



GOES R

GOES-T/18 Transition to Operations

Matthew Seybold, GOES-R Data Operations Manager

Joseph Fiore, GOES-R User Services Coordinator



NOAA ~ NASA

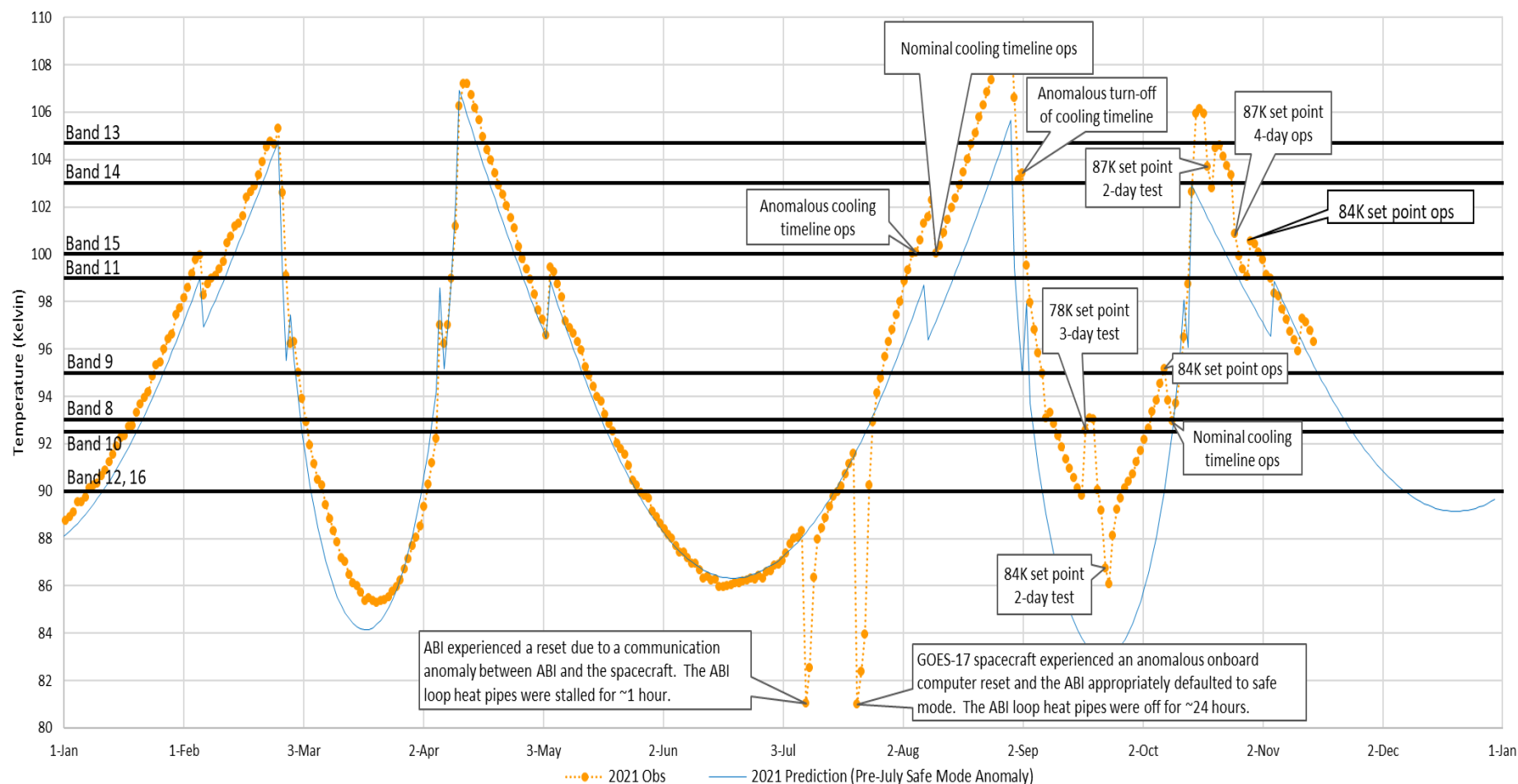




GOES-T T2O Schedule – Designed to Replace GOES-17 ABI Imagery As Soon As Possible

- GOES-17 ABI has been operating with a Loop Heat Pipe (LHP) Anomaly for its entire lifetime which results in degraded imagery during four warm periods of each year
- Recent anomalies have caused further challenges in regulating the ABI Focal Plane Module (FPM) temperatures, resulting in additional warming and image degradation
 - On July 9, 2021 (DOY 190), the GOES-17 ABI experienced a reset due to a communication anomaly between ABI and the spacecraft. The ABI loop heat pipes were stalled for ~1 hour.
 - On July 22-23, 2021 (DOY 203/204), the GOES-17 spacecraft experienced an anomalous onboard computer reset and the ABI appropriately defaulted to safe mode. The ABI loop heat pipes were off for ~24 hours.
 - The current FPM temperature trends are expected to persist indefinitely, effectively accelerating the expected rate of image degradation by ~2 years. An annual net increase of ~1 K per year is also still expected for coming years.
- Employment of multiple mitigations: Wider calendar use of cooling timeline, adjustment to FPM set point temperatures, supplementary operation of GOES-15, acceleration of GOES-T T2O

