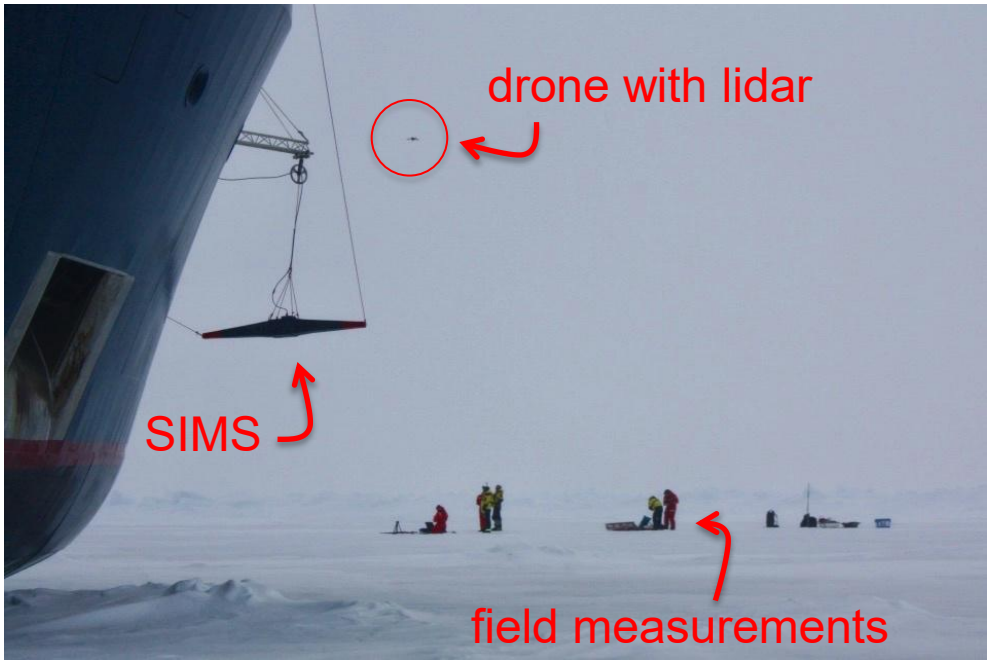
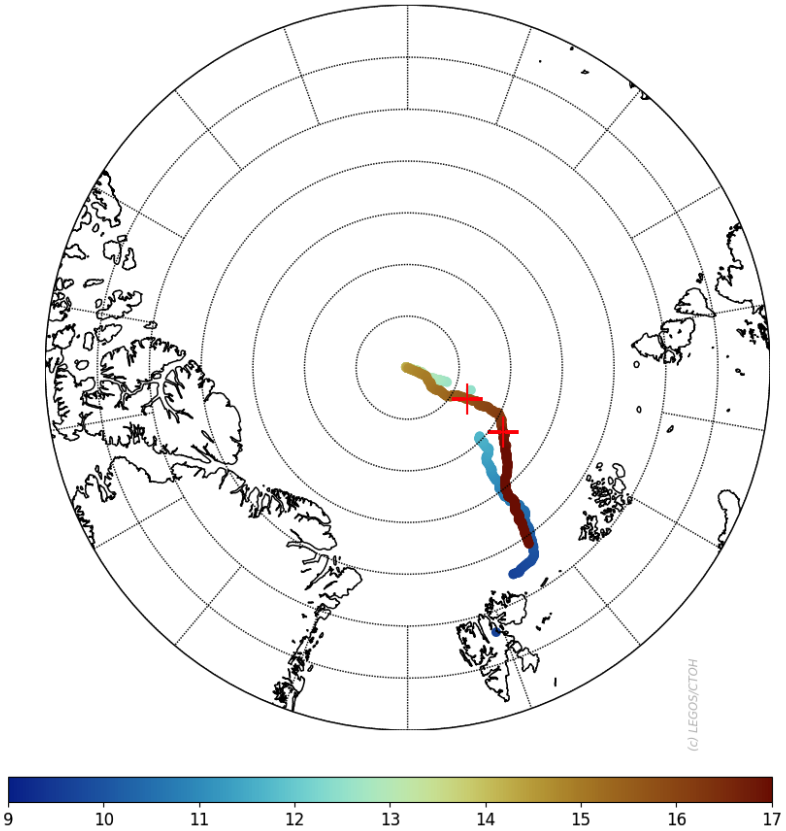
St3TART Final Review
WP2: Sea Ice (SI)
DESIR results

Final Review

April 20th, 2023

DESIR Campaign





day from 9th to 17th of July 2022 of SIMS activity

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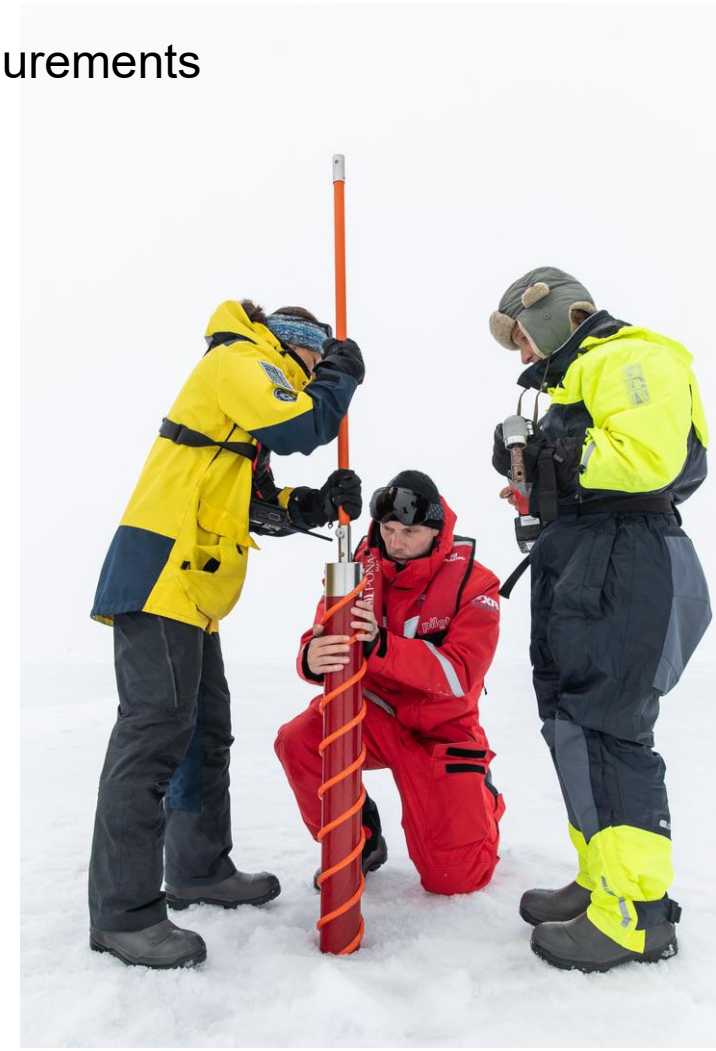
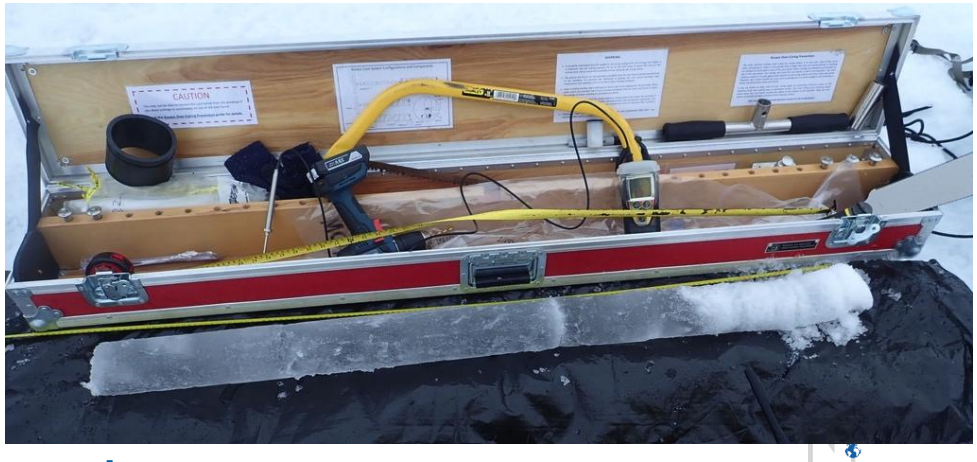
Field measurements





St3TART
FRM for Sentinel-3 Land Altimetry

DESIR Campaign

sampling	#1	#2	#3	#4	#5	#6
day since 2022/07/01	13.43	13.512	14.458	14.458	16.5	16.5
longitude	75.3007	75.3007	14.3917	14.3917	56.9757	56.9757
latitude	89.8694	89.8694	89.9804	89.9804	85.5532	85.5532
SIT	1.74	1.79	1.77	1.83	1.92	1.80
SD	0.13	0.17	0.90	0.90	0.00	0.00

