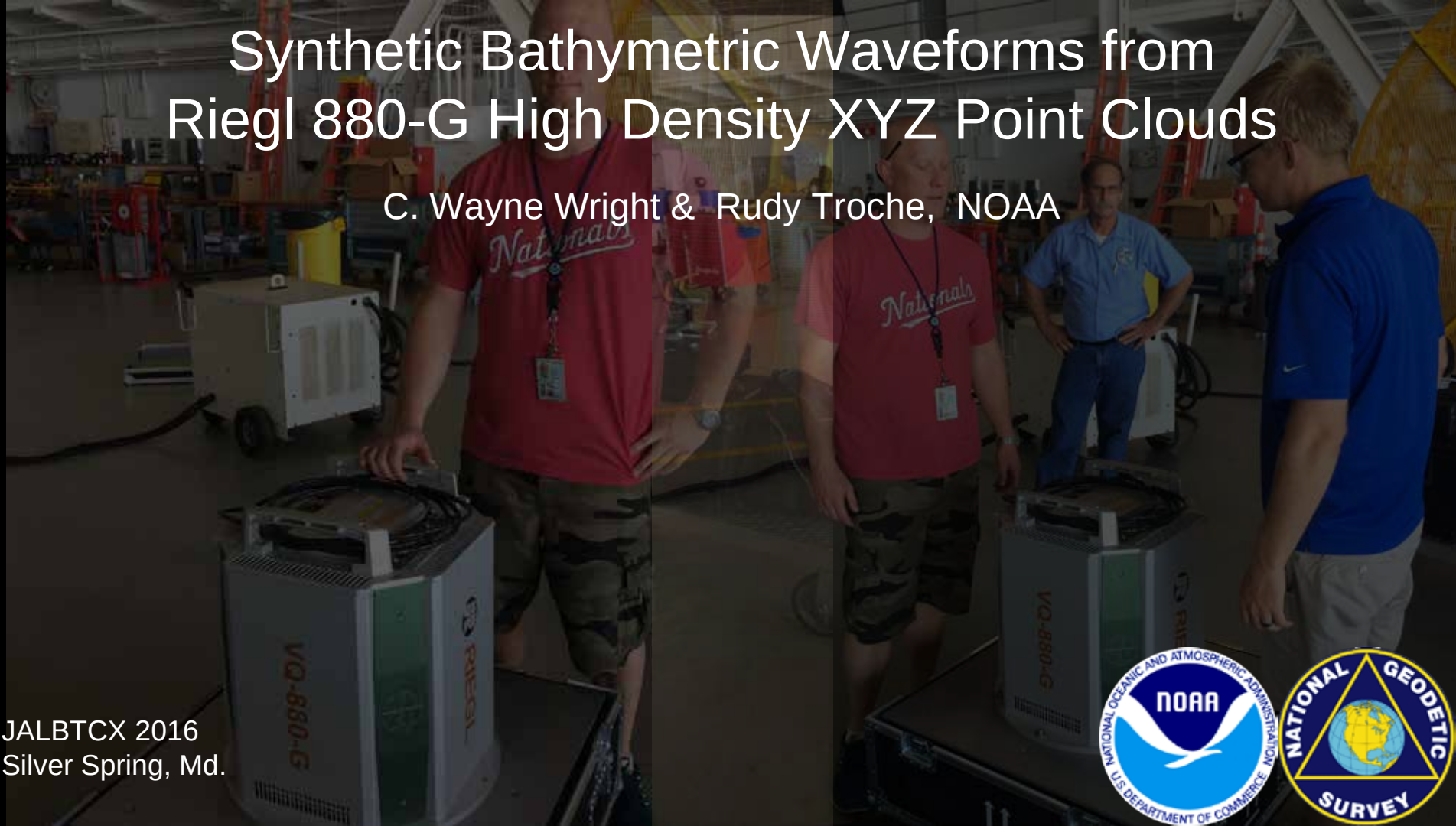
Synthetic Bathymetric Waveforms from Riegl 880-G High Density XYZ Point Clouds

C. Wayne Wright & Rudy Troche, NOAA



JALBTCX 2016
Silver Spring, Md.

The Sensor & Operating Conditions

Specifications

Riegl 880-G

140 kHz to 550 kHz PRF

20-50 points per square meter.

Narrow Field of view (~ 2mr)

