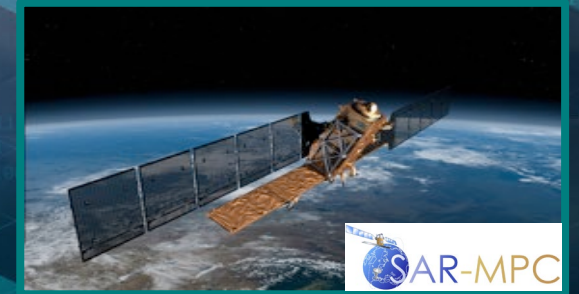


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23–27 May
2022

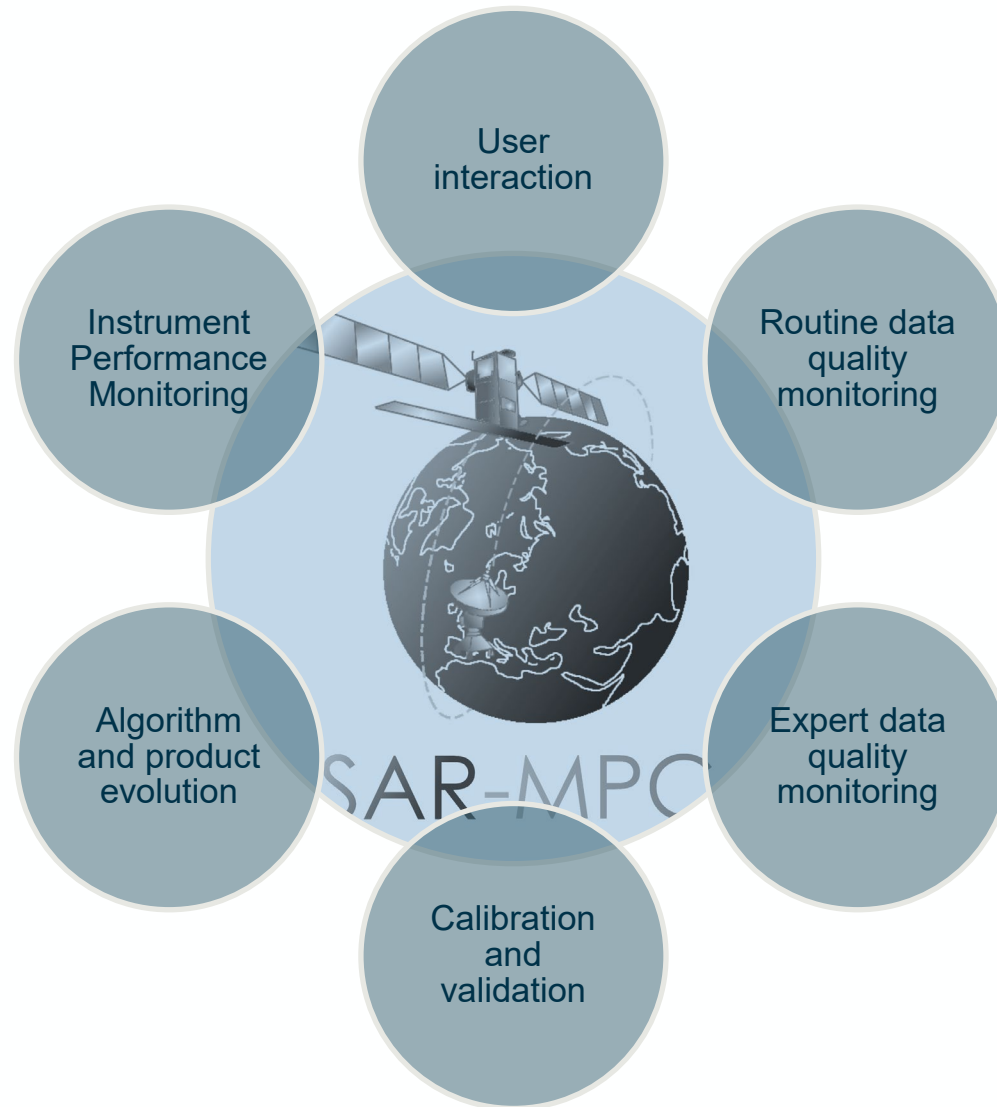
TAKING THE PULSE
OF OUR PLANET FROM SPACE



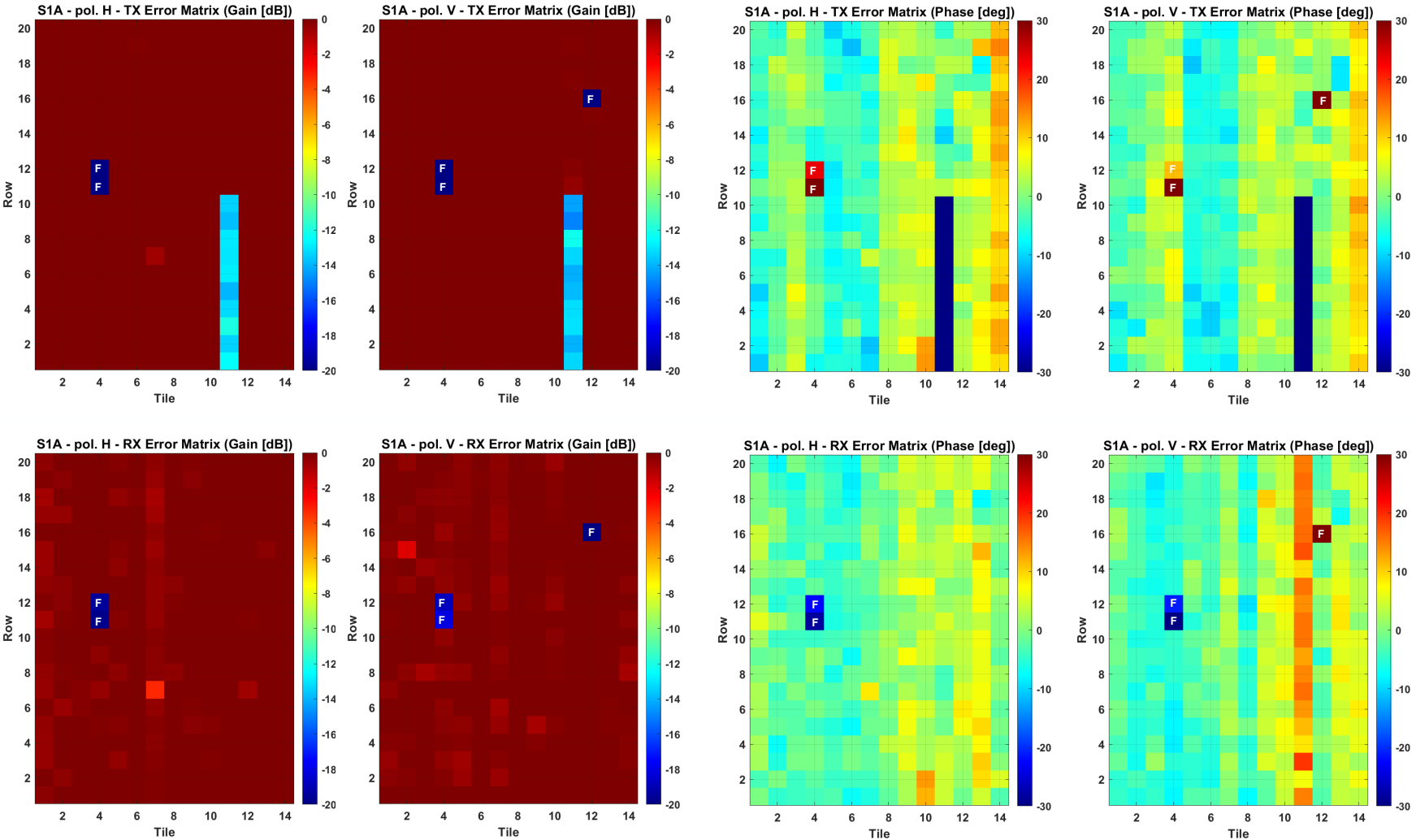
An overview of Sentinel-1 instruments status, product performance and evolution

