SAR ALTIMETRY DATA at German Bight

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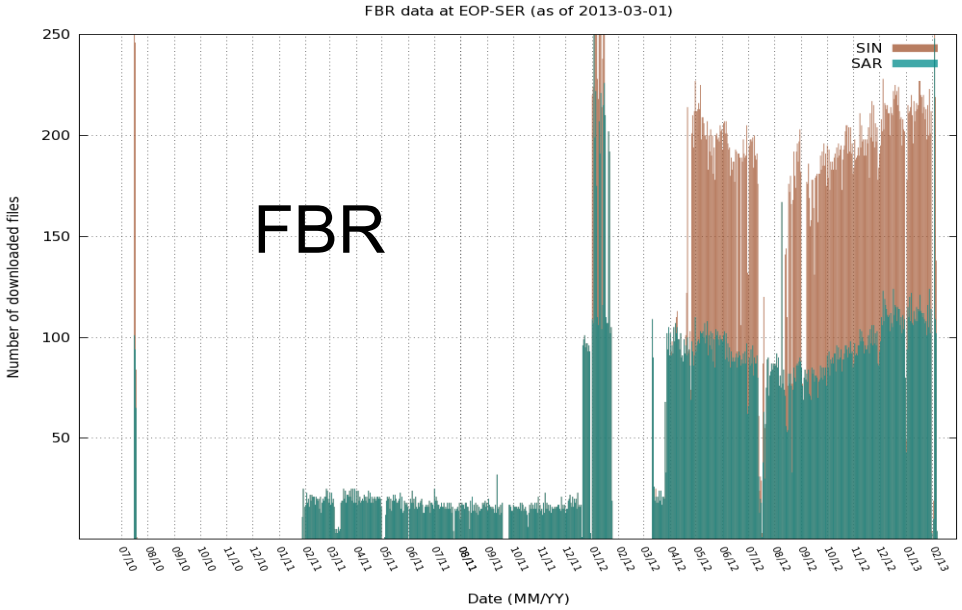
ESRIN EOP-SER L1b/L2 SAR Prototype

Rationale: At ESRIN EOP-SER Section, for validation purposes and preparation to Sentinel-3 mission, we implemented own processor prototype in order to Delay-Doppler process and re-track CryoSat FBR data

- **SAR/SARin L1b & L2 Processor Prototype**
- **Input: CRYOSAR SAR FBR DATA**
- **Coding Language: MATLAB**
- **At L1b, Standard Delay-Doppler Processing (description on line in a TN in CryoSat Wiki Forum)**
- **At L2, Re-tracker with SAMOSA Analytical SAR Model (roll/pitch mispointings in input) using Levmar (Levenberq-Marquardt) LSE**
- **Output L1b → Radar Echogram**
- **Output L2 → SLA (W/O SSB), SSH , SWH, sigma0, wind speed**