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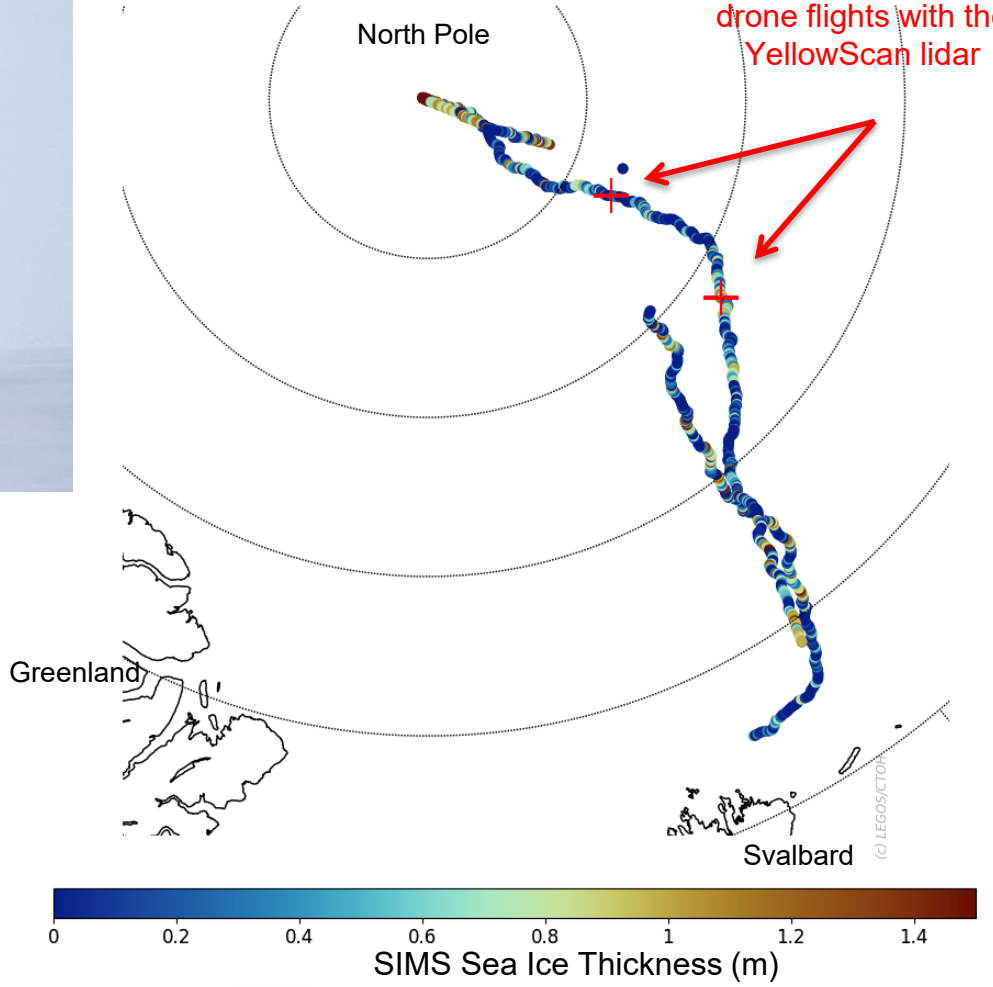
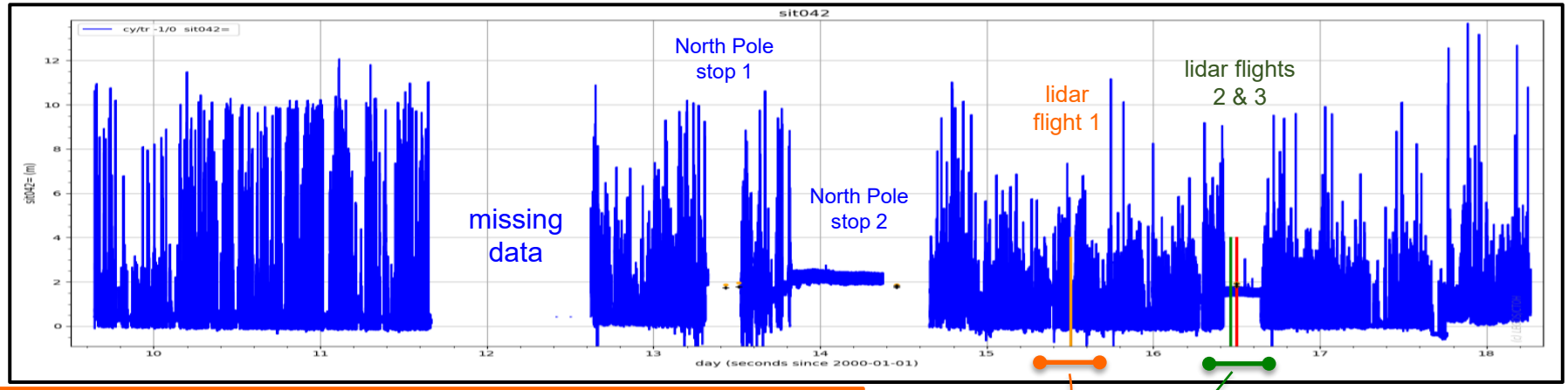
SIMS measurements all along the travel between Svalbard and North Pole