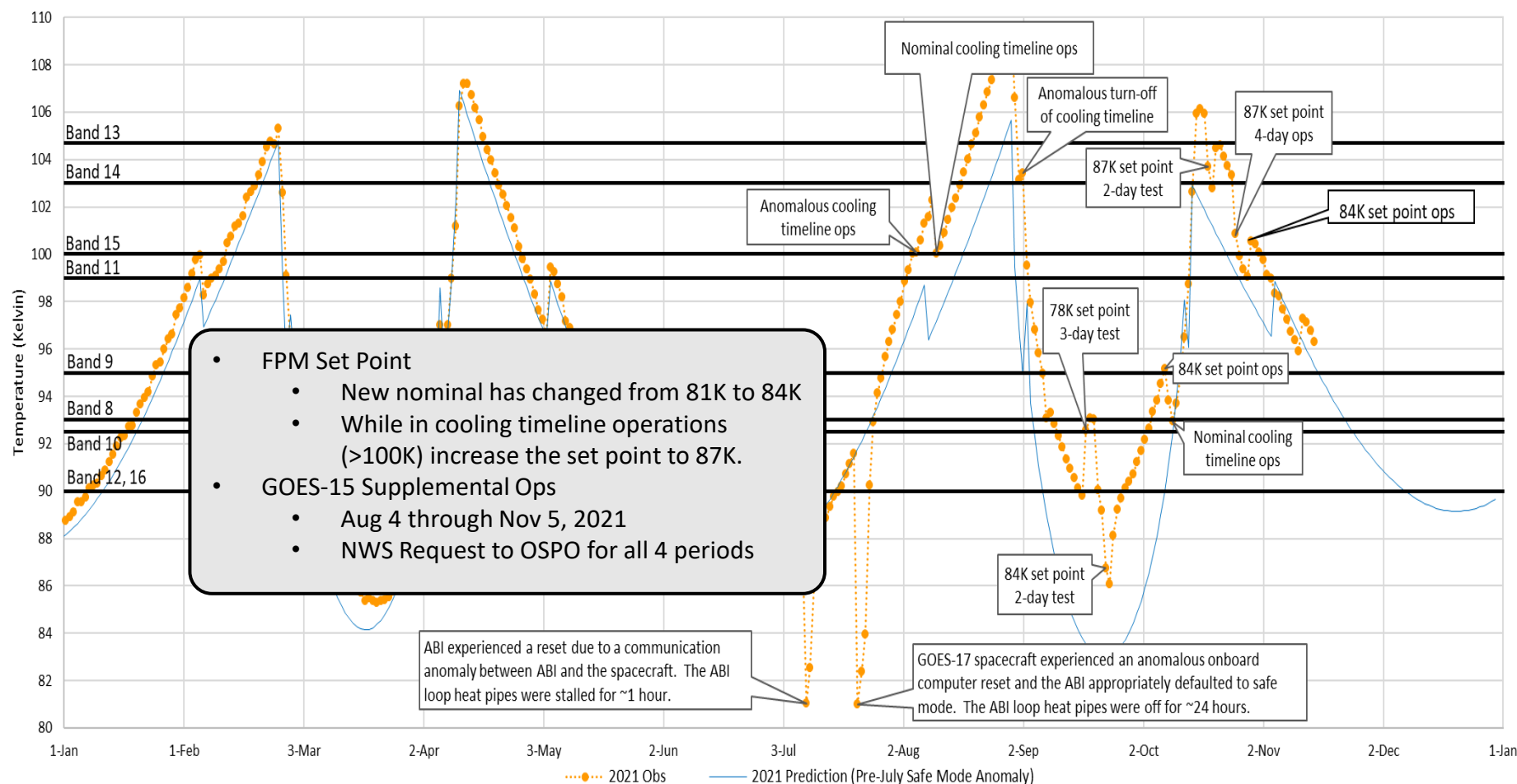
GOES-17 Daily Peak Longwave Infrared Focal Plane Module Temperatures



This plot shows daily maximum temperature of the ABI focal plane module. These maximums occur at night. The higher the temperature, the more saturated imagery becomes. Where the temperature rises to approach a black line for each band, marginal saturation may be observed in imagery. Where the temperature curve exceeds a black line for each band, the imagery may begin to saturate so much that it becomes unusable.



GOES-17 Daily Peak Longwave Infrared Focal Plane Module Temperatures



This plot shows daily maximum temperature of the ABI focal plane module. These maximums occur at night. The higher the temperature, the more saturated imagery becomes. Where the temperature rises to approach a black line for each band, marginal saturation may be observed in imagery. Where the temperature curve exceeds a black line for each band, the imagery may begin to saturate so much that it becomes unusable.



GOES-West Transition Plan - Swap of GOES-17/18

- Transition plan swaps GOES-17 with GOES-18 as the operational GOES-West satellite
 - Assumes successful launch and checkout of GOES-T/18
- Incorporates early drift of GOES-18 to the West operational longitude
 - Allows for early operational use of GOES-18 ABI after Beta maturity is achieved
 - Transition plan incorporates RF conflict mitigation between GOES-17/18 X-band and T&C uplinks/downlinks
 - Users do not need to re-point antennas
- GOES-18 will be drifted to 136.8W to complete instrument PLT activities
 - 0.4 deg offset from GOES-17 allows X-band RDL downlink from both G17/G18
 - 0.2 deg offset from 137.0W meets ground product generation requirements
 - Both GOES-17 and GOES-18 images will be re-mapped to 137.0W
- GOES-18 ABI data available to support August GOES-17 ABI warm period
 - GOES-18 ABI data available via Cloud interface and interleaving with GOES-17 non-ABI product data
- After operational transition, GOES-18 is nudged over to 137.2W
- GOES-17 drifted to 105W and placed in on-orbit storage



