

# Highlights from the Sentinel-6 Validation Team Meetings

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*EUMETSAT, ESA/ESTEC, NOAA, NASA/JPL, CNES*

*OSTST Fall Meeting 2022, 4 Nov 2022*

Continued,  
enhanced ocean altimetry  
and climate monitoring  
from space

31 October > 4 November 2022

IDS workshop  
OSTST meeting



In partnership with:



Venice - Italy



<https://ostst-altimetry-2022.com/>

- S6 MF became the CEOS Altimetry Reference Mission in April 2022
  - Jason-3 then moved to an interleaved orbit, adding more information to oceanography
  - Sentinel-6 Validation Team supported these decisions by providing valuable independent expert advice on the data quality: Workshops in May '21, Nov '21, Jul '22
- Partners remain involved during operations
  - This Copernicus mission is supported by an international partnership, with joint responsibility for the mission performance: the Mission Performance Working Group (NASA/ESA/NOAA/EUMETSAT/CNES) monitors the data and products quality and, together with the Project Scientists, steer evolutions and improvements of the overall mission value.
  - There remains to be a close connection with Industry on issues concerning satellite health and operations



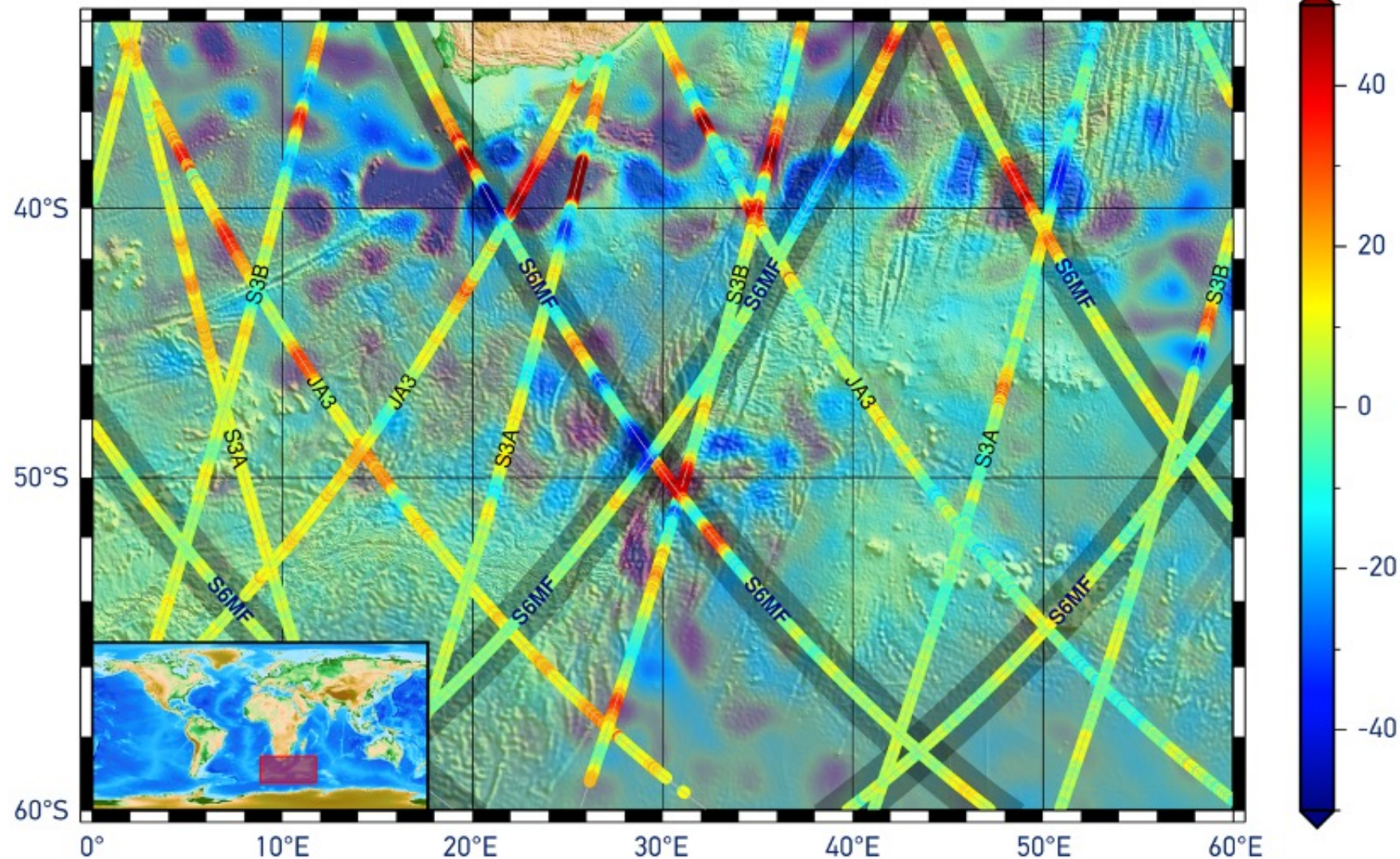


# COPERNICUS SENTINEL-6 MISSION

FIRST DATA FROM SENTINEL-6 MICHAEL FREILICH SATELLITE LAUNCHED ON 21 NOVEMBER 2020

DAY : THURSDAY 10 DECEMBER 2020 || HOURS : 9:00 - 10:00 AM CET

sea level anomaly (cm)



