WP4.5: Assessment of CryoSat-2 ocean data

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DHI

Abstract

Objective:

- Use of high-resolution wave height and wind speed products from the SRAL SAR to improve design data in marine engineering

Activities:

a) Development of data handling and analysis tools

b) Preparation of altimeter, in-situ and model data

c) Demonstration of improved wave and wind design data

Achievements:

a) Development verification case for wave and wind data in the North Sea

b) Demonstrate validation case of numerical models in NE Atlantic

c) Establish along-track validation wave and wind extreme case

Altimeter data

Mission	Provider	Processing Mode	Return Cycle	Applied Parameters
CryoSat-2	CLS	PLRM, 1Hz	369 days*	H_s, U_{10}
CryoSat-2	CLS	SAR, 1Hz	369 days*	H_s, U_{10}
CryoSat-2	CLS	PLRM, 1Hz	369 days*	H_s, U_{10}
CryoSat-2	CLS	SAR, 20Hz	369 days*	H_s, U_{10}
CryoSat-2	STARLAB	SAR, 20Hz	369 days*	H_s
Jason-2	DHI	LRM, 1Hz	10 days	H_s, U_{10}

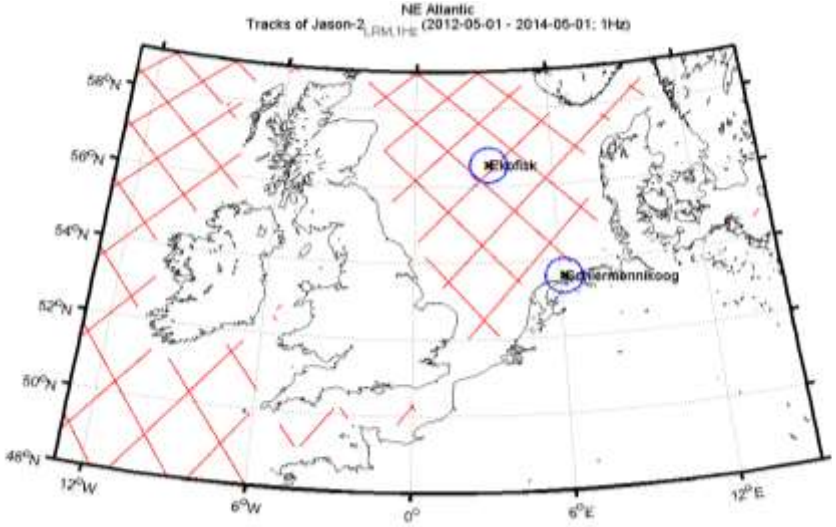
* With 30 day sub-cycle

Temporal coverage:

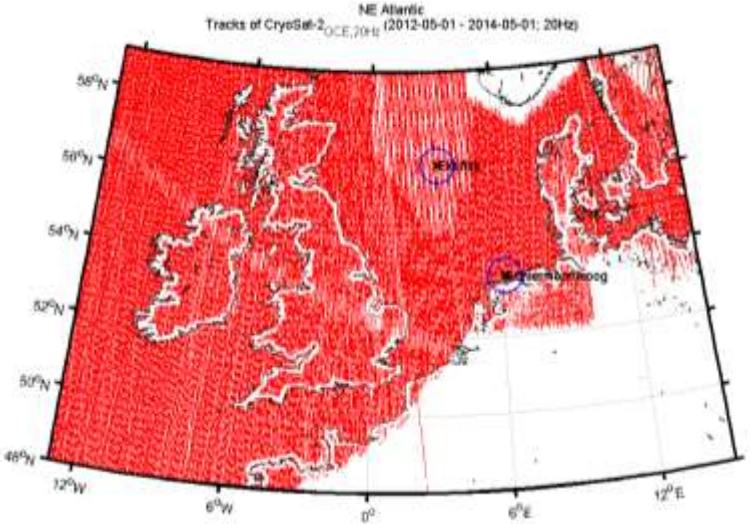
- CLS: 2 years (2012-05-01 – 2014-04-30)
- STARLAB: 1 year (2012-05-01 – 2013-04-30)