Archive and Data Collection Segment

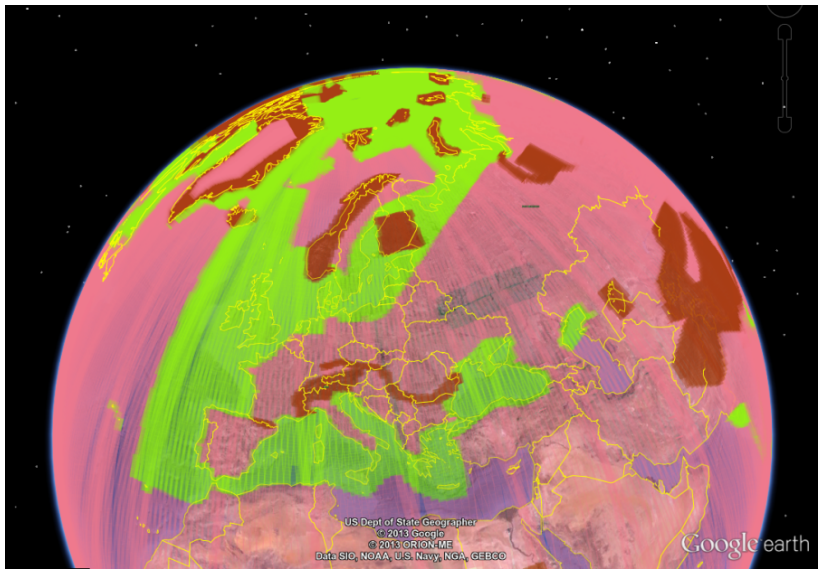


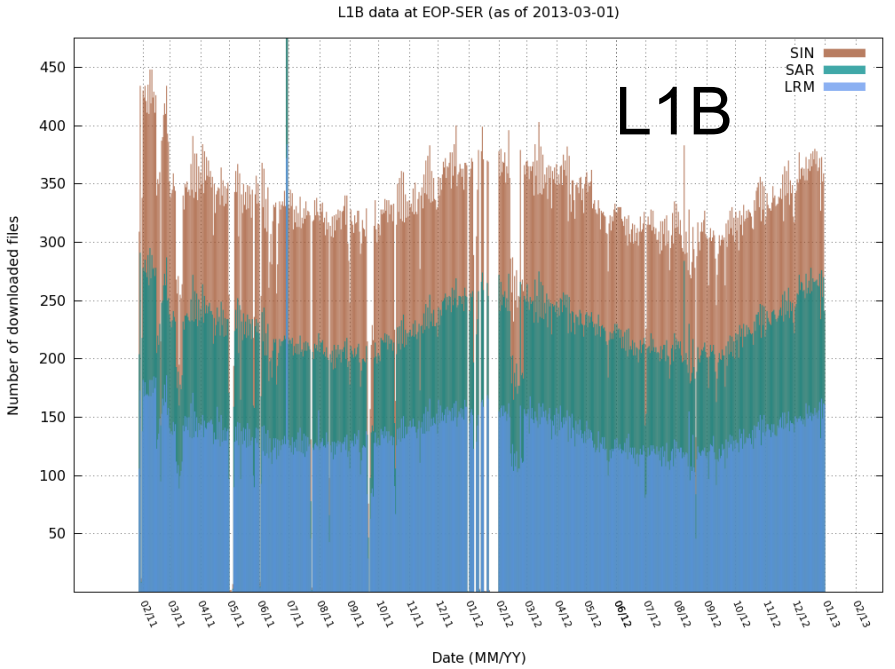
The total amount of archived FBR (SAR/ SARin) data is over 9 Terabytes.

The normal processed data (CS_OFFL_) span from Jan. 2011 to June. 2013.

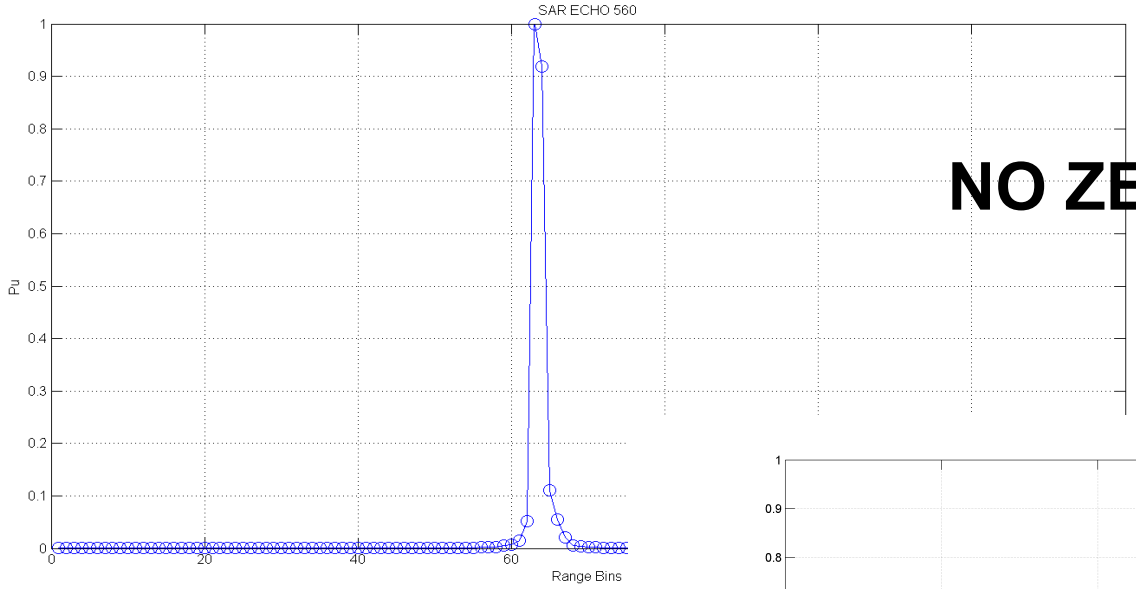
A local L1B archive (2011-2012), just short of 900 Gigabytes, is also kept locally.