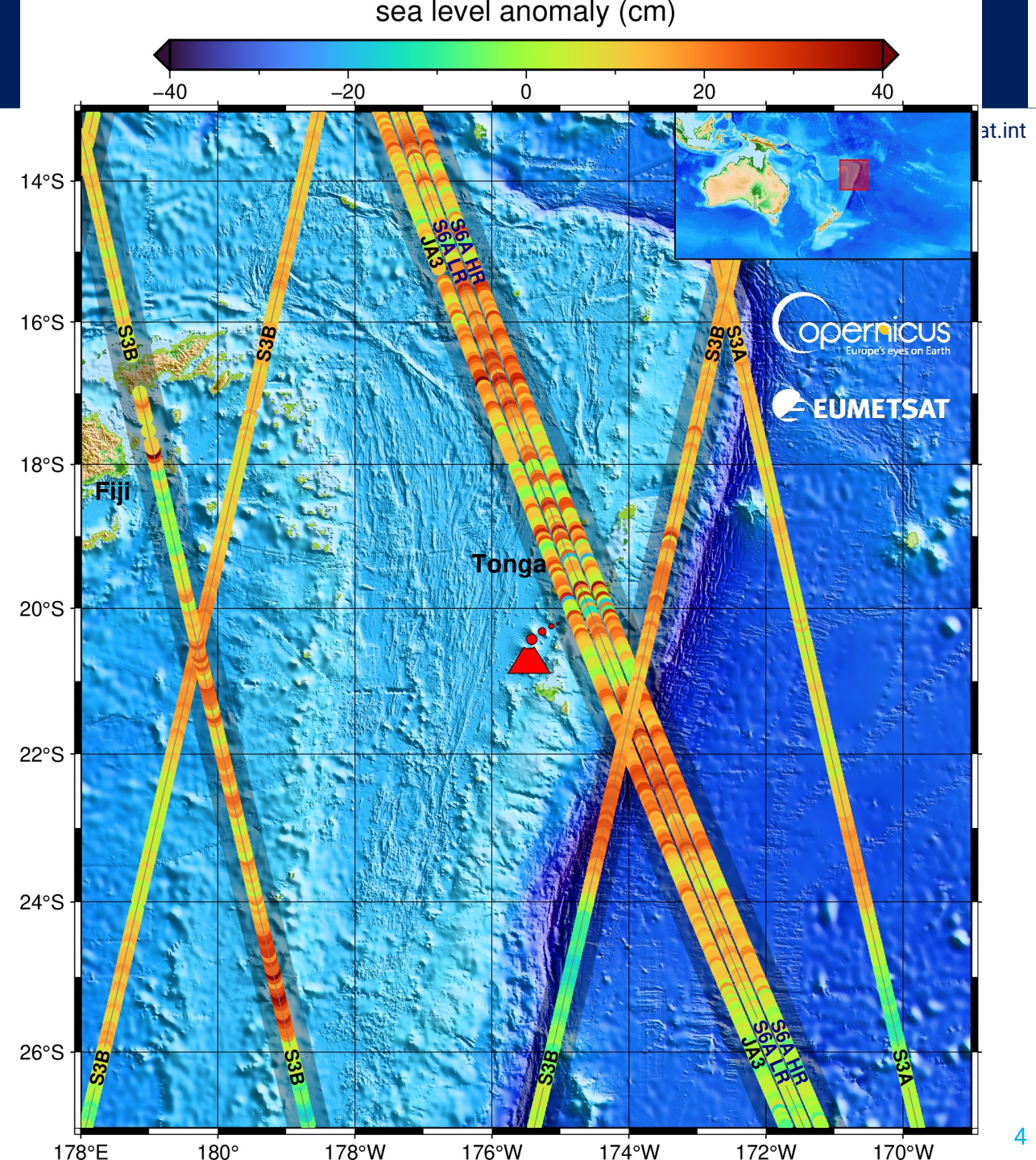
#Sentinel6





# Chance tsunami encounter

- 14 January 2022
- The underwater volcano Hunga Tonga-Hunga Ha'apai in the Pacific Ocean erupts
- The Copernicus altimeter missions *Sentinel-6A* *Michael Freilich* and *Jason-3* capture the subsequent tsunami