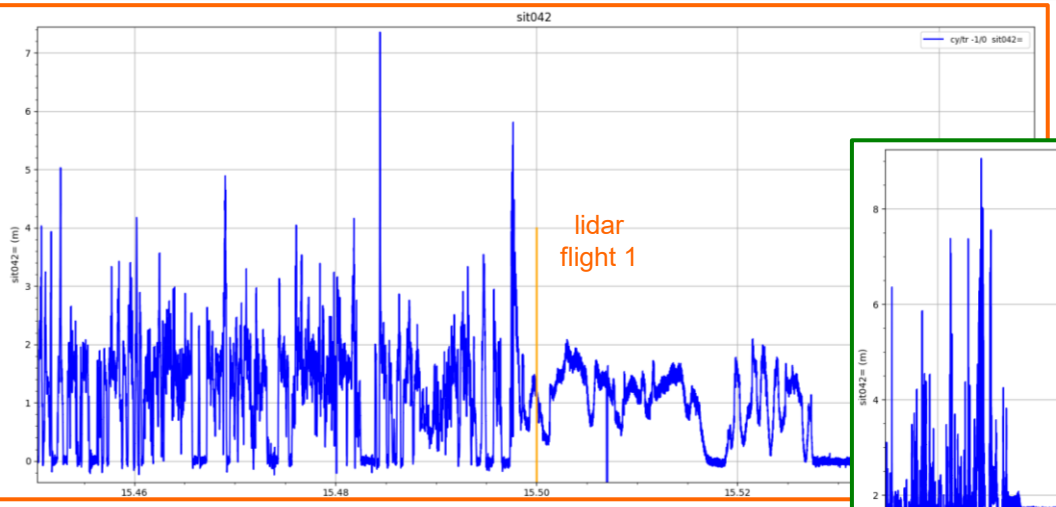


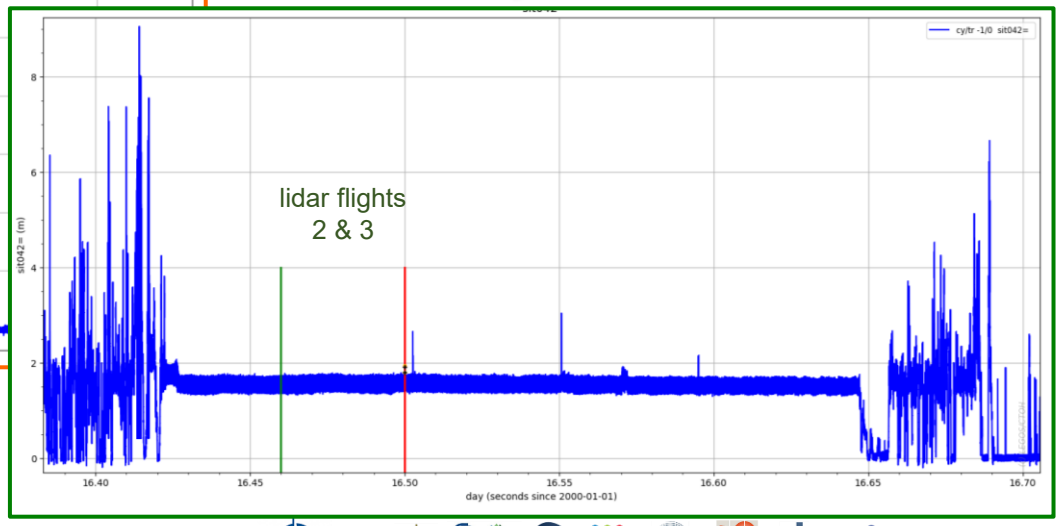
DESIR Campaign



zoom 1

zoom 2





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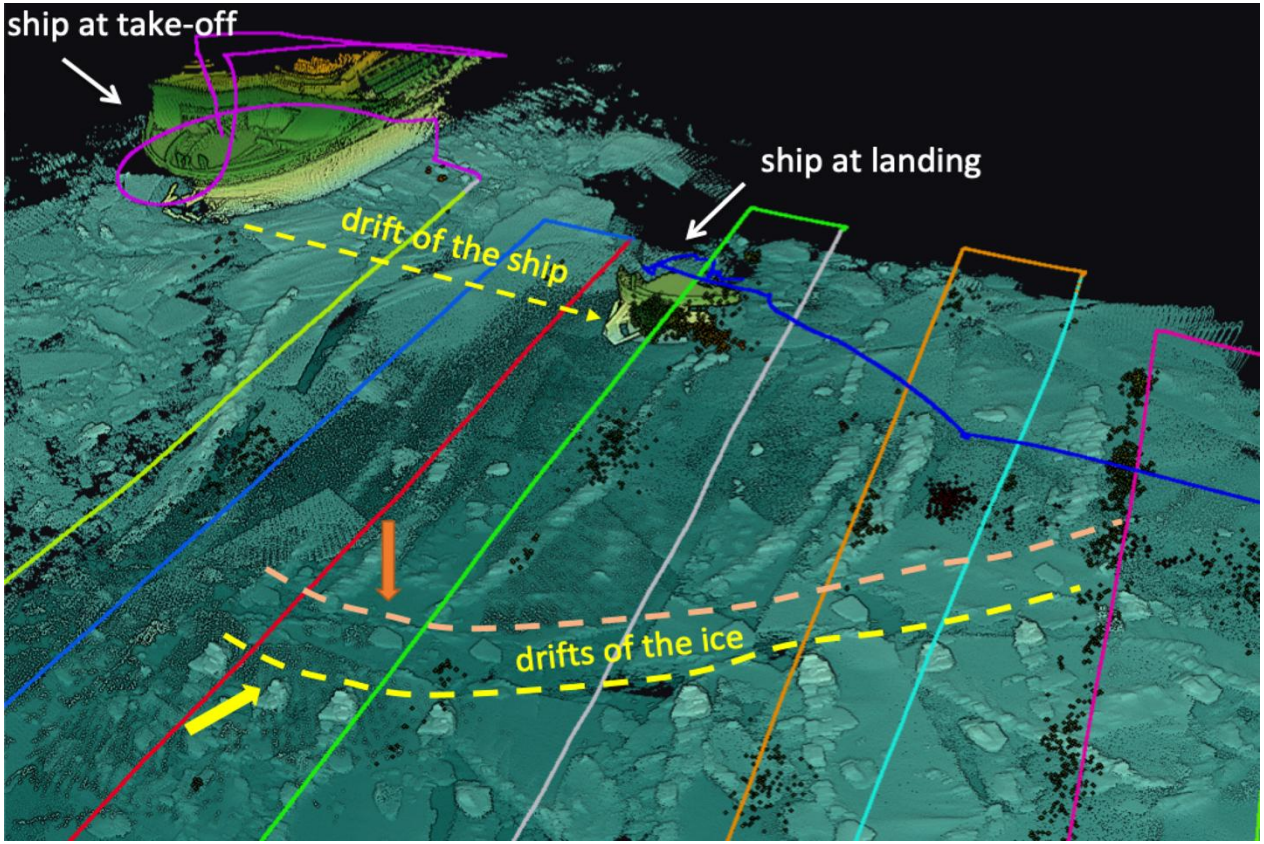
Typical strategy to acquire 3D scene with the YellowScan to build 3D model:



-> not possible to reconstruct a 3D sea ice model because of deformation …
... and not very usefull.

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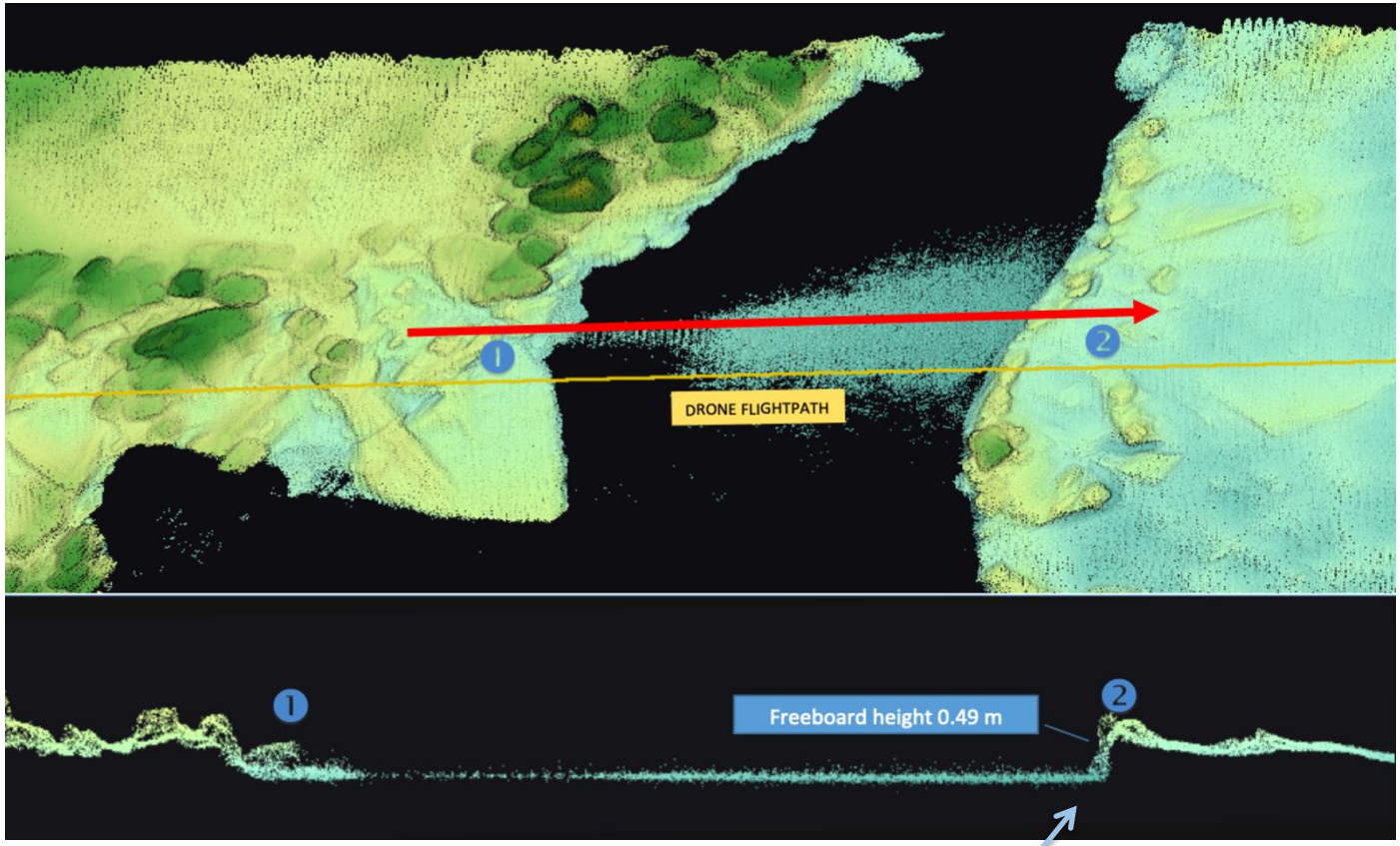

- Freeboard measurement at water/ice transition
- But not representative of the height of the full floes because of the ridges and erosion at the edge

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- 1.70m of drift between 2 consecutive tracks !
- Position provided by YellowScan