Big Thanks to Bruno Lucas for this

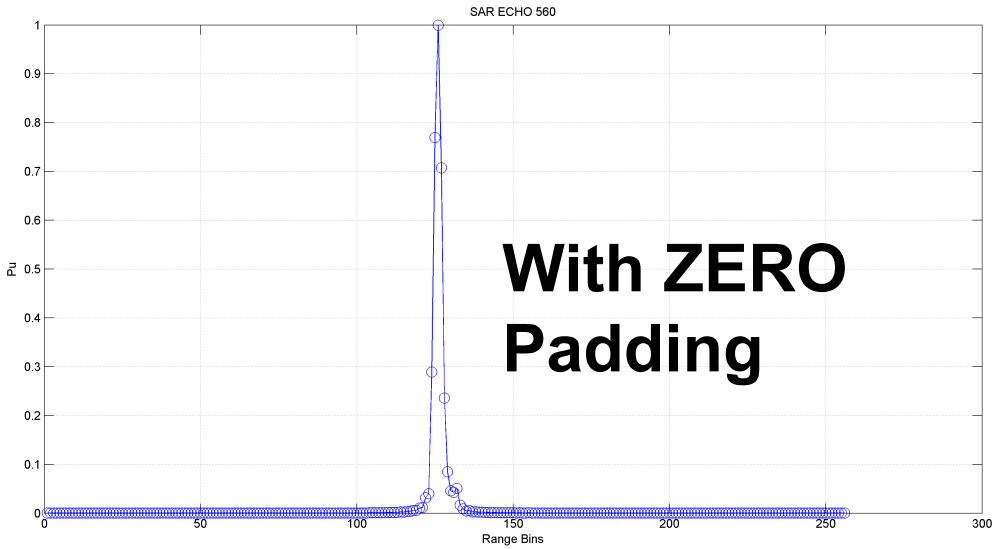




Processing Options: Zero-Padding Always Applied



NO ZERO Padding

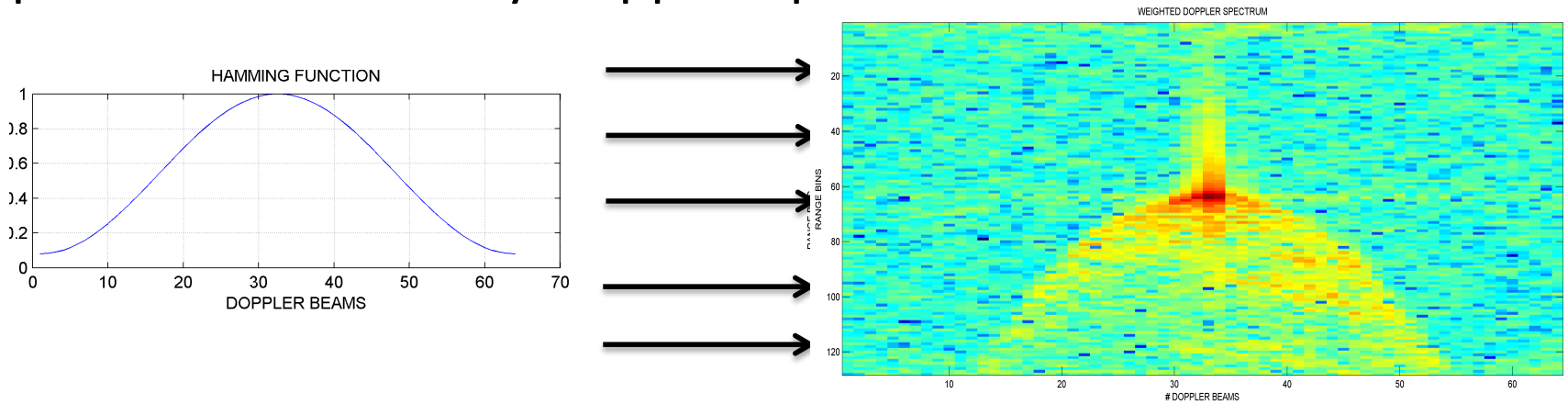


With ZERO Padding

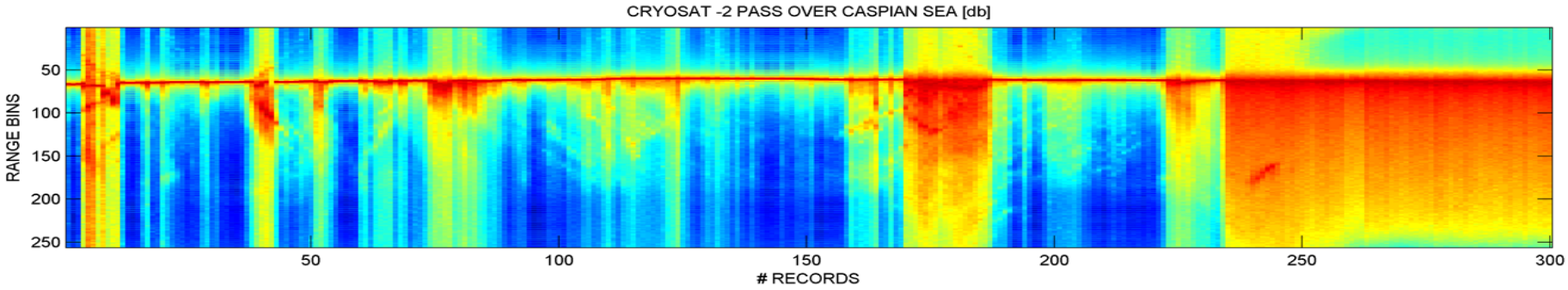
Jason CS … shall we apply or not the zero padding ?

Processing Options: Weighting Function