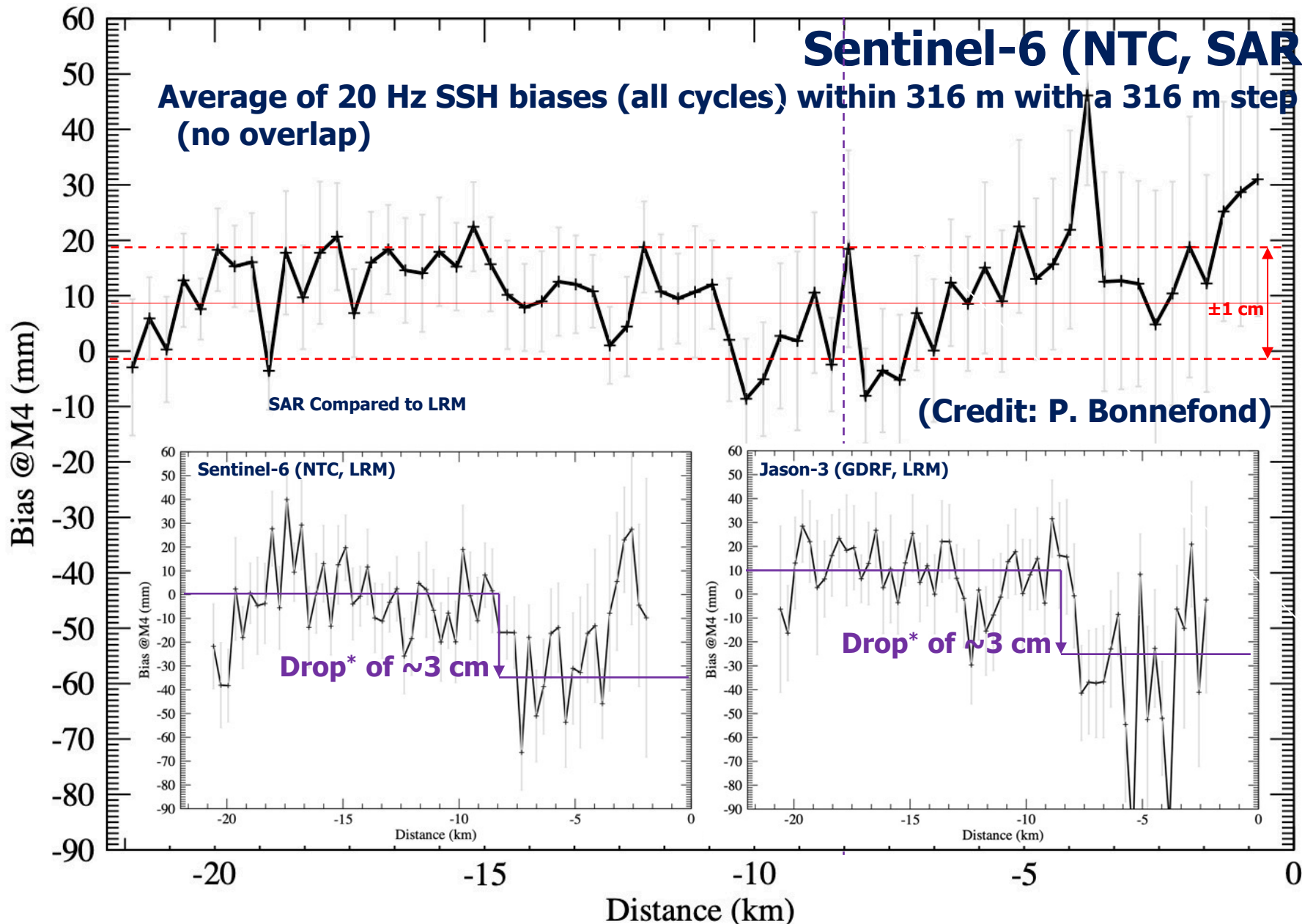




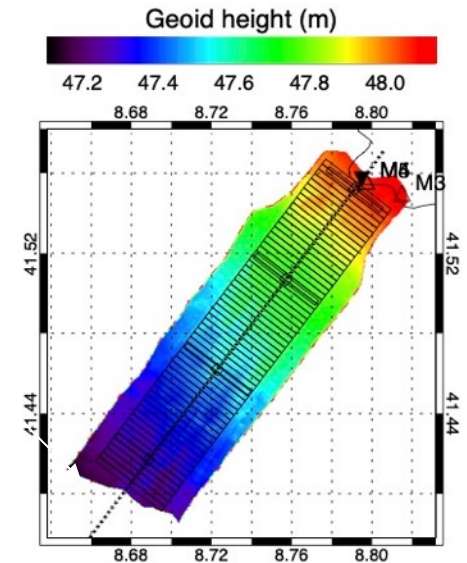


# Corsica facilities: Sentinel-6 MF close look up to the coast

copernicus.eumetsat.int



- Most of the averaged of 20Hz SSH biases in boxes of 316 m are within  $\pm 1$  cm (standard deviation of 9.6 mm)