Muriel Pinheiro, Antonio Valentino, Guillaume Hajduch, Pauline Vincent, Andrea Recchia, Niccolò Franceschi, Alessandro Cotrufo, Riccardo Piantanida and Kersten Schmidt

23/05/2022

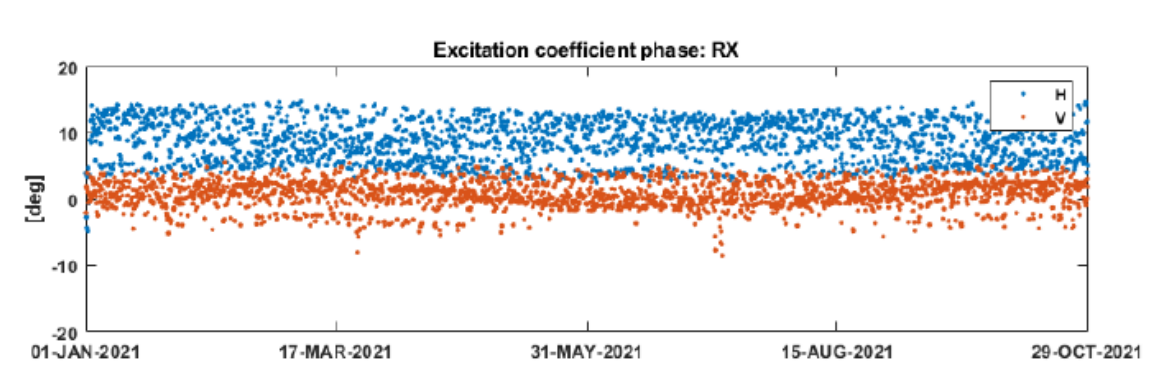
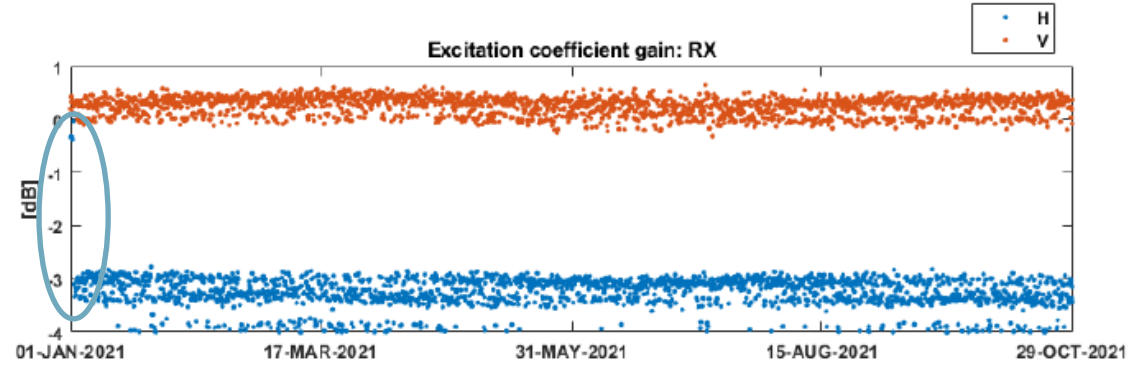
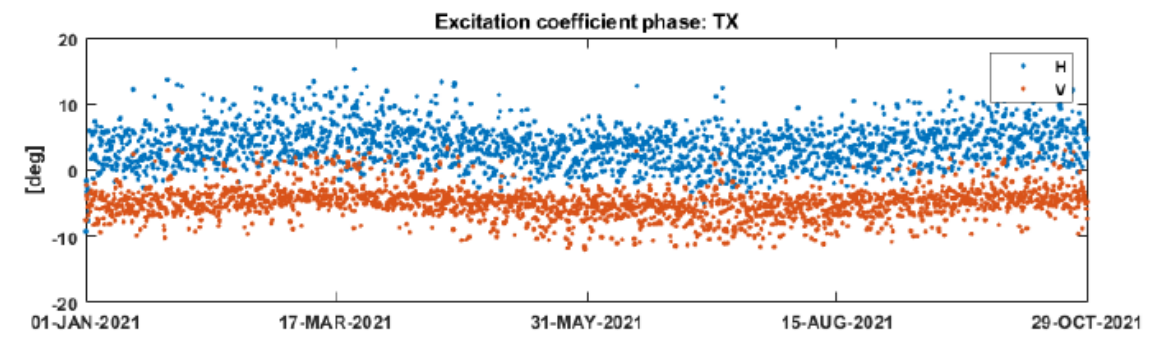
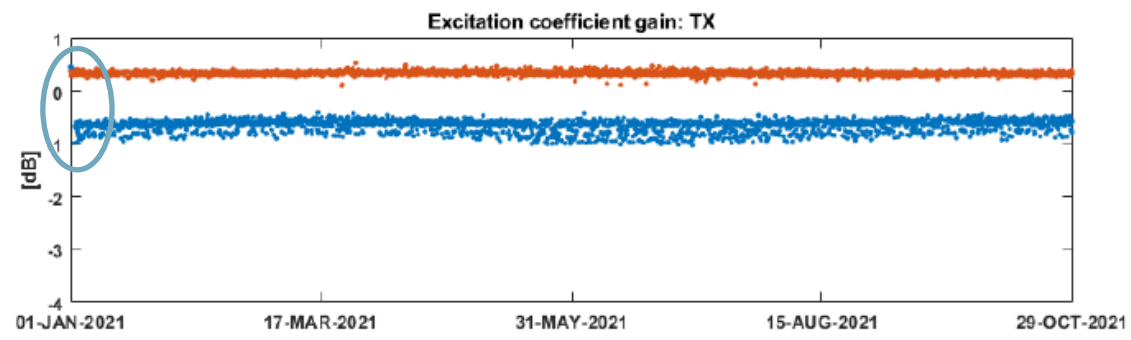


Antenna status from the average of the RFC products acquired in the period 01st to 31st Mar 2022



Date	Tile	Row	Mode	Notes
05/05/14	4	11,12	TX H TX V RX V	Failures related to the same Electronic Front End element
09/06/14	4	12	RX H	
29/04/15	4	11	RX H	
18/05/15	12	16	TX V RX V	Intermittent failures since 16/04/15
18/10/14 22/07/15	5	1-20	RX H RX V	Intermittent failures of tile 5. Switch to redundancy solved the problem
27/06/16	11	1-10	TX H TX V	Reduced TX power for half tile 11 to avoid instrument switch-off
17/10/17	11	1-10	TX H TX V	Update of tile 11 configuration to improve antenna electronic status
04/01/21	7	7	TX H RX H	Small gain reduction and phase jump