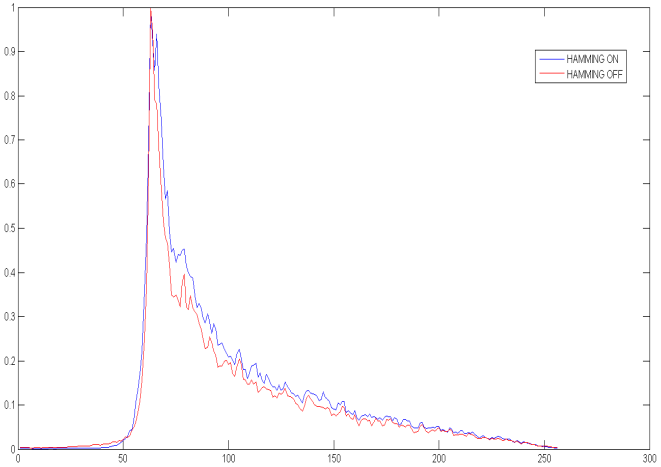
To suppress parabolic artifacts on the radargram to the quasi- specular coastal waters, => application of Weighting Function (Hamming) in Doppler Domain to Delay-Doppler Spectrum before the Beam Forming



Effect of the application of Weighting Function to eliminate parabolic artifacts on radargram (echo stack)