- The drop in LRM due to land contamination for distance below  $\sim 8$  km disappears in SAR (standard deviation reduced from 20.9 mm in LRM to 9.6 mm in SAR)
- Comparable drop in LRM for Sentinel-6 MF and Jason-3

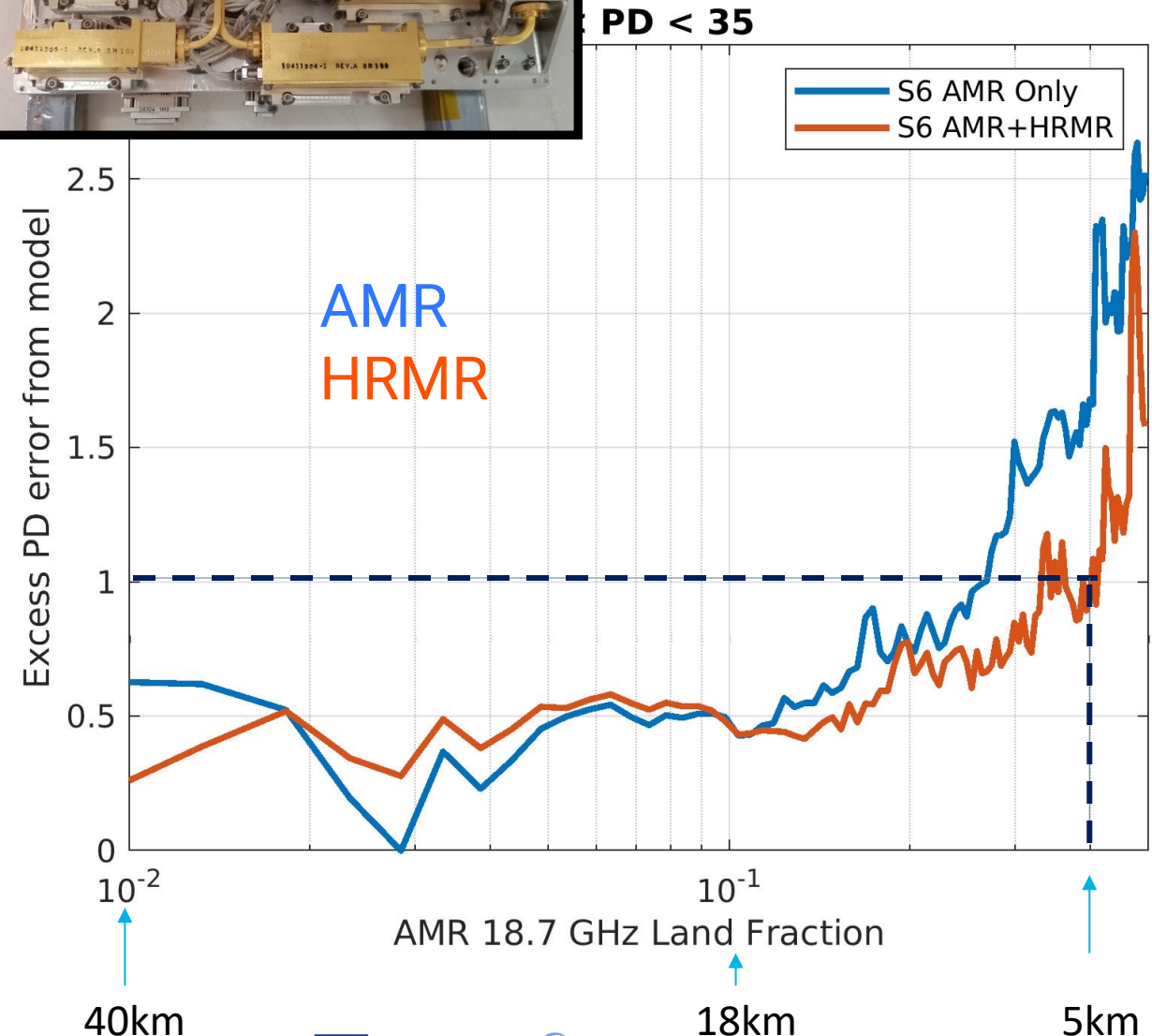
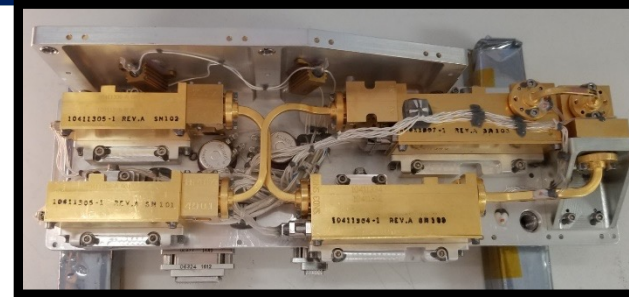




