

A Study of the conformance of altimetry and in-situ sea surface data near coast in the German Bight

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Outline

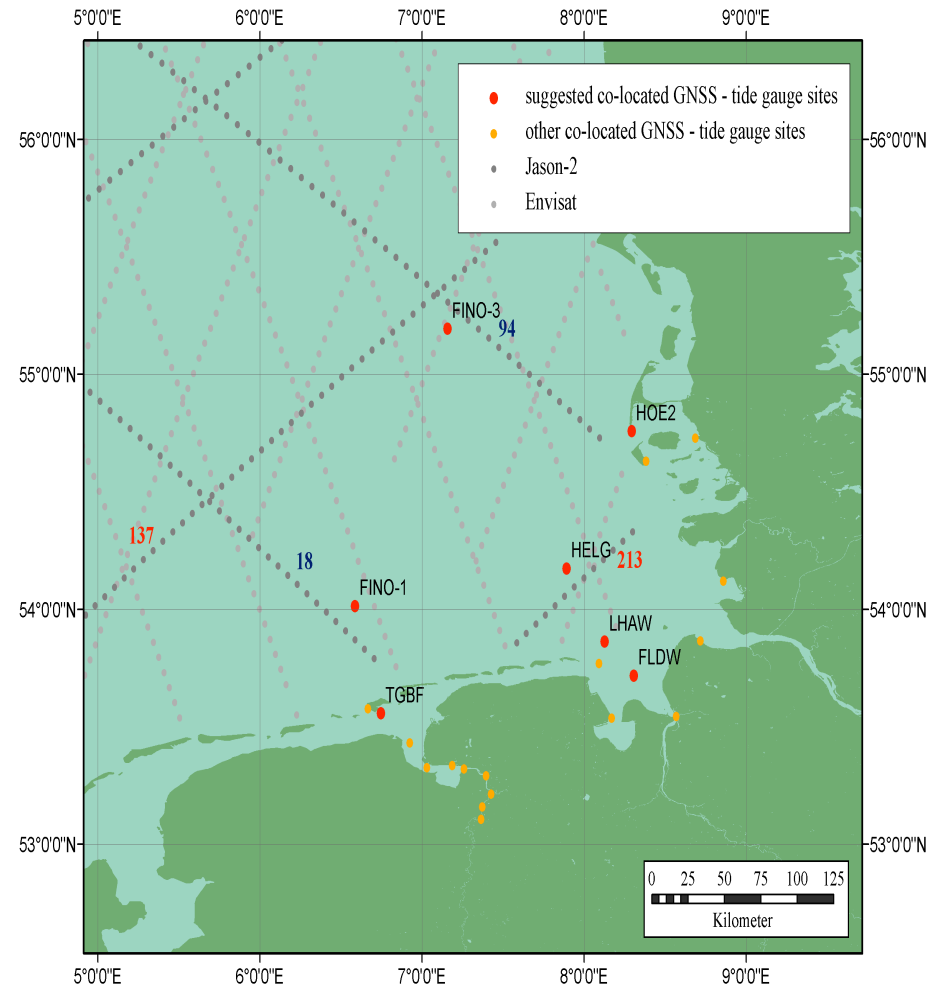
- Goals
- Data Overview
- Results
- Conclusions

1. Goals – Region & Methodology

1. Open Sea

2. Pass 213 near coast

3. FINO3 (SWH Cryosat2)

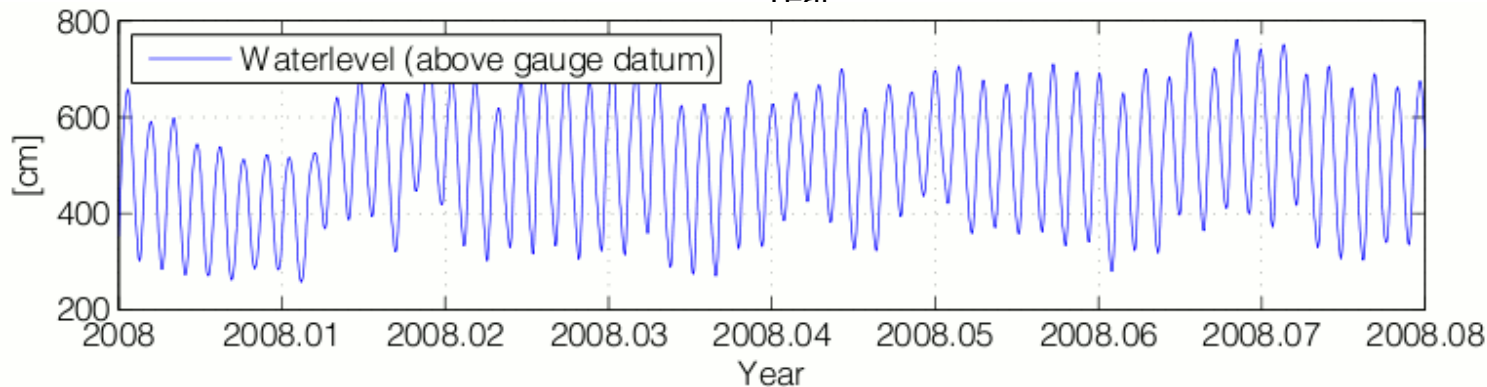
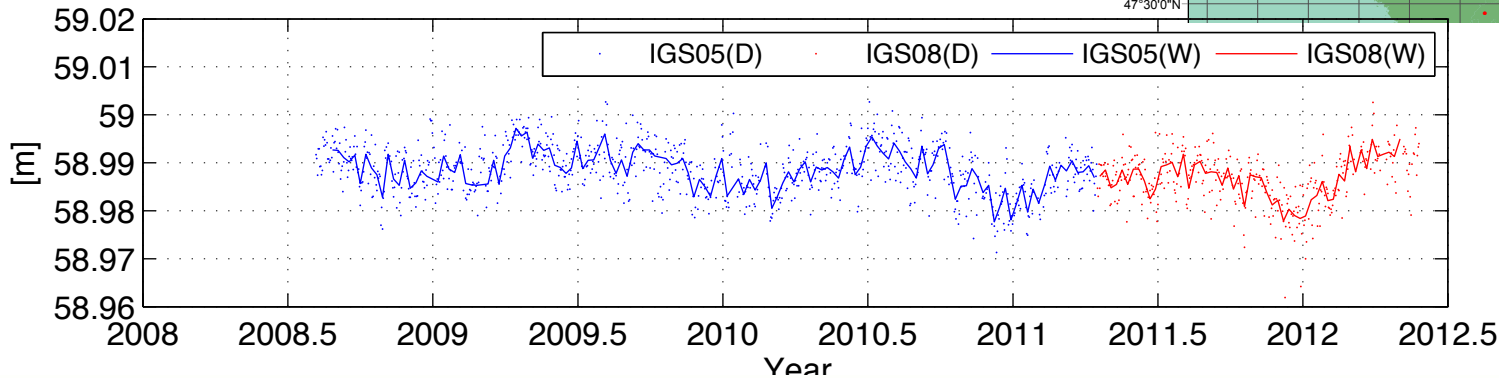
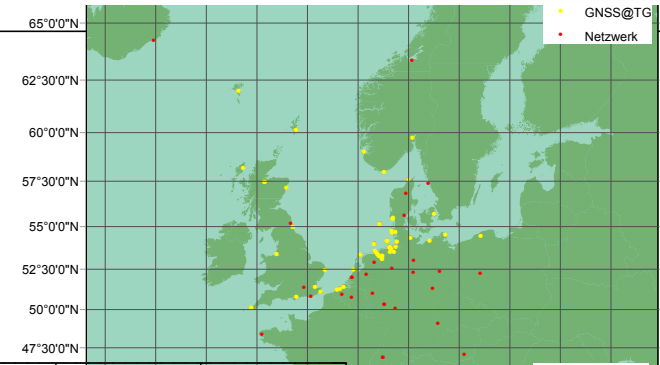