Weighting only when in coastal zone



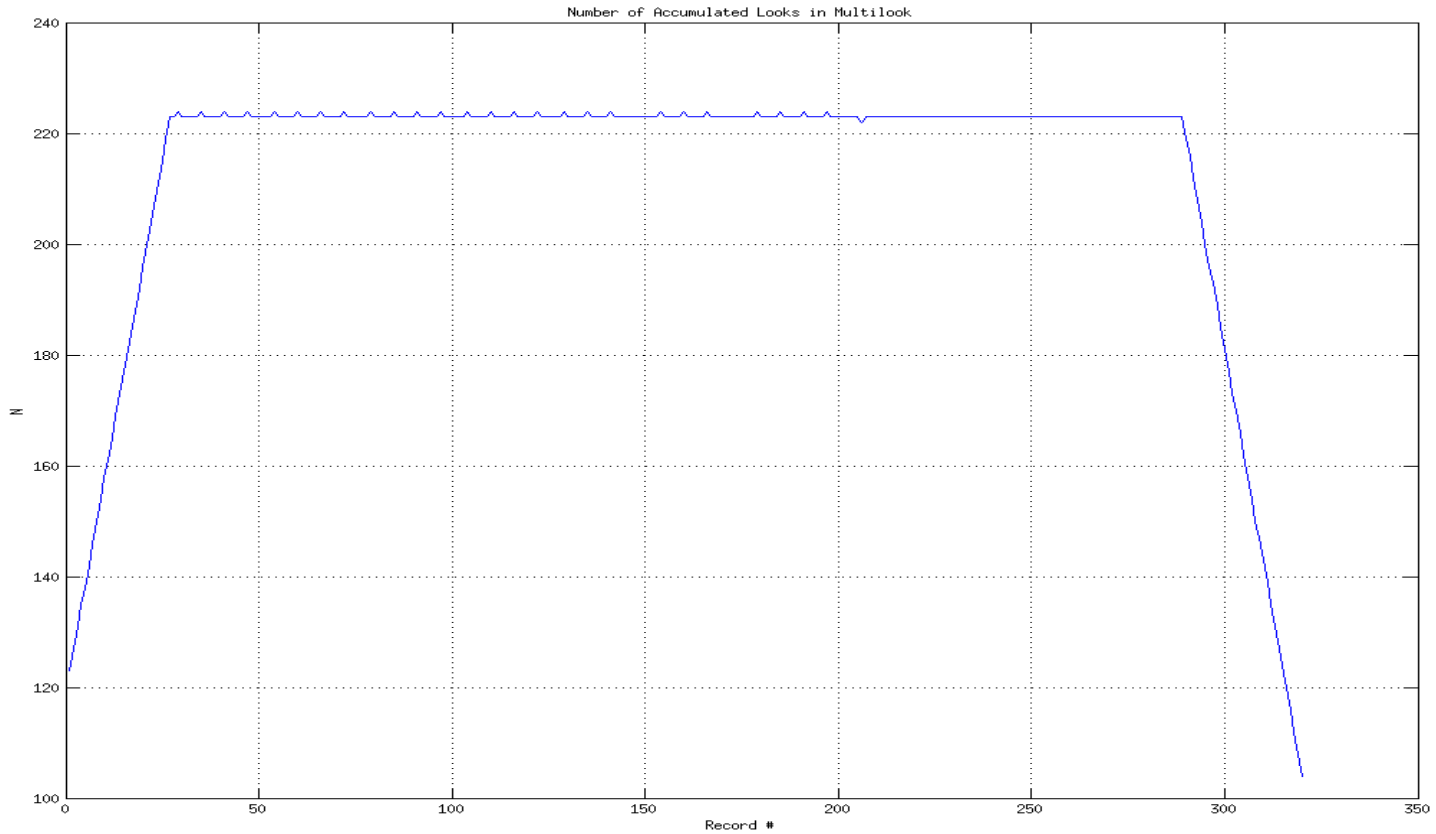
Because weighting means a slight data distortion and degradation of azimuth resolution (from 300 to 450), we apply the weighting function only over land or in coastal zone

- Distance to land >10 km => weighting off
- Distance to land <10 km => weighting on

Distance calculated according to a water/land mask

Jason CS … shall we apply or not the weighting function ?

Processing Options: Beam Number Index in the Products



Recommendation: Provide in L1b Products Number of Looks and index of the beams (matching between SAR L1b processing and L2 SAR retracking)

Sigma 0 & Wind Speed

For first time in our tool, we tried also to calculate absolute sigma0 and wind speeds

•To derive sigma0 from retracked Pu, we invert the SAR radar equation (considering in the radar equation the SAR footprint)

•We align CryoSat SAR sigma0 to Envisat Sigma0 (i.e. we apply a fixed sigma0 bias) and then we apply Envisat Wind Model (Abdalla)

•But “not sure to apply correctly the gain corrections”