GOES-West Transition Plan - Swap of GOES-17/18

Based on 3/1/22 Launch Date

Date (Based on 3/1/22 Launch)	GOES-17		GOES-T/18	
	Location	Activity	Location	Activity
3/1 – 3/23	137.2°W	GOES-West Operations		Launch and Orbit Raising
3/24 – 5/15			89.5°W	GOES-18 PLT Part 1 <ul style="list-style-type: none">Instrument Outgassing, Spacecraft PLTFirst ABI Image (Vis & IR) @ 89.5W
5/16 – 6/6			<i>Drift to 136.8W</i>	GOES-18 Drift from 89.5W to 136.8W <ul style="list-style-type: none">Drift Readiness Review held on 5/12PLT activities paused; No GOES-18 product data
6/7			136.8°W	GOES-18 PLT Part 2 begins
7/25			136.8°W	GOES-18 ABI reaches Beta maturity <ul style="list-style-type: none">GOES-18 ABI 'supplemental' data via Cloud
8/1-9/6	137.2°W	GOES-17 ABI Warm Period <ul style="list-style-type: none">G-18 ABI interleaved in G-17 data	136.8°W	GOES-18 ABI data interleaved in GOES-17 data
9/6-12/6	137.2°W	GOES-West Operations <ul style="list-style-type: none">GOES-17 Nominal Distribution	136.8°W	GOES-18 product maturation continues <ul style="list-style-type: none">GOES-18 ABI 'supplemental' data via Cloud
9/26	137.2°W	GOES-West Operations <ul style="list-style-type: none">GOES-17 Nominal Distribution	136.8°W	GOES-18 PLT Part 2 Complete (9/26) <ul style="list-style-type: none">NASA Post Launch Assessment Review (9/24)Handover Readiness Review (10/3)GOES-18 Handover to OSPO (10/3)
Est. 1/3	137.2°W	Full G-18 GRB relayed through G-17 <ul style="list-style-type: none">Users do not need to re-point antennasX-band downlink off and instruments shut down	136.8°W	GOES-18 Declared operational GOES-West <ul style="list-style-type: none">Ops Transition Readiness Review held 1 week priorBegin full G-18 GRB broadcast (relay through G-17)
1/4 – 1/11		Full G-18 GRB relayed through G-17 during longitude shift	Slow drift to 137.2°W	GOES-18 gradual shift to 137.2
1/12	Drift to 105°W	End G18 data relay through G17 RF GOES-17 drift to 105°W followed by storage mode	137.2°W	GOES-18 Nominal Distribution <ul style="list-style-type: none">End G-18 GRB relay through G-17Begin G-18 GRB broadcast / nominal distributionSAR/DCS services transitioned to G-18