600 meter (2,000 feet) nominal flight altitude

Each laser pulse can return 0 to 20+ discrete return points for each laser pulse

55,000,000 points per second possible

Each point has range and intensity values

Recording waveforms possible, but it rapidly

Synthetic Waveforms

Adjustable virtual surface footprint

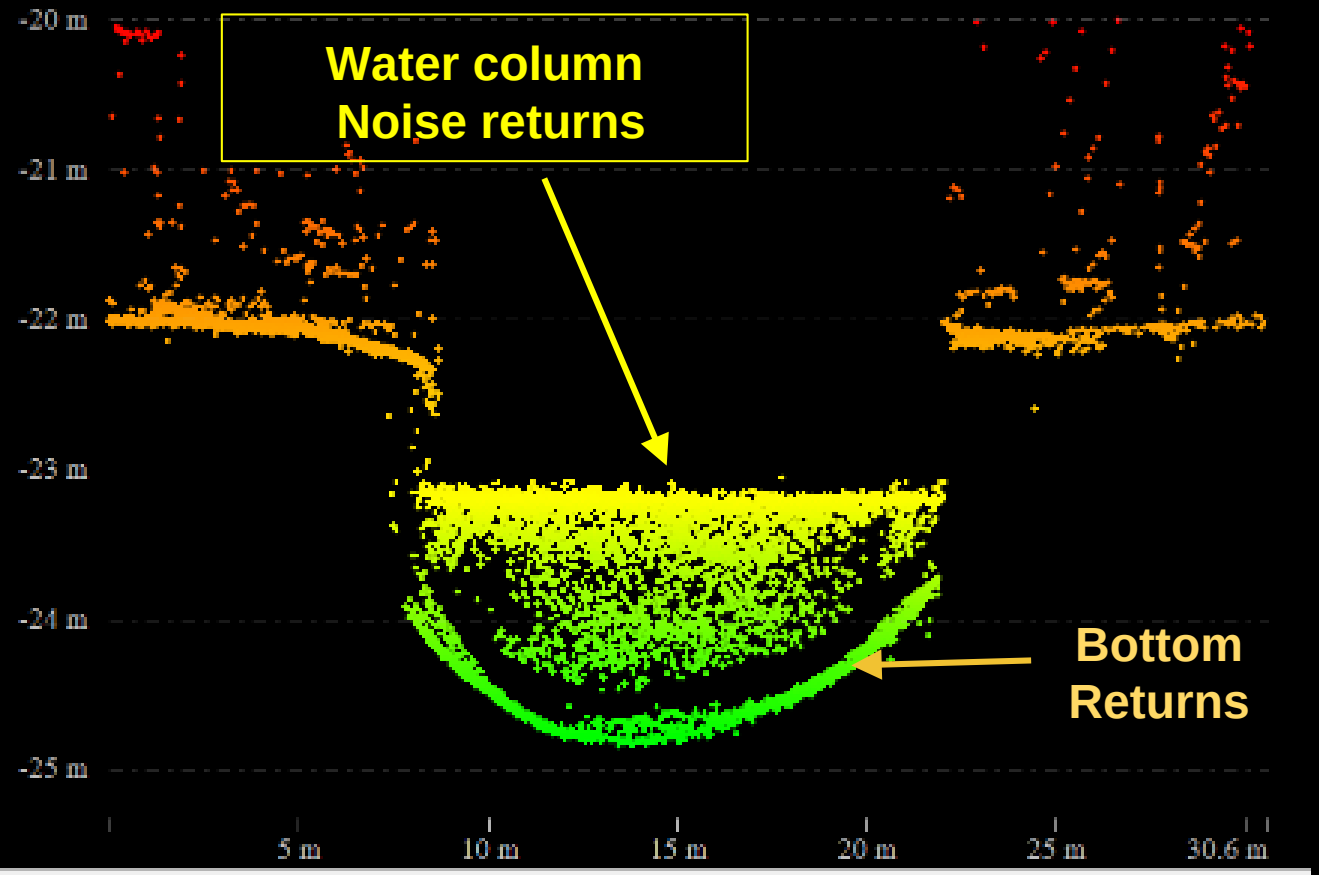
Can be adapted to bottom topography

Can be any closed shape, circular, rectangular, or combination of closed shapes

Allows existing traditional waveform based water column characterization and bottom detection methods

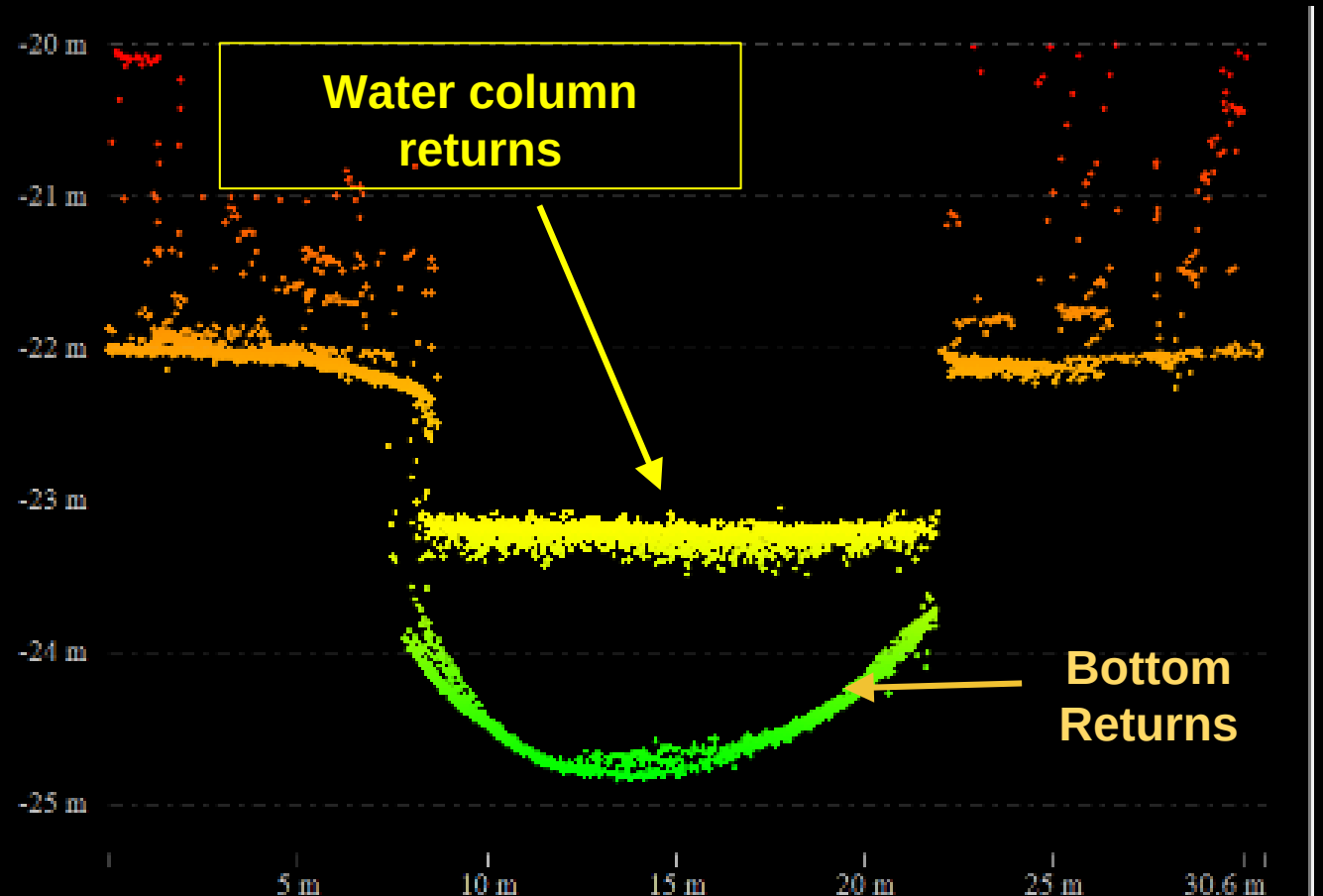
Used to generate a bottom DEM which is in turn used to drive automatic editing of the original point cloud to find the bottom in the presence of water column “noise”