# HRMR Coastal Path Delay Performance

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- In addition to the traditional 3 low-frequency radiometer channels of AMR, HRMR adds another 3 high-frequency channels
- HRMR processor integrated into operational processing since 15 Sep.
- HRMR+AMR has up to 50% reduction in variance from AMR only coastal PD to coast
- HRMR+AMR excess error globally less than 1 cm to 5 km from land
- HRMR algorithm work on-going and further improvement expected





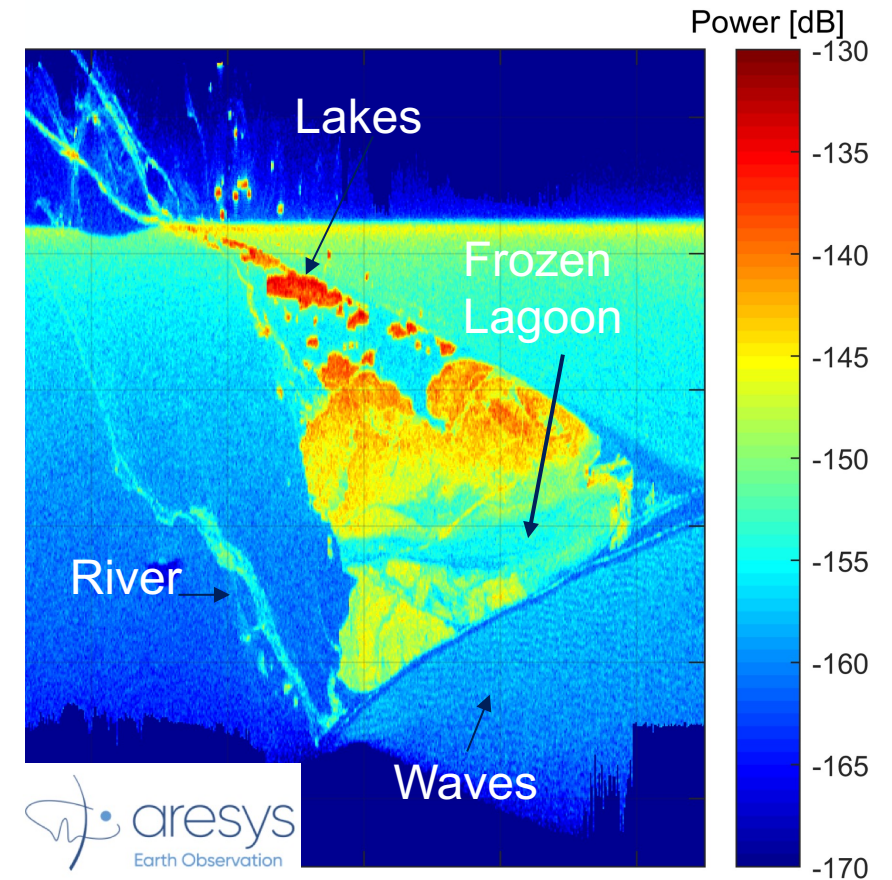
S6-MF Poseidon-4 altimeter reveals unprecedented detail in the Ozero Nayval lagoon and surrounding river areas. Fully focussed synthetic aperture radar **processing highlights the low noise performance of new digital instrument architecture.**



