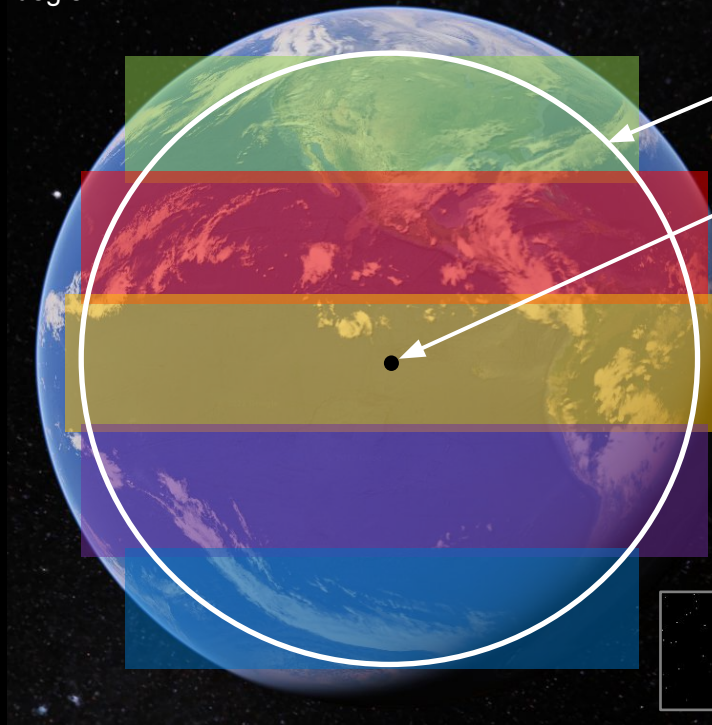
Swath #1
12.509°
Time 205.06 sec

Swath #2
15.228°
Time 249.64 sec

Swath #3
16.316°
Time 267.47 sec

Swath #4
15.228°
Time 249.64 sec

Swath #5
12.509°
Time 205.06 sec

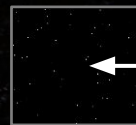


Sounding Disk 15.4°

Earth from GEO subtends 17.4°

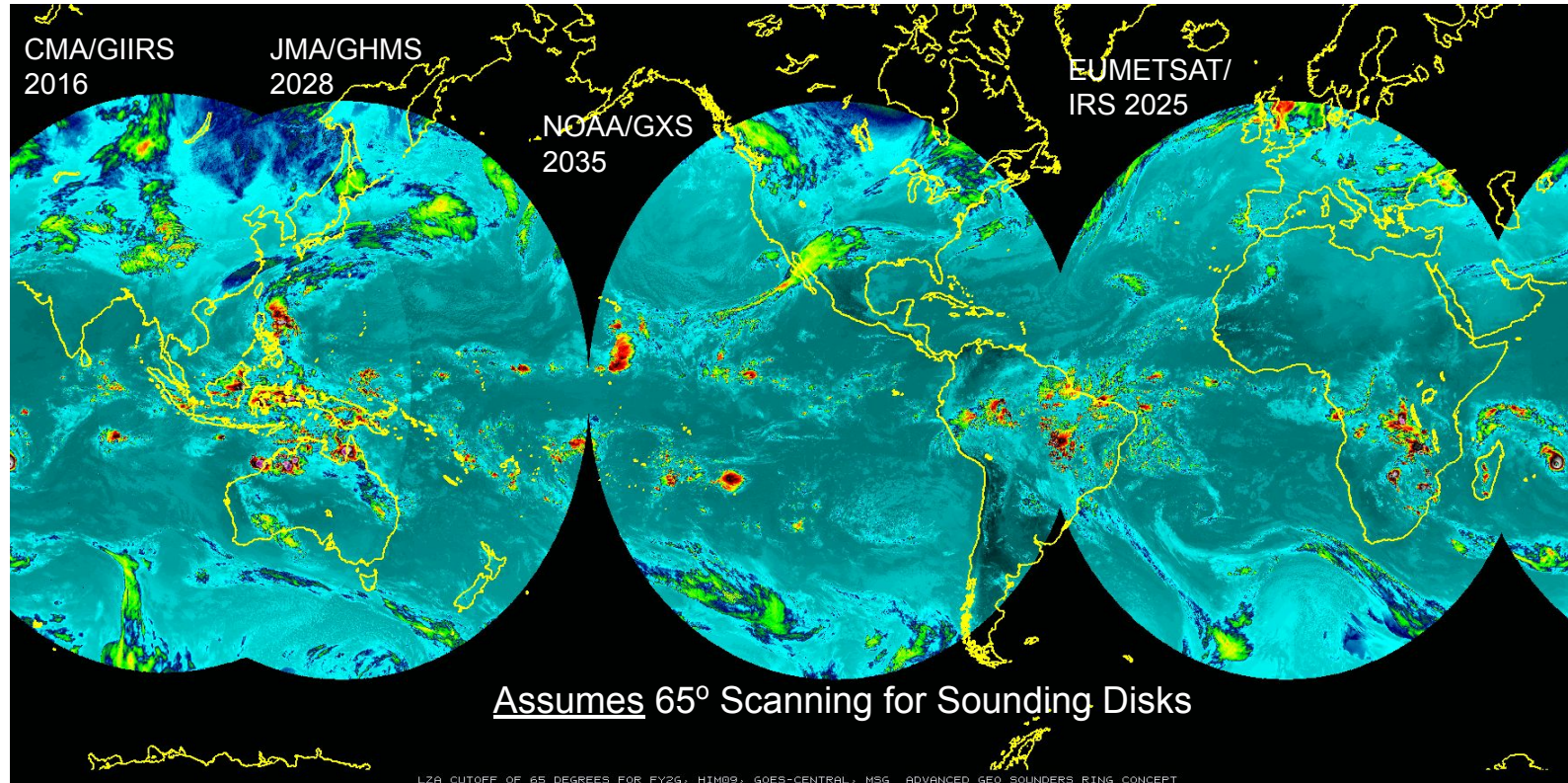
Cross Track FOV (swath width) 3.48°

FOR 22.0° Cone centered @ nadir (Not to Scale)



Field of Regard (FOR) includes off-Earth regions for moon, star, or dark sky calibration

Critical Component of the GEO-RING of IR Sounders



WMO WIGOS 2040 includes geostationary hyperspectral IR sounders