Long-Term Assessment of Sentinel-3 NRT Wind and Wave Data

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Introduction

- Sentinel-3A & Sentinel-3B radar altimeter (SRAL) near real time (NRT) Level 2 STM Marine Product (SR_2_WAT). Only 1-Hz data are considered.

- Products:
  - wind speed
  - Significant wave height (SWH).

- Latest status of products.

- Validation against ECMWF model and in-situ measurements.
Sentinel-3A SAR Wind Speed
Sentinel-3 SAR wind speed comparison against in-situ data

**Sentinel-3A**

- Entries: 5,780
- Mean Buoy: 8.977
- Mean S3A: 8.912
- Bias (S3A-Buoy): -0.065
- St. Dev. Diff.: 1.464
- Scatter Index: 0.163
- Correlation: 0.928
- Symmetric Slope: 0.995
- Regr. Coefficient: 0.937
- Regr. Constant: 0.502

**Sentinel-3B**

- Entries: 5,790
- Mean Buoy: 9.035
- Mean S3B: 8.927
- Bias (S3B-Buoy): -0.108
- St. Dev. Diff.: 1.538
- Scatter Index: 0.170
- Correlation: 0.917
- Symmetric Slope: 0.989
- Regr. Coefficient: 0.912
- Regr. Constant: 0.690
Sentinel-3 SAR wind speed comparison against model

**Sentinel-3A**

- Entries: 1535522
- Mean ECMWF: 7.701
- Mean Altimeter: 7.845
- Bias (S3A-ECM): 0.144
- St Dev of Diff.: 1.056
- Scatter Index: 0.137
- Correlation Coef: 0.955
- Symmetric Slope: 1.014
- Reg. Coefficient: 0.947
- Reg. Constant: 0.555

**Sentinel-3B**

- Entries: 1,532,482
- Mean ECMWF: 7.697
- Mean Altimeter: 7.721
- Bias (S3B-ECM): 0.024
- St Dev of Diff.: 1.052
- Scatter Index: 0.137
- Correlation Coef: 0.955
- Symmetric Slope: 0.999
- Reg. Coefficient: 0.934
- Reg. Constant: 0.530
S3A SAR Wind Speed Bias & SDD (wrt model)
Sentinel-3 wind speed bias against model
Sentinel-3A, 3B & Jason-3 wind speed bias & SDD (wrt model)
Sentinel-3 SAR Significant Wave Height (SWH)
Sentinel-3 SAR sig. wave height comparison against in-situ data

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**Sentinel-3A**

Entries: 12,449  
Mean Buoy: 2.535  
Mean S3A: 2.635  
Bias (S3A-Buoy): 0.100  
St. Dev. Diff.: 0.300  
Scatter Index: 0.119  
Correlation: 0.981  
Symmetric Slope: 1.034  
Regr. Coefficient: 0.999  
Regr. Constant: 0.103

**Sentinel-3B**

Entries: 12,301  
Mean Buoy: 2.568  
Mean S3B: 2.690  
Bias (S3B-Buoy): 0.123  
St. Dev. Diff.: 0.321  
Scatter Index: 0.125  
Correlation: 0.980  
Symmetric Slope: 1.039  
Regr. Coefficient: 0.994  
Regr. Constant: 0.139
Sentinel-3 SAR sig. wave height comparison against model

**Sentinel-3A**

- Entries: 1,535,522
- Mean WAM: 2.595
- Mean Altimeter: 2.625
- Bias (S3A-WAM): 0.030
- St Dev of Diff: 0.246
- Scatter Index: 0.095
- Correlation Coef: 0.985
- Symmetric Slope: 1.018
- Reg. Coefficient: 1.026
- Reg. Constant: -0.038

**Sentinel-3B**

- Entries: 1,532,482
- Mean WAM: 2.595
- Mean Altimeter: 2.640
- Bias (S3B-WAM): 0.045
- St Dev of Diff: 0.265
- Scatter Index: 0.102
- Correlation Coef: 0.982
- Symmetric Slope: 1.024
- Reg. Coefficient: 1.028
- Reg. Constant: -0.028
S3B SWH Bias & SDD (wrt model)
Sentinel-3 significant wave height bias against model

Satellite: Sentinel-3A
Wave Height Bias (Sat-Mod) [m]
For period between 21:36:41UTC on 13.10.2019 and 20:55:34UTC on 13.10.2020

Satellite: Sentinel-3B
Wave Height Bias (Sat-Mod) [m]
For period between 21:00:05UTC on 13.10.2019 and 20:59:52UTC on 13.10.2020
Sentinel-3A, 3B & Jason-3 SWH bias & SDD (wrt model)
Conclusions
Conclusions

Operational NRT Sentinel-3 wind and wave measurements were assessed.

Surface Wind Speed:
- Stable and very good: Globally unbiased & SDD=1.0 m/s & 1.5 m/s wrt model & buoys, respectively. (regional biases with seasonal changes).
- Slightly better than Jason-3.

Significant Wave Height (SWH):
- Although SWH is stable and very good.
- Its SDD is higher compared to other altimeters (recent SDD values are very close to those of Jason-3).

- Improvement in wave model (CY46R1) in June 2019 picked up in the altimeter comparison.