Altimeter coverage in NE Atlantic (after quality screening)

Jason-2
(LRM, 1Hz) DHI



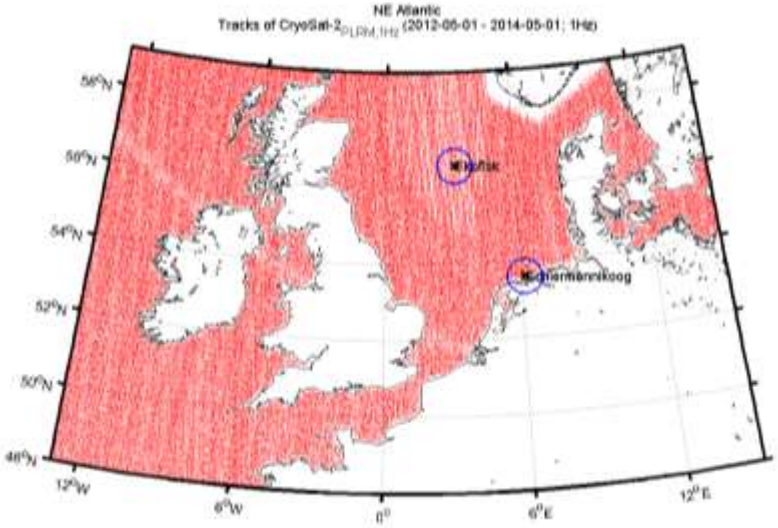
CryoSat-2
(SAR, 20Hz) STARLAB



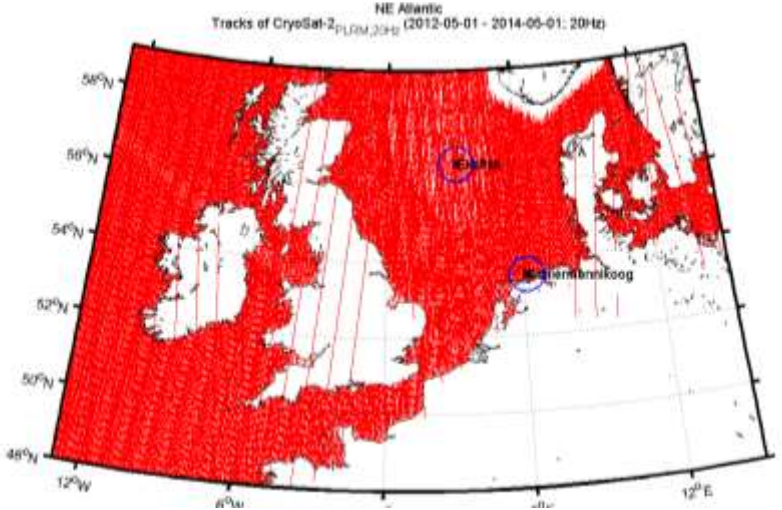
- No data of Norwegian coast
- Data on land (except near coast)
- Strange pattern in Central Northern North Sea

Altimeter coverage in NE Atlantic (after quality screening)

CryoSat-2 (PLRM & SAR, 1Hz) CLS



CryoSat-2 (PLRM & SAR, 20Hz) CLS



- No data of Norwegian coast
- Data on land for 20Hz only
- Strange pattern in Central Northern North Sea

03.