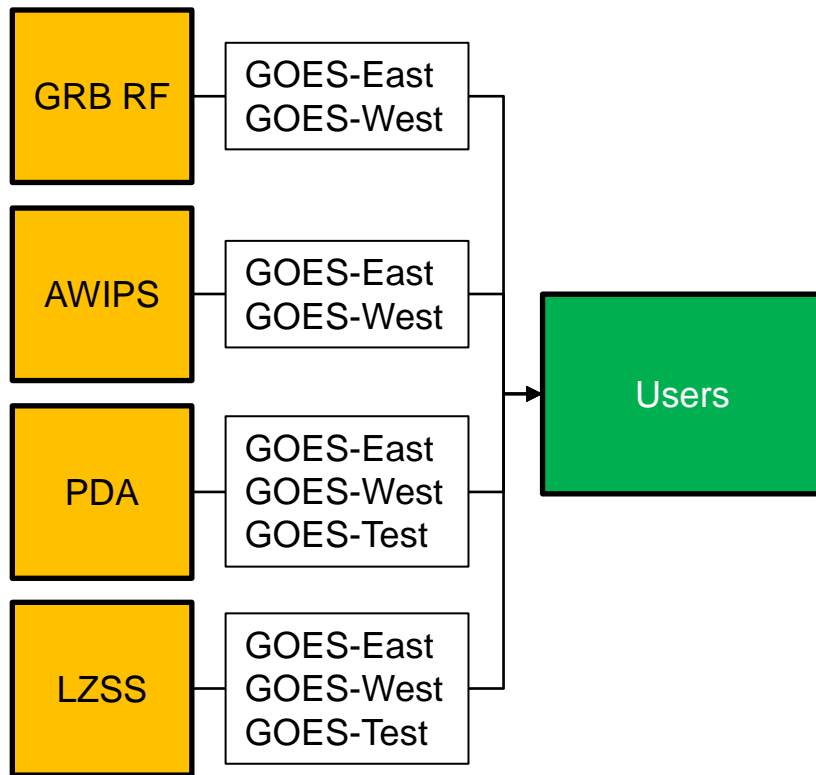
Legend: GOES-West Operational Satellite



Product Data Interleaving Background

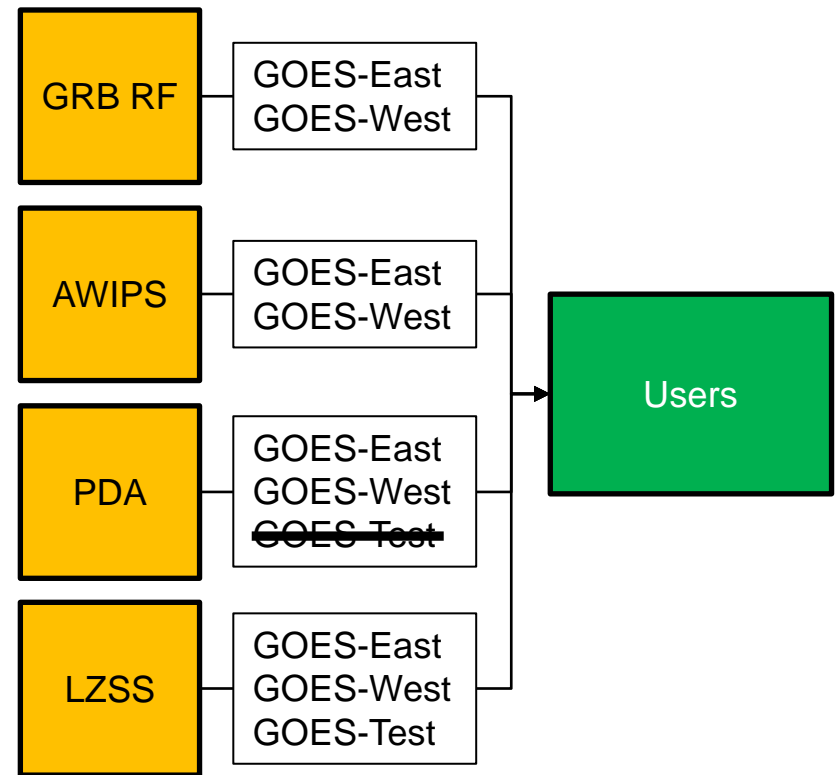
- NWS requested that the GOES-R Program distribute beta GOES-T ABI products during August 2022 warm season
- Interleaving is a method that allows the GOES-R GS to merge data from multiple satellites into a single data processing flow
 - Data to AWIPS and GRB uplink can be configured to contain a mixture of data from GOES-17 Non-ABI and/or GOES-T/18 ABI
 - Will present to the end user as a single GOES-West stream
- When interleaving all product metadata will be maintained so the original source spacecraft designator will remain intact
 - Users will always be able to determine which satellite was used to generate the data being reviewed

Nominal PLT (at WCDAS)



Stream	ABI Source	Other Inst Source
GOES-East	GOES-16	GOES-16
GOES-West	GOES-17	GOES-17
GOES-Test	GOES-18	GOES-18

Failover PLT (at CBU)

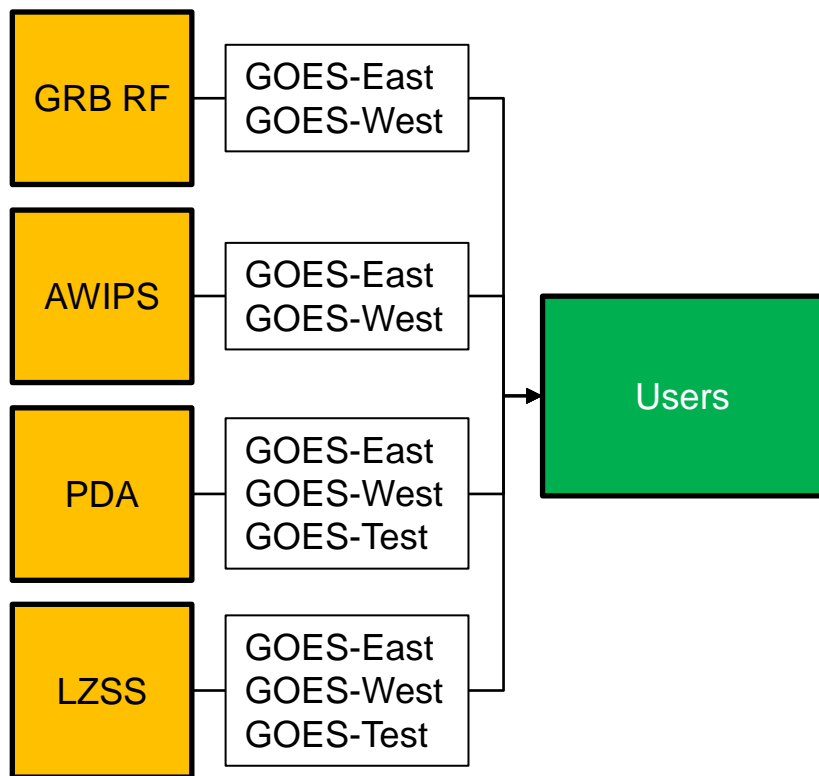


Stream	ABI Source	Other Inst Source
GOES-East	GOES-16	GOES-16
GOES-West	GOES-17	GOES-17
GOES-Test	GOES-18	L0 only GOES-18 L0 only

- CBU has only two DO strings, so GOES-18 L1b data will not be generated.

Nominal PLT (at WCDAS)

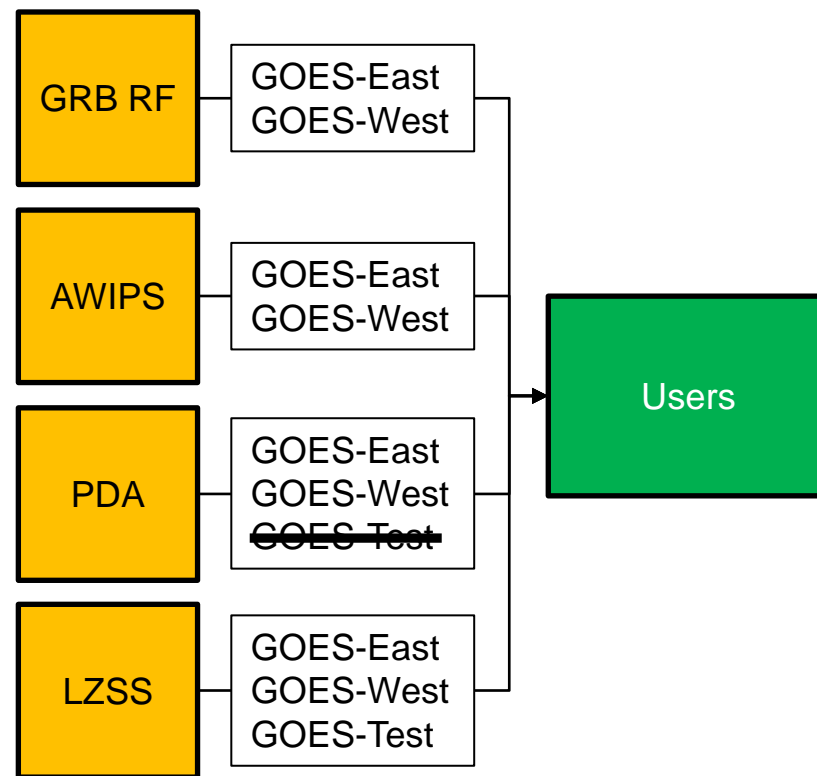
Nominal Interleave (at WCDAS)