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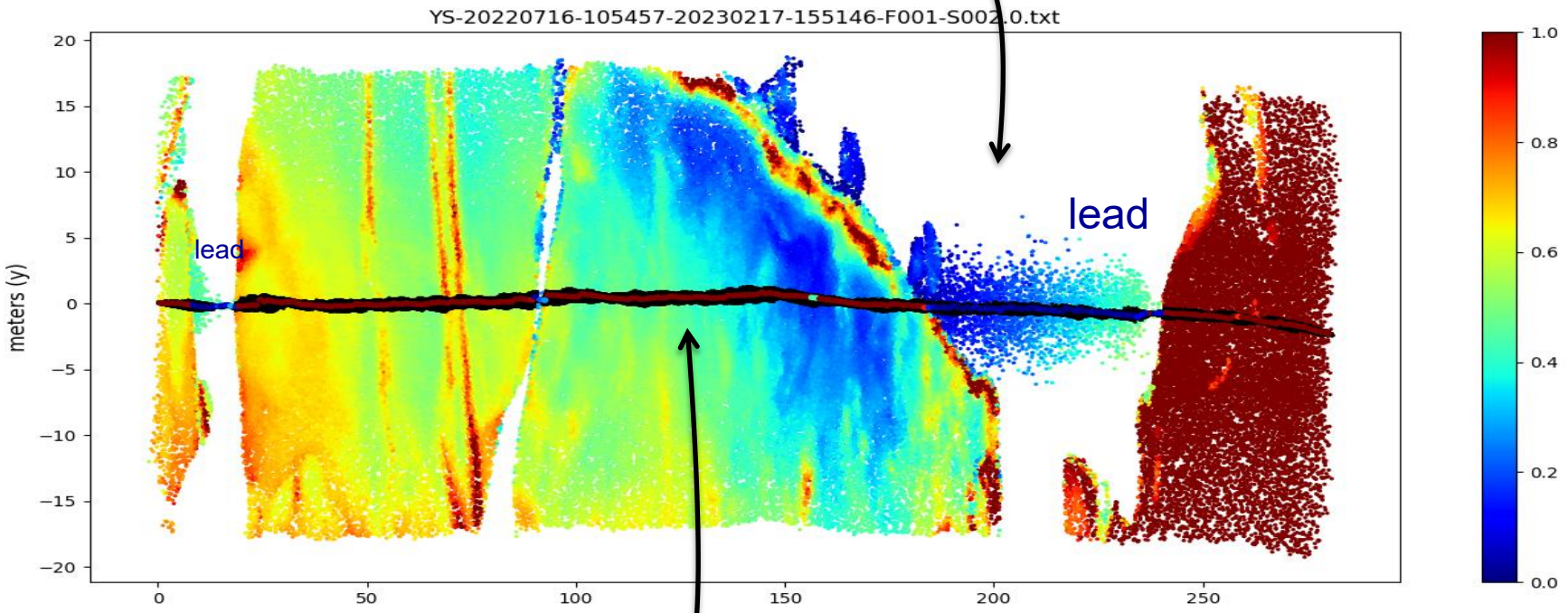
- Use the water reference level within the leads
- Along-track processing
- No back-scatter off-nadir in the leads



Measurements at nadir:

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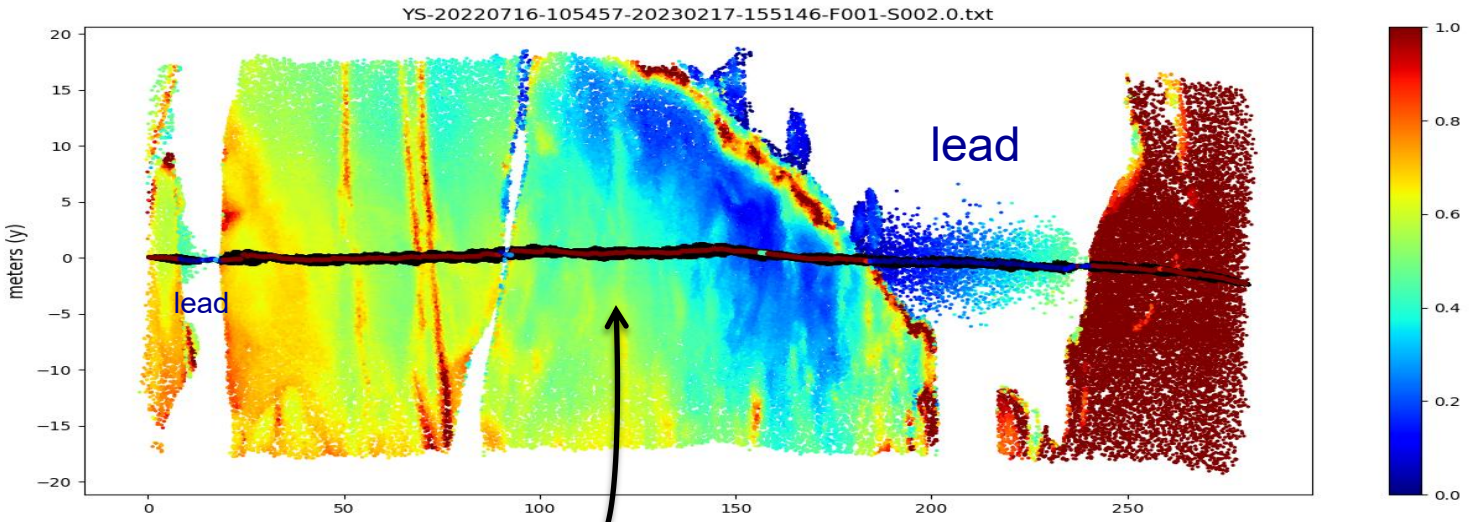
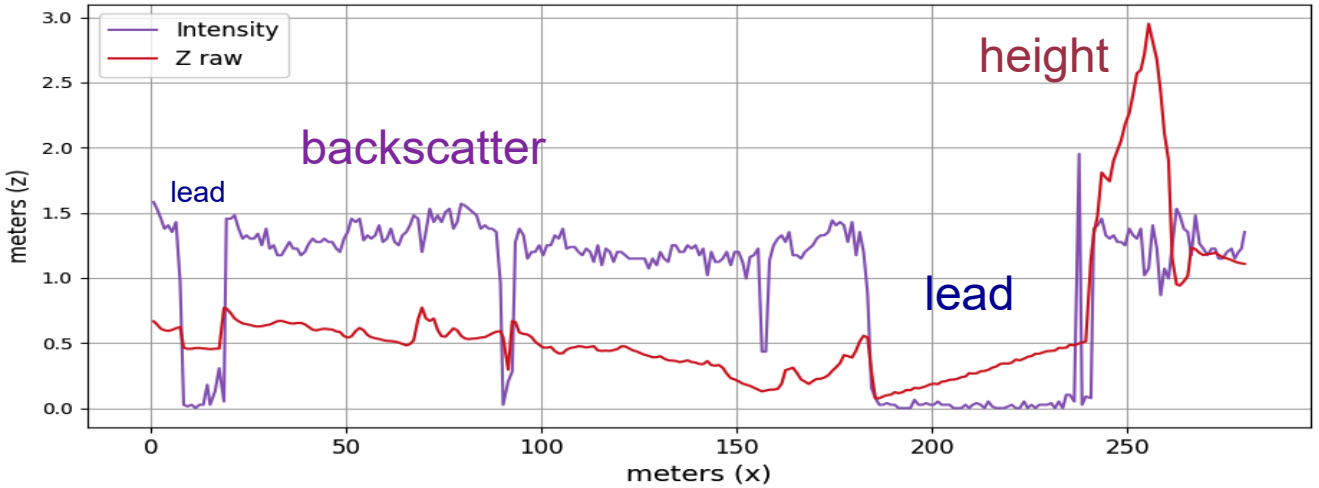


Section of the measurements at nadir:



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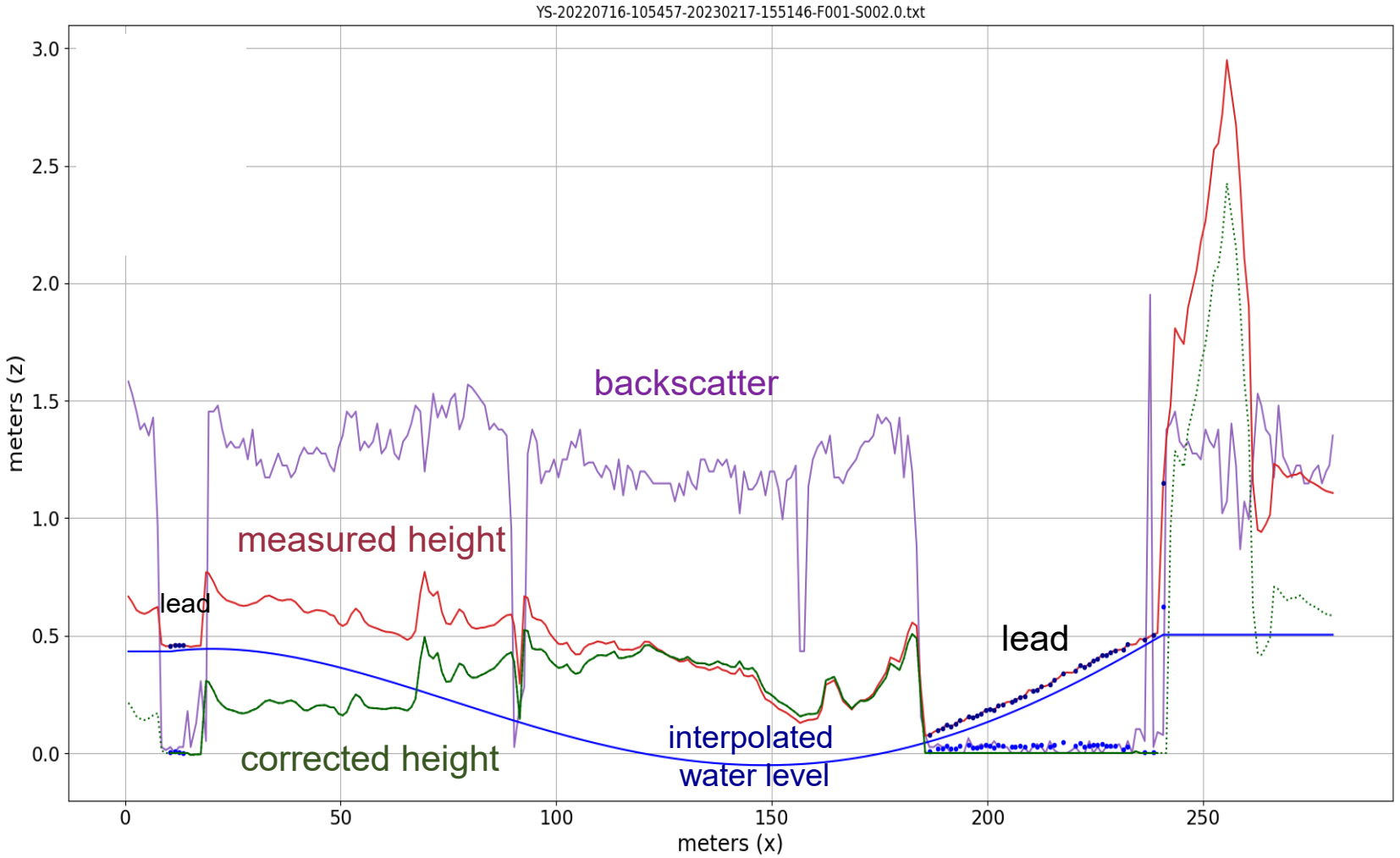

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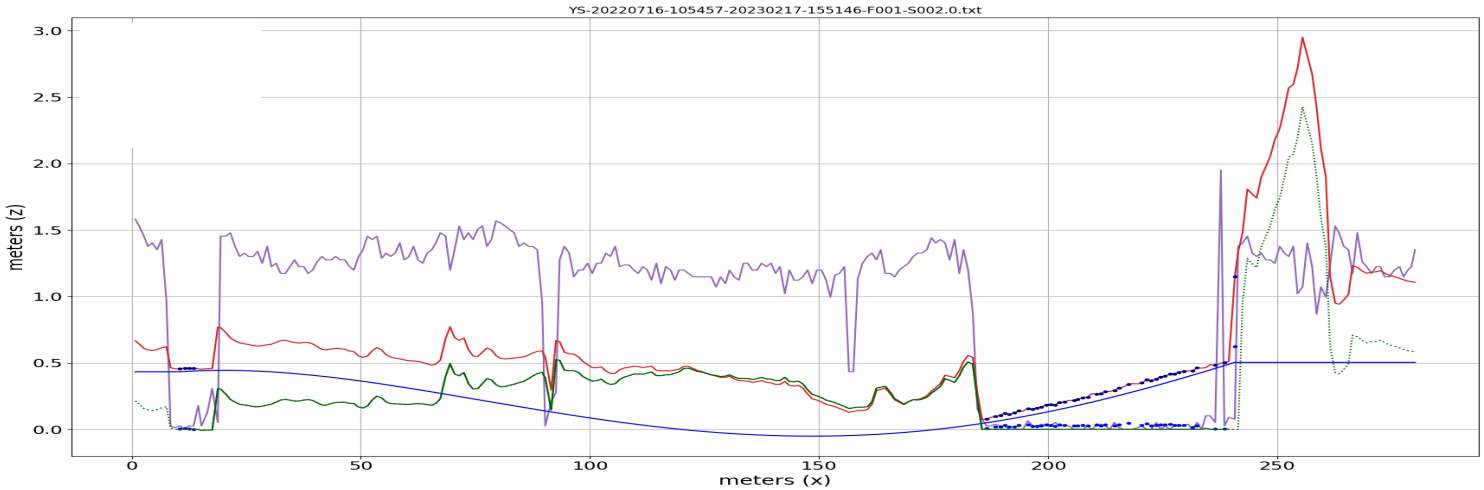