In-situ verification

1. Offshore site: Ekofisk (Central North Sea)
2. Coastal site: Schiermonnikoog (~10km of Dutch coast)

In-situ verification

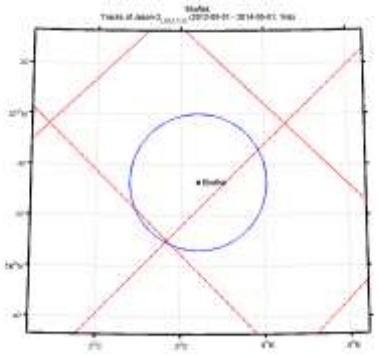
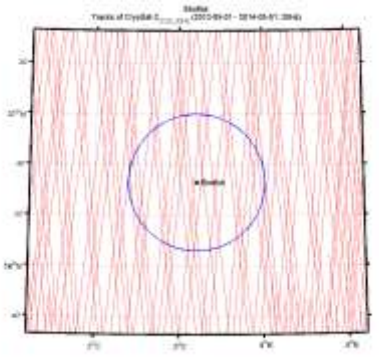
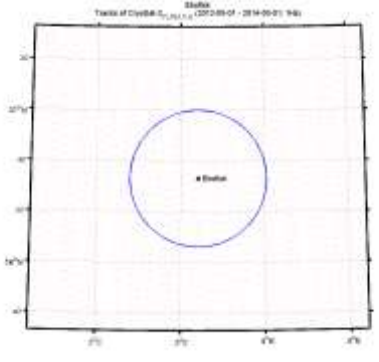
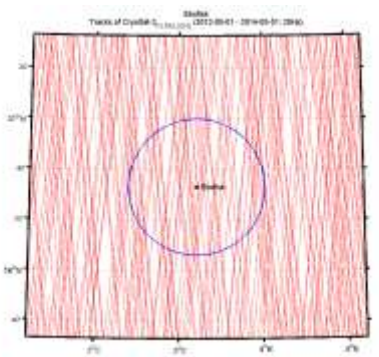
Purpose:

a) To verify and inter-compare the altimeter data sets

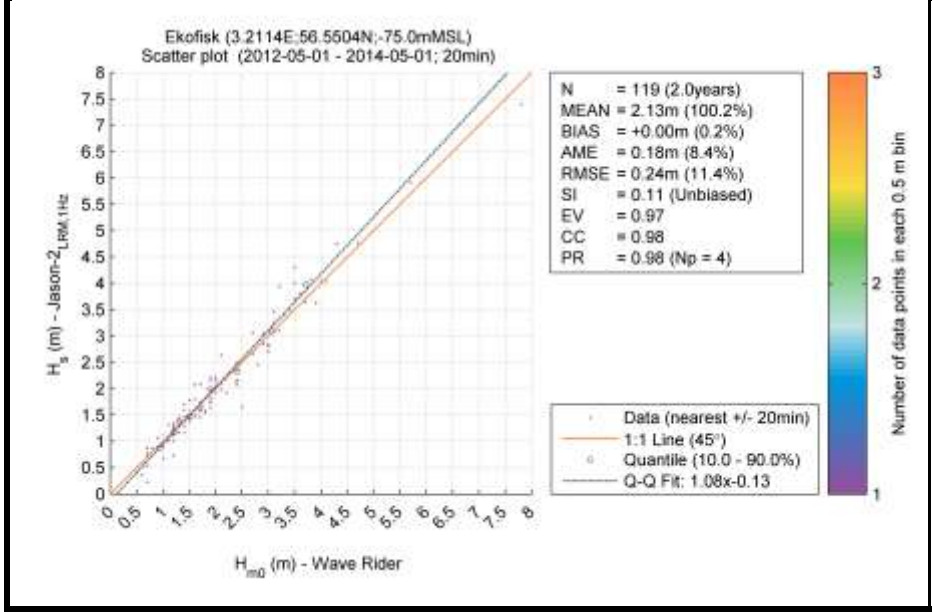
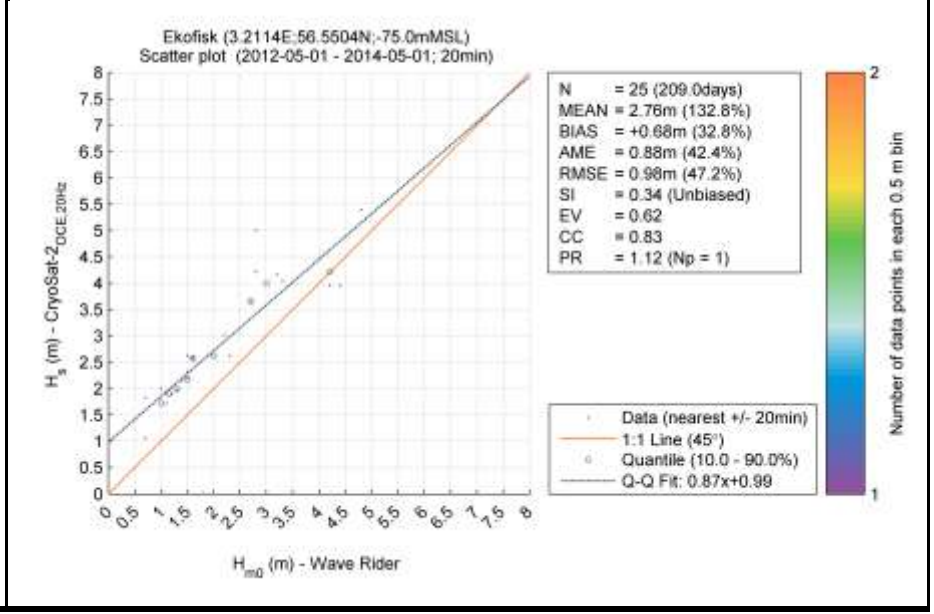
b) To demonstrate the validity of the coastal re-tracked SAR data offshore and near-shore