2.1 Data Overview – GPS and TG

Waterlevels – TG min 2000-2010 WSV

GPS@TG – 19 permanent (BfG)
3 BKG EUREF GNSS,
GREF



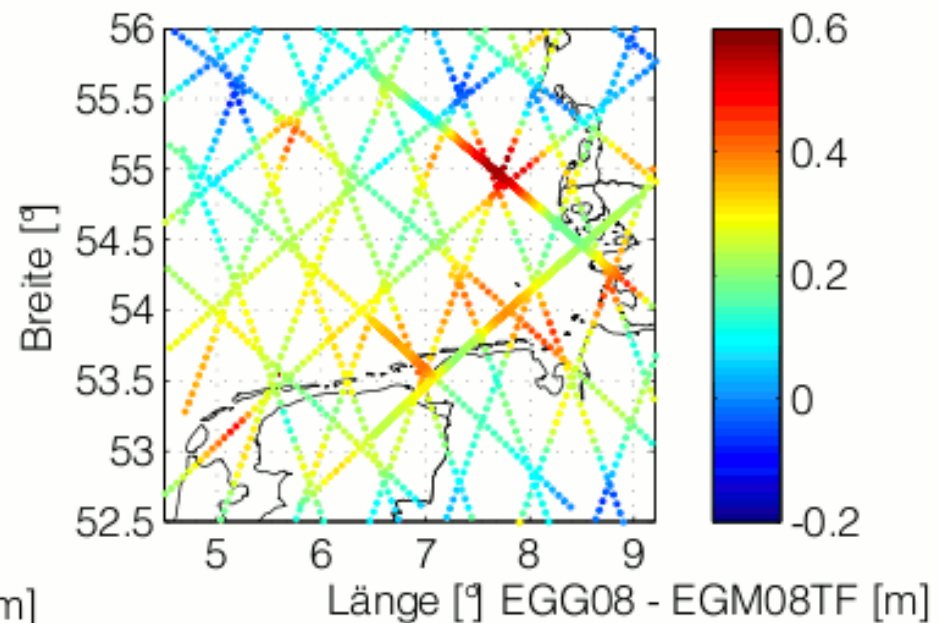
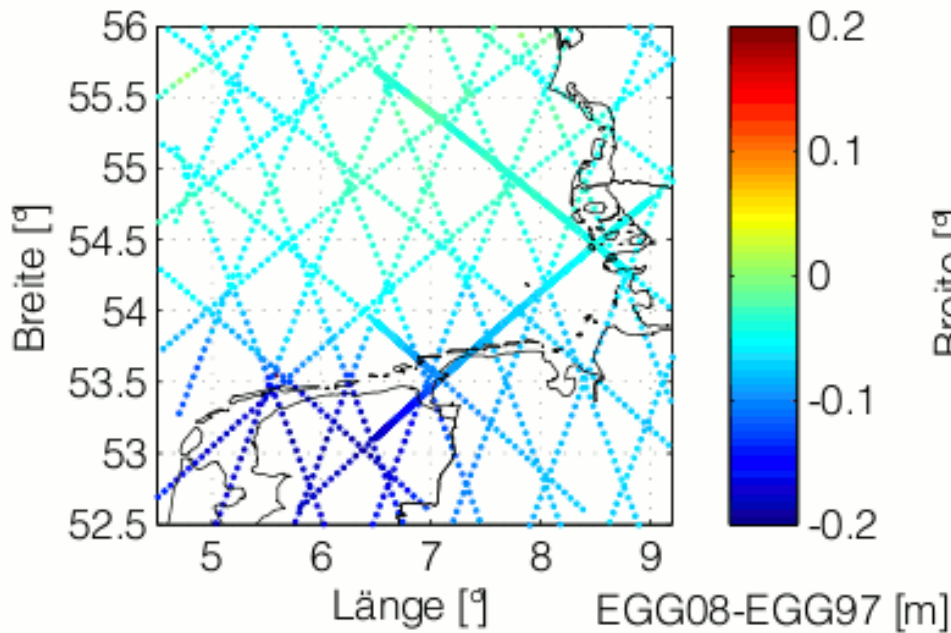
2.2 Data Overview - altimetry

- 1-hz data (Jason—1, -2, RADS)
- 20 hz data (Jason-2, GDR, Pistach, SGDR)
- Standard geophysical correction
 - : dry & wet tropo from model, ionospheric, sea state bias, electromagnetic bias, solid earth tide, load tide.

Selection corr. Time Spacing	Oceanic response to Atmospheric Pressure (IB) Correction	Ocean tide correction
Near simultaneous	NOT Applied	NOT applied

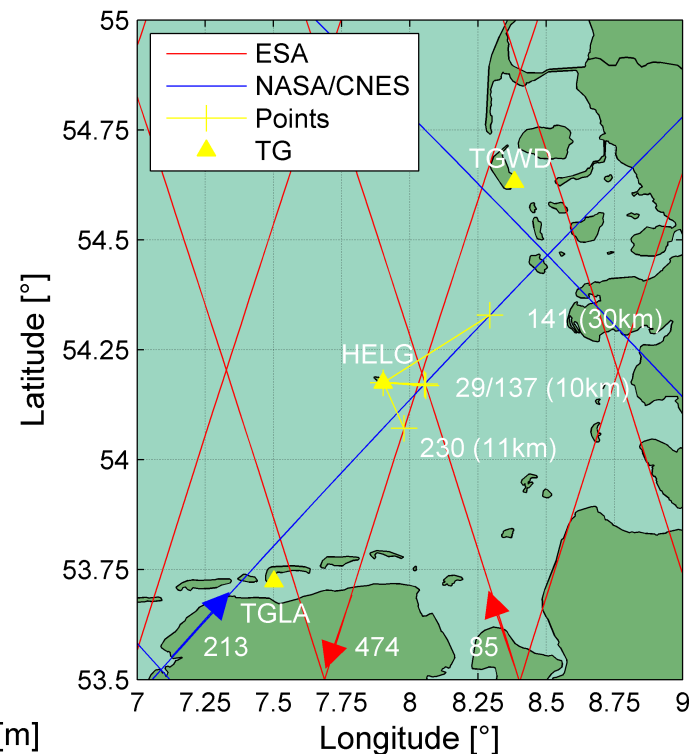
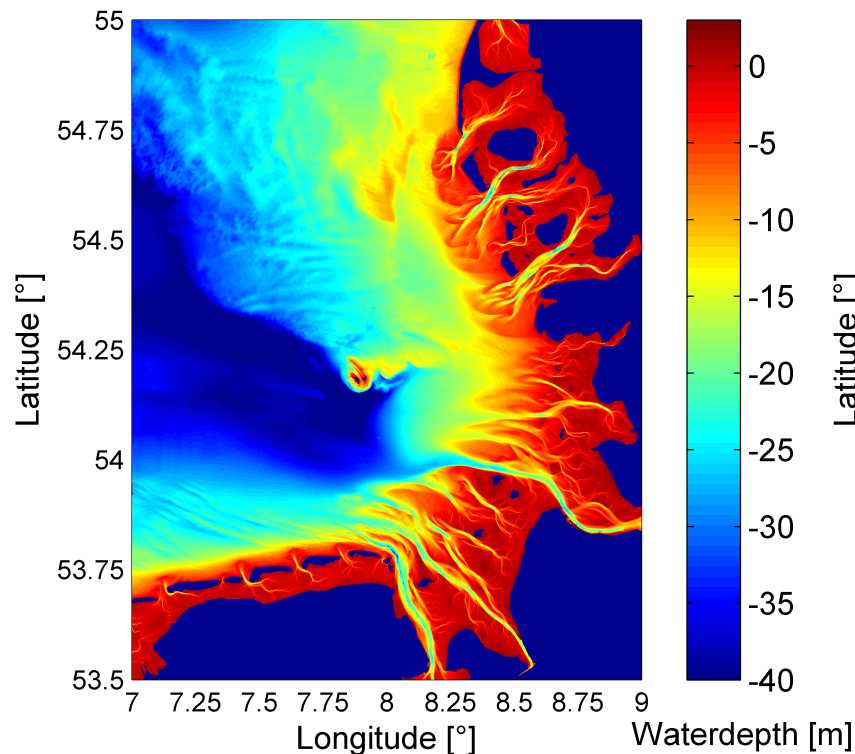
2.3 Data Overview

■ Geoid



2.3 Data Overview

- Test area – Helgoland (HELG) open sea
 - TG Langeoog (TGLA) coastal
 - TG Wittdün (TGWD)