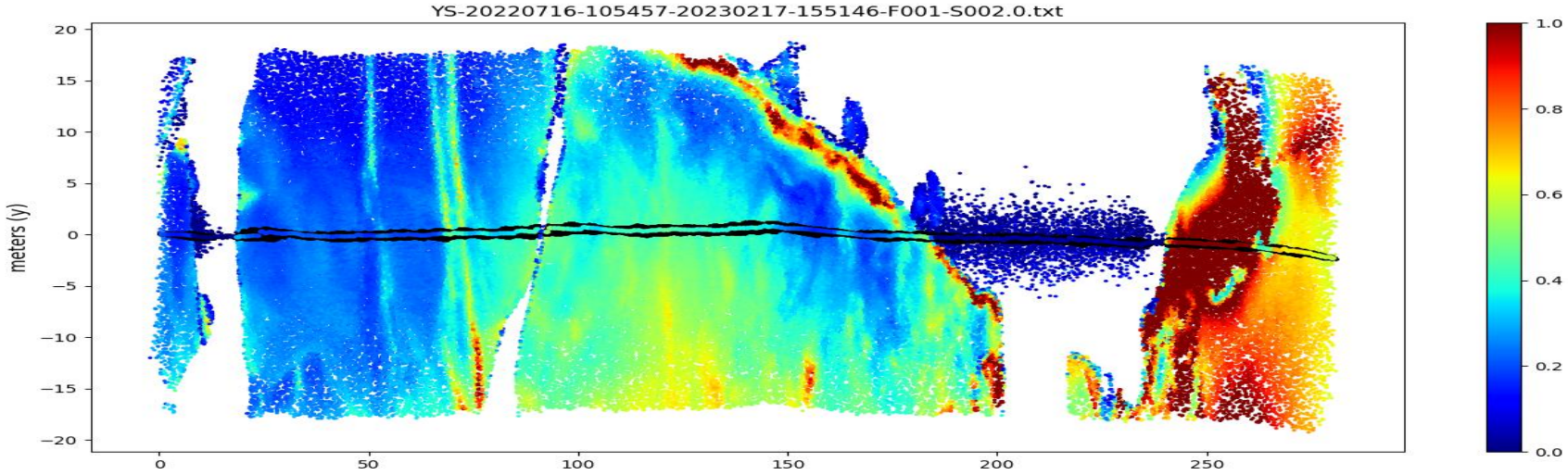

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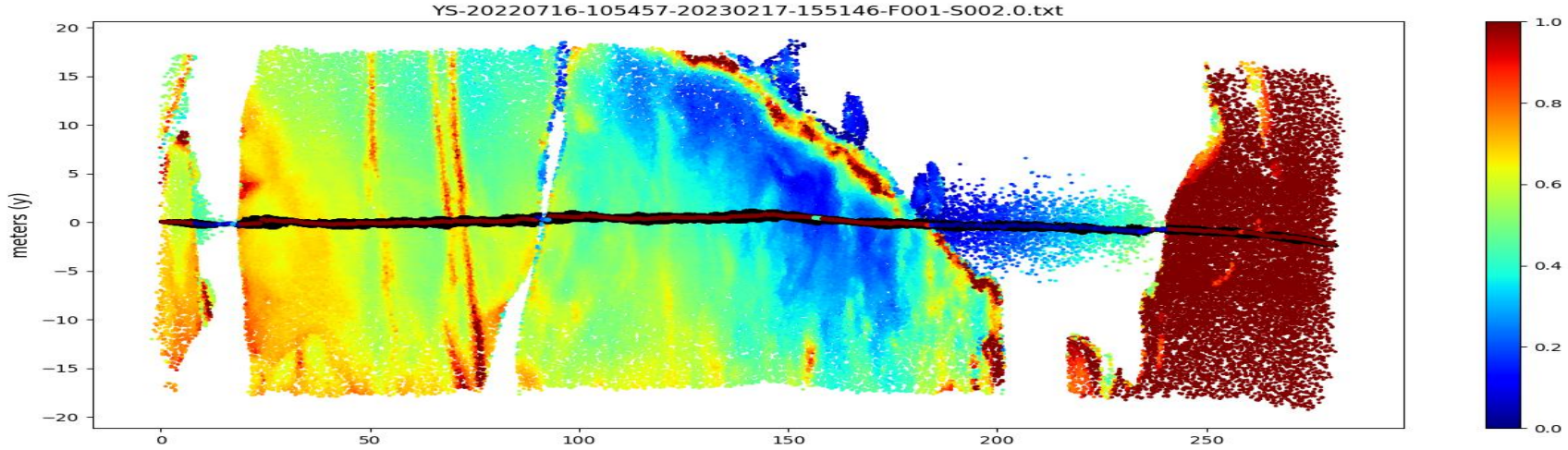
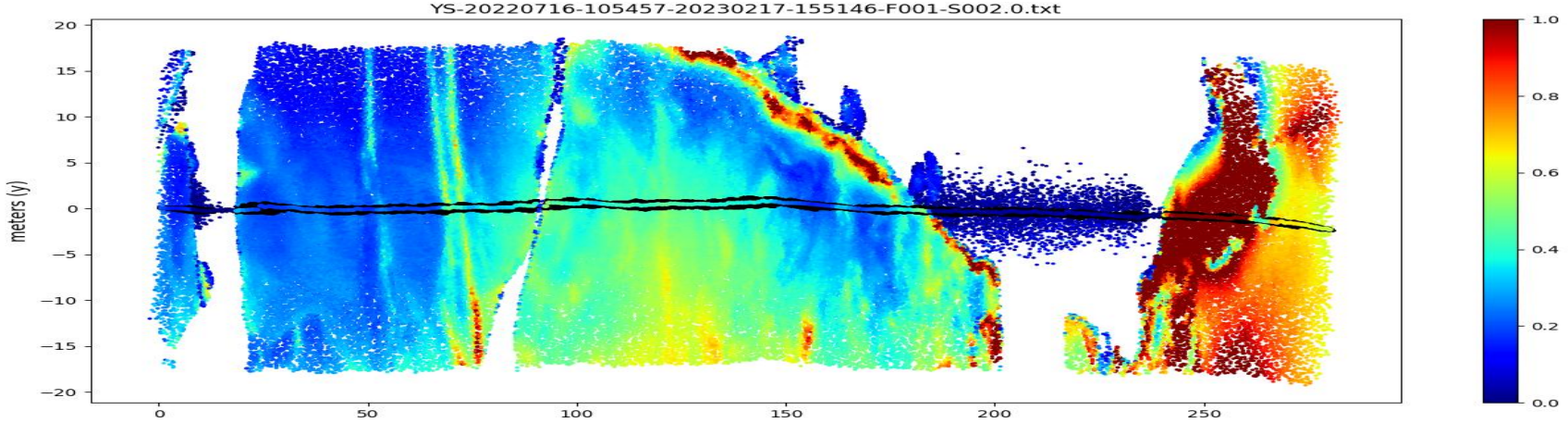
Before correction:



After correction:



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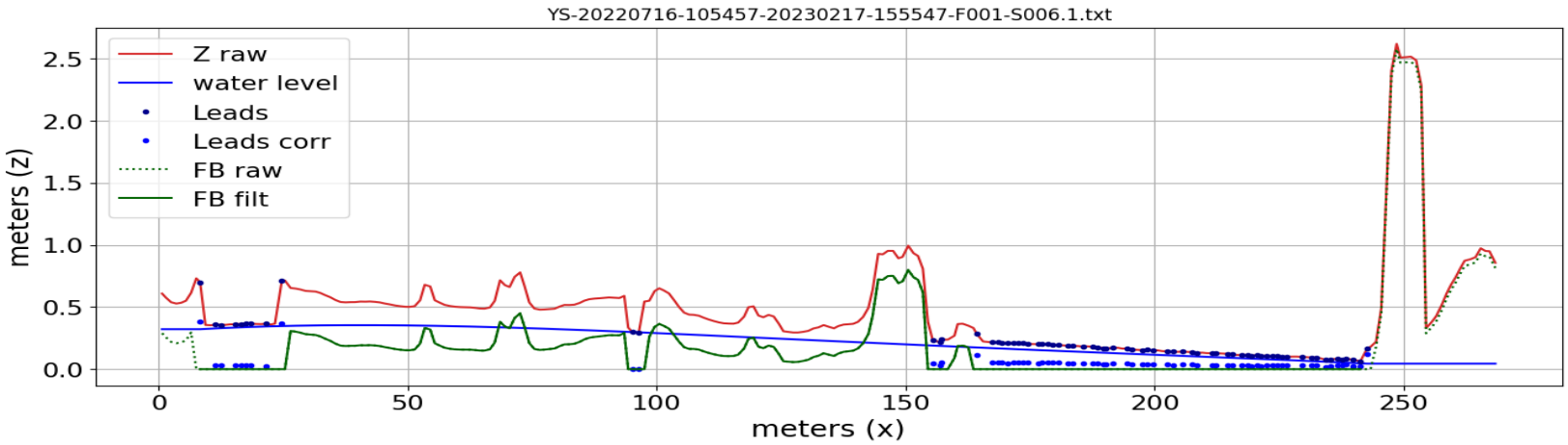

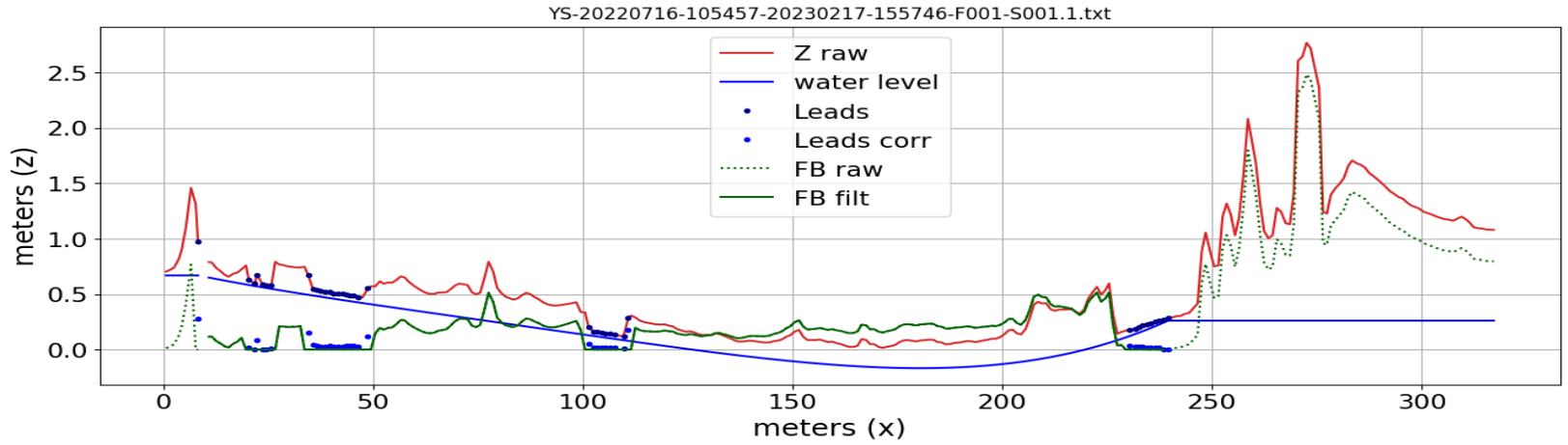

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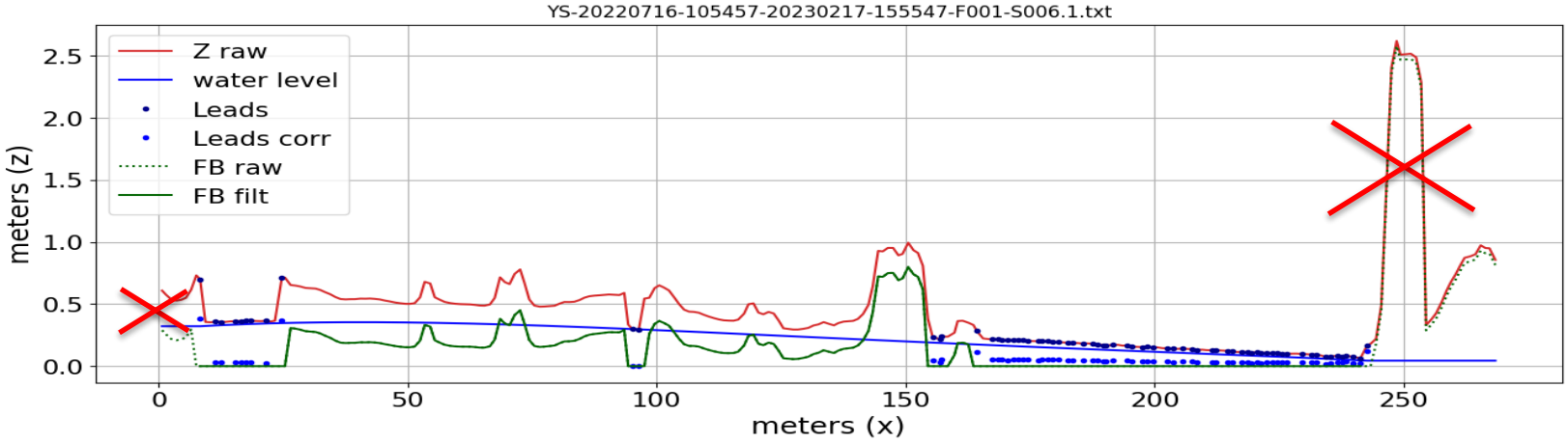