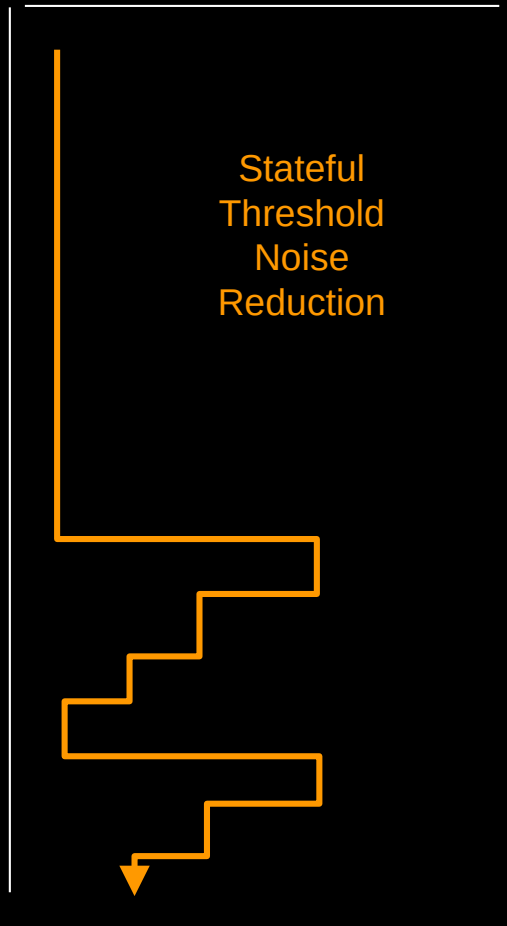
The issue… Water Column “Noise” Returns



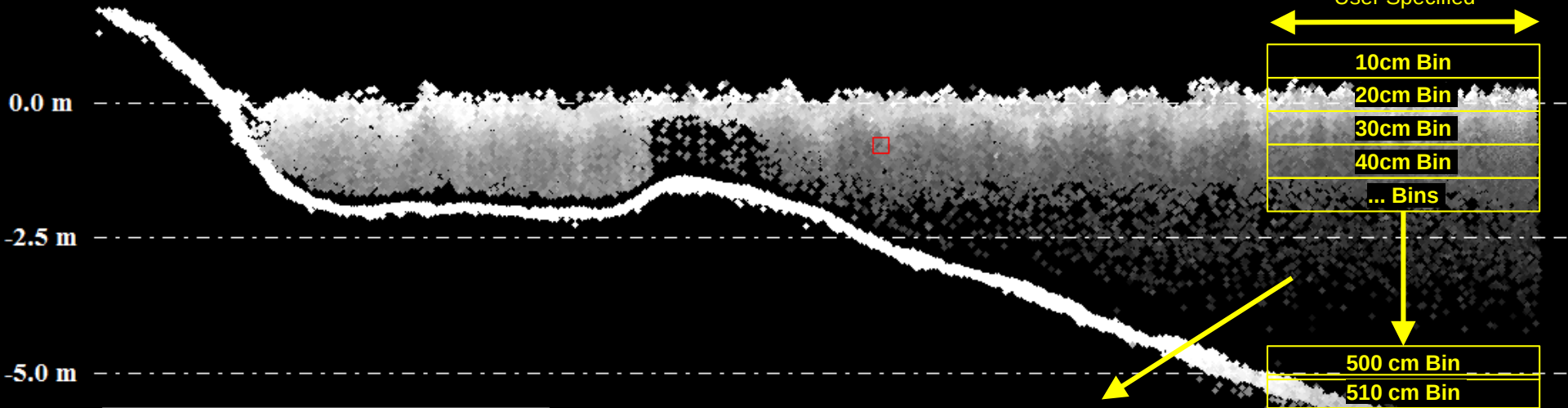
Constant
Threshold
Setting

Solution #1: Stateful Thresholds

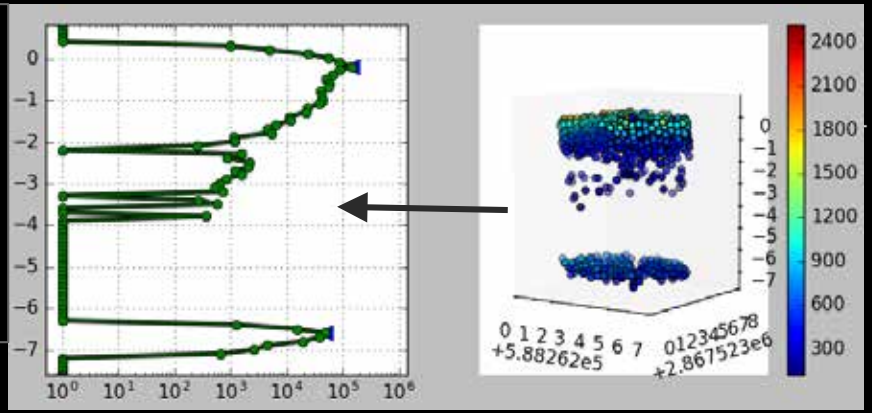




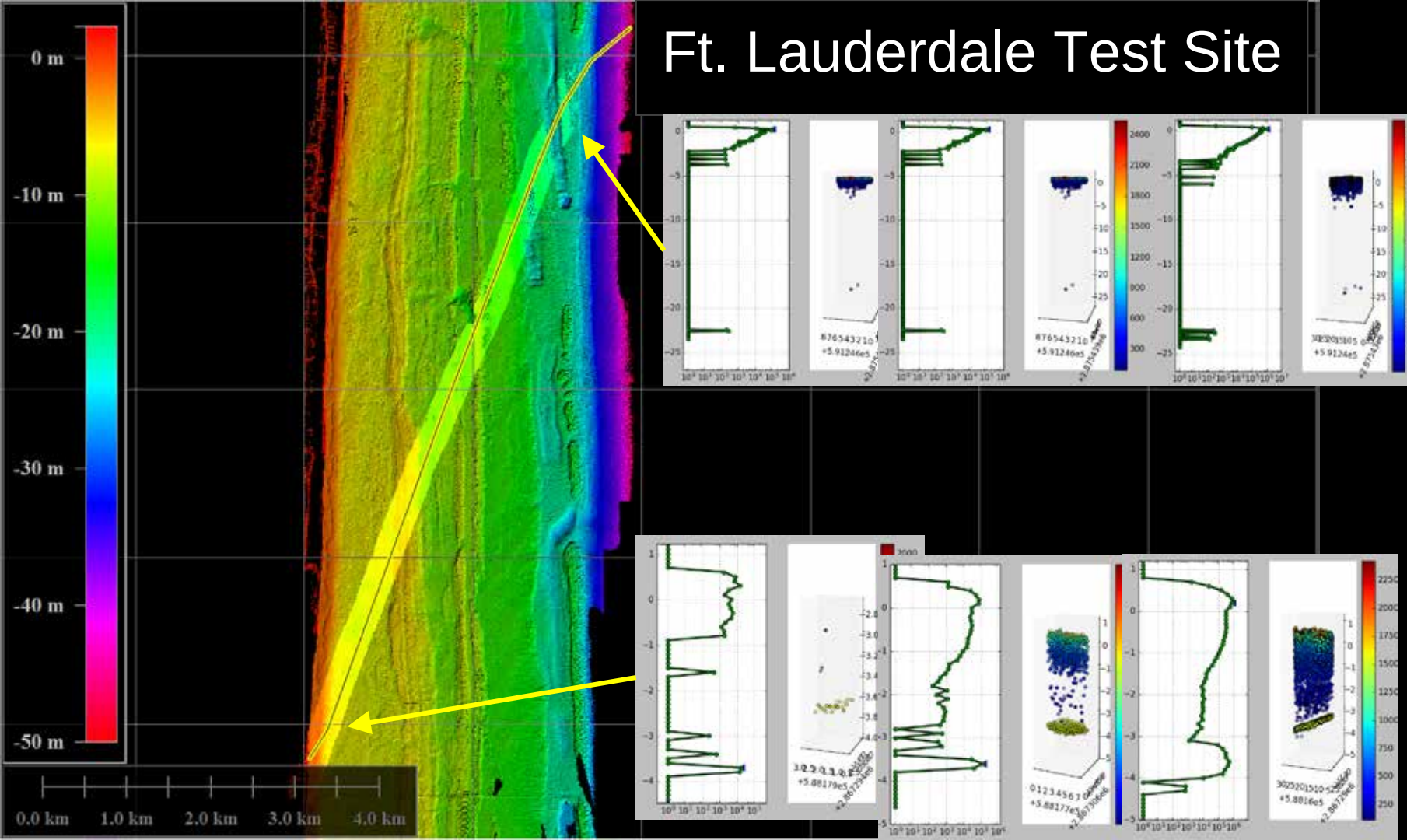
Solution #2: Synthetic Waveforms