Stream	ABI Source	Other Inst Source
GOES-East	GOES-16	GOES-16
GOES-West	GOES-17 \swarrow -18	GOES-17
GOES-Test	GOES-18 \nwarrow -17	GOES-18

Failover PLT (at CBU)

Failover Interleave (at CBU)

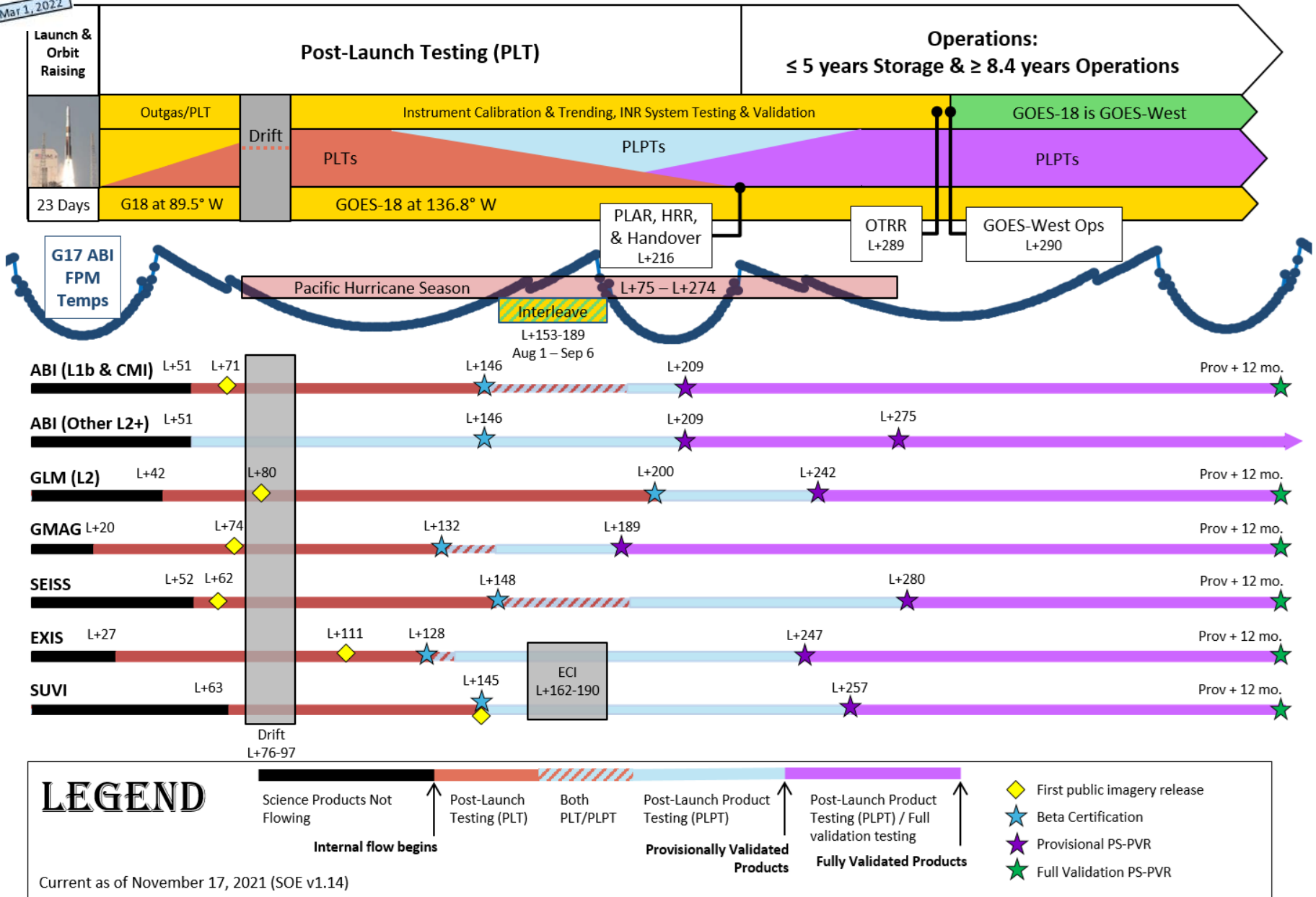


Stream	ABI Source	Other Inst Source
GOES-East	GOES-16	GOES-16
GOES-West	GOES-17 \swarrow -18	GOES-17
GOES-Test	GOES-18 \nwarrow -17 L0 only	GOES-18 L0 only

- CBU has only two DO strings, so GOES-18 L1b data will not be generated.
- CBU has only two DO strings, so GOES-18 Non-ABI and GOES-17 ABI L1b/L2+ data will not be generated. L0 will still be generated.

GOES-T Post-Launch Science Product Validation Schedule

Mar 1, 2022



Note: All dates are coordinated with Flight/MOST PLT SOE group and are subject to change.