Collocation criterion:

- Nearest point per pass within 50km and 30min
- No along-track interpolation or smoothing was conducted at this stage

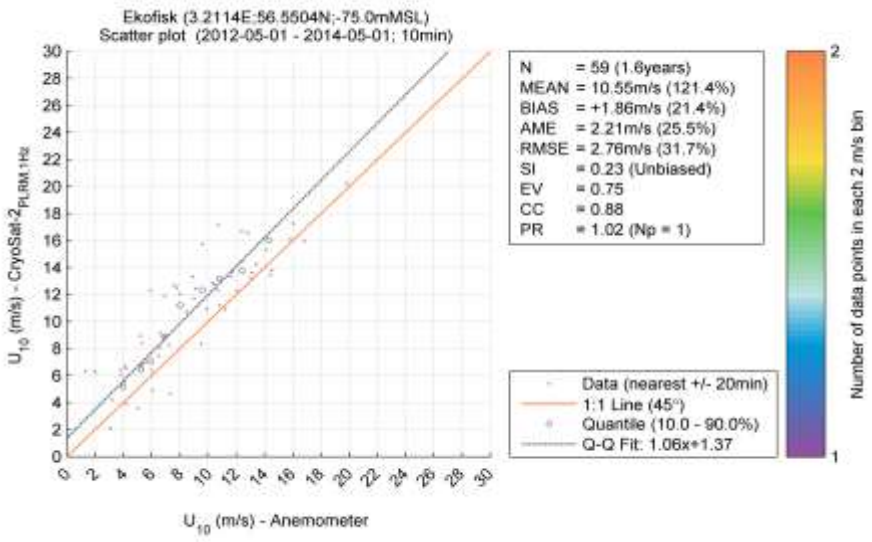
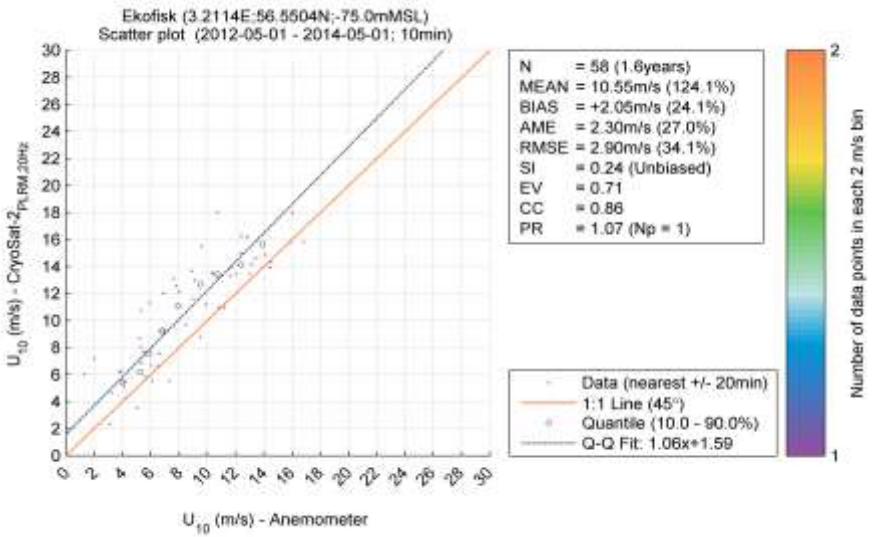
Jason-2 (LRM, 1Hz) DHI	CryoSat-2 (20Hz) STARLAB
	