Sentinel-2B (10m) Ozero Nayvak peninsular, Russia, 15 August 2020



Sentinel-1B **Interferometric** Wide Swath, 29 Nov 2020



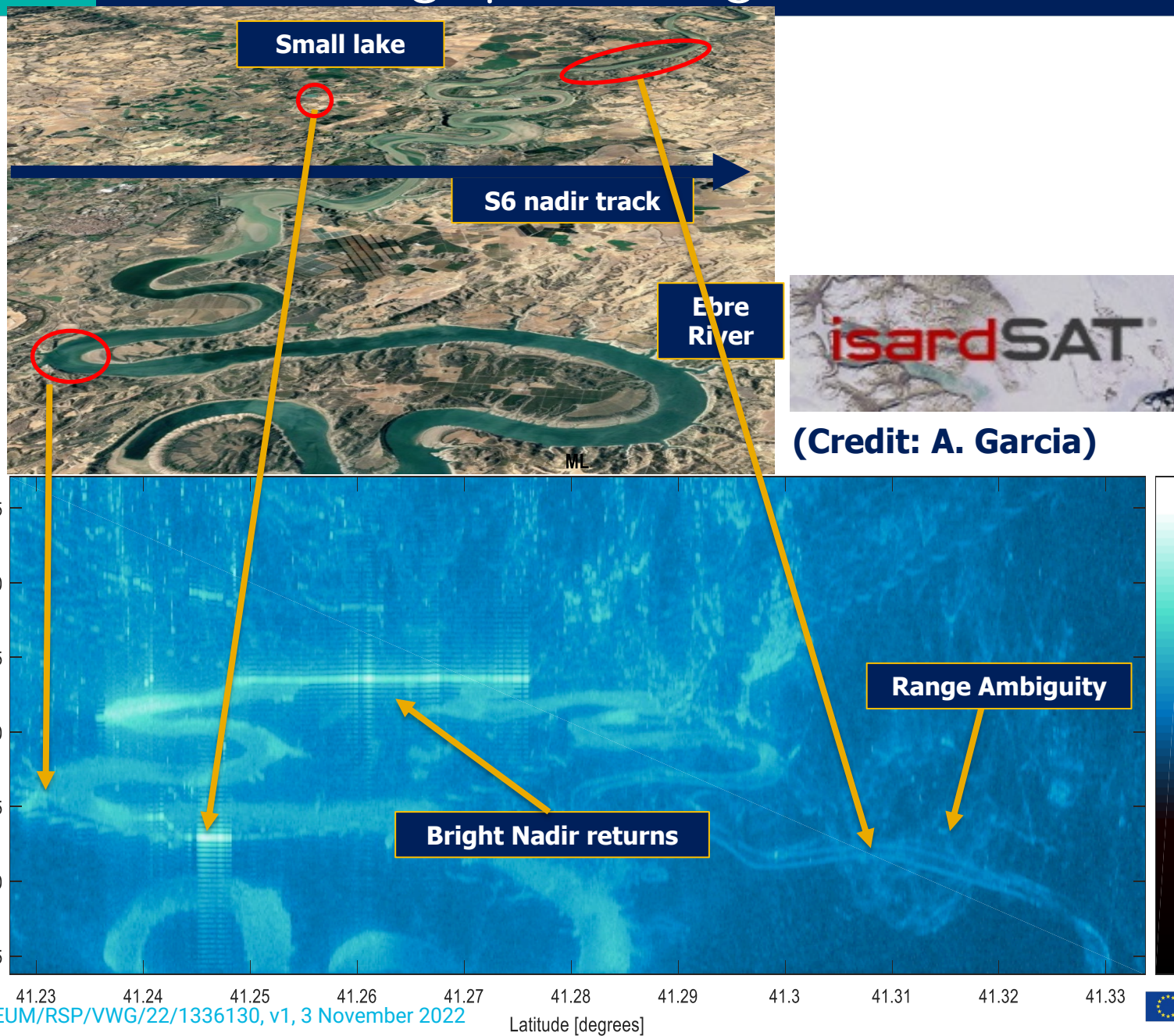
Sentinel-6MF (a) LRM (b) Fully Focussed SAR Range image, 30 Nov 2020