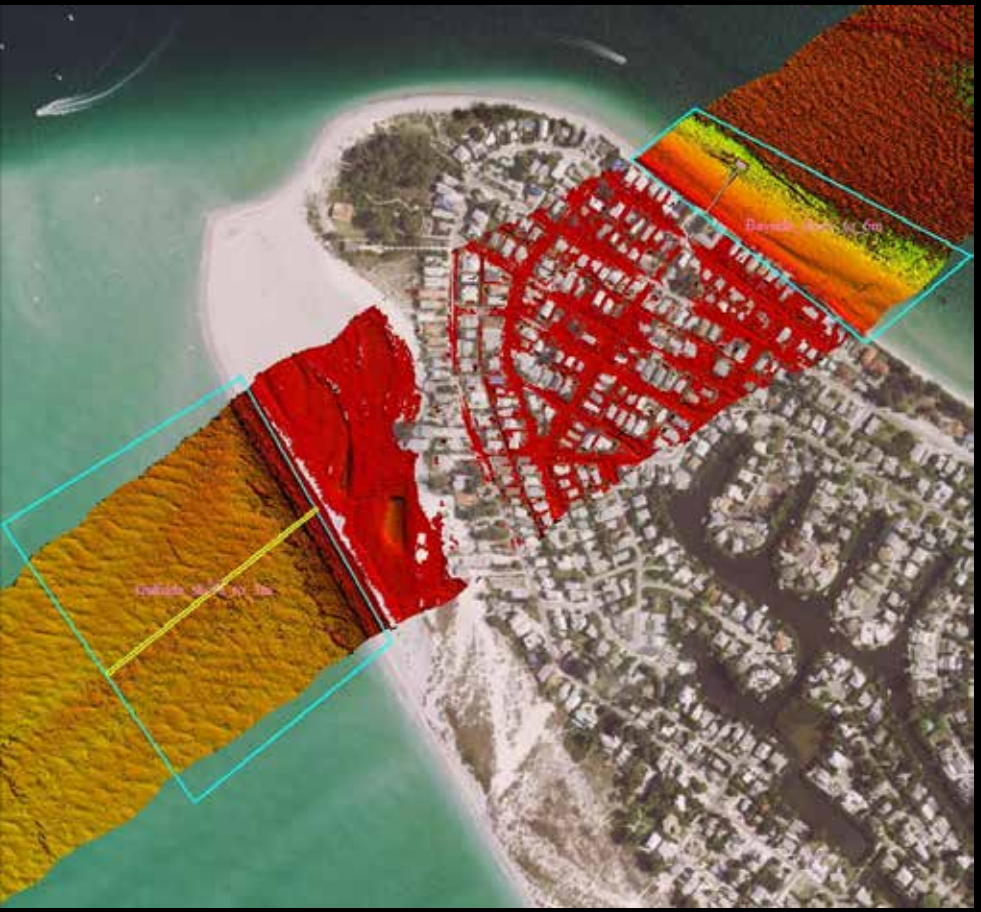
- Each return bin is the sum of all the intensity values of each point within each bin.



Ft. Lauderdale Test Site

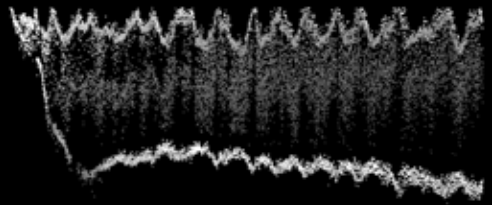


Anna Maria 3 PRF Settings

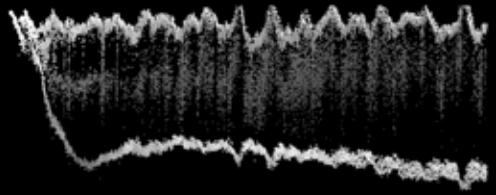


Same flightline flown at three different prf settings:

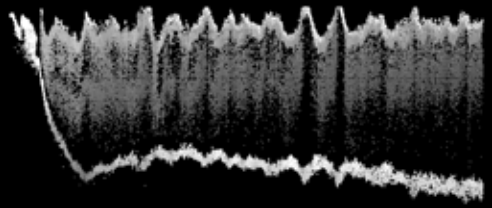
145 kHz



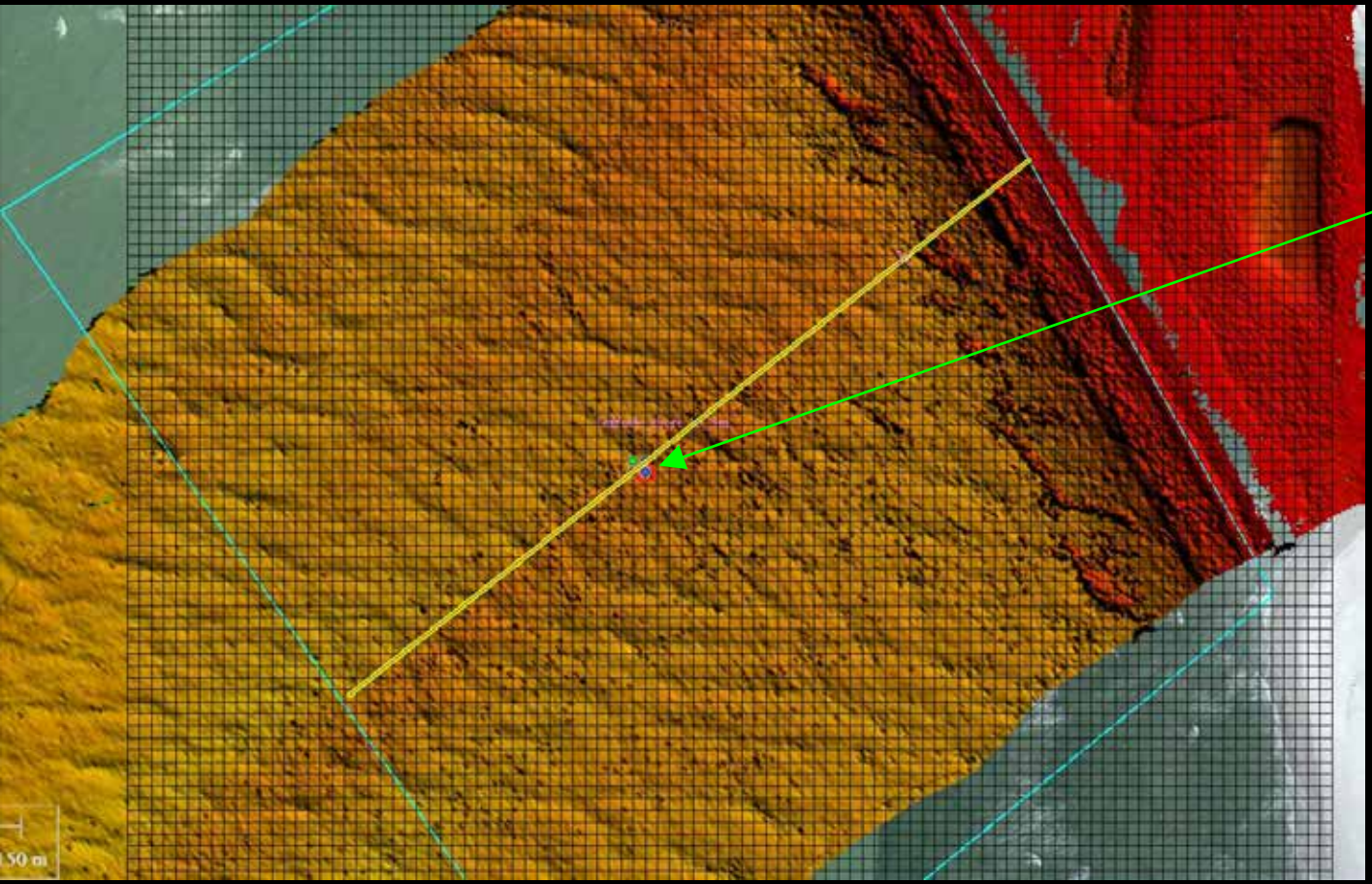
245 kHz



550 kHz

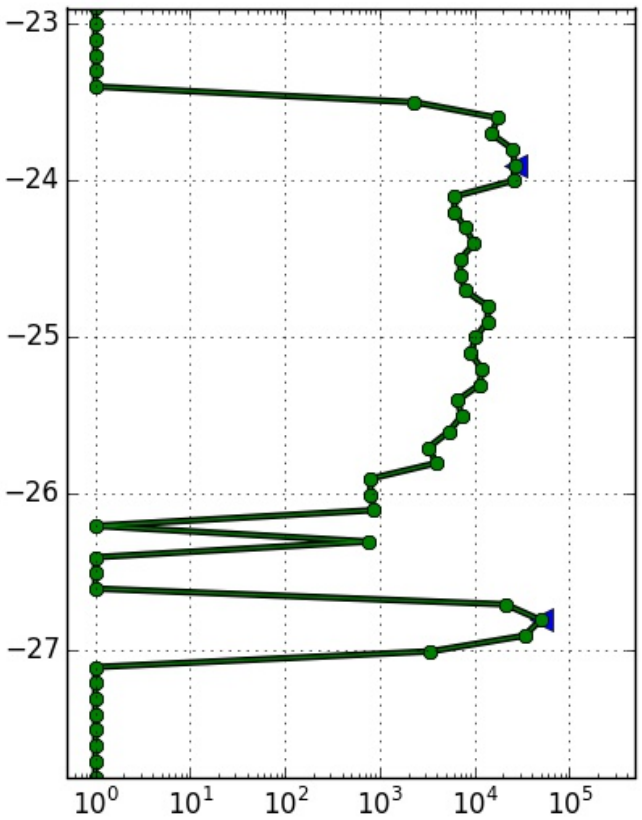


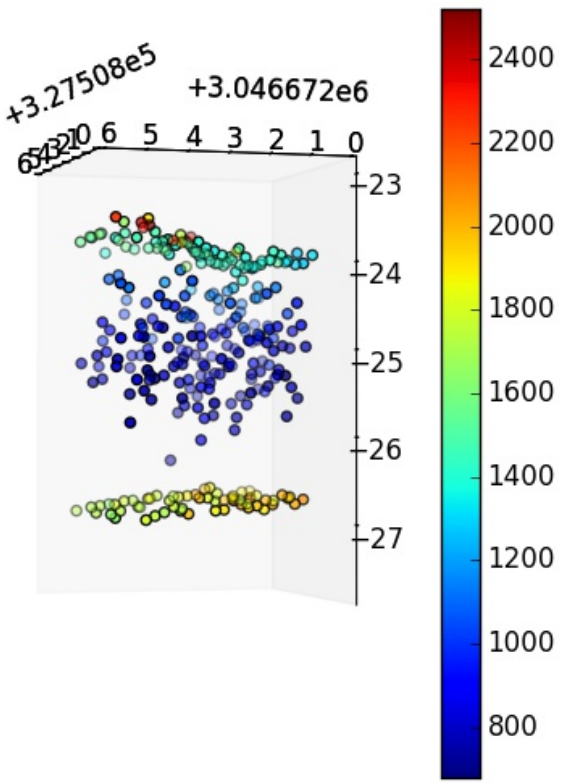
Anna Maria 3 PRF Settings



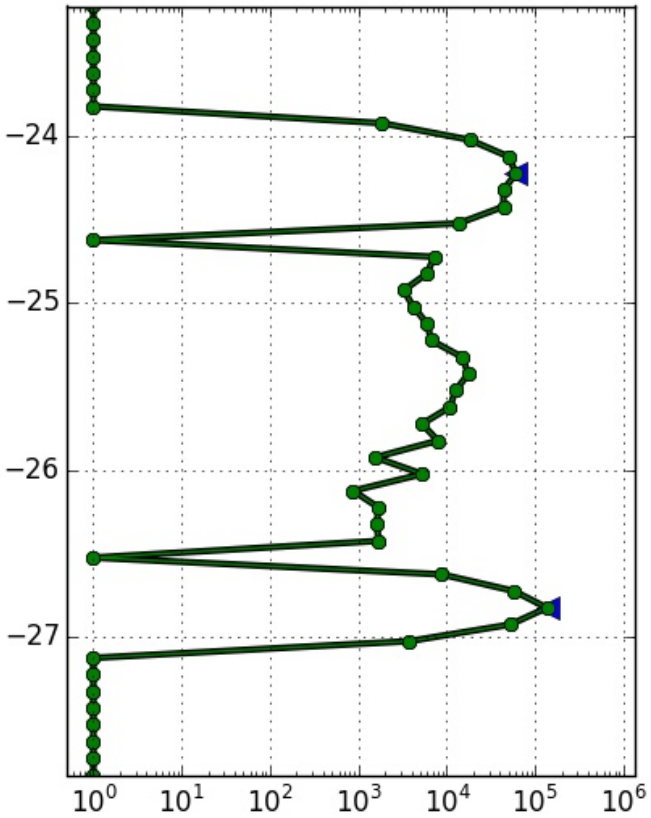
5m grid, cell being sampled

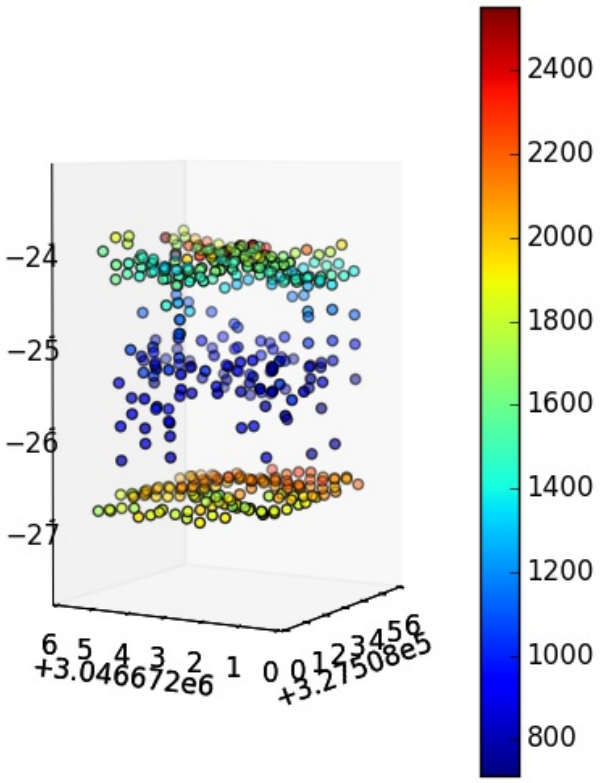
Anna Maria 145 PRF



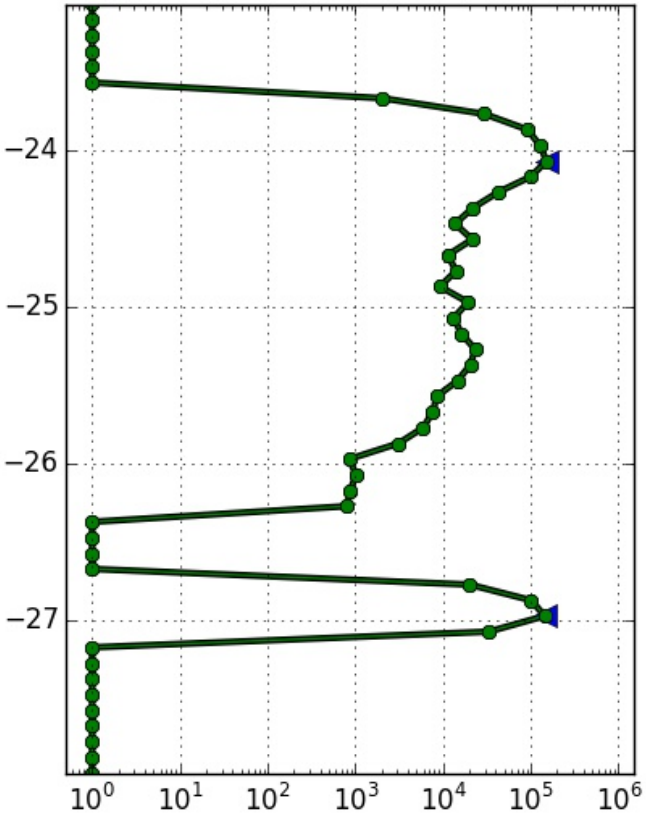