3.1 Results – Off Shore SSHs

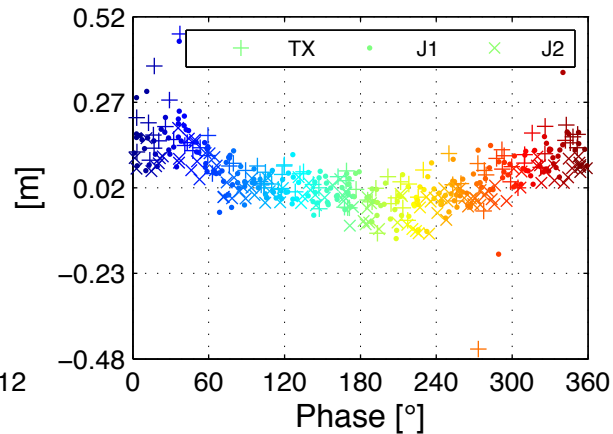
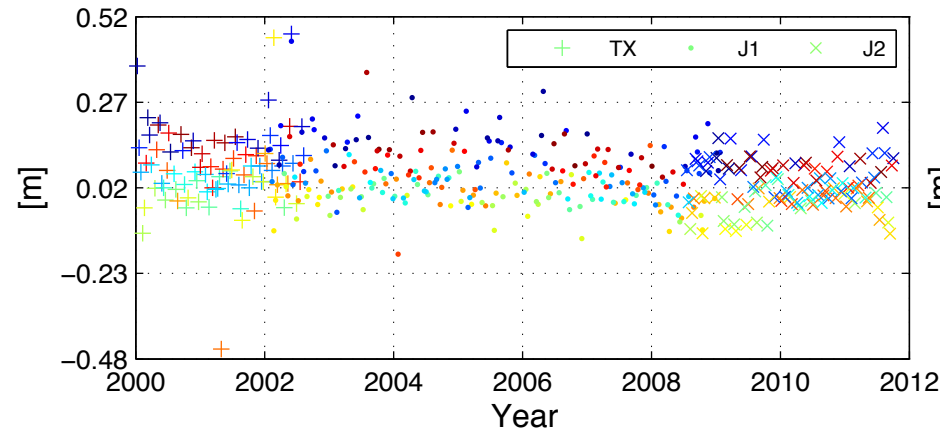
- No inference from land
- P 137 (10 Km)
- Corr=0.9, std = 6-7 cm

1hz, RADS

	corr	Dist	dSSH_E mean	dSSH_E std	SSH_G mean	SSH_G std	Obs/ max
TX	0.99	10.2	1.7	6.4	2.4	6.4	75/109
J1	0.99	10.2	5.1	7.9	5.8	7.9	222/257
J2	0.99	10.2	6.7	7.4	7.4	7.4	65/95
E2	0.99	10.5	6.6	8.3	7.5	8.1	44/60
N1	0.99	10.7	8.1	7.7	9.5	7.8	23/30

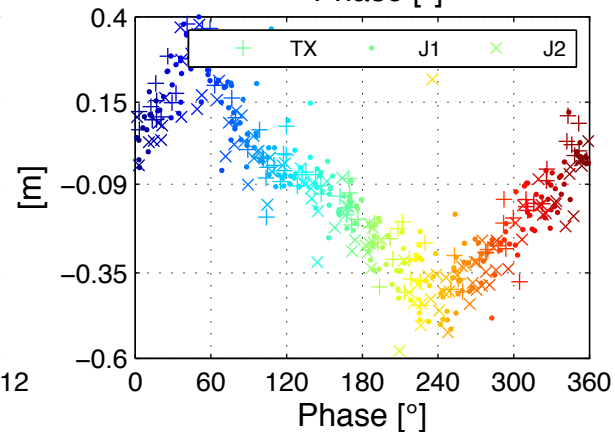
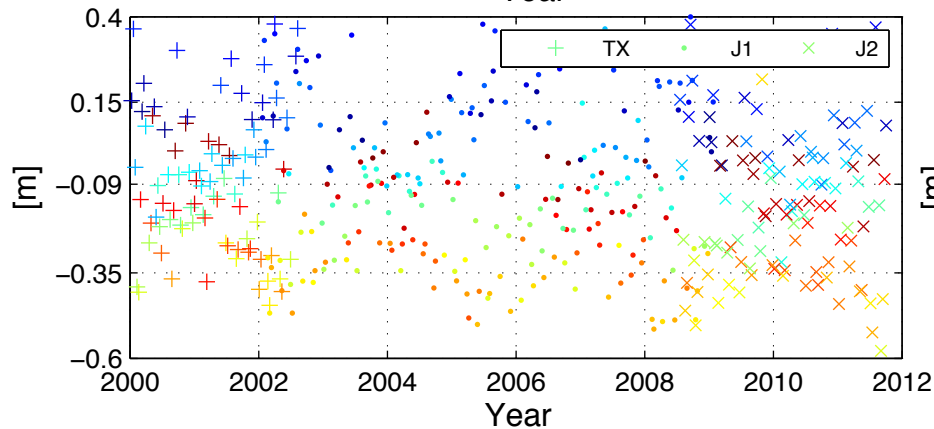
3.1 Results – Off Shore SSHs

- depend on the phase of the tide (difference between two low water is a period T).
- empirical correction to be **subtracted** from AL-TG to account for this effect



P137 (10 Km)

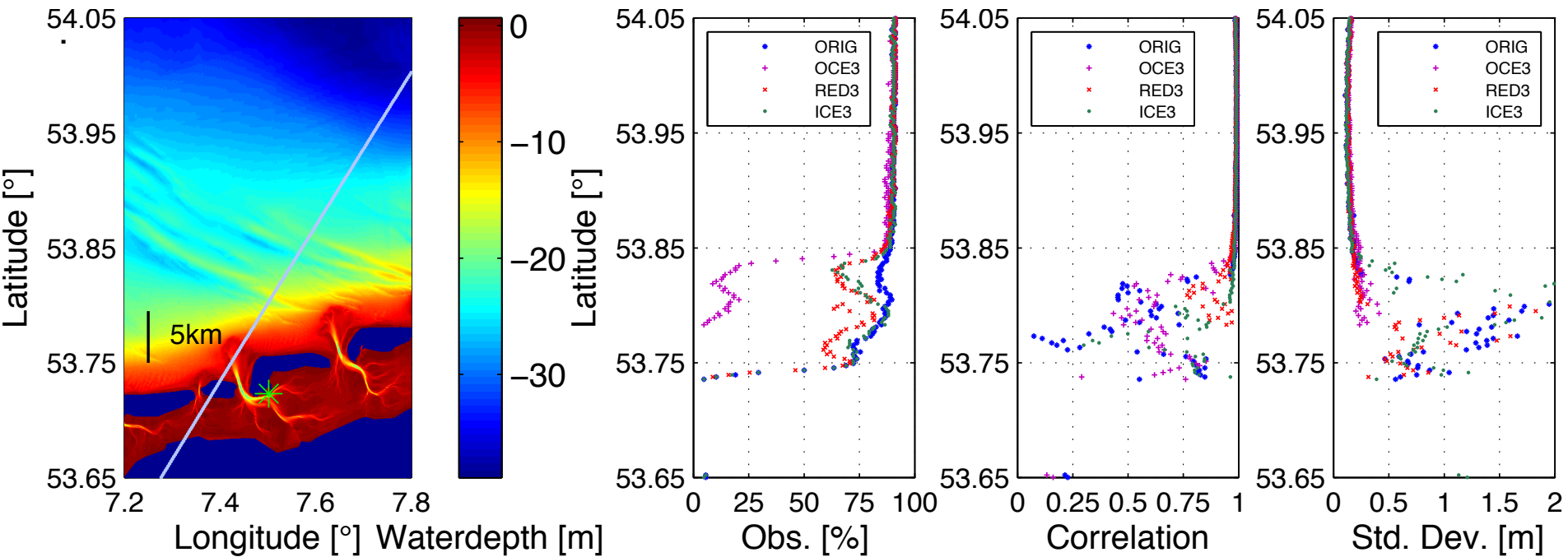
minimum
is at high
water



P131 (30 Km)