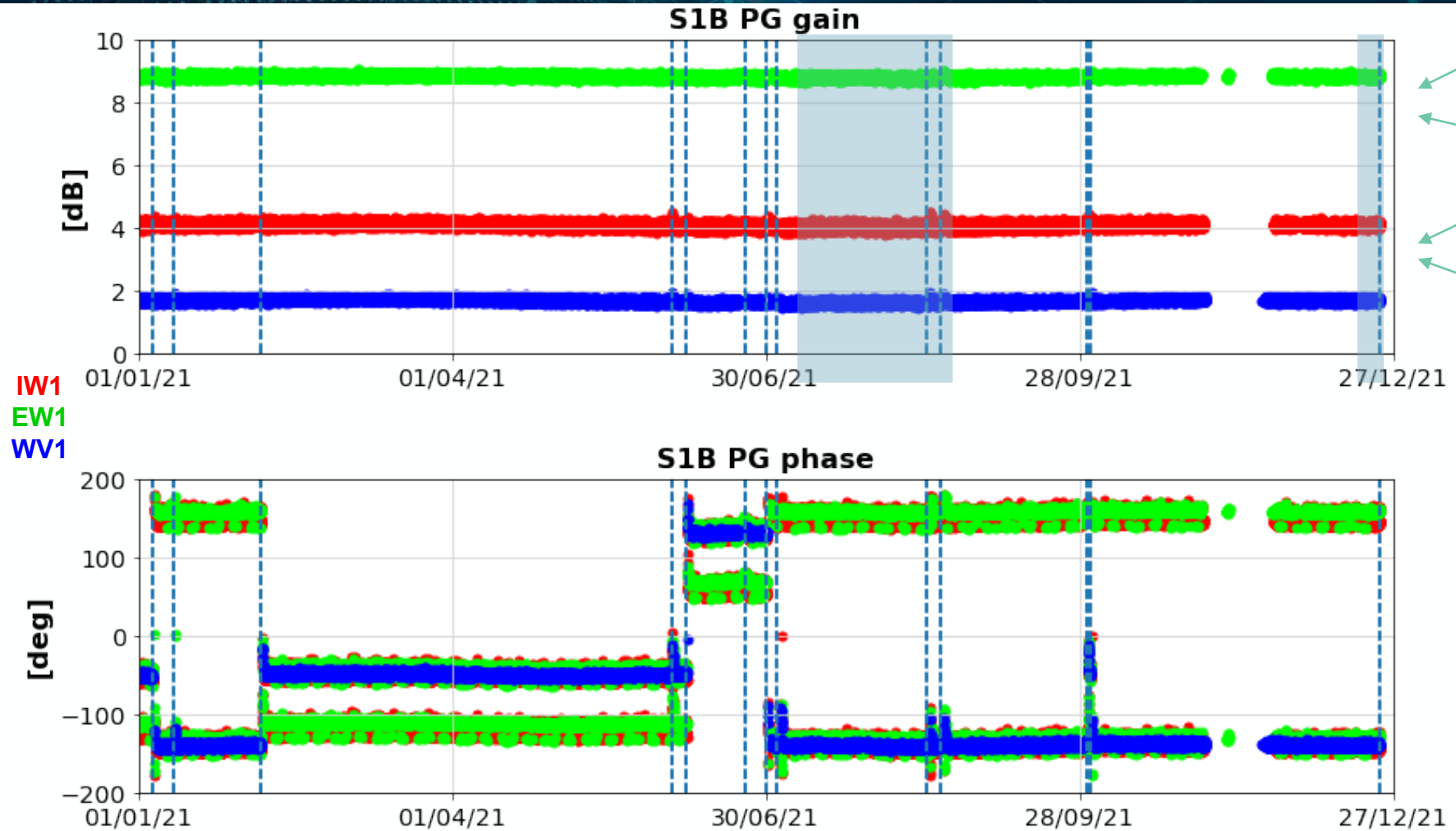
Begin of January 2021 a slight degradation (a loss of about 1 dB in TX and 3 dB in Rx for H-pol channel) of TRM (7,7) was observed



No further degradation was observed



Instrument Performance: PG stability



PG gain stable, PG phase jumps as expected with instrument reset

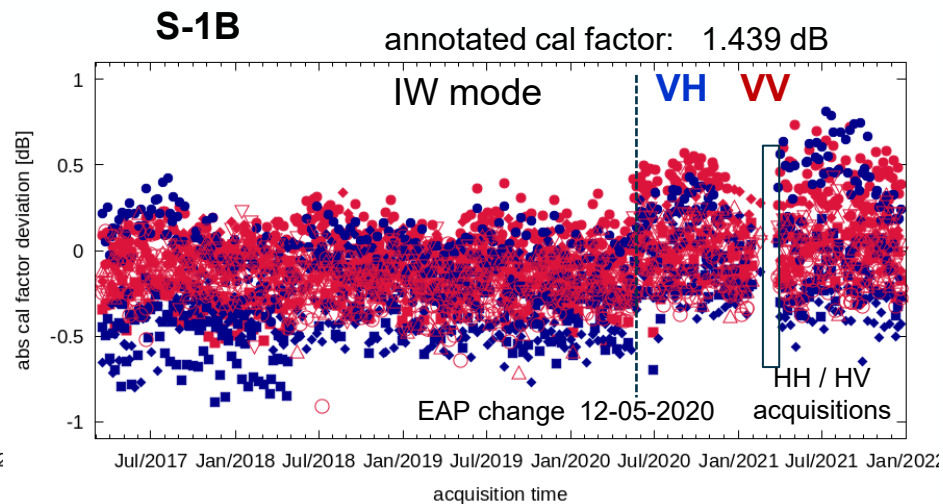
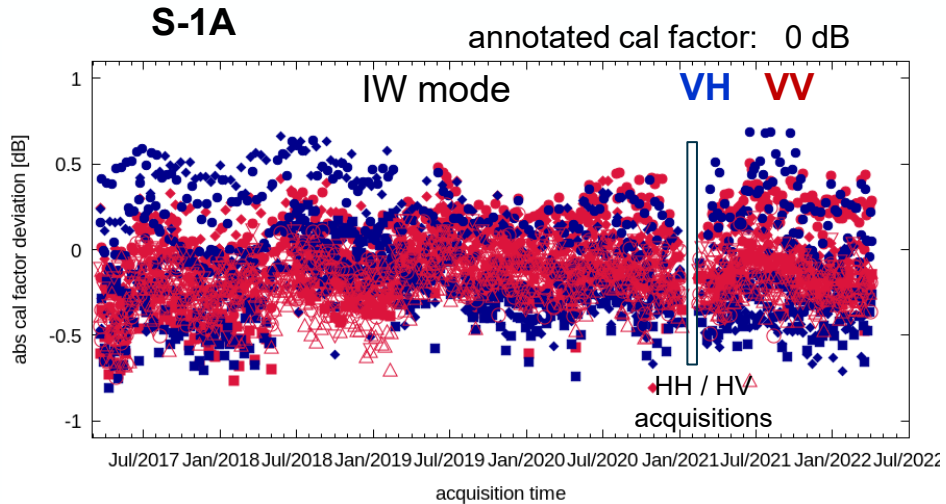
No degradation associated to strong RFI events

No degradation prior to S1 anomaly

Occurrences of instrument resets are reported as vertical dashed lines



Observation period: 03/2017 – 04/2022



	S-1A		S-1B	
	μ [dB]	σ [dB]	μ [dB]	σ [dB]
IW 1-3 VV	-0.12	0.21	-0.06	0.21
IW 1-3 VH	-0.10	0.30	-0.17	0.28
IW 1-3 VV&VH	-0.111	0.242	-0.096	0.240