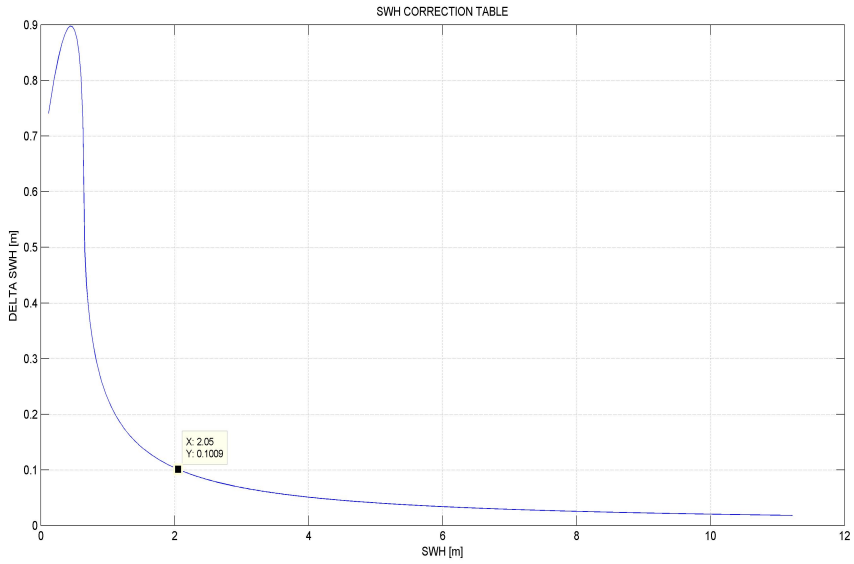
Alpha PTR: SWH Correction Curve to be consistent with RADS

In the SAMOSA model, the sinc PTR is approximated to gaussian function (as done in Brown's Model).

The gaussian function is expressed in term of an adimensional coefficient (alpha_PTR)

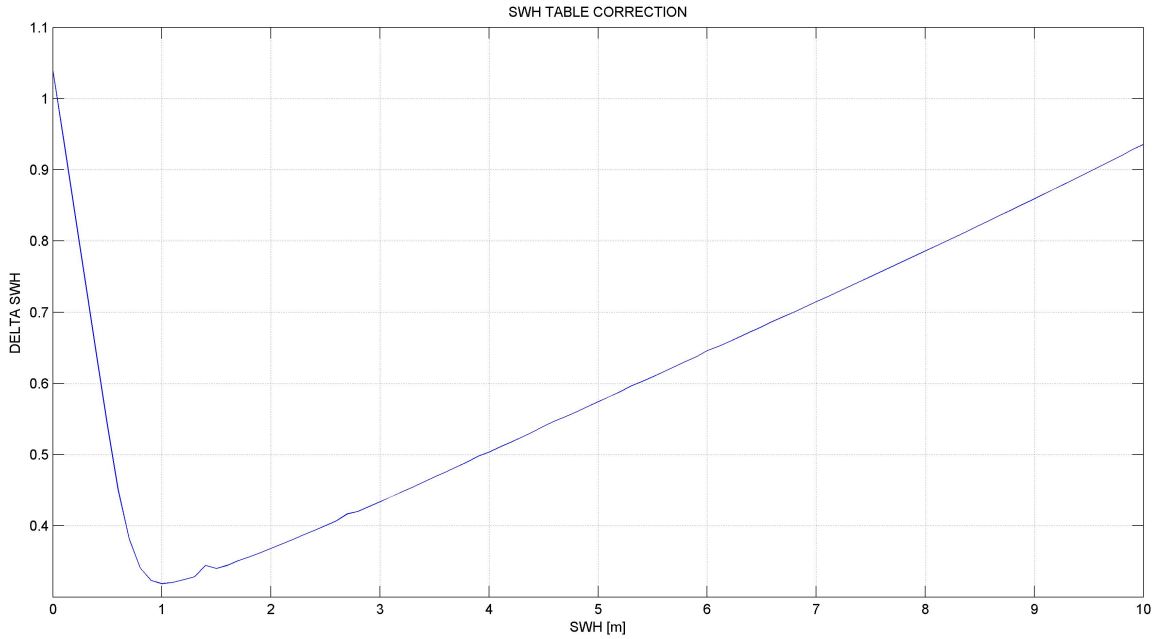
- In Esrin Prototype, this parameter is set to Alpha_PTR=0.3854
- In RADS, this parameter is set to Alpha_PTR=0.513