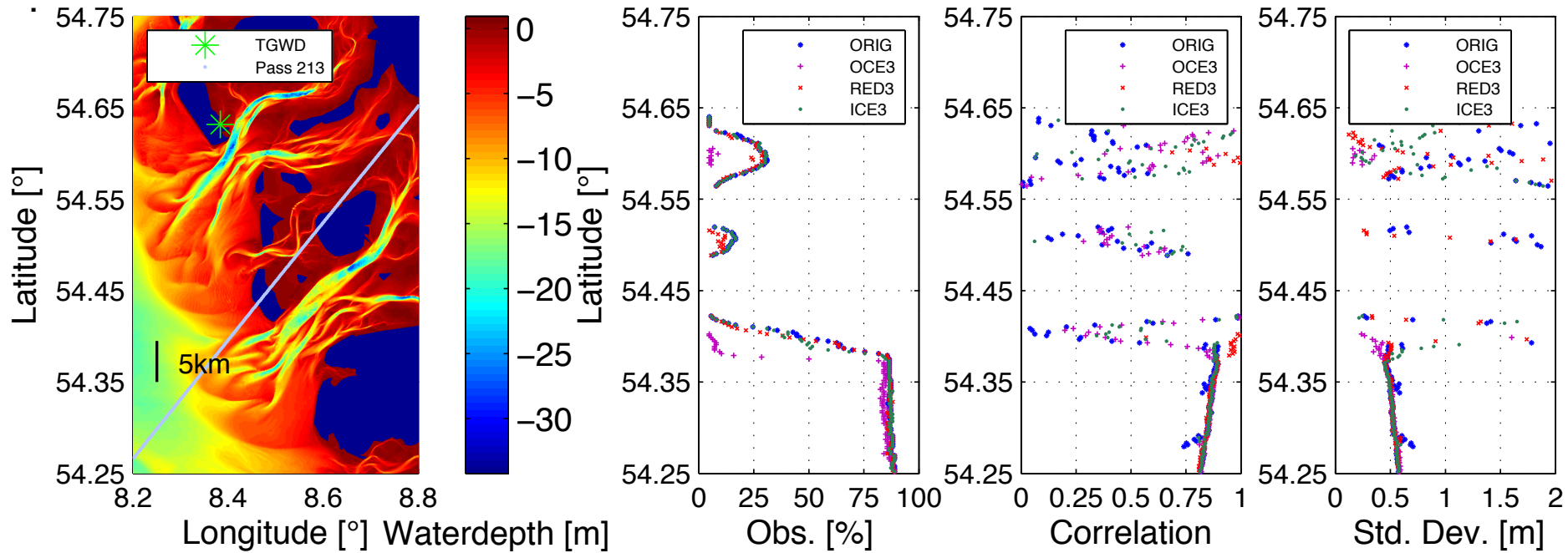
3.2 Results – Coastal SSHs, Land-Sea

- Corr, STD with TG at the coast. Eg. Borkum d=24 Km, std = 10. cm



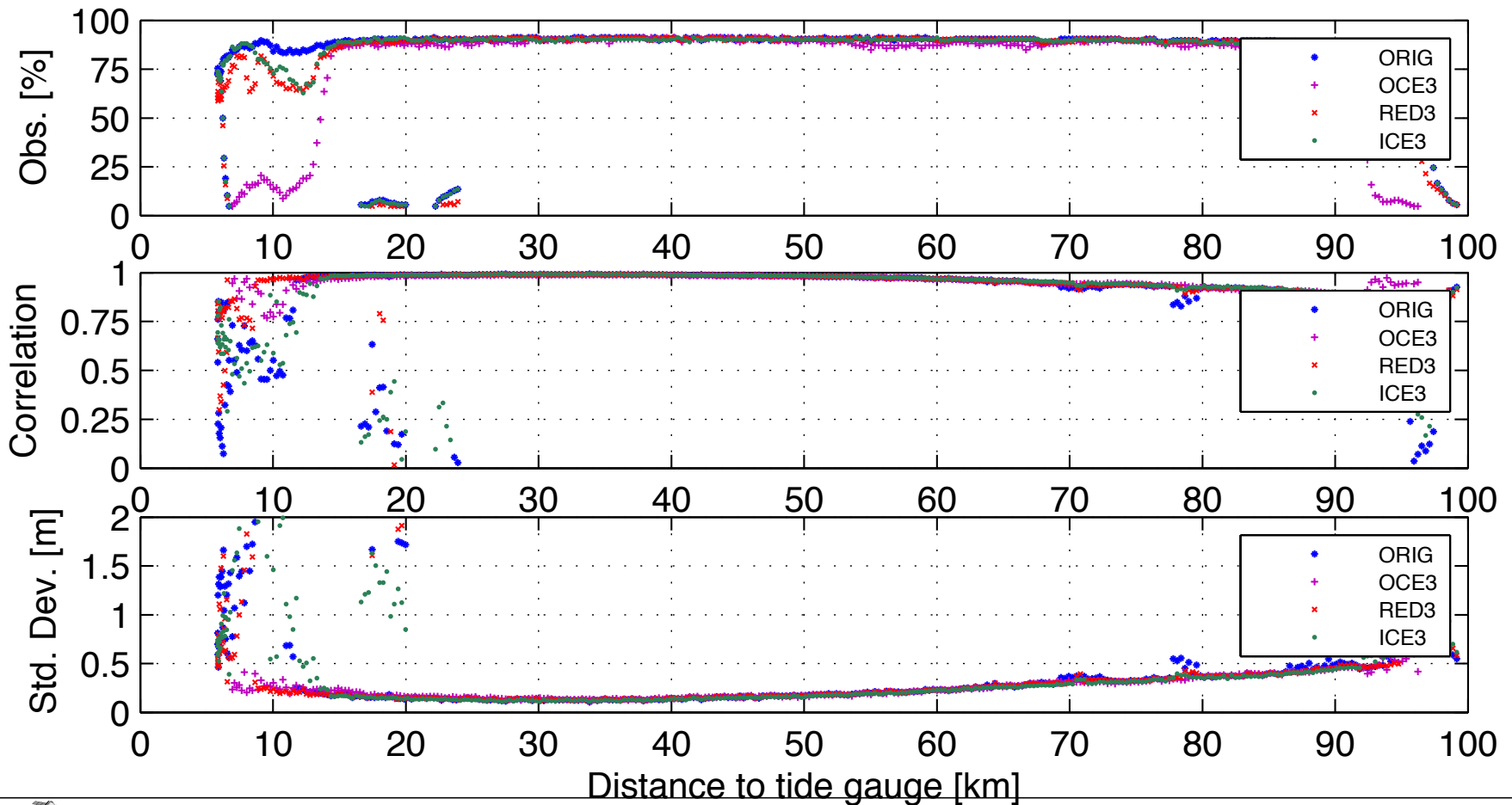
3.3 Results – Coastal SSHs, Sea-Land

- Corr, STD with TG at the coast. Eg. Borkum d=24 Km, std = 10. cm



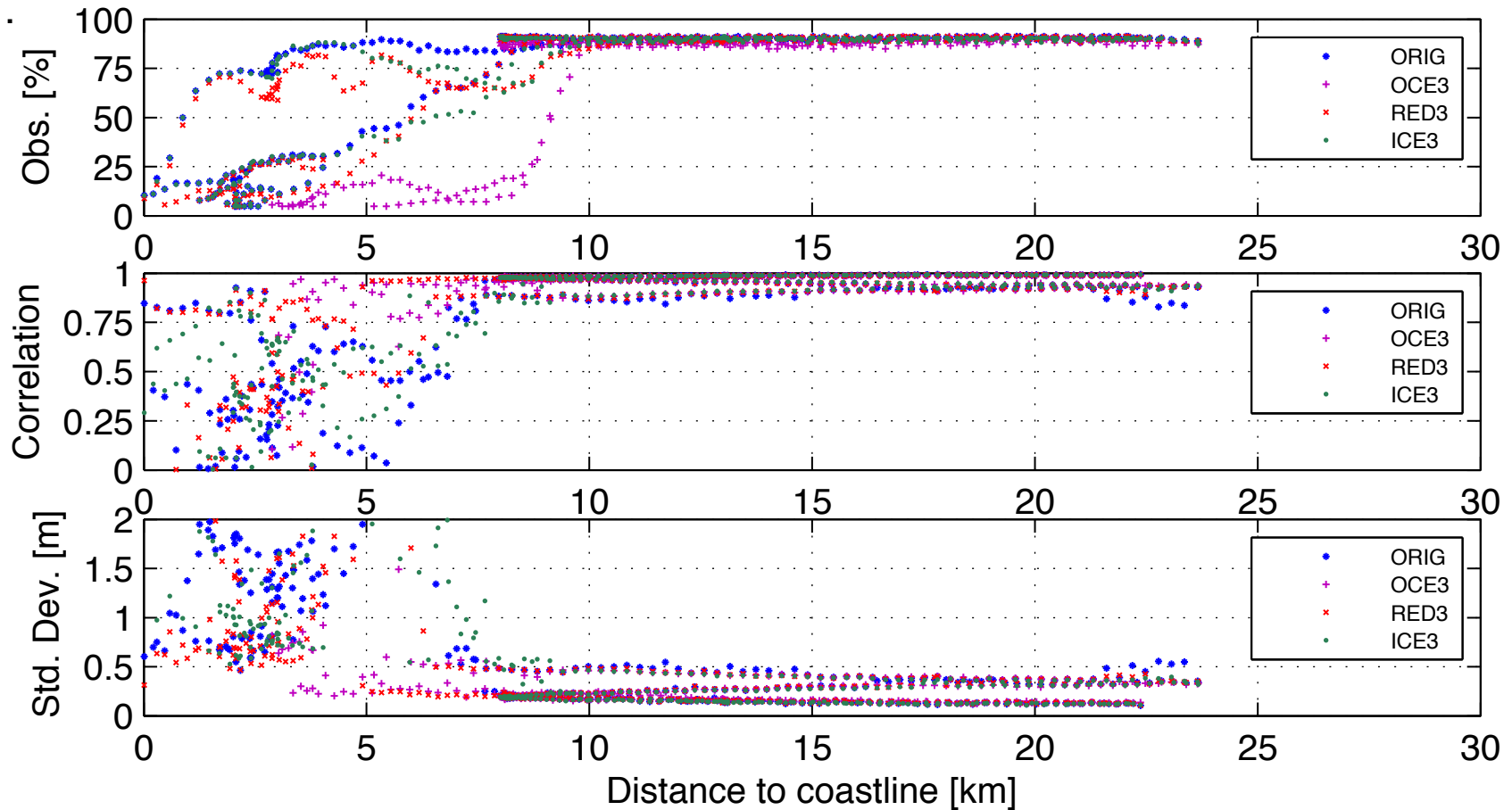