CryoSat-2 (PLRM & SAR, 1Hz) CLS	**CryoSat-2 (PLRM & SAR, 20Hz) CLS**
	

Verification of Hs @ Ekofisk (Central North Sea)

Jason-2 (LRM, 1Hz) DHI	CryoSat-2 (SAR, 20Hz)[1] STARLAB
	

- Good agreement for Jason-2
- Some overestimation of small Hs for CryoSat-2

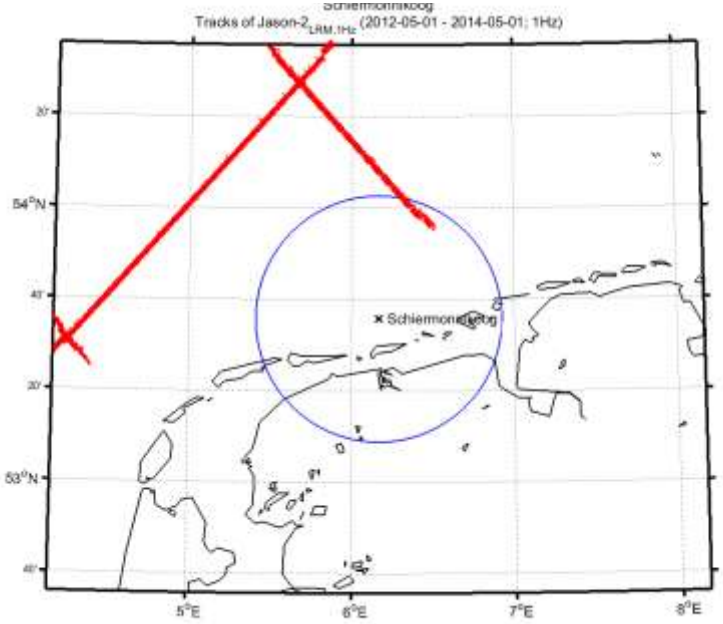
Verification of U_{10} @ Ekofisk (Central North Sea)

CryoSat-2 (PLRM, 1Hz) CLS	CryoSat-2 (PLRM, 20Hz) CLS
	

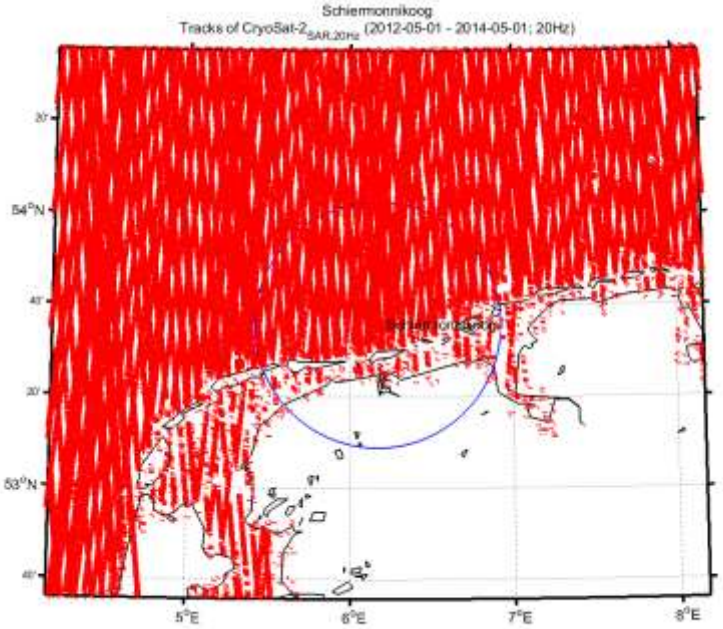
- Reasonable RMSE and QQ fit, but trend of positive BIAS ~2m/s!
- Similar accuracy of 1Hz and 20Hz PLRM data

