Broadening the spectrum of topo-bathymetric airborne laser scanning

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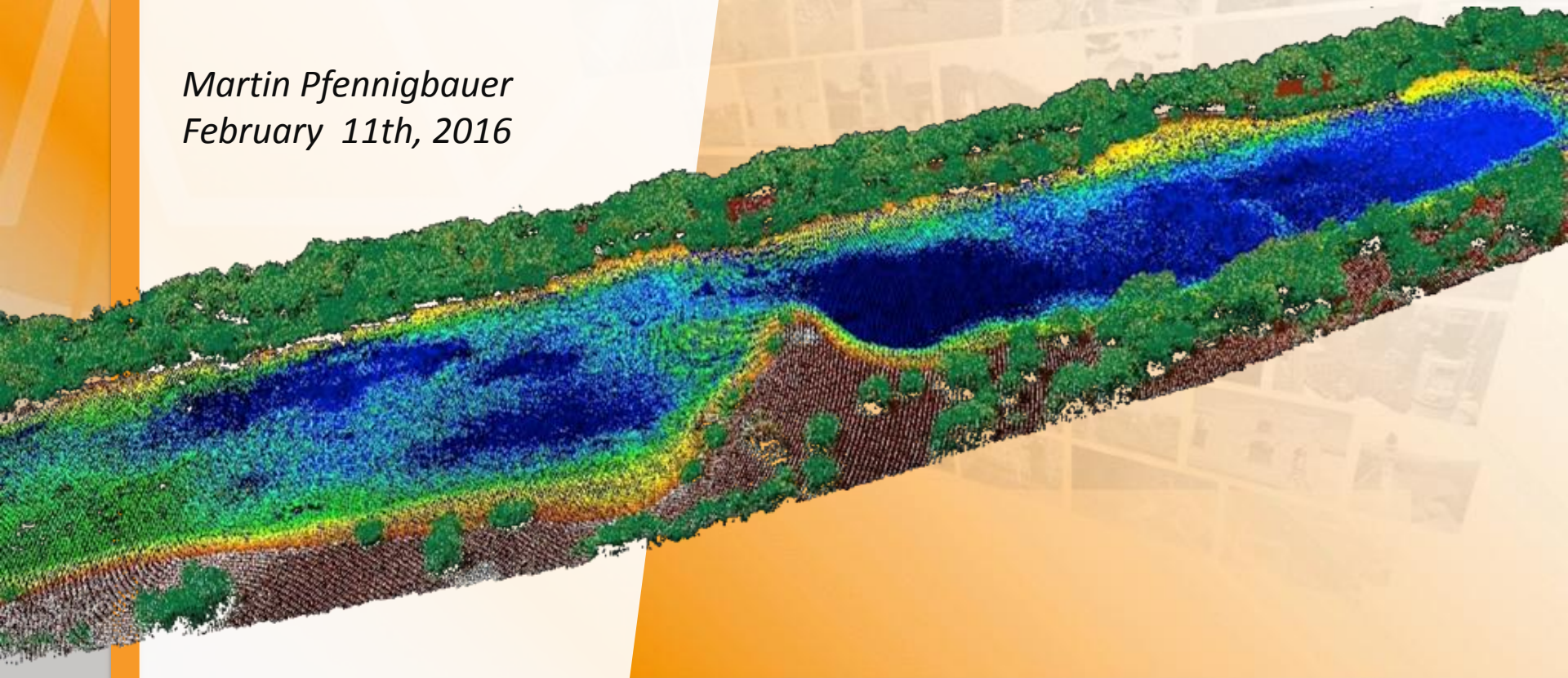
February 11th, 2016



VQ-880-G

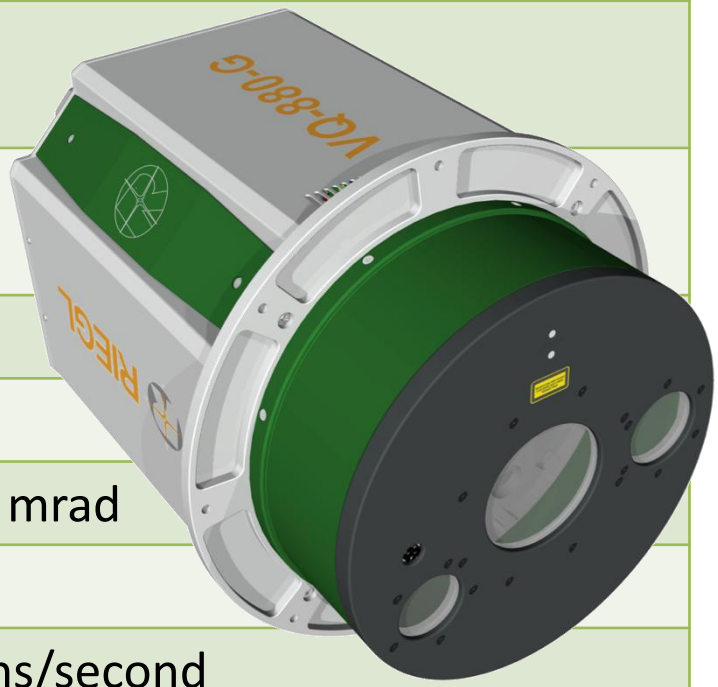
Airborne Laser Scanning system for combined hydrographic and topographic surveying