In order to be consistent with RADS (our reference), we apply to retracked SWH a correction table after the retracking (a posteriori)

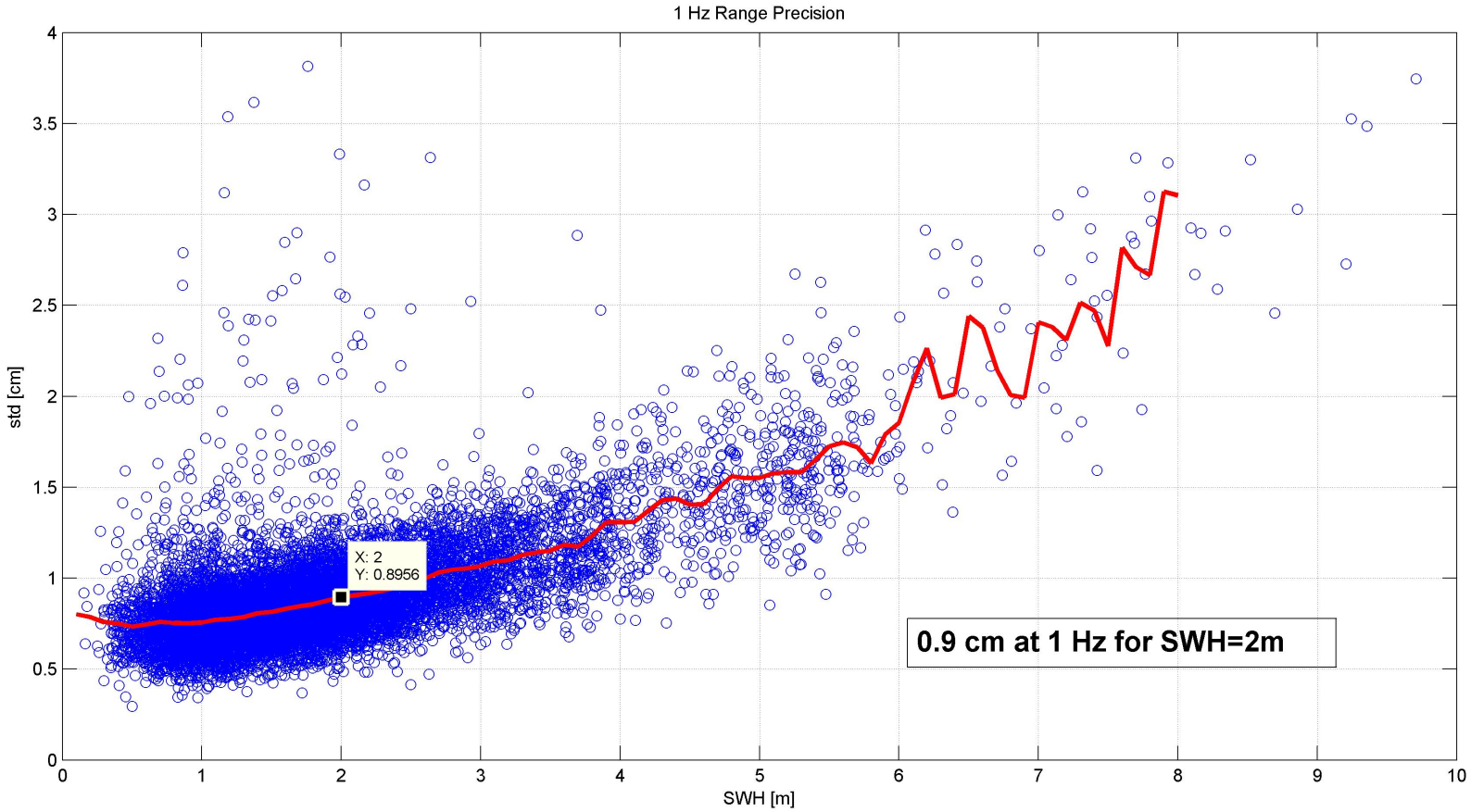


ALPHA PTR: SWH Correction Curve (Work In Progress)