# FFSAR image processing over Ebre river

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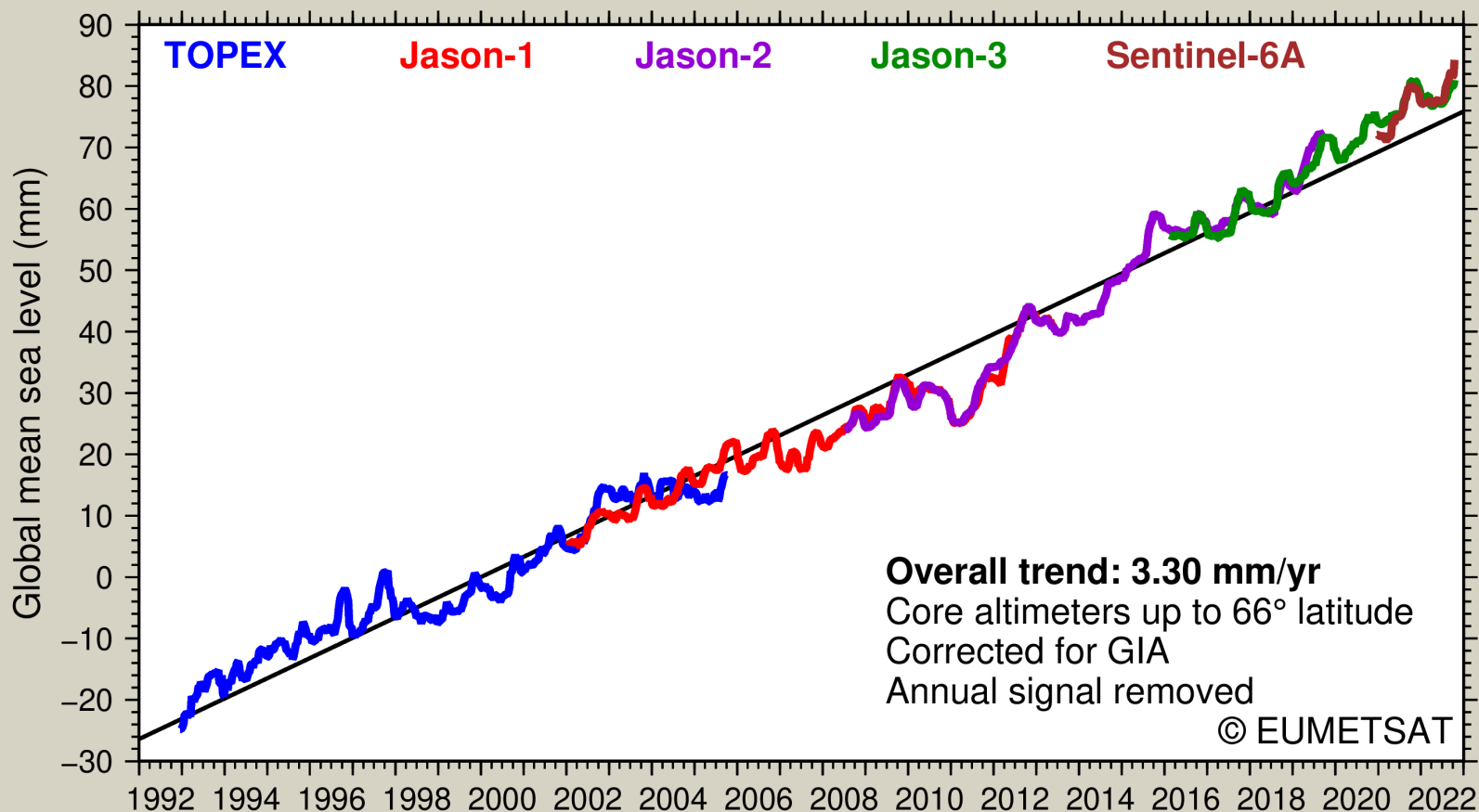
- Processed at a resolution of 0.6 m in azimuth (left to right) and  $<0.6$  m in the range direction (vertical).
- Further multi-looked to 20m in azimuth to reduce speckle noise
- Bright returns from preferential nadir targets
- Replica (ghost) image due to FFSAR ambiguity typical of highly reflective targets in low backscatter areas





