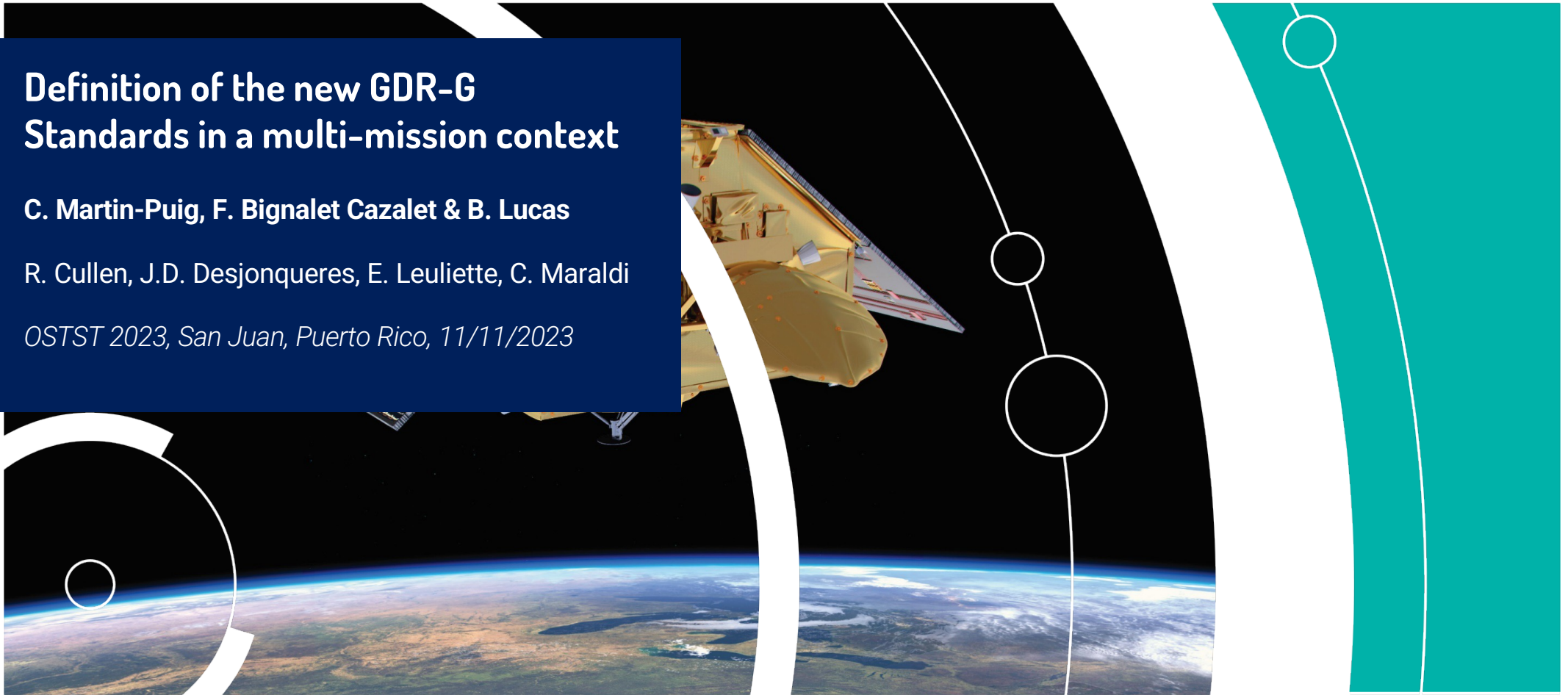


Definition of the new GDR-G Standards in a multi-mission context

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Why do we need mission standards ?

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- At present there are 11 flying altimeters. We have almost 30 years of satellite altimetry data, and we continue improving data quality through new algorithms or auxiliary files.
- There is a clear need identified by the ocean user community that all agencies operating altimetry missions work together in full collaboration with the aim to harmonize the algorithms, and define a set of common standards.
- All CNES' operated missions follow GDR-F standards, so do EUMETSAT's S3 and S6.
- But full-harmonization between missions among agencies was never discussed in detail until now.
- We are pleased to announced to the user community that all agencies are working in full collaboration in defining a set of common standards, and best data processing practices to ensure full harmony between our mission.