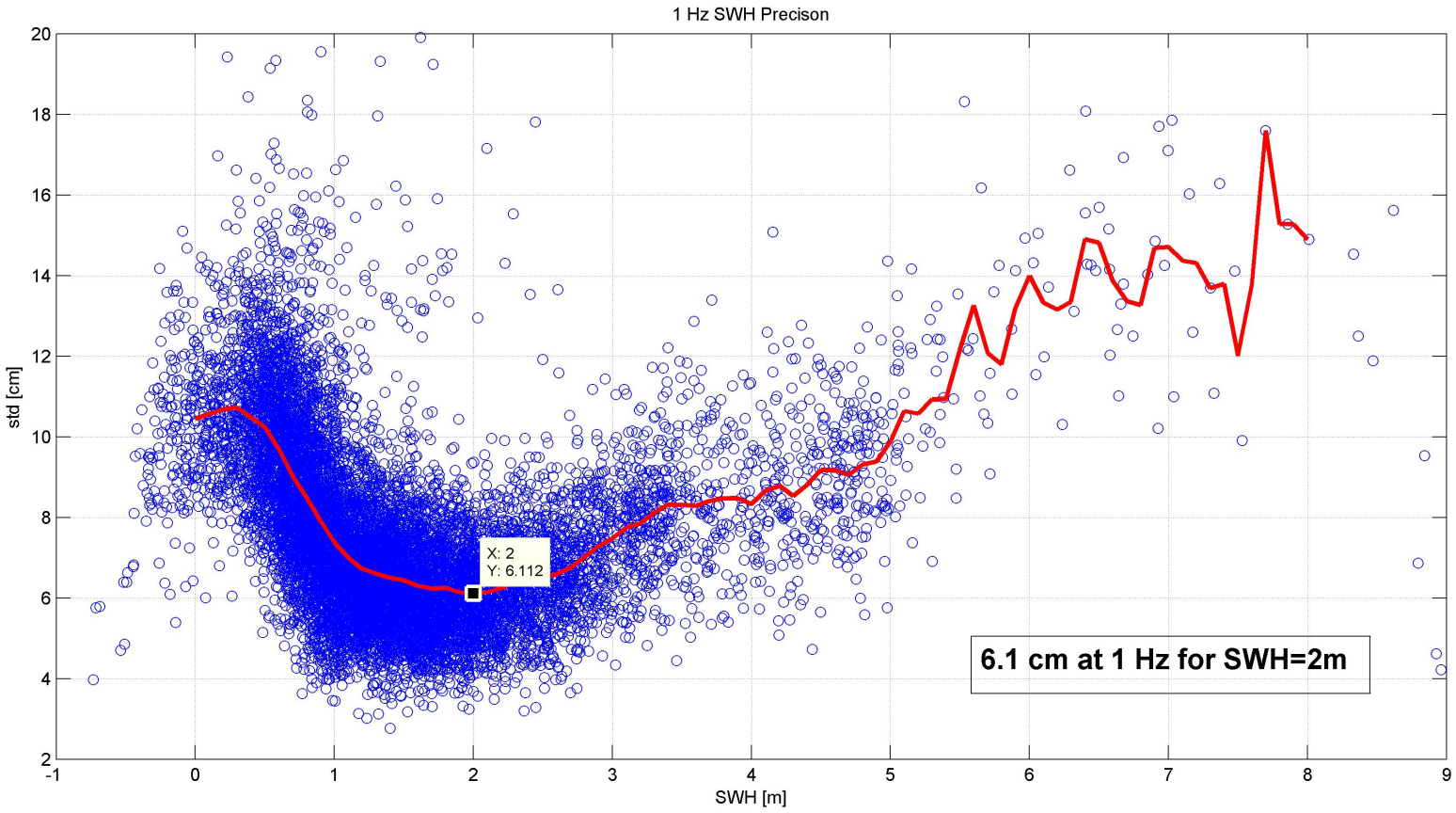
As done for Jason Missions, we tried to calculate the SWH Correction table calculating a simulated numerical solution (i.e. taking in count SINC PTR), and afterwards retracking the simulated echoes with the SAMOSA analytical model. The difference in SWH between the one in input to simulation and the one in output from retracking is the correction table for SWH.



1 Hz Range Precision Curve



1 Hz SWH Precision Curve



1 Hz Wind Speed Precision Curve