November 29, 2021



GOES-T L1b Science Product Validation Status

ABI L1b Product	Beta	Provisional	Full
Radiances	7/25/2022	9/26/2022	FY23
GLM L2 Product			
Lightning: Events, Groups, Flashes	9/17/2022	10/29/2022	FY23
SEISS L1b Products			
Energetic Heavy Ions	7/27/2022	11/21/2022	FY23
Magnetospheric e ⁻ /p ⁺ : Low Energy	7/27/2022	11/21/2022	FY23
Magnetospheric e ⁻ /p ⁺ : High Energy	7/27/2022	11/21/2022	FY23
Solar & Galactic Protons	7/27/2022	11/21/2022	FY23
EXIS L1b Products			
Solar Flux: EUV	7/7/2022	11/3/2022*	FY23
Solar Flux: X-ray Irradiance	7/7/2022	11/3/2022*	FY23
SUVI L1b Product			
Solar EUV Imagery	7/24/2022	11/13/2022*	FY23
GMAG L1b Product			
Geomagnetic Field	7/11/2022	9/6/2022	FY23

*EXIS and SUVI Provisional dates may be affected by final scheduling of CECI testing.

Validation Maturity Levels:

Not Validated

Beta Maturity

Provisional Maturity

Full Maturity



GOES-T L2+ Science Product Validation Status

L2+ Products	Beta	Prov	Full
Cloud and Moisture Imagery (CMI) and Sectorized CMI (KPP)	7/25/2022	9/26/2022	FY23
Aerosol Detection (Smoke & Dust)	7/25/2022	12/1/2022	
Aerosol Optical Depth	7/25/2022	12/1/2022	
Clear Sky Mask	7/25/2022	9/26/2022	
Cloud Cover Layers	7/25/2022	12/1/2022	
Cloud Optical Depth	7/25/2022	12/1/2022	
Cloud Particle Size Distribution	7/25/2022	12/1/2022	
Cloud Top Height	7/25/2022	9/26/2022	
Cloud Top Phase	7/25/2022	9/26/2022	
Cloud Top Pressure	7/25/2022	12/1/2022	
Cloud Top Temperature	7/25/2022	12/1/2022	
Derived Motion Winds	7/25/2022	9/26/2022	
Derived Stability Indices	7/25/2022	12/1/2022	
Downward S/W Radiation: Surface	7/25/2022	12/1/2022	

L2+ Products	Beta	Prov	Full
Fire/Hot Spot Characterization	7/25/2022	12/1/2022	FY23
Ice Age & Thickness	7/25/2022	12/1/2022	
Ice Concentration & Extent	7/25/2022	12/1/2022	
Ice Motion	7/25/2022	12/1/2022	
Land Surface Albedo	7/25/2022	12/1/2022	
Land Surface Reflectance	7/25/2022	12/1/2022	
Land Surface Temperature	7/25/2022	12/1/2022	
Legacy Vertical Moisture Profile	7/25/2022	12/1/2022	
Legacy Vertical Temperature Profile	7/25/2022	12/1/2022	
Rainfall Rate/QPE	7/25/2022	12/1/2022	
Reflected S/W Radiation: TOA	7/25/2022	12/1/2022	
Sea Surface Temperature	7/25/2022	12/1/2022	
Snow Cover	7/25/2022	12/1/2022	
Total Precipitable Water	7/25/2022	12/1/2022	

Validation Maturity Levels:

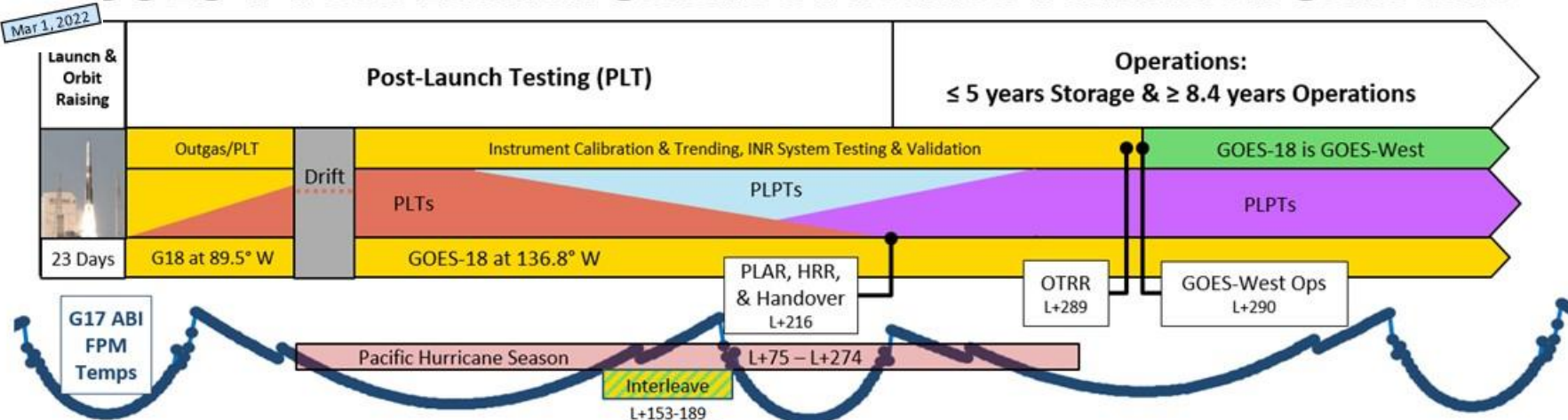
Not Validated

Beta Maturity

Provisional Maturity

Full Maturity

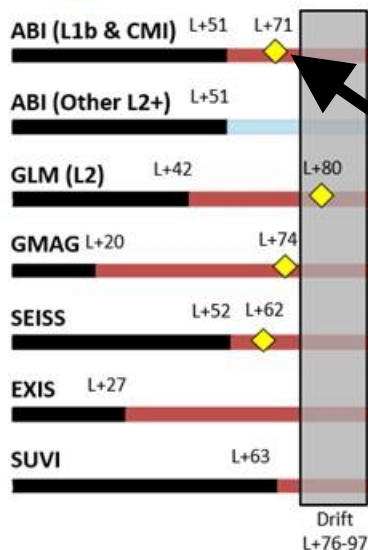
GOES-T Post-Launch Science Product Validation Schedule