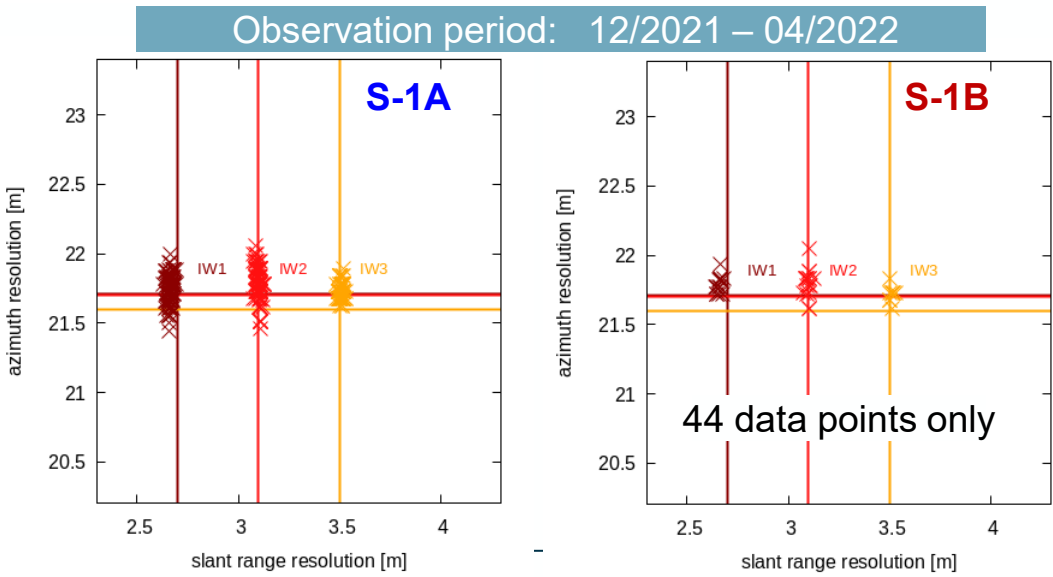
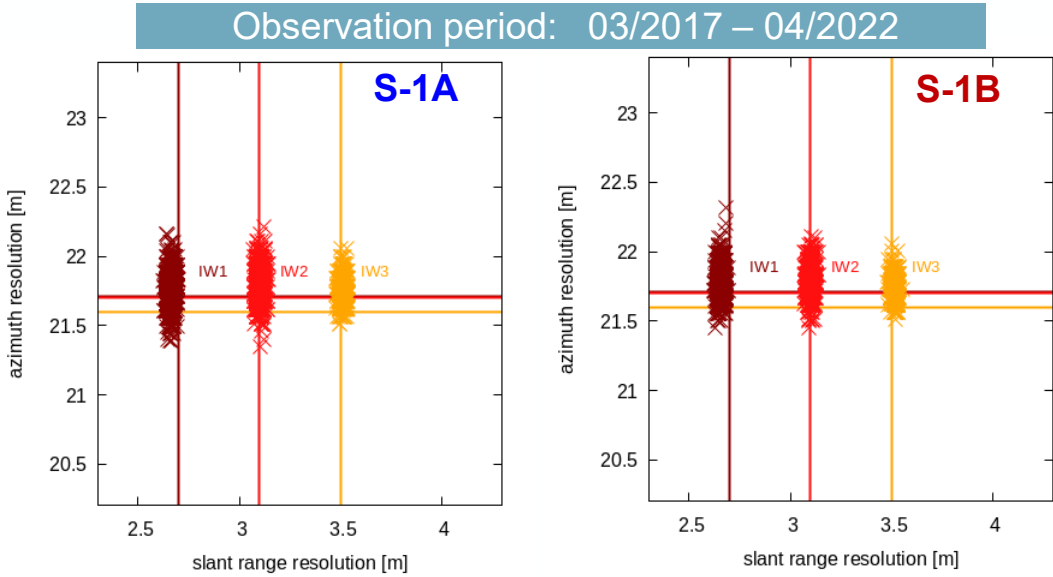
Derived radiometric accuracy

	S-1A	S-1B
absolute radiometric accuracy (1σ)*	0.324 dB	0.318 dB

* including
 Long term stability of the instrument 0.05 dB (1σ)
 Dynamic range error 0.067 dB (1σ)
 Reference target accuracy 0.20 dB (1σ)

Radiometric accuracy continues to be within mission requirements and stable over time

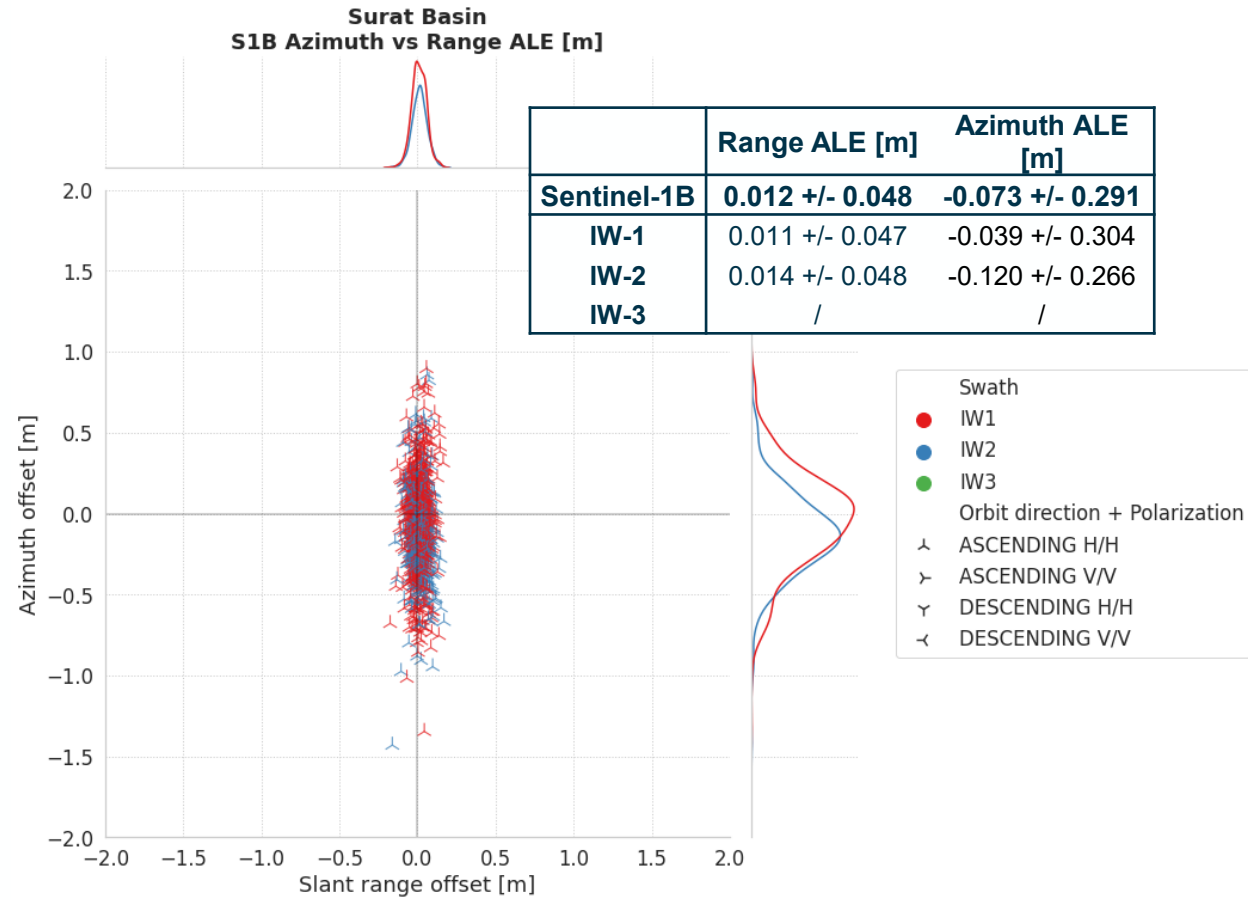
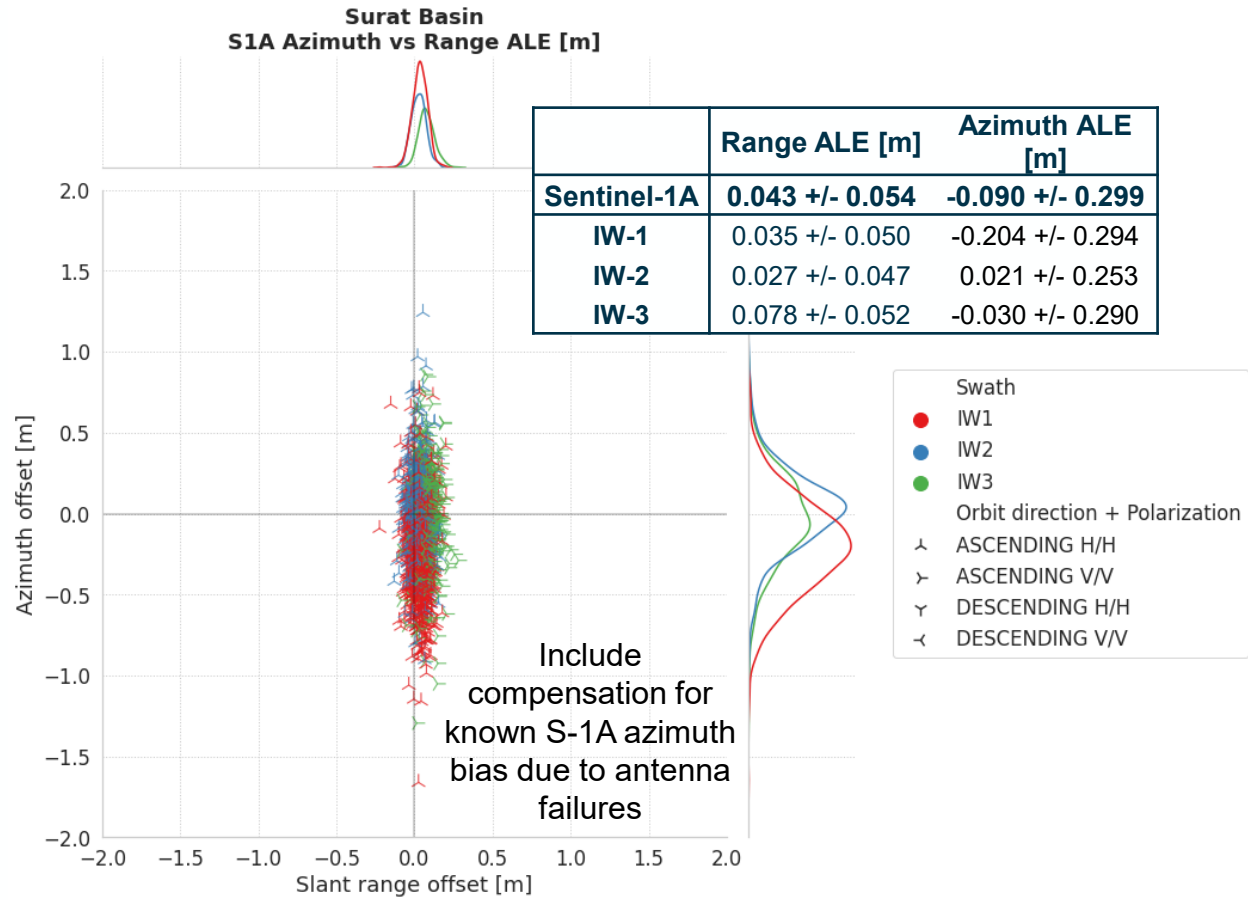
Stay tuned! Monday, 05:20 pm
 “Radiometric Comparison of the Sentinel-1 SAR Constellation”