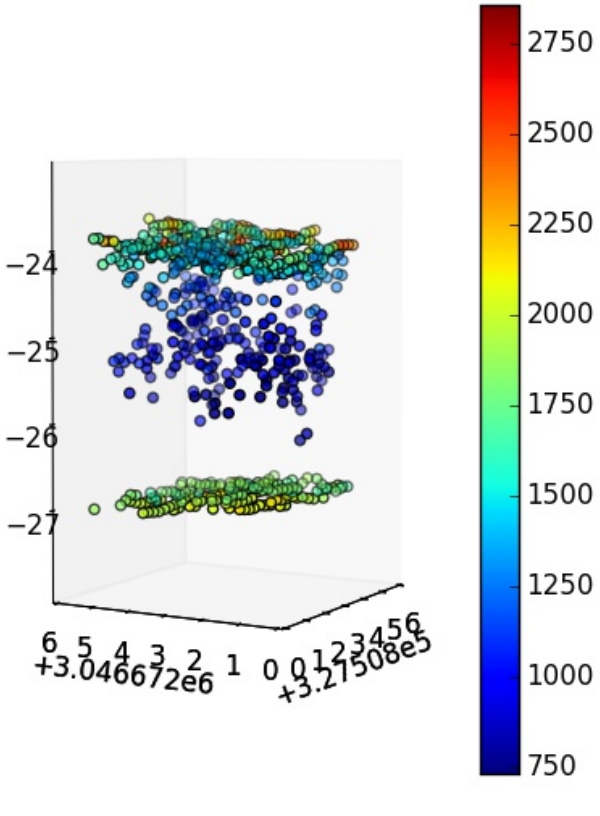
Anna Maria 245 PRF



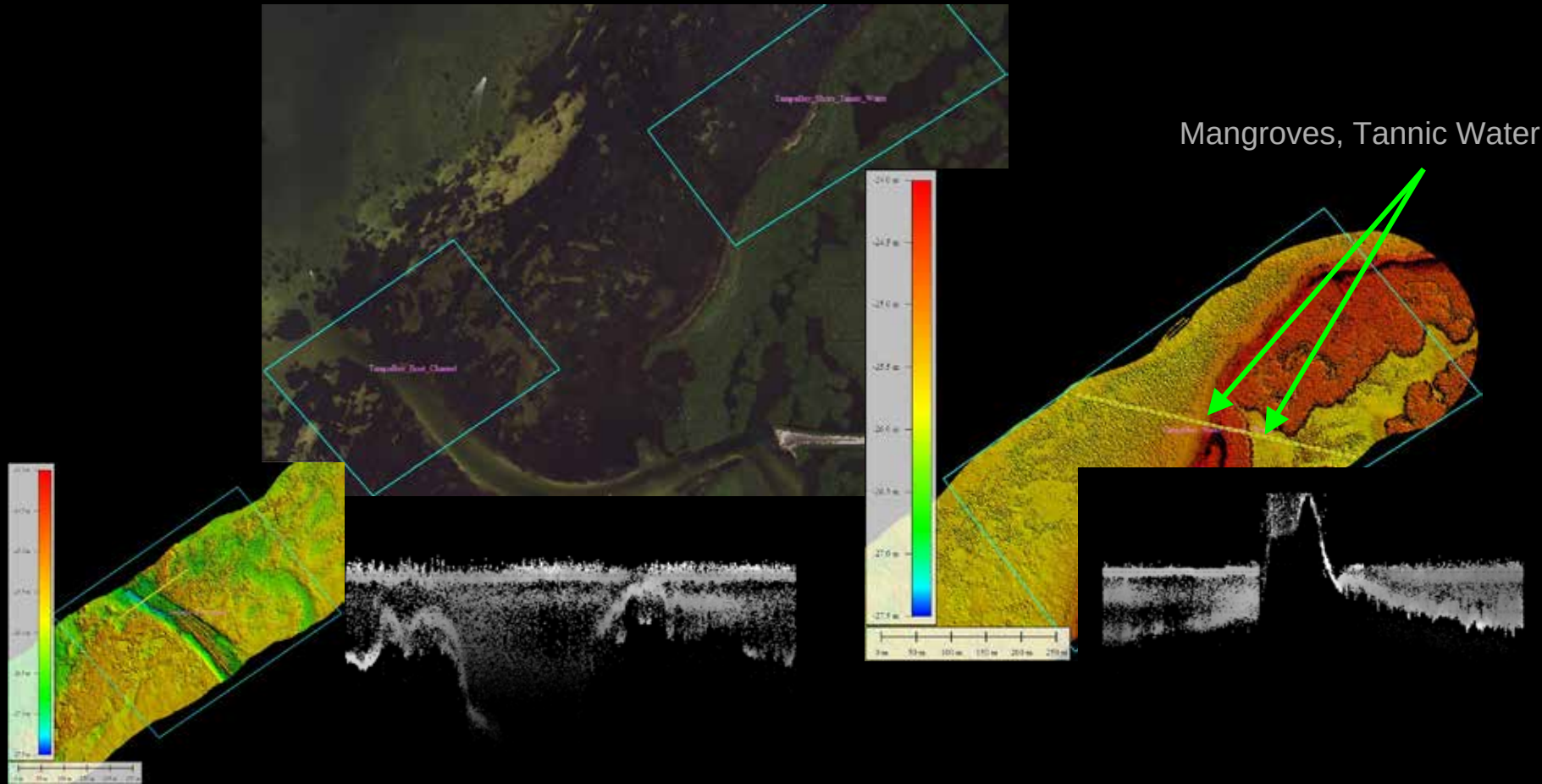


Anna Maria 550 PRF





Tampa Bay, High Suspended Sediments



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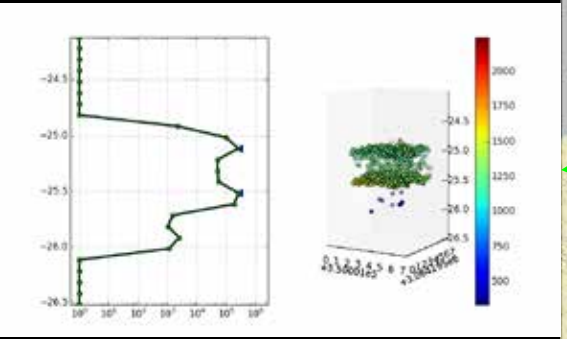
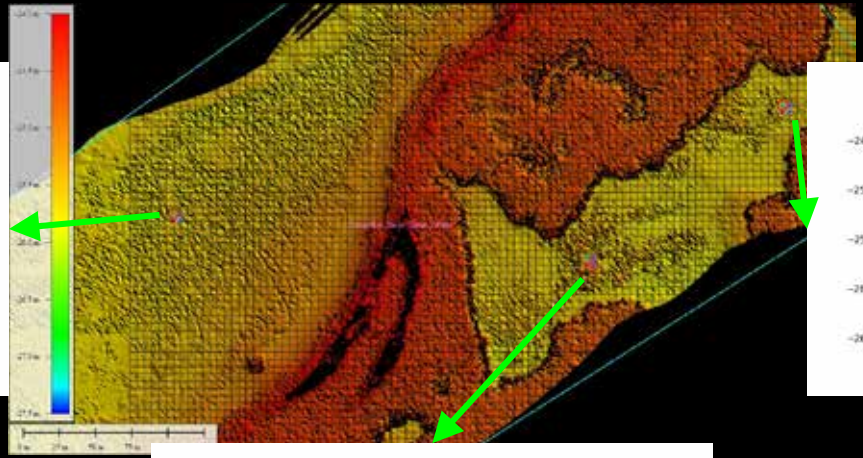
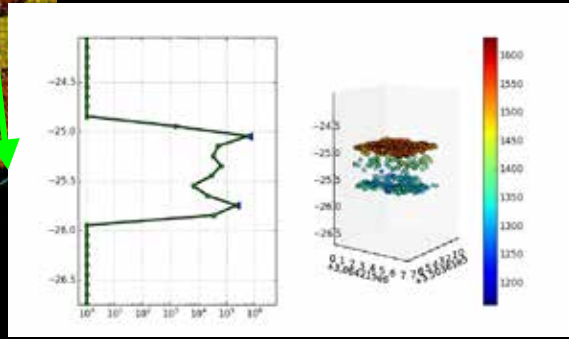
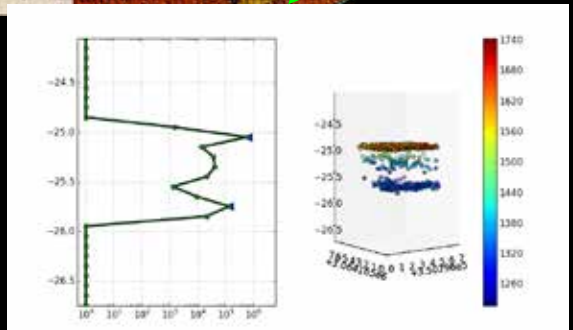
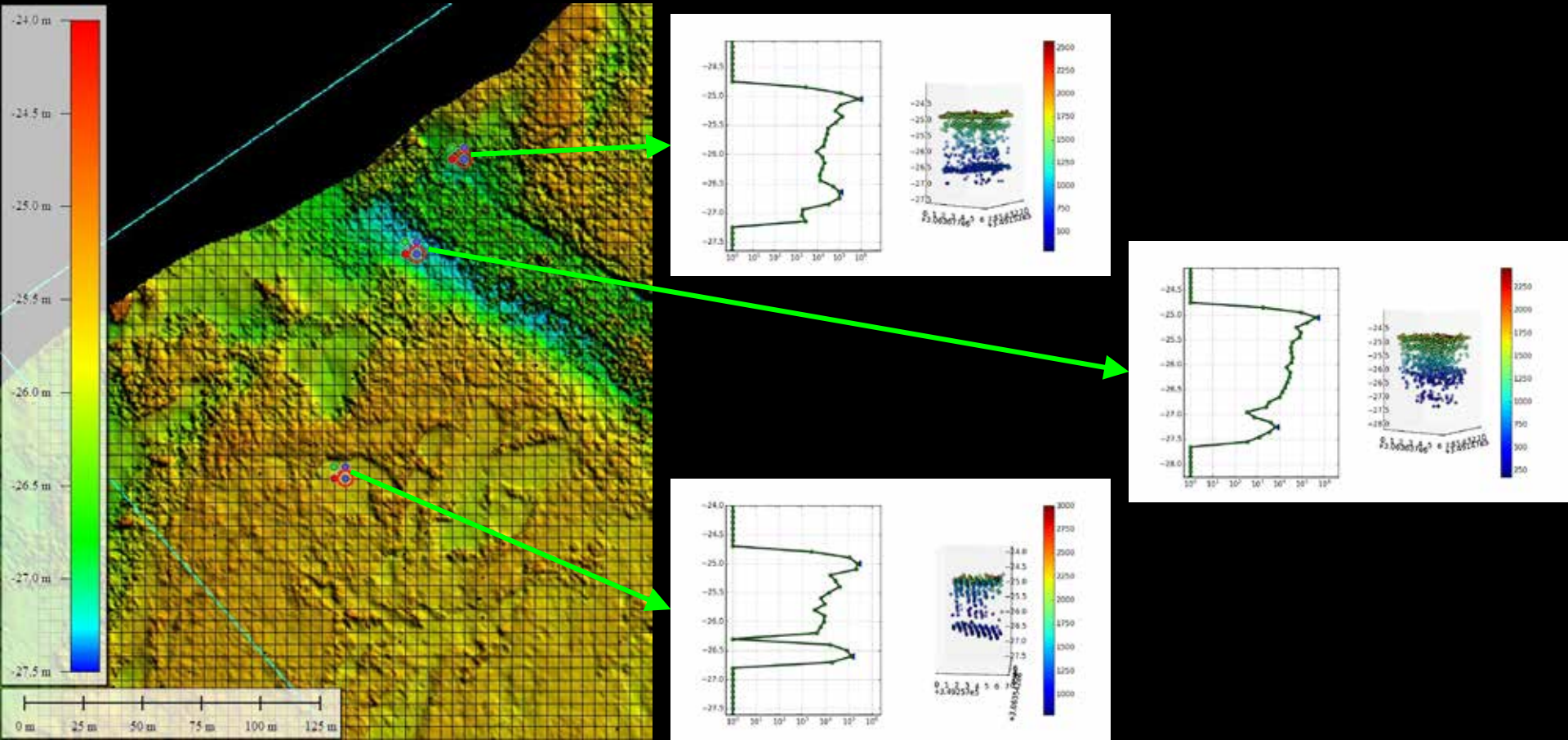