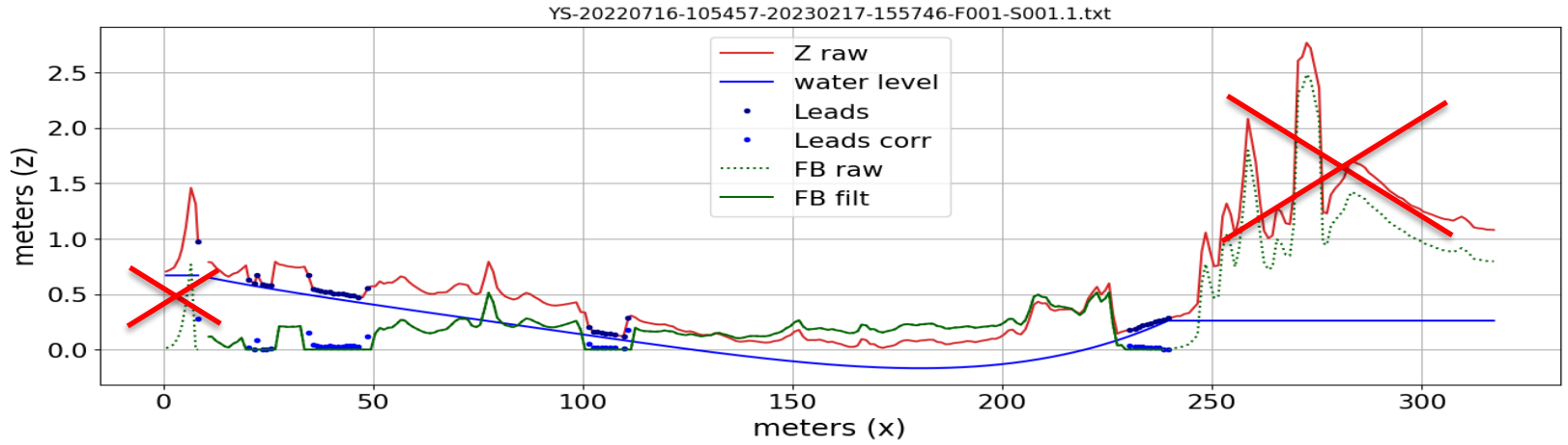

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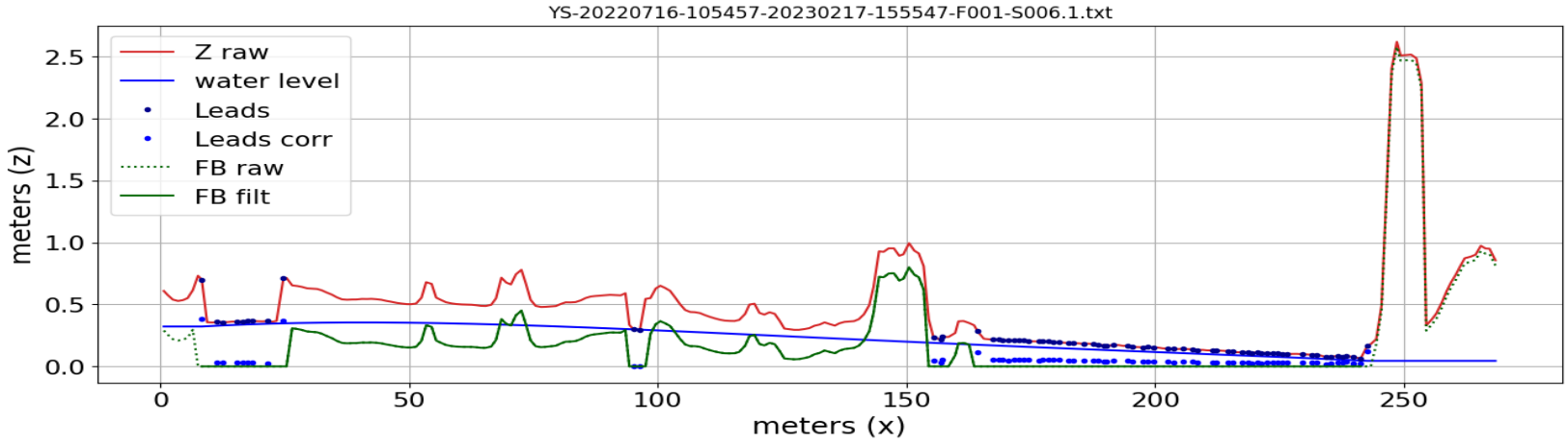
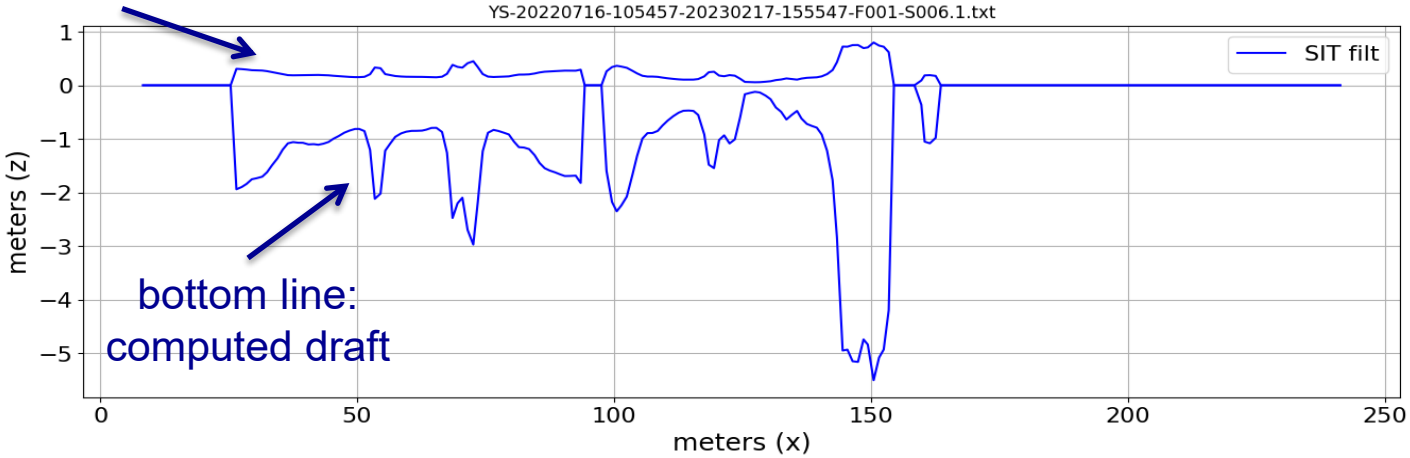


$$SIT = [\rho_w \cdot FB_{laser} + (\rho_s - \rho_w) \cdot SD] / (\rho_w - \rho_i)$$

top line :
measured FB



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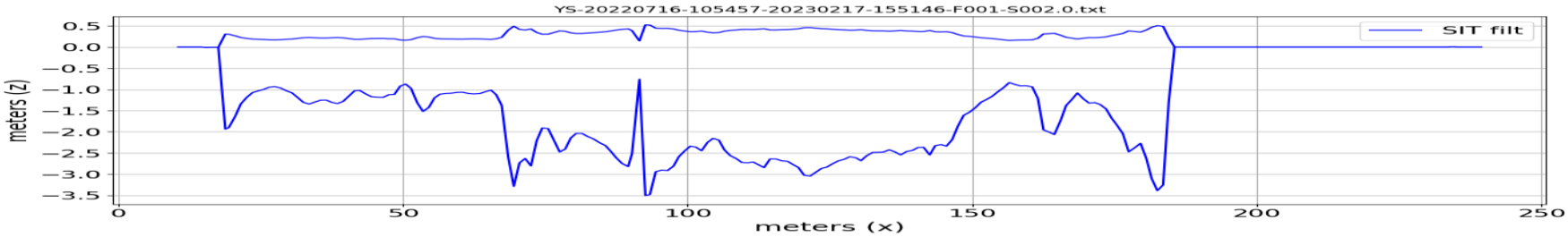
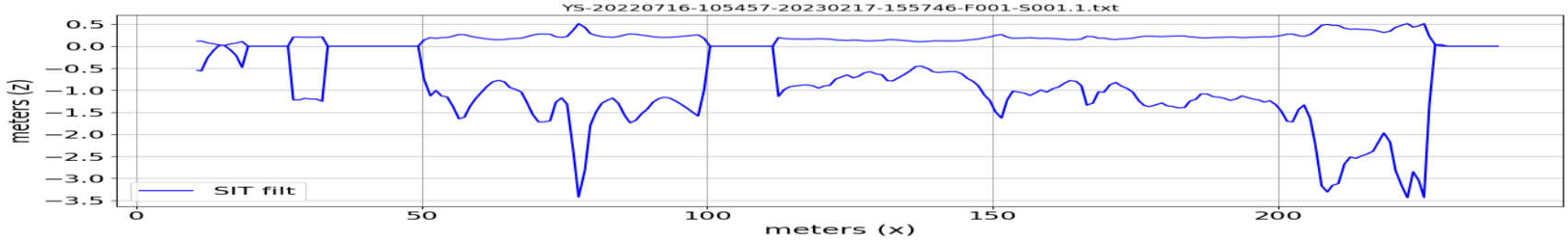