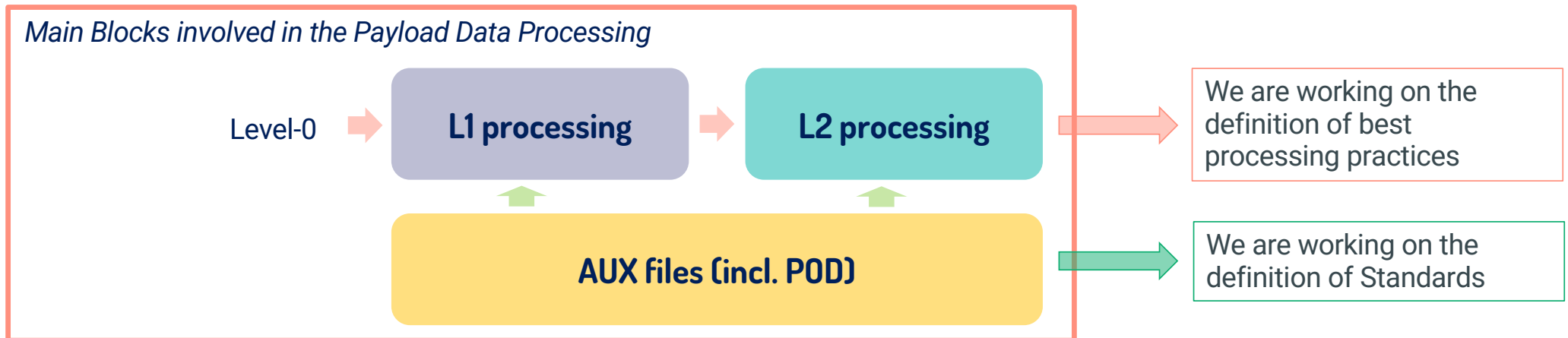


What do we mean by standards vs best processing practices?

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- **Technical Standard definition:** a technical standard is an established norm or requirement for a repeatable technical task which is applied to a common and repeated use of rules, conditions, guidelines or characteristics for products or related processes and production methods, and related management systems practices.
- Before the existence of SAR altimeters, setting standards as a whole (processors + AUX data) made total sense.
- With the increase of missions, the existence now of different altimeter instruments with different processing needs, the Agencies agree the following approach will facilitate the harmonization among missions:





Available now in BC005, S6 PBF09 and GDR-F

Mission	Latency	S3 BC005	S6 PBF09	J3 GDR-F
Dynamic AUX Files				
Meteo Files	NRT-OGDR	ECMWF Op Forecast	ECMWF Op Forecast (MeteoAltimeterGaussian_N640_001.nc)	ECMWF Op Forecast
	STC-IGDR	ECMWF Op Analysis	ECMWF Op Analysis	ECMWF Op Analysis
	NTC-GDR	ECMWF Op Analysis	ECMWF Op Analysis	ECMWF Op Analysis
Pole Location	NRT-OGDR	CNES Forecast	CNES Forecast	CNES Forecast
	STC-IGDR	CNES Forecast	CNES Forecast	CNES Forecast
	NTC-GDR	CNES Restituted	CNES Restituted	CNES Restituted
Dynamic Atmosphere Correction	NRT-OGDR	TUGO Forecast	TUGO Forecast	TUGO Forecast
	STC-IGDR	1. TUGO Preliminar 2. TUGO Forecast	1. TUGO Preliminar 2. TUGO Forecast	TUGO Preliminary
	NTC-GDR	TUGO Restituted	TUGO Restituted	TUGO Restituted
Modelled Ionospheric Correction	NRT-OGDR	GIM preliminary	GIM Preliminary	GIM preliminary
	STC-IGDR	GIM Restituted	1. GIM Restituted 2. GIM Preliminary	GIM Restituted
	NTC-GDR	GIM Restituted	GIM Restituted	GIM Restituted
Wave Model Files	NRT-OGDR	Wave Model Forecast (WVF) - MeteoFrance	Wave Model Forecast (WVF) - MeteoFrance	N/A
	STC-IGDR	1. Wave Model Analysis (WMA) 2. Wave Model Forecast (WMF) All MeteoFrance	1. Wave Model Analysis (WMA) 2. Wave Model Forecast (WMF) All MeteoFrance	CNES/MFWAM Analysis
	NTC-GDR	Wave Model Analysis (WMA) - MeteoFrance	Wave Model Analysis (WMA) - MeteoFrance	CNES/MFWAM Analysis
Static Aux Files				
Meteo Altimetry Gaussian Grid	ALL	ECMWF	ECMWF	ECMWF
Load Tide Solution 1	ALL	GOT 4.10.c model	GOT 4.10.c model	GOT 4.10.c model
Load Tide Solution 2	ALL	FES2014	FES2014	FES2014
Elastic Ocean Tide Solution 1	ALL	GOT 4.10.c model	GOT 4.10.c model	GOT 4.10.c model
Elastic Ocean Tide Solution 2	ALL	FES2014	FES2014	FES2014
Pole Tide	ALL	Desai et al., 2015	Desai et al., 2015	Desai et al., 2015
MSS Solution 1	ALL	Hybrid CNES/CLS 15, Scripps, DTU15	CNES/CLS15	CNES/CLS15
MSS Solution 2	ALL	DTU2021	DTU18	DTU 18
MSS/Geoid Slopes Map	ALL		DNS2008	CNES
Geoid Height Map	ALL	EGM2008	EGM2008	EGM2008
Ocean Depth and Land Elevation (Bathymetry)	ALL	ACE2 (2008)	ACE2 (2008)	ACE2 (2008)
Wind Tables	ALL	1D Abdalla 2007 + 2D (Gourrion et al. 2002; Collard 2005)	2D (Gourrion et al. 2002; Collard 2005)	2D (Gourrion et al. 2002; Collard 2005)
Solid Earth Tide	ALL	Cartwright and Edden	Cartwright and Edden	Cartwright and Edden
Climatological Pressure Grids	ALL	RDRay and RMPonte 2003	RDRay and RMPonte 2003	RDRay and RMPonte 2003
Pressure Variability File (S1/S2)	ALL	RDRay and RMPonte 2003	RDRay and RMPonte 2003	RDRay and RMPonte 2003
Mean Dynamic Topography	ALL	CNES-CLS 18	CNES-CLS13	CNES-CLS13
Distance and Angle To Coast	ALL	Scharroo 2019 based on GSHHG	Scharroo 2019 based on GSHHG	Scharroo 2019 based on GSHHG
Sea State Bias	ALL	Non param SSB, Tran 2021	SSB_2020_J3_GDRF	SSB_2020_J3_GDRF
Internal Tide	ALL	Internal tide [Zaron, 2019] HRET v8.1	Internal tide [Zaron, 2019] HRET v8.1	Internal tide [Zaron, 2019] HRET v8.1



New Standards – Dynamic Files

Mission	Standard YES/NO	Latency	S3 BC006	S6 PBG01	J3 GDR-G
Dynamic AUX Files					
Meteo Files	YES	NRT-OGDR	ECMWF Op Forecast	ECMWF Op Forecast (MeteoAltimeterGaussian_N640_001.nc)	ECMWF Op Forecast
		STC-IGDR	ECMWF Op Analysis	ECMWF Op Analysis	ECMWF Op Analysis
		NTC-GDR	ECMWF Op Analysis	ECMWF Op Analysis	ERA5
Modelled Ionospheric Correction	YES	NRT-OGDR	GIM preliminary	GIM Preliminary	GIM Forecast
		STC-IGDR	GIM Restituted	1. GIM Restituted 2. GIM Preliminary	GIM Preliminary
		NTC-GDR	GIM Restituted	GIM Restituted	GIM Preliminary
Wave Model Files	YES	NRT-OGDR	Wave Model Forecast (WVF) - MeteoFrance	Wave Model Forecast (WVF) - MeteoFrance	Wave Model Forecast (WVF) - MeteoFrance
		STC-IGDR	1. Wave Model Analysis (WMA) 2. Wave Model Forecast (WMF) All MeteoFrance	1. Wave Model Analysis (WMA) 2. Wave Model Forecast (WMF) All MeteoFrance	CNES/MFWAM Analysis
		NTC-GDR	Wave Model Analysis (WMA) - MeteoFrance	Wave Model Analysis (WMA) - MeteoFrance	CNES/MFWAM Analysis