3.4 Results – Coastal SSHs, Sea-Land

- RED3 performs at best



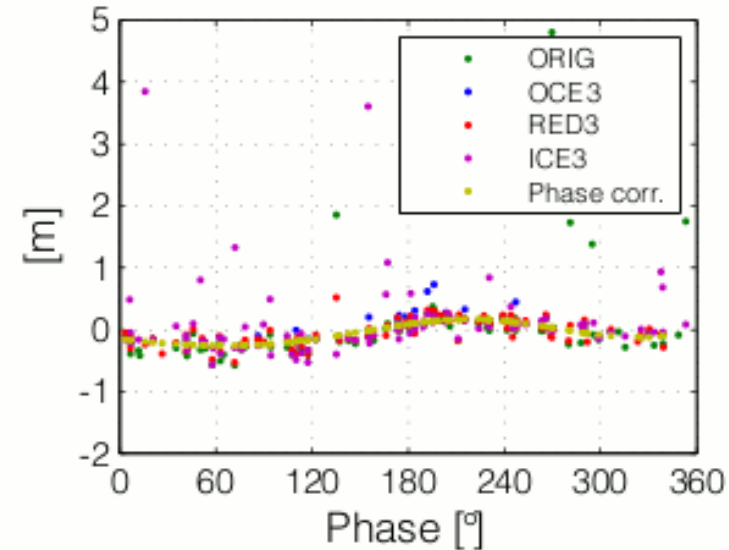
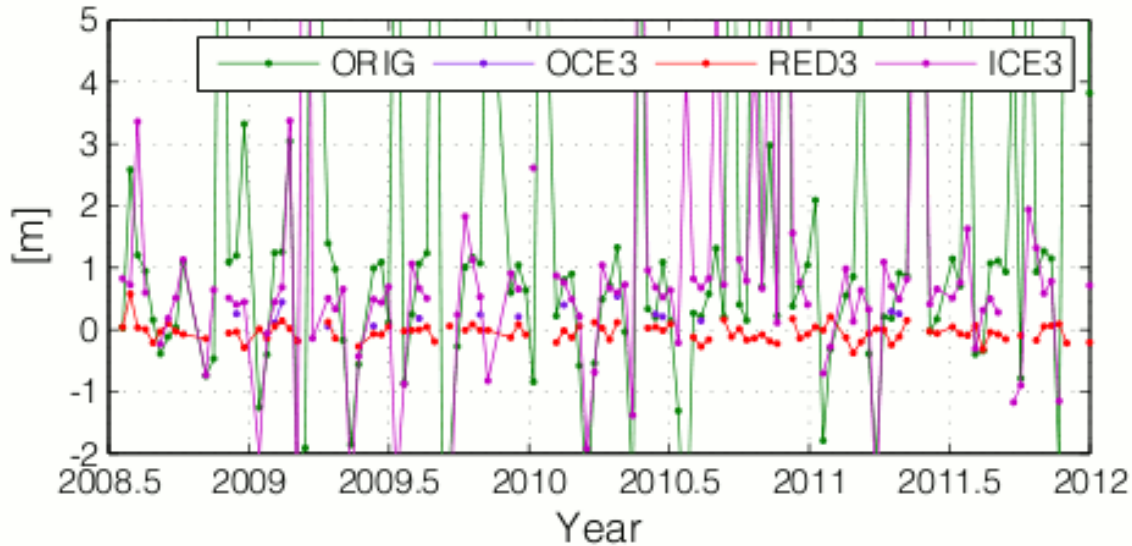
3.5 Results – Coastal SSHs, Sea-Land

- RED3 performs at best



3.6 Results – Coastal SSHs, Sea-Land

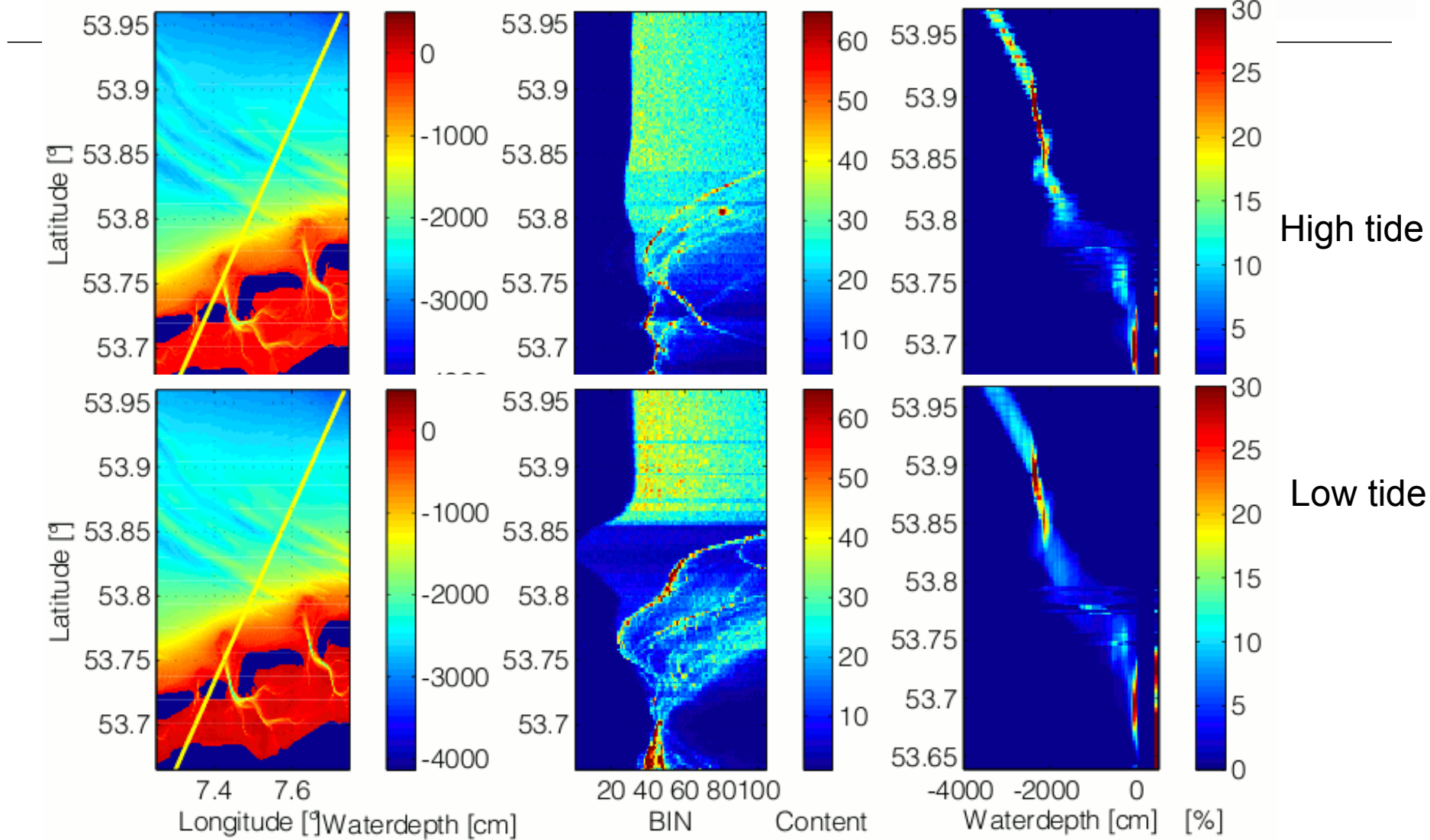
- Point Number 355 (add location) → RED3 performs at best