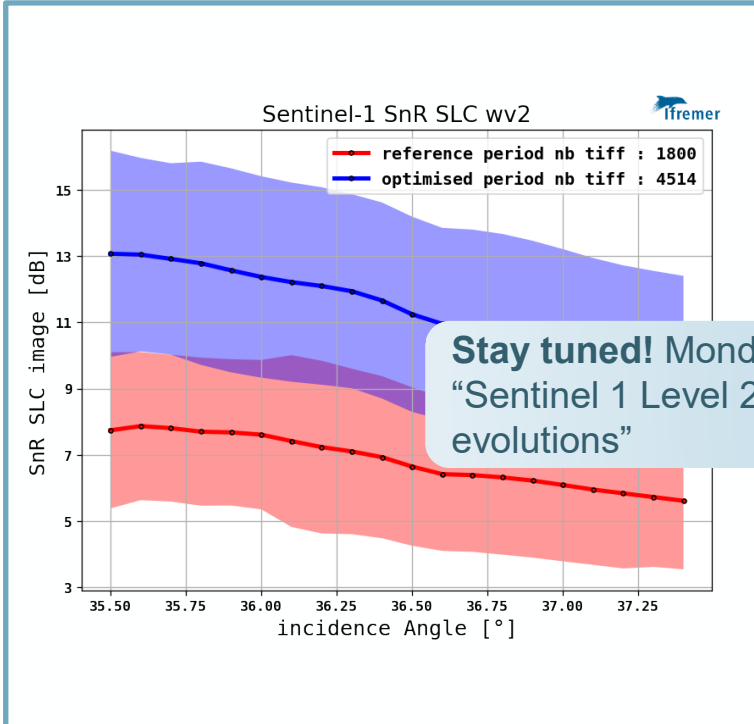
Resolution		S1A	S1B
Slant Range [m]	IW1	2.66 ± 0.01	2.66 ± 0.01
	IW2	3.10 ± 0.01	3.10 ± 0.01
	IW3	3.51 ± 0.01	3.51 ± 0.01
Azimuth [m]	IW1	21.75 ± 0.10	21.79 ± 0.06
	IW2	21.78 ± 0.12	21.80 ± 0.10
	IW3	21.73 ± 0.06	21.72 ± 0.05

Stable resolution with similar values for both units

Observation period: 03/2021 – 04/2022

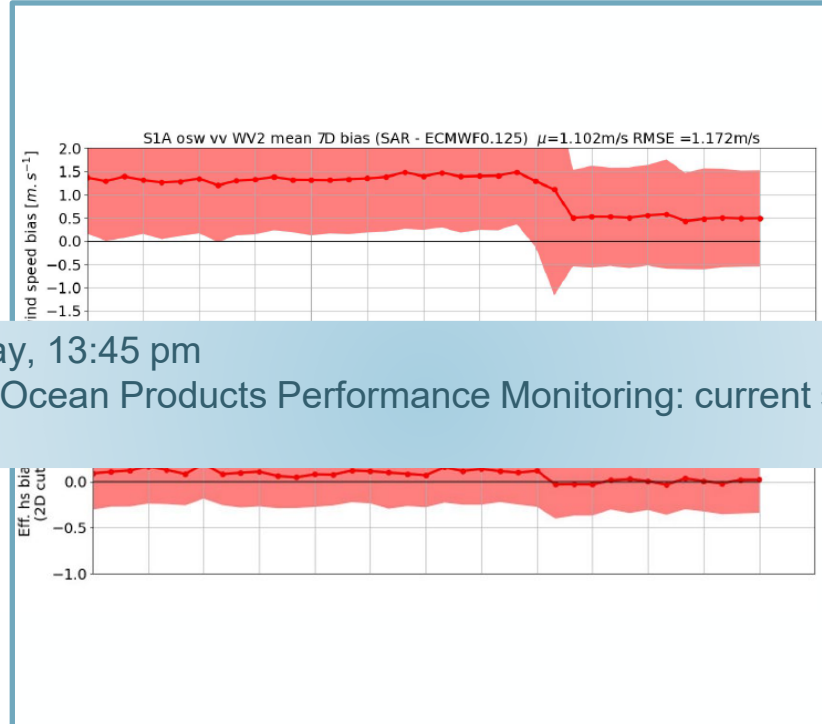


Decimetre accuracy after considering environment and system corrections

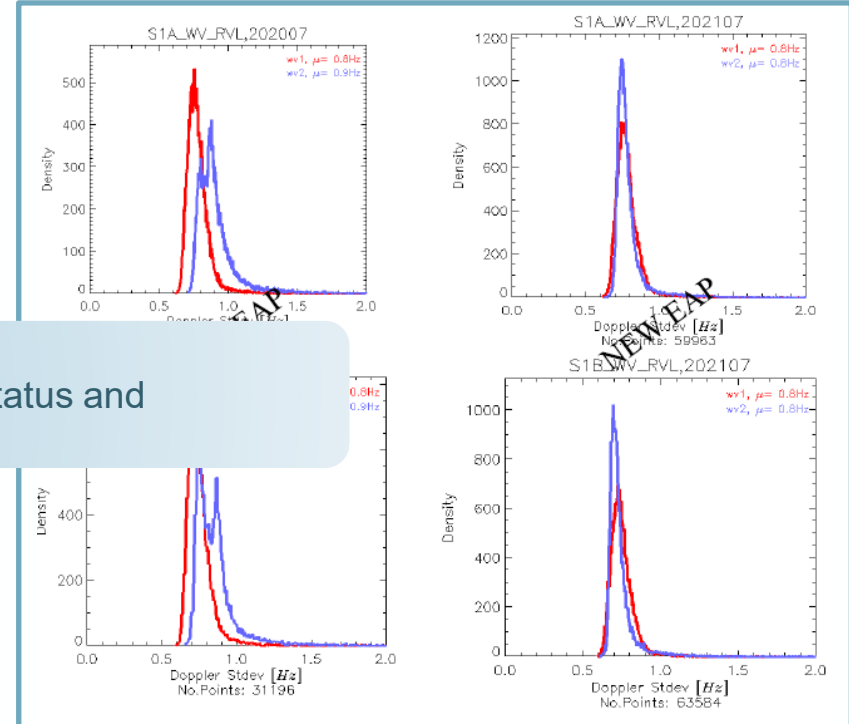


Stay tuned! Monday, 13:45 pm
“Sentinel 1 Level 2 Ocean Products Performance Monitoring: current status and evolutions”