- J3 GDR will include ERA5 for better long term homogeneity → instead S3/S6 will adopt it in reprocessing as additional information. NOTE: No ECMWF data will be overwritten to avoid discontinuities.
- ALT iono correction to be updated for all timeliness replace Iijima [1999] algorithm by Dettmering [2022] algorithm.
 - *Dettmering, D., and C. Schwatke, Ionospheric corrections for satellite altimetry - impact on global mean sea level trends, Earth and Space Science, 9(4), doi:10.1029/2021EA002098, 2022.*
- J3 OGDR will benefit of Forecast Wave Model



New Standards – Static Files

Static Aux Files					
Meteo Altimetry Gaussian Grid	YES	ALL	ECMWF	ECMWF	ECMWF
Load Tide Solution 1	YES	ALL	GOT 5.2	GOT 5.2	GOT 5.2
Load Tide Solution 2	YES	ALL	FES2022	FES2022	FES2022
Elastic Ocean Tide Solution 1	YES	ALL	GOT 5.2	GOT 5.2	GOT 5.2
Elastic Ocean Tide Solution 2	YES	ALL	FES2022	FES2022	FES2022
Pole Tide	YES	ALL	Desai et al., 2015	Desai et al., 2015	Desai et al., 2015
MSS Solution 1	YES	ALL	Hybride CNES/CLS 2022 + Scripps + DTU	Hybride CNES/CLS 2022 + Scripps + DTU	Hybride CNES/CLS 2022 + Scripps + DTU
MSS Solution 2	YES	ALL	DTU 2021	DTU 2021	DTU 2021
MSS/Geoid Slopes Map	YES	ALL	DNS2008	DNS2008	CNES
Geoid Height Map	YES	ALL	EGM2008	EGM2008	EGM2008
Ocean Depth and Land Elevation (Bathymetry)	YES	ALL	ACE2 (2008)	ACE2 (2008)	ACE2 (2008)
Wind Tables	YES	ALL	1D Abdalla 2007 + 2D (Gourrion et al. 2002; Collard	2D (Gourrion et al. 2002; Collard 2005)	2D (Gourrion et al. 2002; Collard 2005)
Solid Earth Tide	YES	ALL	Cartwright and Edden	Cartwright and Edden	Cartwright and Edden
Climatological Pressure Grids	YES	ALL	Update to RDRay and RMPonte 2003	Update to RDRay and RMPonte 2003	Update to RDRay and RMPonte 2003
Pressure Variability File (S1/S2)	YES	ALL	Update to RDRay and RMPonte 2003	Update to RDRay and RMPonte 2003	Update to RDRay and RMPonte 2003
Mean Dynamic Topography	YES	ALL	CNES_CLS_MDT_2022	CNES_CLS_MDT_2022	CNES_CLS_MDT_2022
Distance and Angle To Coast	YES	ALL	Scharroo 2019 based on GSHHG	Scharroo 2019 based on GSHHG	Scharroo 2019 based on GSHHG
Sea State Bias	See colum H45	ALL	Non param SSB, Tran 2021 (or more recent)	SSB_2020_J3_GDRF	SSB_2020_J3_GDRF
Internal Tide	YES	ALL	Internal tide [Zaron, 2019] HRET v8.1	Internal tide [Zaron, 2019] HRET v8.1	Internal tide [Zaron, 2019] HRET v8.1

- GOT 4.10.c → GOT 5.2
- FES2014 → FES 2022.
- MSS Sol1 CNES/CLS15 → Hybride CNES/CLS 2022 + Scripps + DTU.
- Geoid Maps EGM 2008 → EGM is planning a release end 2023, or Q1 2024 and will be updated in alt products. The EGM update will add among other things data from GOCE and GRACE.
- CNES' team is working on an updated version of RDRay and RMPonte and this updated version may be taken into consideration.
- CNES_CLS_MDT_2013/18 in S3 will evolve to CNES_CLS_MDT_2022.
- For SSB the agreement under discussion is that all teams compute it in the same form (e.g. 2D, vs 3D).
- POE-G standards as presented at OSTST.