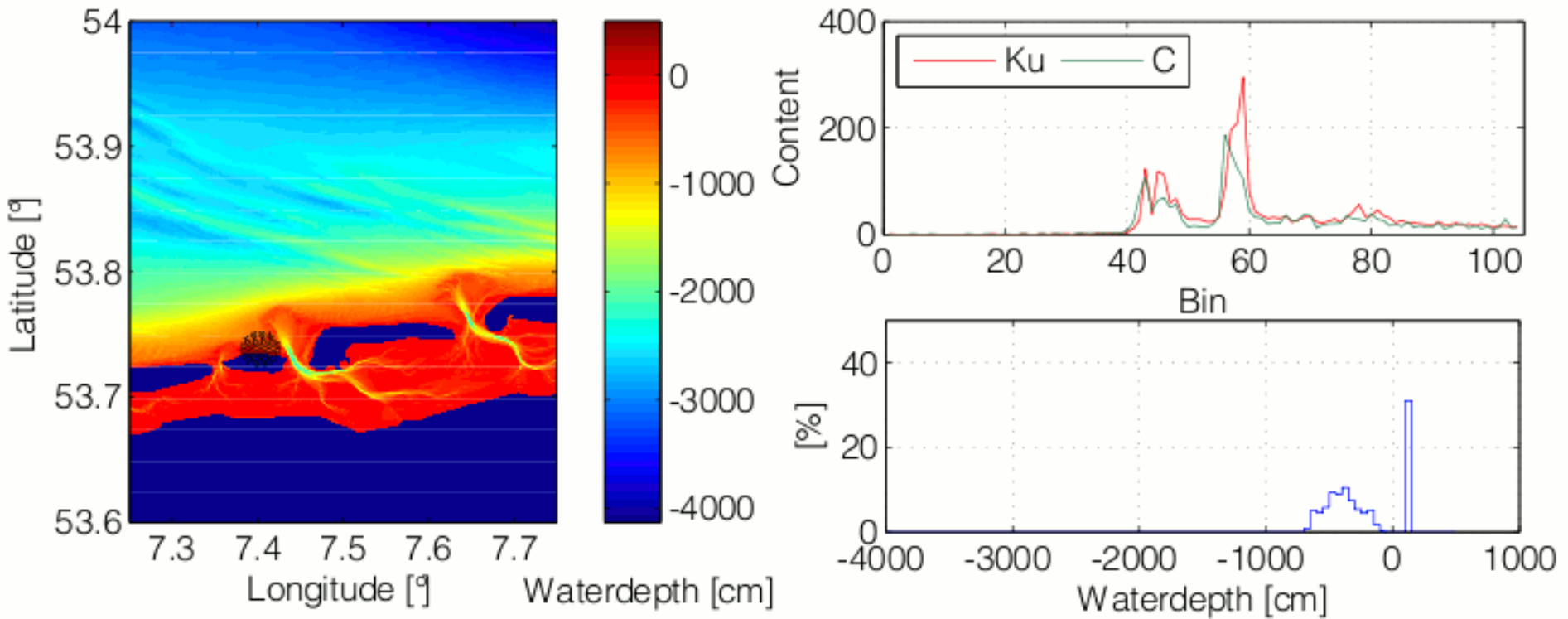
	Corr	STD (cm)	Obs/max
GDR	0.49	354	106/118
OCE3	0.79	23	15/118
RED3	0.97	19	85/118
ICE3	0.53	190	96/118