Improved WV2 SNR of about 5dB



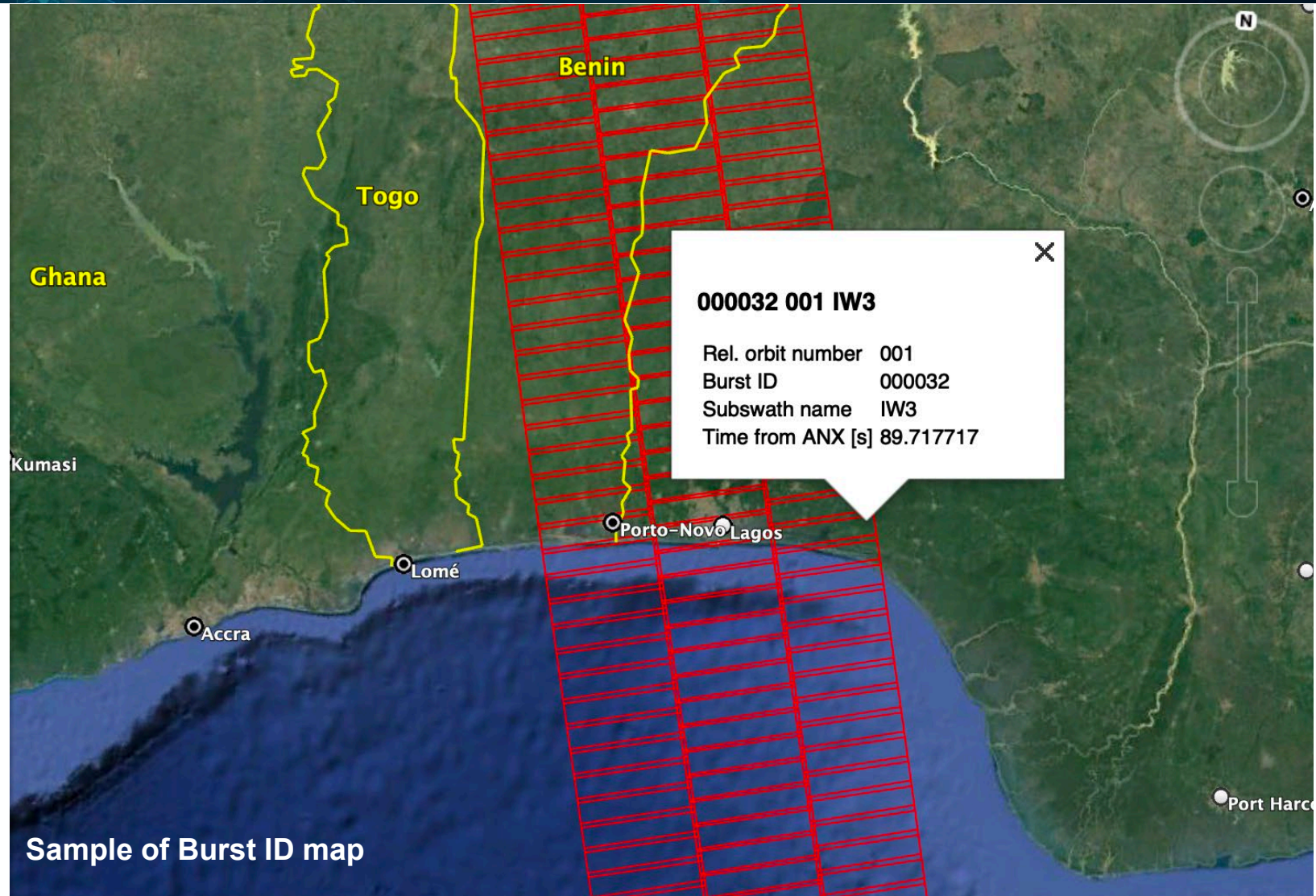
OSW: wind speed and eff. HS bias decreased since update



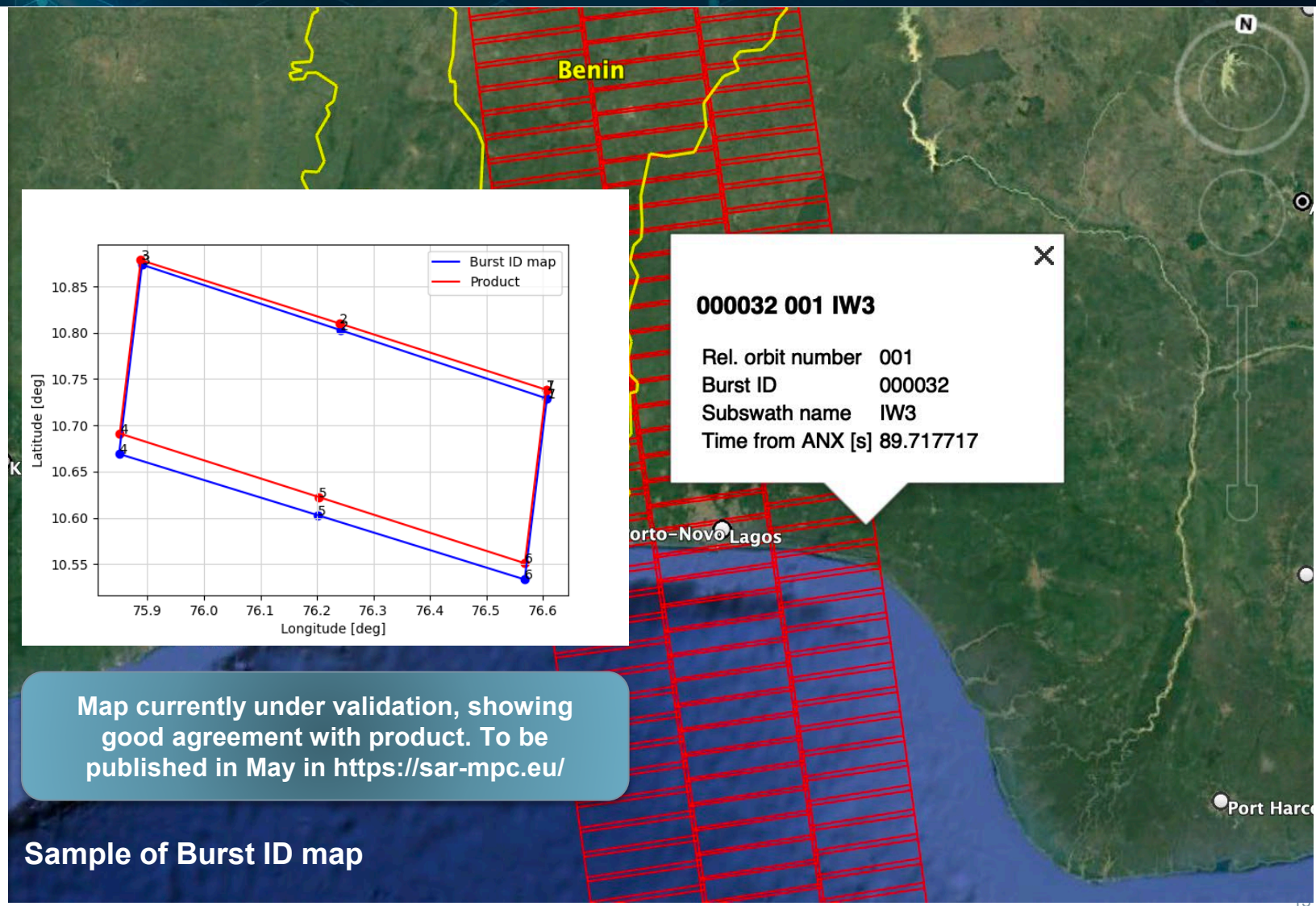
RVL: Improved Doppler std. and consistence between wv1 and wv2

Improvement from optimized configuration confirmed by the MPC

- Sentinel-1 performs systematic acquisitions in IW and EW modes
- Bursts overlap almost perfectly between different acquisitions and are always located in the same place
- Starting with IPF v3.4 a new element has been added to the products annotations: the **Burst ID**
- A **Burst ID map** was generated by the MPC and should allow users to identify specific burst of interest