◆ First Public Image Release

- First public images/plots will be released after orbit raising and initial image navigation and radiometric assessment
- CWG/AWG POCs are established for creation of First Drafts of Public Image/Data Mock-Ups
- PRO Lead, Program Chief of Staff and NESDIS Communications facilitate and provide copy-edits for story-board layouts and captions

Process is the same as successful GOES-16/17 process



LEGEND

Science Products Not Flowing

Internal flow begins

Post-Launch Testing (PLT)

Both PLT/PLPT

Post-Launch Product Testing (PLPT)

Provisionally Validated Products

Post-Launch Product Testing (PLPT) / Full validation testing

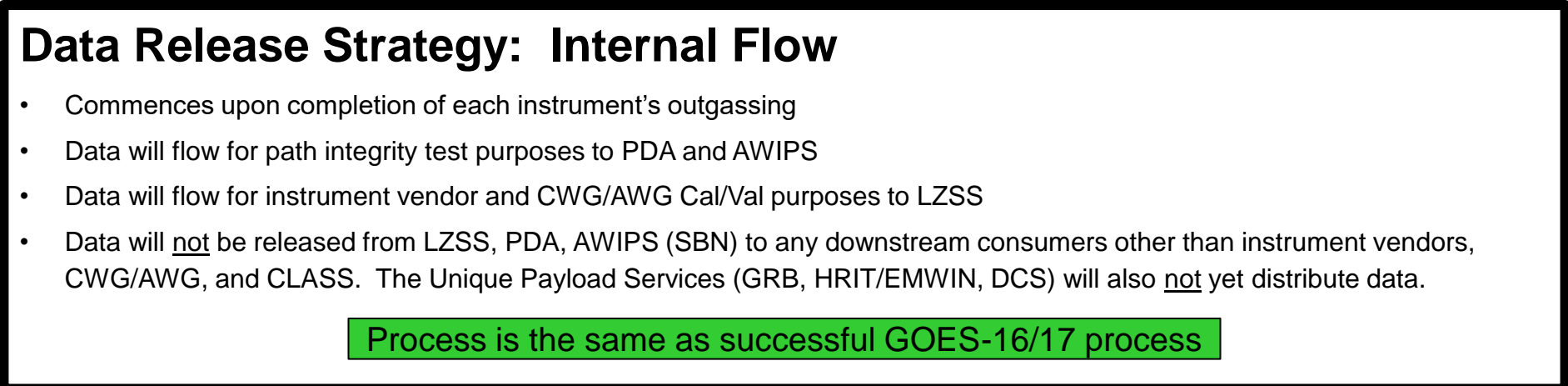
Fully Validated Products

- ◆ First public imagery release
- ★ Beta Certification
- ★ Provisional PS-PVR
- ★ Full Validation PS-PVR

Current as of November 17, 2021 (SOE v1.14)

Note: All dates are coordinated with Flight/MOST PLT SOE group and are subject to change.

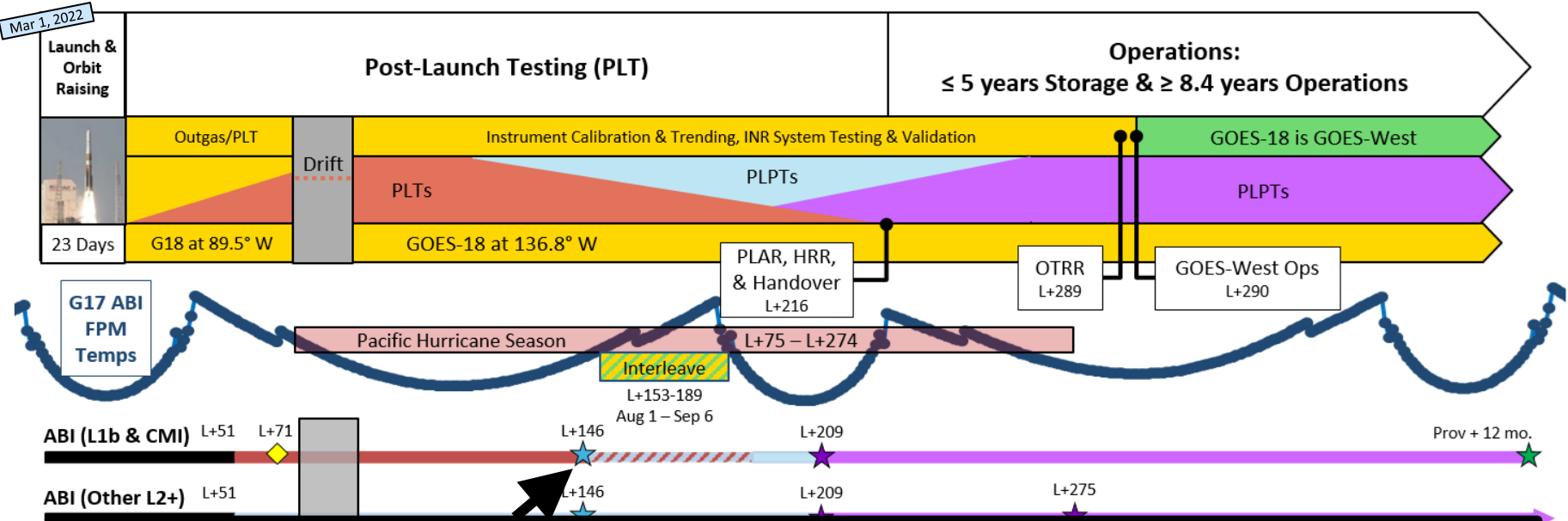
Mar 1, 2022



Internal flow begins Provisionally Validated Products Fully Validated Products Provisional PS-PVR Full Validation PS-PVR