10.5 Km

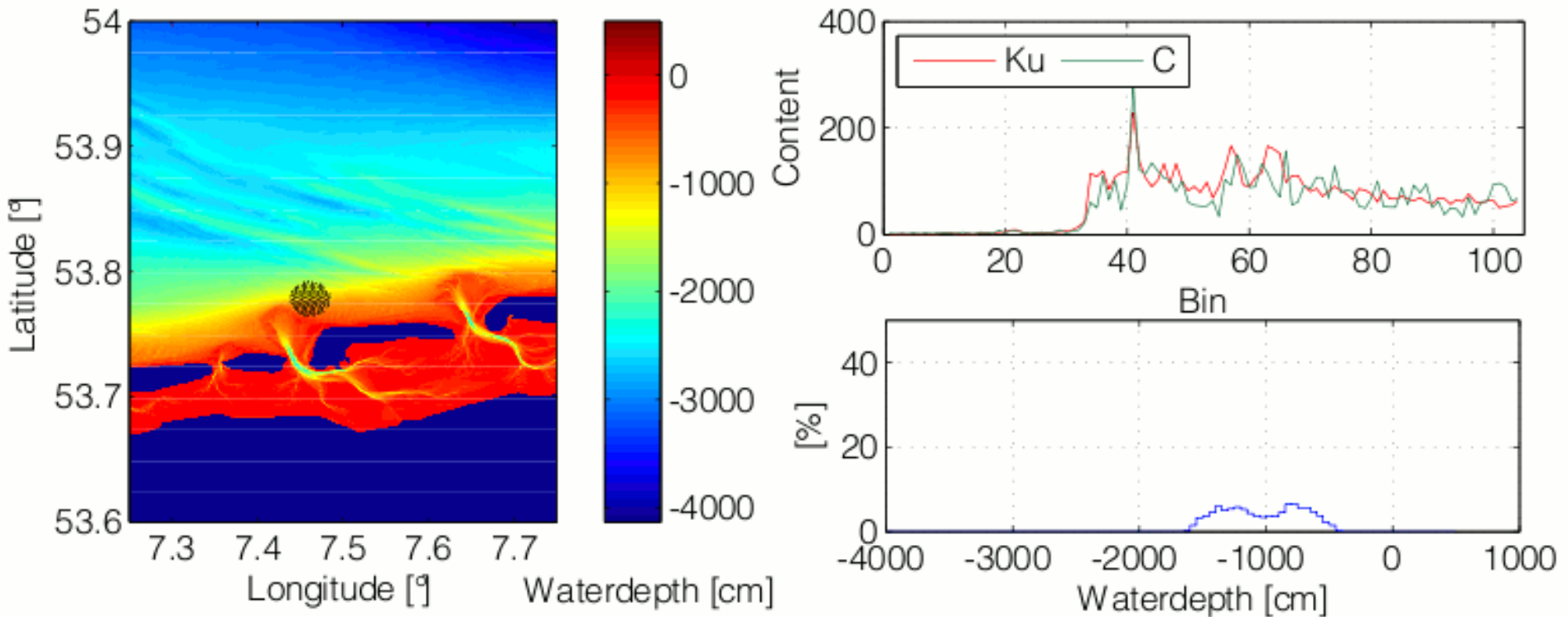
3.7 Results – Waveforms and Footprints



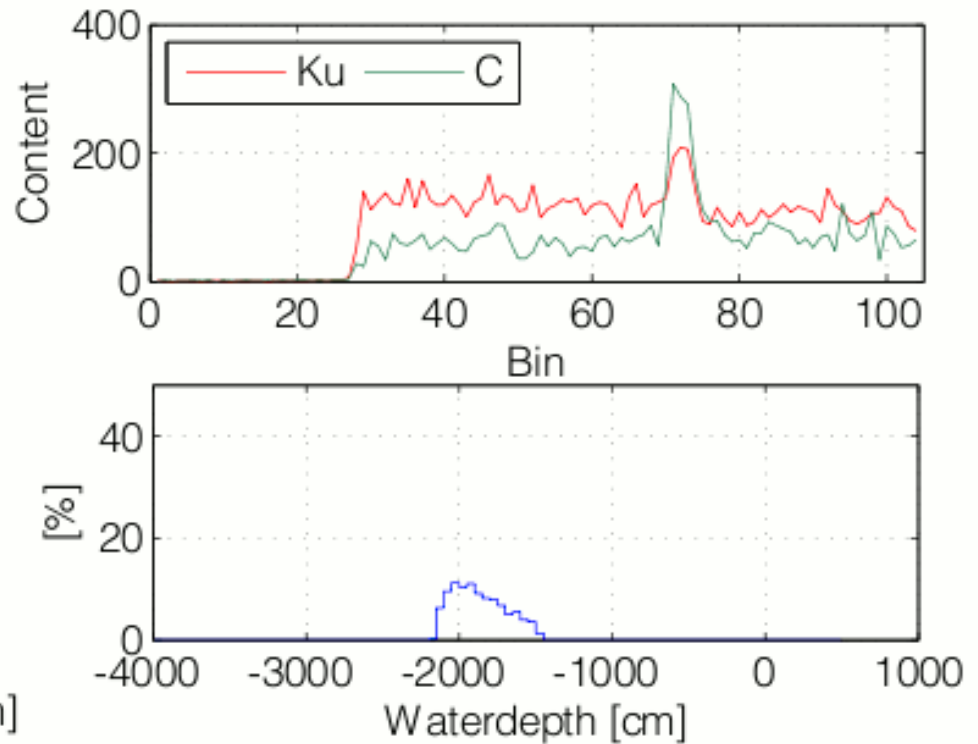
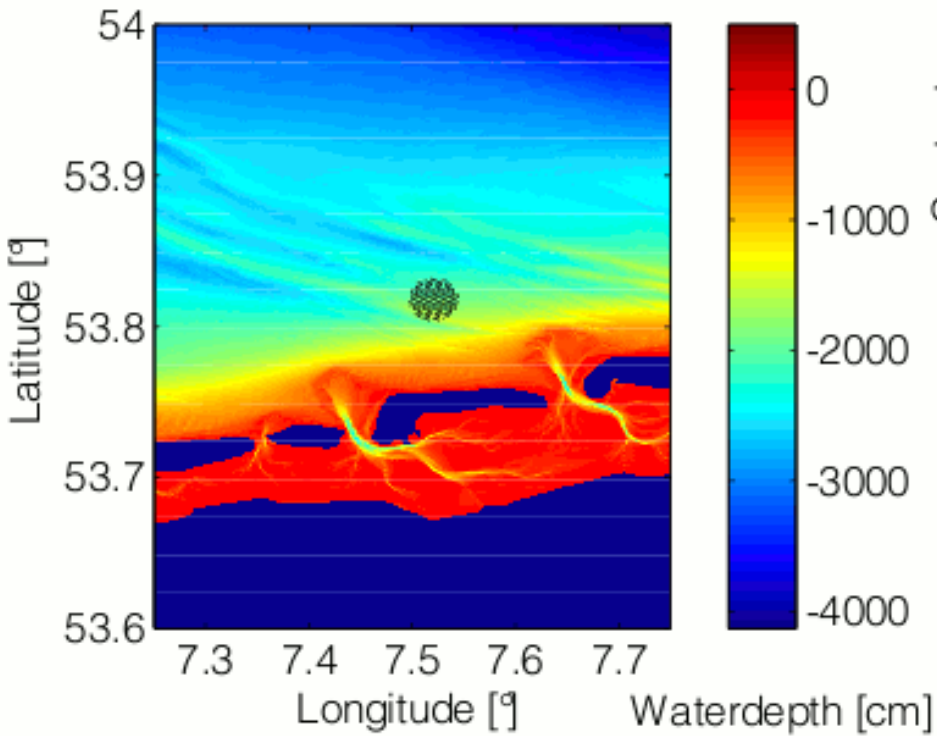
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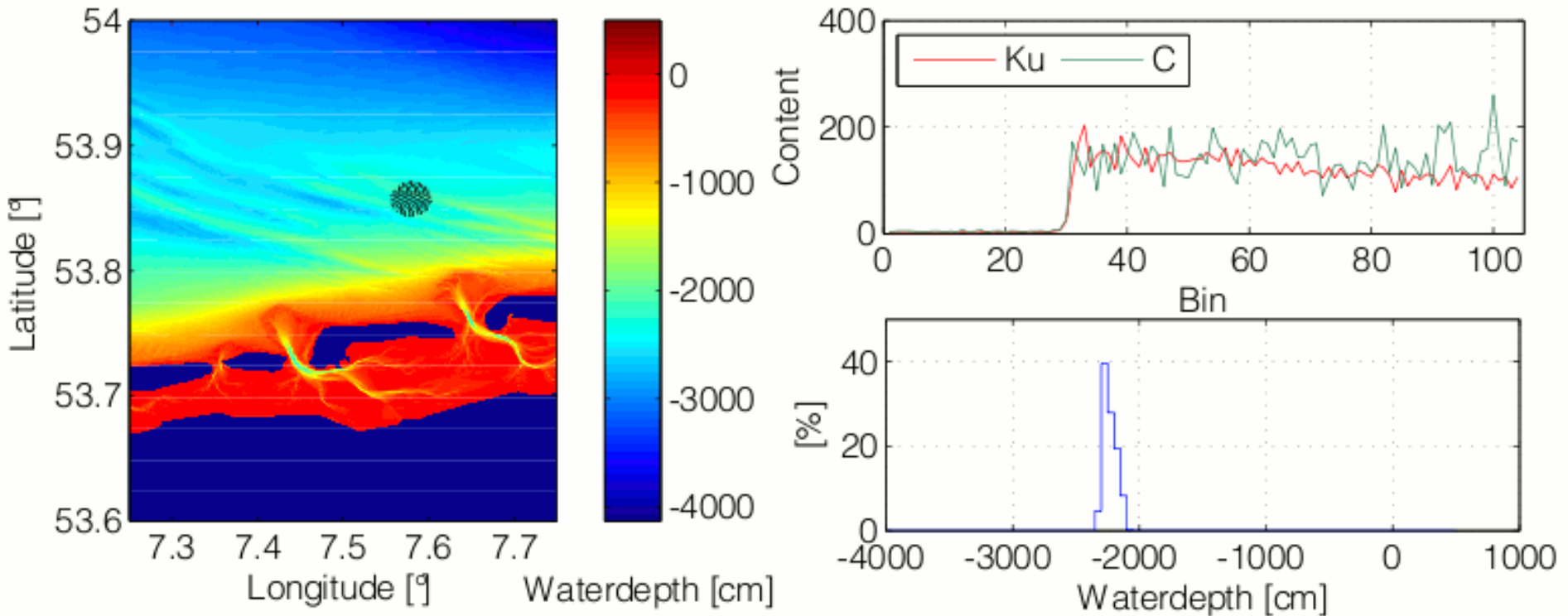
3.7 Results – Waveforms and Footprints