# Sea level rise is a societal threat

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Sentinel-6 will maintain the satellite reference altimeter time series

Low-lying coastal zone is home to 680 million people

3 million extra people at flooding risk for every cm of sea level rise

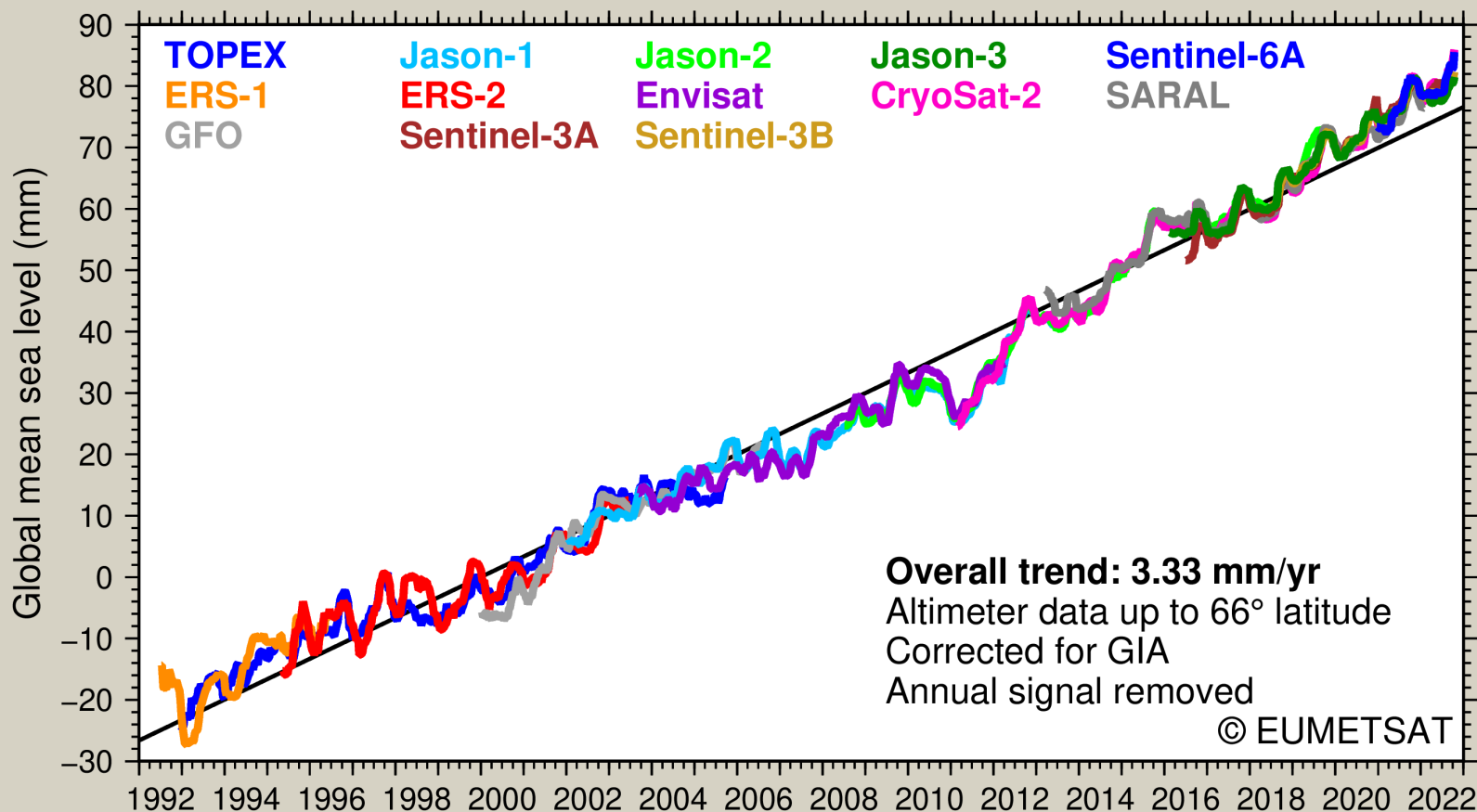
IPCC predictions for 2100 show 43 – 84 cm increase of average sea levels





# Sea level rise is a societal threat

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13 altimeters since 1992 show the same trend and curvature of the mean sea level

Low-lying coastal zone is home to 680 million people

3 million extra people at flooding risk for every cm of sea level rise

IPCC predictions for 2100 show 43 – 84 cm increase of average sea levels





# Thank you!

Questions are welcome.