date hour	ref	max	mean	std	median	MAD
15 12h	2.1	7.56	1.804	1.254	1.886	0.462
	4.1	7.56	2.105	1.680	1.874	1.220
	6.1	4.09	1.699	0.677	1.676	0.261
16 11h	2.0	4.03	2.184	0.891	2.320	0.795
	6.1	6.30	1.704	1.326	1.272	0.462
	1.1	3.95	1.479	0.791	1.380	0.327
	1.2	6.06	2.385	1.444	2.751	1.083
16 12h	2.1	5.15	2.303	1.295	2.224	0.879
	6.2	4.15	1.667	0.765	1.612	0.432
	7.1	3.25	1.756	0.902	1.863	0.794



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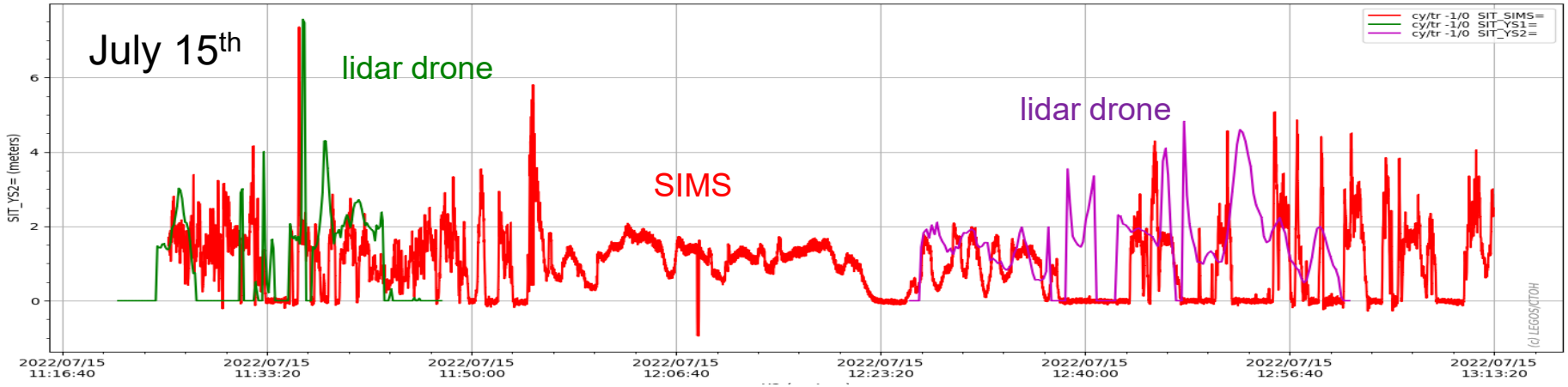
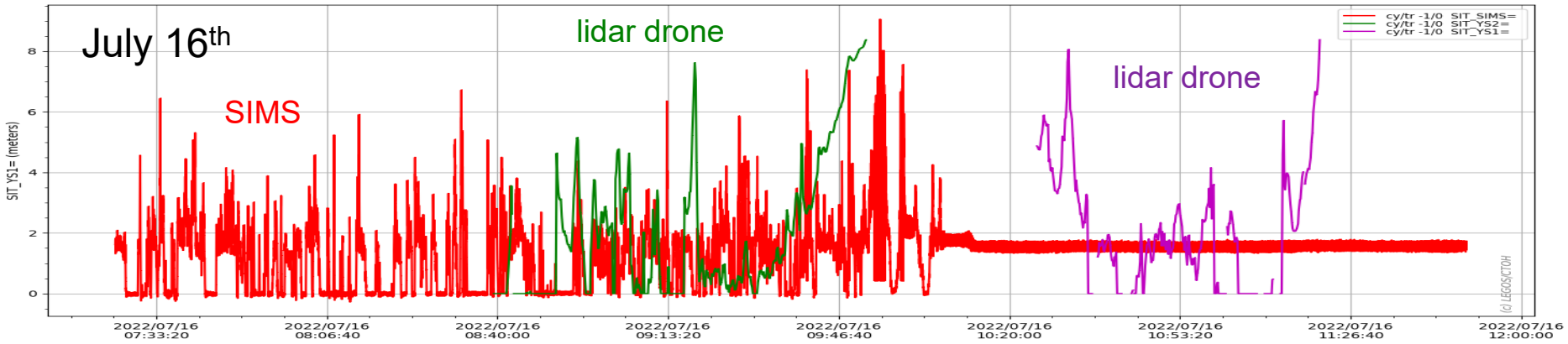
Good consistencies between SIMS and drone-born lidar



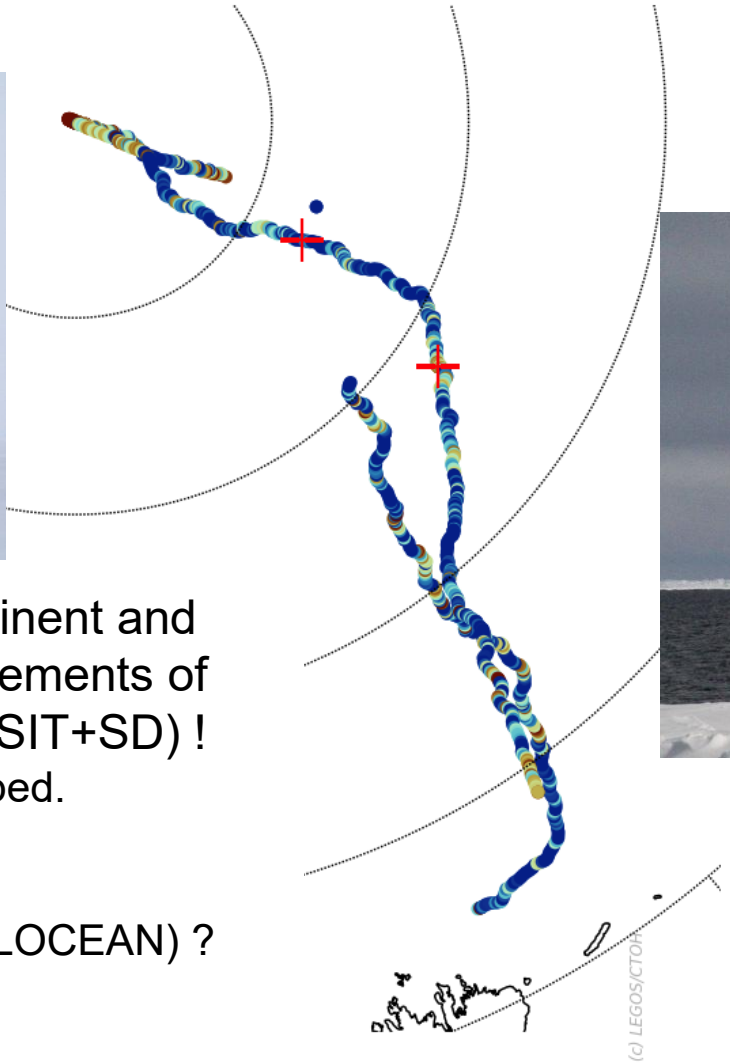


Conclusions (1/6)

- Feasibility demonstrated by 2 drone missions
- Backscatter over water only at nadir (no need for 3D scanner)
- Synthesis of difficulties and workarounds in TD12:

- No blocking points
- Need more studies:
  - to ease polar drone deployment from a vessel (without mandatory need of a professional pilot)
  - to improve the precision of the altitude of the drone
  - if possible to combine lidar and snow-radar

Conclusions (6/6)



SIMS provides with very pertinent and operational real time measurements of the total Sea Ice Thickness (SIT+SD) !

- About 10 ice-breakers equipped.
- Can we get the data ?
- Systematize the installation ?
- Add a snow-radar (NORCE, LOCEAN) ?
- Low bias impact ?