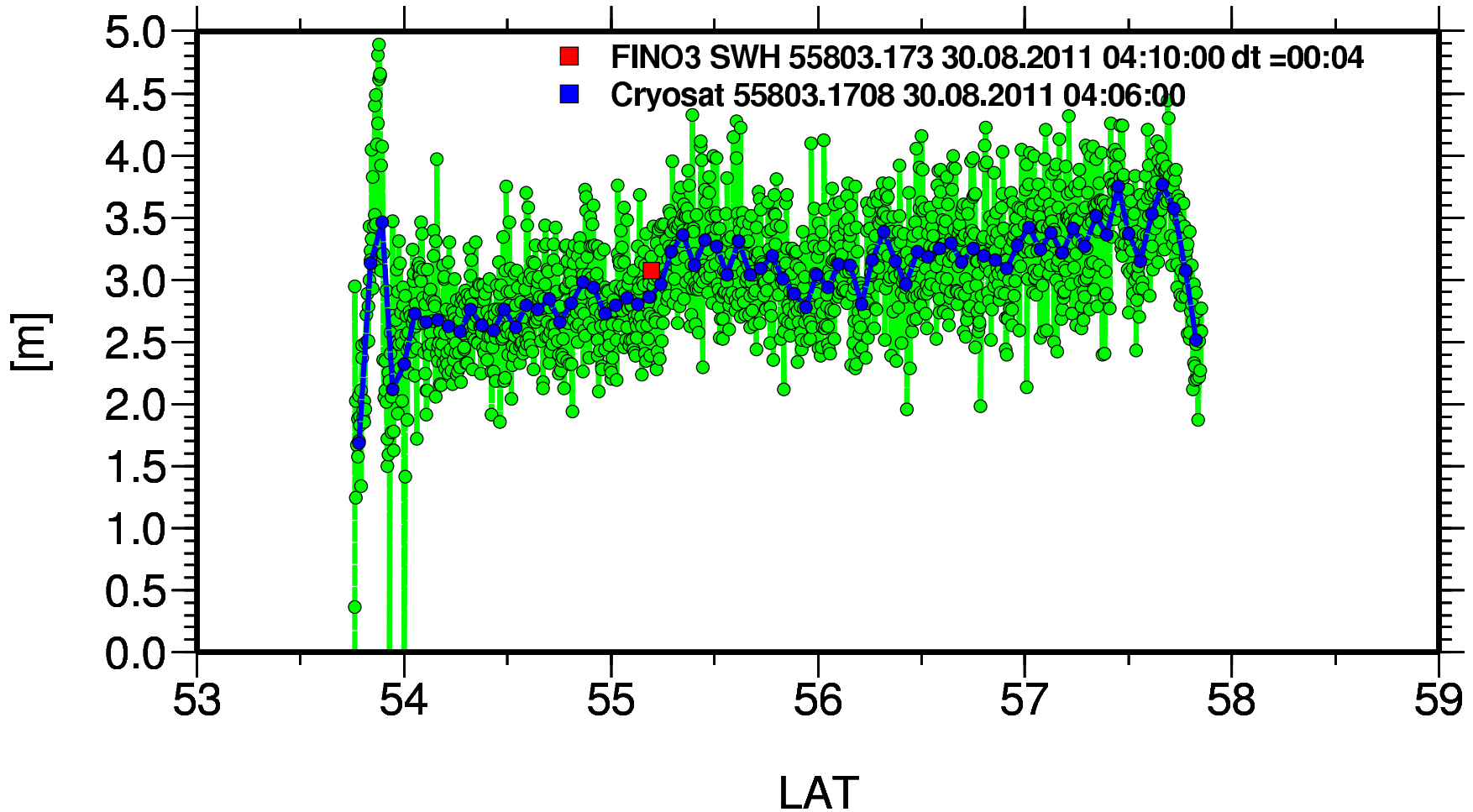
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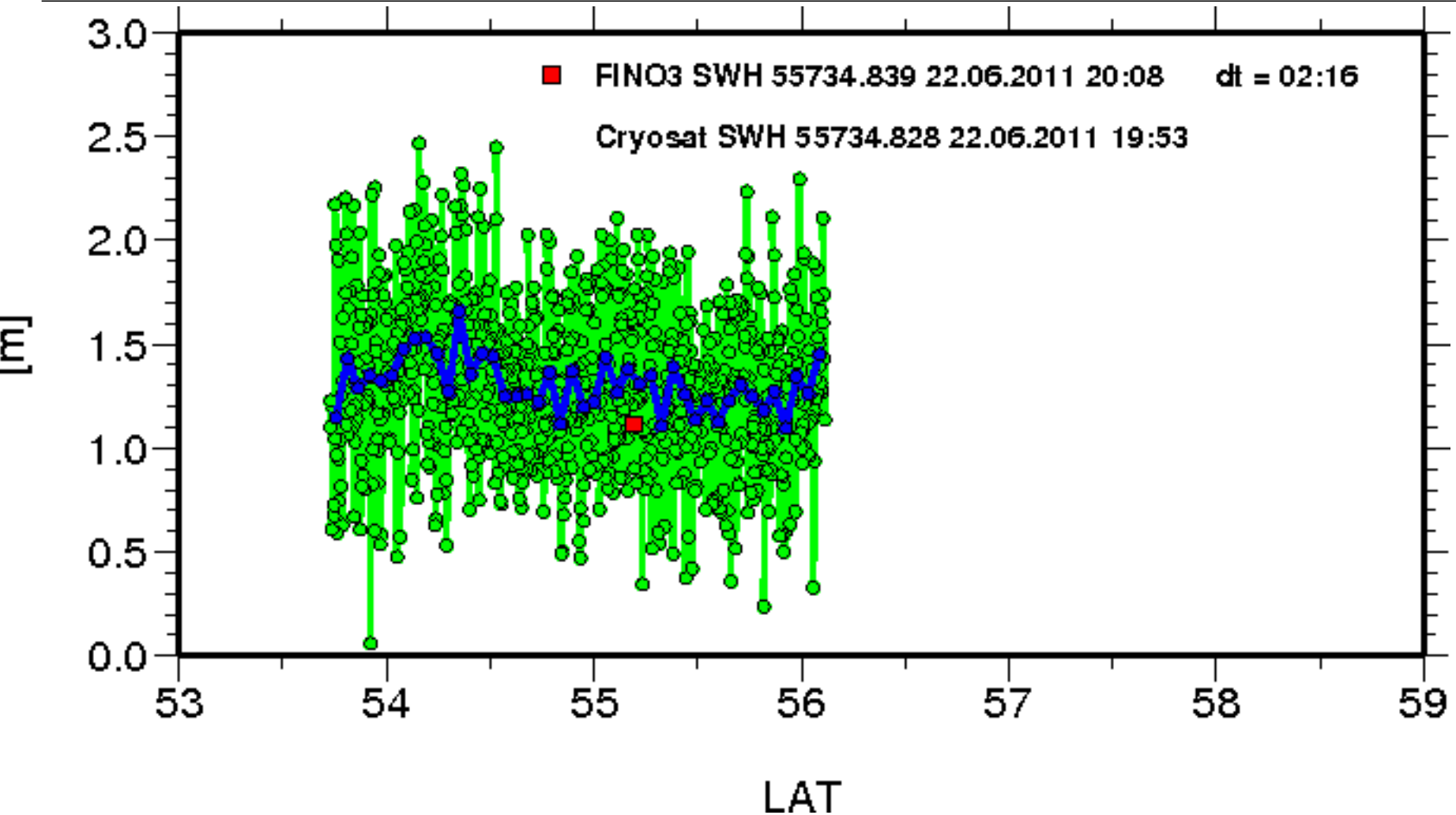
3.7 Results – Waveforms and Footprints



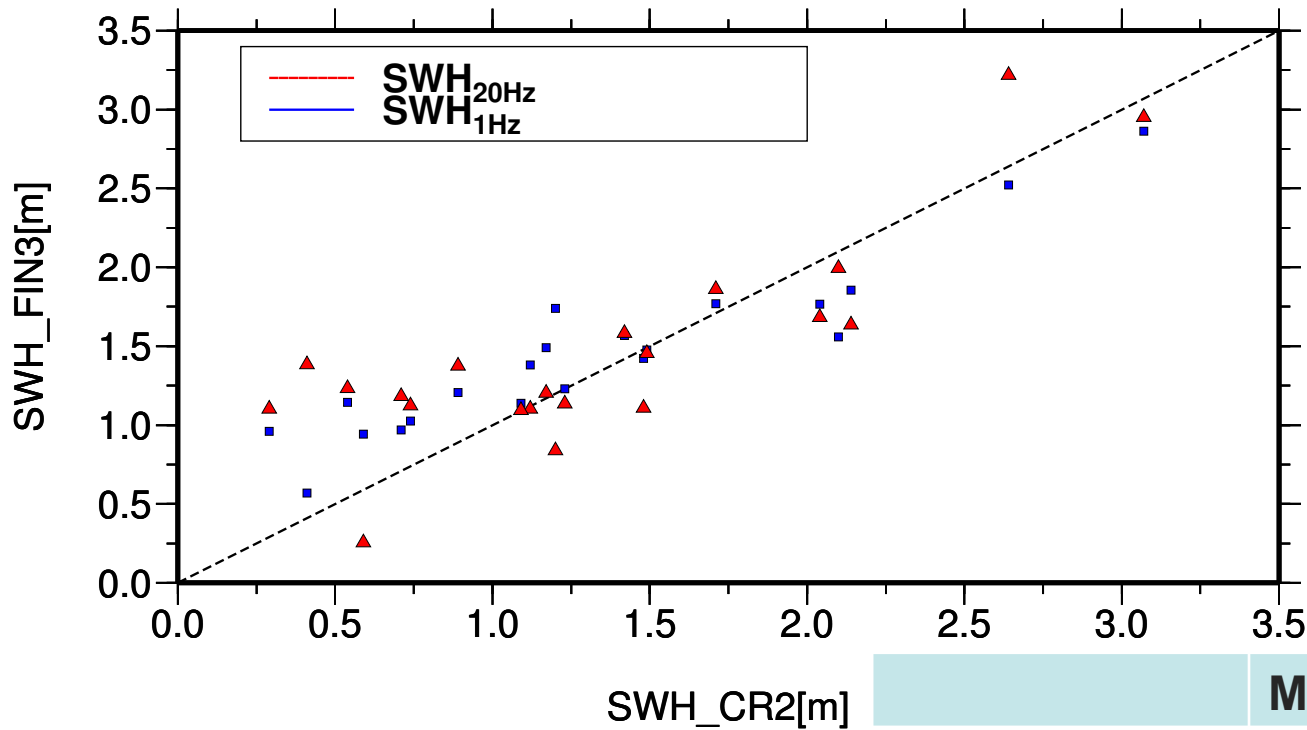
3.8 Results – SWH Comparison



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3.8 Results – AWAC (Acoustic Wave and Current Profiler) and SAR Cryosat SWH



21 passes in 2011

	Mean	STD	RMS
SWH C2	1.45	0.66	1.59
SWH FINO3	1.34	0.73	1.52
C2-FINO3	0.12	0.42	0.43



4. Conclusions

- **Absolute** Validation of SSH via GNSS-TG stations and altimetry
- **RED3** retracker as „**best retracker**“
- **PISTACH** improve data between 5 and 10 from coast
- **At less than 4 Km also PISTACH are too noisy**
- **PISTACH not available < 53.7 lat (Wattenmeer)**
- **SWH from SAR Cryosat within 0.4 m (rms), 0.12 (bias) (21 passes)**