Coastal site: Schiermonnikoog (~10km of Dutch coast)

Jason-2
(LRM, 1Hz) DHI

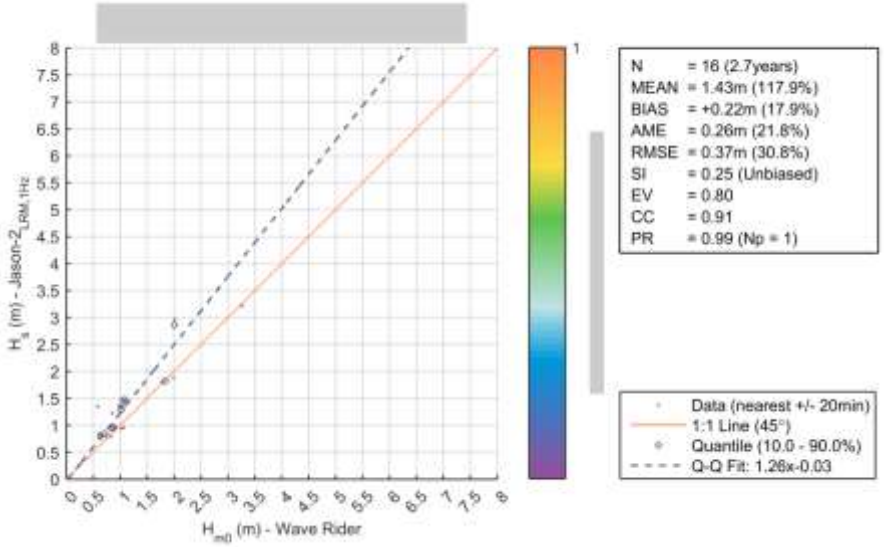


CryoSat-2
(SAR, 20Hz) CLS

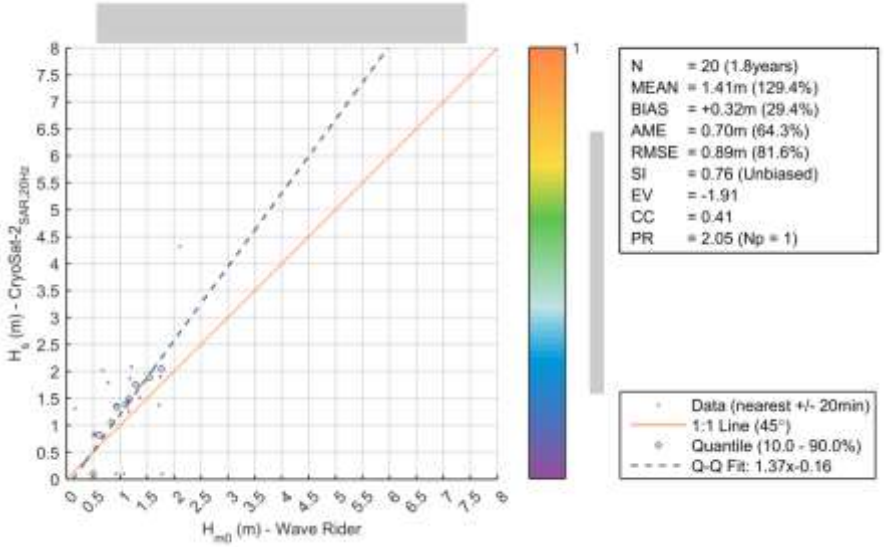


Verification of Hs @ Schiermonnikoog (~10km of Dutch coast)

Jason-2
(LRM, 1Hz) DHI



CryoSat-2
(SAR, 20Hz) CLS



NB: Only nearest point applied

Conclusions

- **Conclusions:**
- SAR data based on coastal re-tracking algorithms is (potentially) of similar accuracy as Jason-2 LRM data in open ocean (Ekofisk)
- SAR data is a valuable data source in near-shore areas e.g. for initial assessment and for improved validation and calibration of numerical models.