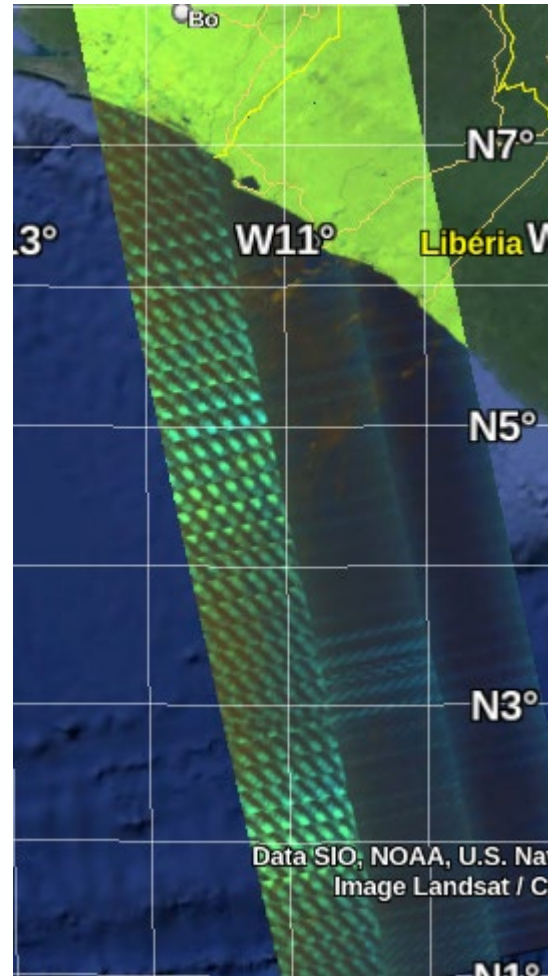


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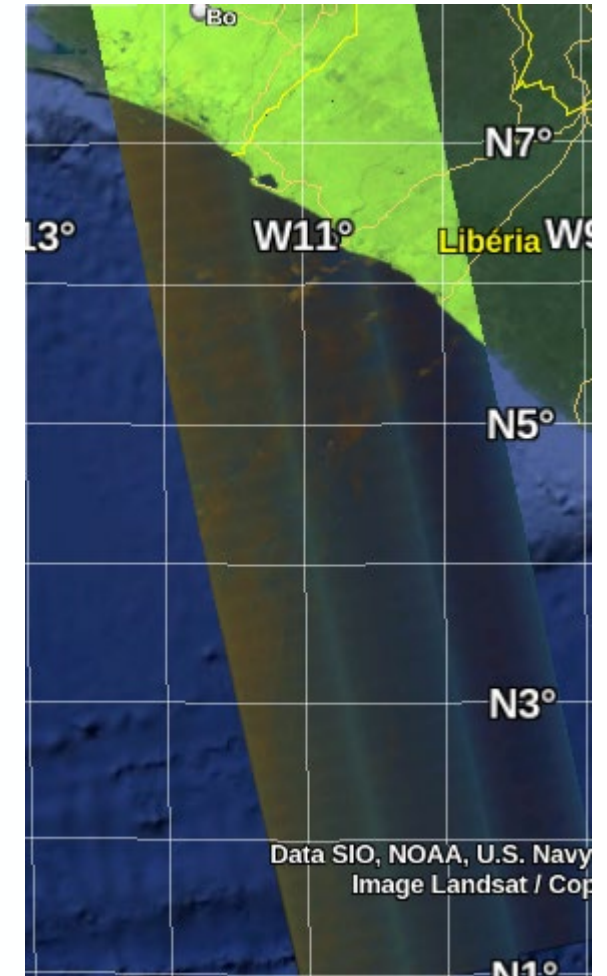


- RFI **detection** and new RFI **annotations** available since **November 04, 2023**.
- **Test campaign in the ground segment for:**
 - Statistical analysis
 - Tuning of processing parameters
 - Assessment of quality of filter
 - Assessment of impact on data quality
- Operational **filtering** of RFI contamination in Sentinel-1 data was **activated on March 23, 2022**.

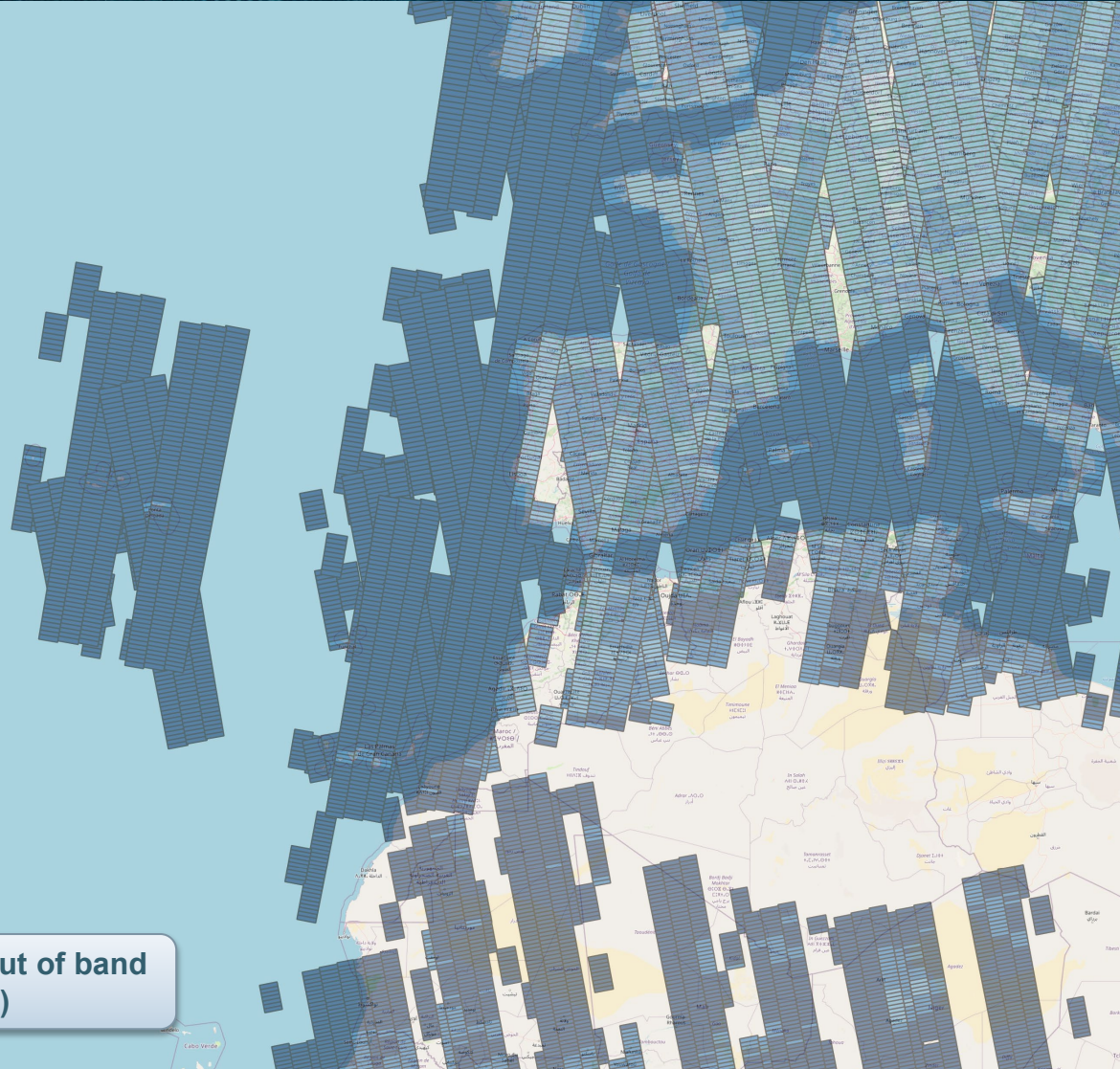
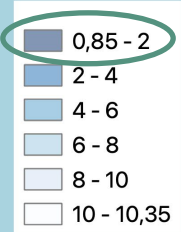
Stay tuned! Monday, 14:00 pm
 “C-band RFI contamination monitoring and operational mitigation in Sentinel-1 products”