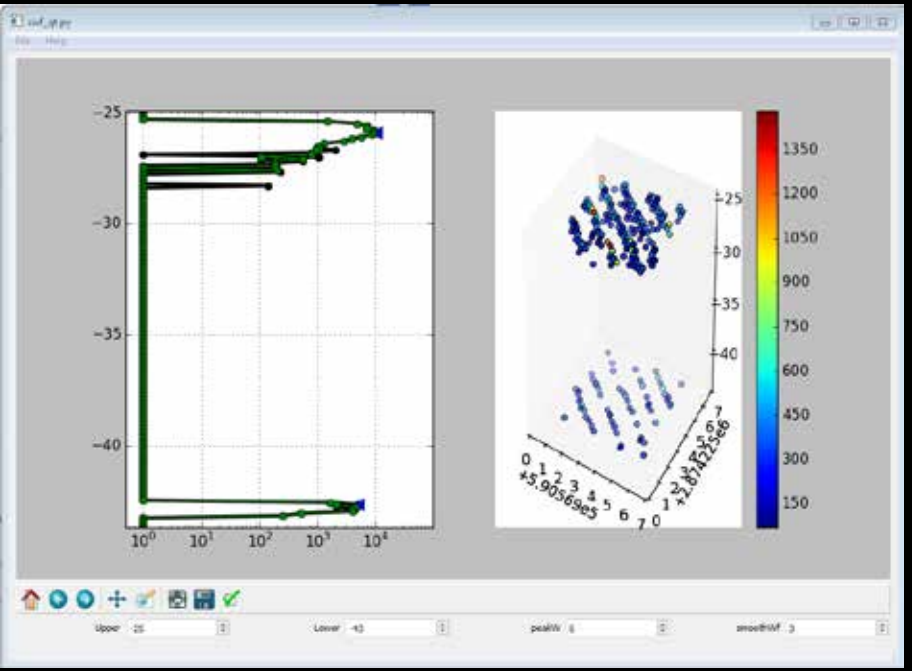




Tampa Bay, Boat Channel



Future Development of SWF



Current Version uses Global Mapper as a user interface for exploring las data and exporting small sample areas to a Python script

- Refine SWF bottom detection algorithm
- Add batch processing of entire flightline
- Filtering of original point cloud from results
- Add multiprocessor capabilities to speed up processing
- Add hardware accelerated GUI for visualizing batch processing algorithm
- Integrate into VQ-880g processing workflow
- We plan to integrate our Synthetic Waveforms into PFM-ABE in the future

Acknowledgements:

USACE Chris Macon & Nick Johnson for providing the JALBTCX Reference datasets

USGS Christine Kranenburg for providing the EAARL-B calibration data from Ft. Lauderdale.

Questions ?