November 29, 2021

GOES-T Post-Launch Science Product Validation Schedule



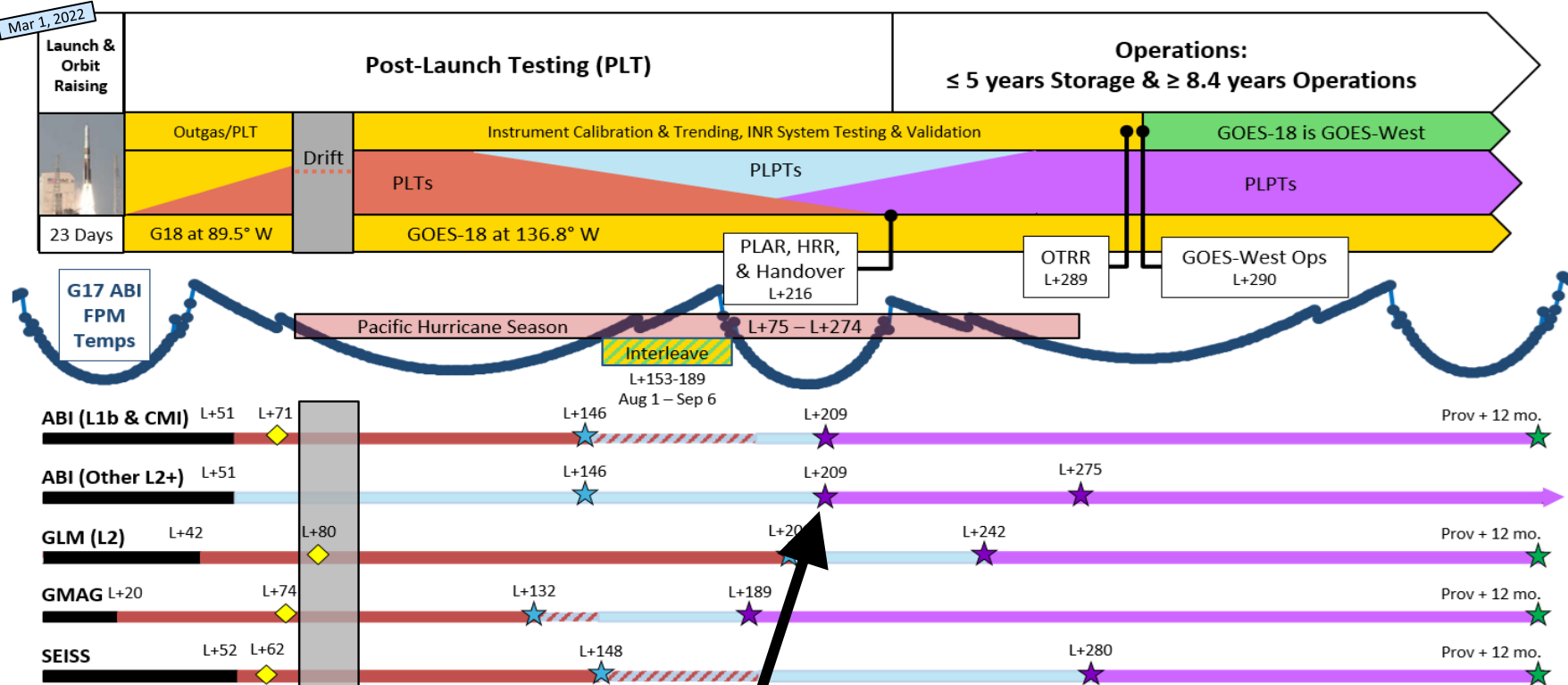
Data Release Strategy: Beginning of External Flow

- Commences by product at Beta Maturity ★ which will not trigger GRB release like GOES-16/17
- LZSS, PDA, AWIPS (SBN) will flow data to their respective, integrated, downstream CWG/AWG cal/val and I&T consumers
- PDA will not yet serve non-cal/val and non-I&T subscription holders
- Unique Payload Service Distribution [GRB, HRIT/EMWIN and GNC-A] will not yet distribute GOES-T
- Interleave starts when G17 ABI warm period begins + G18 ABI L1b & SCMI are Beta + G18 ABI is out of PLT test modes
 - GOES-17 GRB RF will omit GOES-17 ABI L1b and add GOES-18 ABI L1b


Process is similar to successful GOES-16/17 process.
Changes for GOES-T appear in blue.

Note: All dates are coordinated with Flight/MOST PLT SOE group and are subject to change.

GOES-T Post-Launch Science Product Validation Schedule



Data Release Strategy: Completion of External Flow

- Commences by product at Provisional Maturity 
- All subscriptions open to LZSS, PDA, AWIPS (SBN)
- Distribution on for Unique Payload Service Distribution [HRIT/EMWIN and GNC-A]. GRB on at GOES-West declaration.

Process is similar to successful GOES-16/17 process.
Changes for GOES-T appear in blue.