No correction



IPF RFI correction

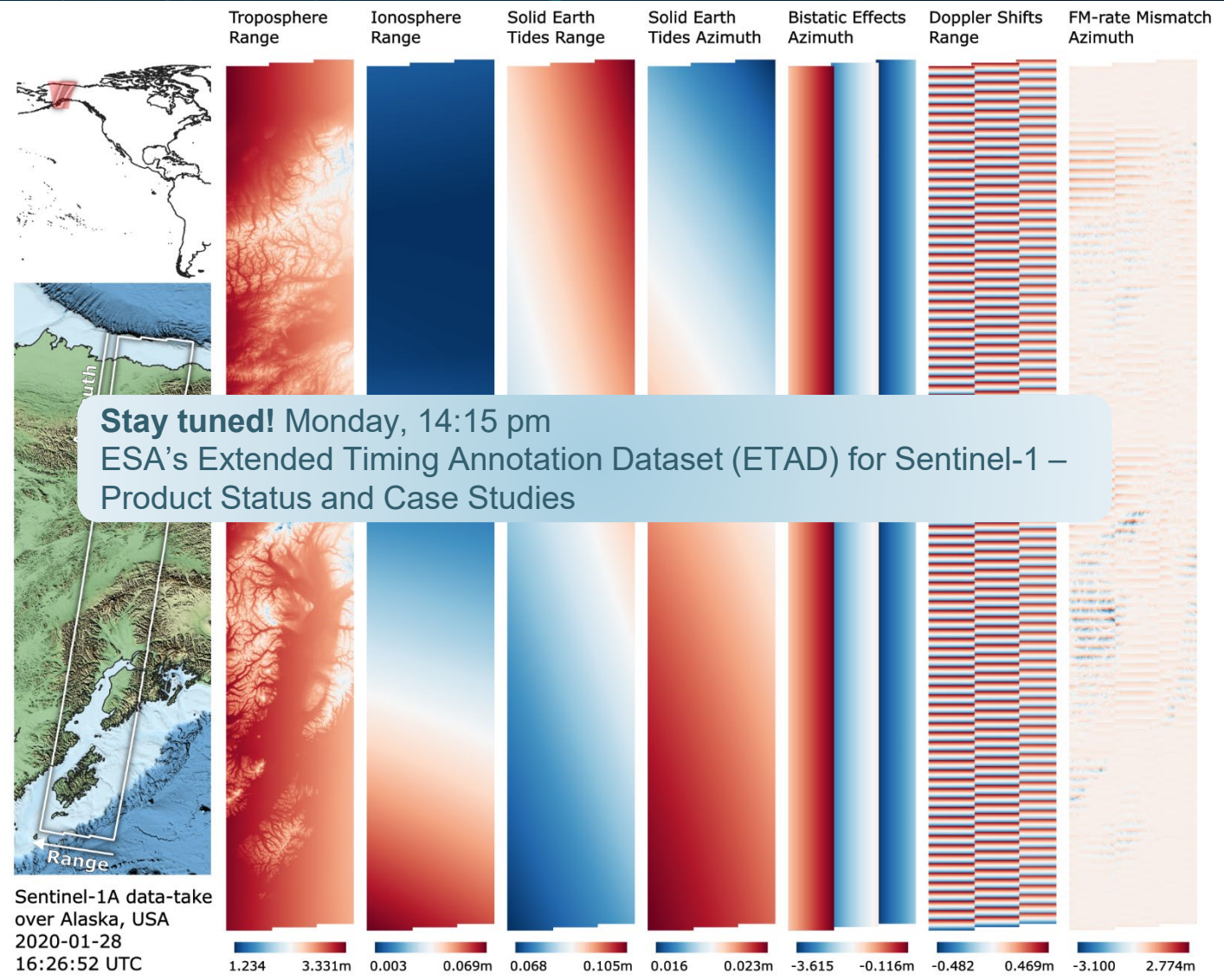


Ratio between in and out of band power (IW VH)

New RFI metadata allows easier detection of slices with mostly noise

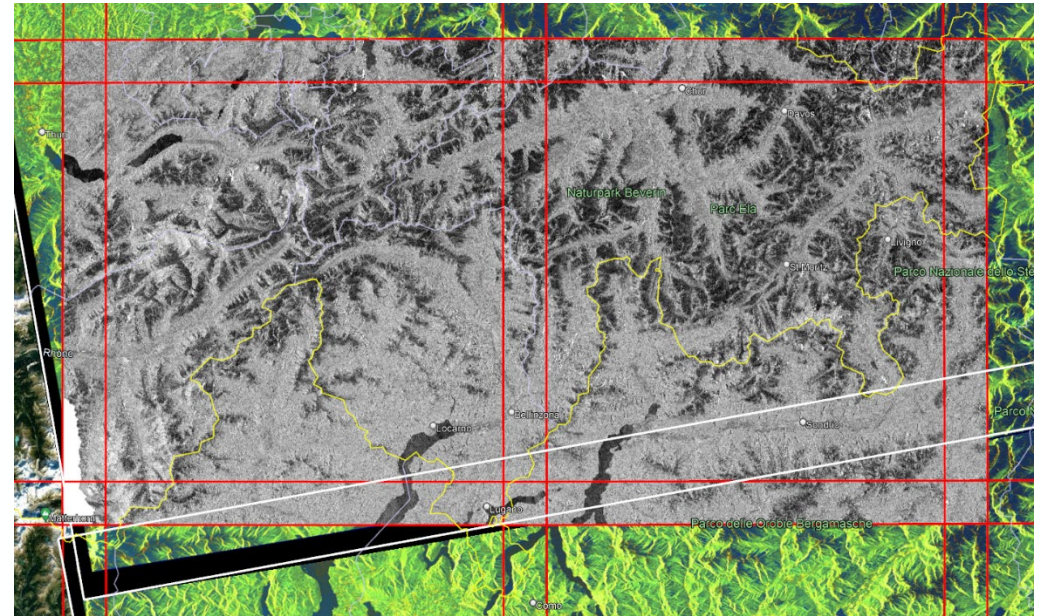
Opportunistic use of RFI metadata can be used to detect doldrums and aid noise vector calibration

- Geometry accuracy shown previously is accessible by putting in place several corrections
- These corrections are easily obtained and applied using the new S1 ETAD product
- Study completed, processor available and product validated
- Test pilot in Geohazard TEP (GEP) for further validation, with focus on applications
- **Early 2022: Test campaign performed at the PDGS confirming operationalization readiness**
 - New flows established with ECMWF and IGS/CODE
 - More than 3 cycles of data acquired
 - Global production, including SM, IW and EW (experimental) modes
 - Step forward in ensuring compatibility with MPC QC system and format harmonization with other S1 products
 - IW data validated at MPC, quality as expected
 - Operational production expected by end of 2022



2021/2022 Highlight: S-1 ARD product

- Activity carried out outside of the MPC
- A first version of the NRB product specification document has been released, and CEOS CARD4L compliant
- Test datasets were generated during Q4 2021 to address several use cases, and have been provided to a group of experts:
 - Ice sheet monitoring
 - Soil moisture retrieval
 - Land cover for time series
 - Baltic monitoring
 - Landslide (over La Palma) together with Sentinel-2
- Prototype is almost complete
- ATBD under preparation
- Expected to be operational by end of 2023 (TBC)



Stay tuned! Monday, 14:30 pm
 “A new ESA ARD product: Sentinel-1 Normalized Radar Backscatter”

- S1A SAR payload behaving well no sign of visible degradation, S1B also well behaved until failure
- Product performance is increasing thanks to the constant effort on the routine monitoring and calibration activities
- Performance indicators, Radiometric & Geometric accuracies are well within their specification
- New products/algorithm evolution improving data usability
- Further results can be found in the annual performance report
<https://sentinel.esa.int/web/sentinel/user-guides/sentinel-1-sar/document-library>