Best processing practices

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What are we discussing on best practices:

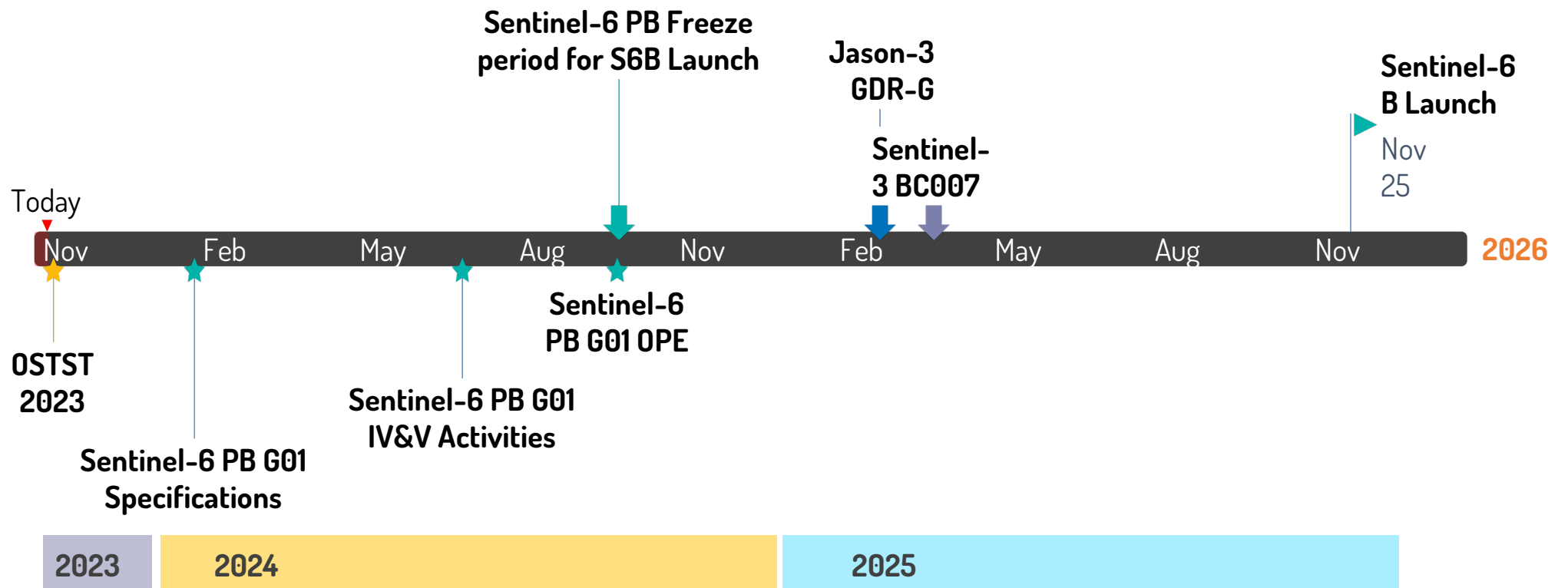
- Harmonizing 1Hz datation between J3 and S6/S3.
- Harmonizing 20Hz to 1Hz compression techniques.
- Harmonizing how we deal with SWH<0.
- Adding C band numerical retracker.
- Harmonizing variables among missions.
- For SAR missions: L1B, L2 processing techniques.

IMPORTANT NOTE:

- Jason-3 GDR-G will add additional information in their products (e.g. hydro retracker, Fast adaptive retracker, SST and ice concentration). Some additional info that Jason-3 will bring may not be adopted in Sentinel-6 baseline G-01.
- Sentinel-3 BC005 already includes ice concentration and it is working on improving polar oceans. Therefore, the mission may add additional data needed for the polar oceans that J3 and S6 may not adopt.
- Some differences will still exist between missions driven by mission objectives or coverage.



Timeline



- In GDR-G there will be no more MLE-3 data.
- Would the community be interested in all missions offering geophysical corrections at 20Hz?
 - If already offered, is the current quality suitable?
 - Enough to replicate 1Hz into 20Hz, or it should be recalculated at 20Hz?



Thank you !

For any question please feel free to contact:

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