

Continued, enhanced ocean altimetry and climate monitoring from space Conference, OSTST, **31 October-4 November 2022** 

# On the assimilation of LR and HR Sentinel-6MF wave data in wave model : Assessement and perspectives

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## **MOTIVATION:**

Since last 14 June 2022 the assimilation of S6MF has been activated in the operational global and regional wave model **MFWAM :** enhancing the reliability of wave submersion warning

Verification and monitoring this update in the analysis and forecast periods : improvement of CMEMS wave products and initial conditions for coastal applications

Impact of the assimilation of reprocessed S6A SWH (Low Resolution) Feb-Mar 2021 : validation with CFO, S3, Saral, HY2B

DA with Jason-3

DA with S6A (LR) Max bias range 60 cm





Without DA



Assessing the quality of SWH from S6 HR and LR with last L2 processing

# **MODEL EXPERIMENTS**

The wave model MFWAM is used for a global scale configuration with grid resolution of 50 km. The model is driven by 6-hourly wind and ice Fraction from IFS-ECMWF atmospheric system. The wave spectrum is Set to 24 directions and 30 frequencies. Model runs have been performed with data assimilation of S6A SWH

Control run is also performed to evaluate the impact of the assimilation.

6 altimeters vs 7 altimeters (including S6A)

Similar performance of S6A and Ja3 and good reduction of bias

#### Impact on scatter index of SWH





**Evaluation of the impact of S6MF HR SWH on AROME domain** 

Downscaled Model MFWAM for S6A HR evaluation of DA impact :

#### • Simulation set-up :

**MFWAM configuration on AROME domain** (38°N-53°N, 8°W-12°E) with 2.5 km grid resolution and hourly wind forcing. **Boundary conditions from North** Atlantic model (without DA)

#### Mean difference of SWH w/wo DA of S6 5 Hz during storm event 22-25 February 2021



Validation with drifting spotter buoys of SUMOS Campaign (Gulf of Biscay) 8-28 February 2021

locations of 20 spotter buoys during SUMOS

**AROME** Domain



Model simulations during SUMOS (Feb. 2021) : Model with DA of hourly S6A HR SWH (5hz) **Control model run without DA** 

Hourly colocation at nearest ~2.5 km between model and buoys 12-28 february 2021



Scatter index (SI) of SWH (%)



Storm case at La Réunion island (indian ocean)

high winds constantly on long fetch conditions : generation of high swell with very long wavelength (630 m)



**Snapshot of SWH from CMEMS-Global on 29 June at 06:00UTC** 







Statistical analysis			
	NO-DA	DA-S6-5Hz	DA-CFO-
s (m)	-0.43	-0.31	-0.34

-5hz Bias 13,8 13,2 13,1 Scatter index (%) 3383 density

Q-Q plot indicates better PDF with DA of S6A (HR-5hz)

#### Validation of DA S6A-HR(5hz) with independent altimeters at ~10 km February 2021

With DA

Without DA





Significant improvement of scatter index and slope with of SWH S6A (HR-5hz)

**Comparison of operational models using** S6A on HY2B track 29 June 03:00(UTC) SWH of 6-7 m near La Réunion

### Key messages

- Successful update of CMEMS global wave system with the assimilation of S6A (LR) SWH
- The assimilation of DA of S6A HR (5hz) SWH showed a significant reduction of bias and scatter index of SWH : thanks to validation with SUMOS drifting buoys (nearest 2.5 km)
- Similar performance between DA of Jason-3 and S6A (LR) SWH
- Better capturing of high SWH in storm conditions such the case shown for red warning level in La Réunion : thanks to S6A SWH contribution



MFWAM are slighlty underestimating the peaks, mostly because of wind underestimation (ARPEGE had a better forecast than IFS)