VQ-880-G Highlights

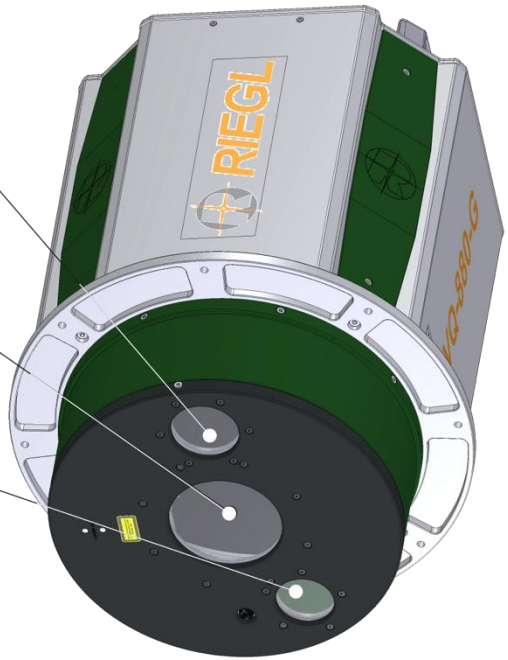
- excellently suited for combined hydrographic and topographic airborne surveying
- high-accuracy ranging based on **echo digitization** and **online waveform processing** with multiple target capability
- concurrent **waveform data output**
- **high spatial resolution** due to narrow laser beam, high pulse repetition rate, and high scanning speed
- **optional fully integrated infrared laser scanner**

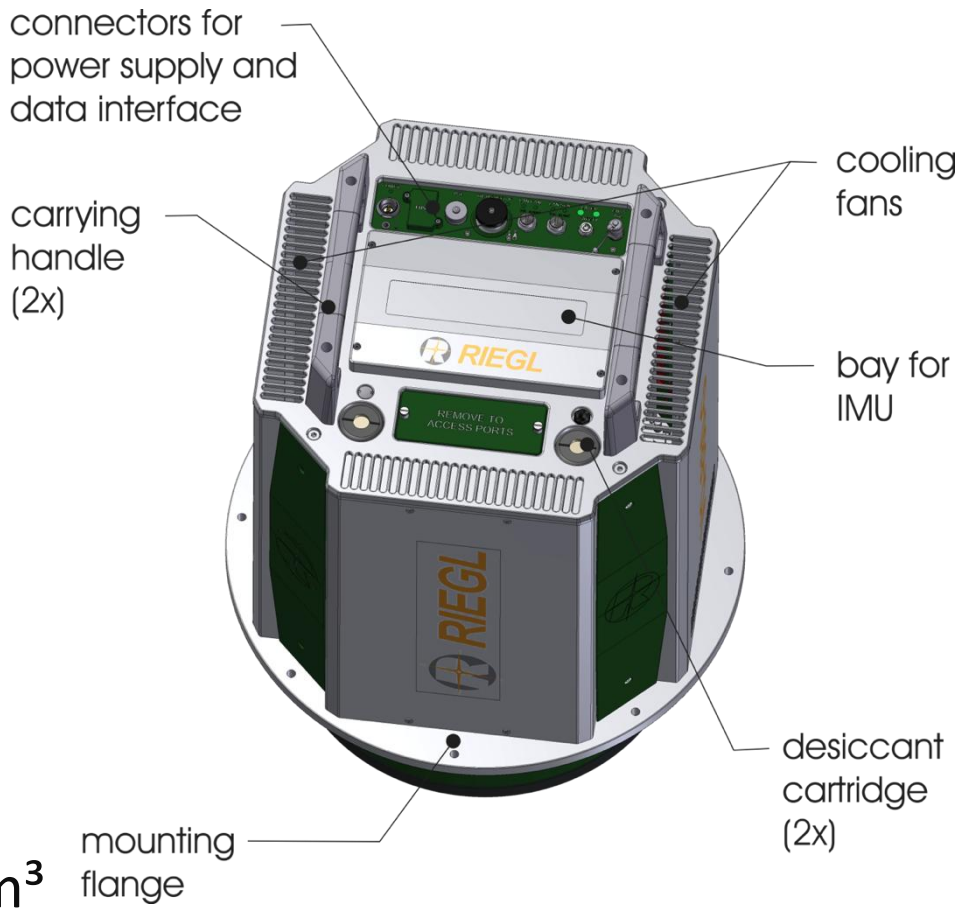
VQ-880-G key specifications

wavelength	**532 nm (visible green light)**
measurement range *topography*	2500 m at ρ ≥ 20% 3600 m at ρ ≥ 60%
measurement range *hydrography*	1.5 Secchi depth bright ground
ranging accuracy	25 mm
Scanner field of view	40°
Laser beam divergence	selectable, 0.7-1.7 mrad
measurement rate	up to 550 kHz
scan speed	up to 80 revolutions/second
laser safety	Laser Class 3B
multiple time around processing	yes



VQ-880-G
System configuration & interfaces





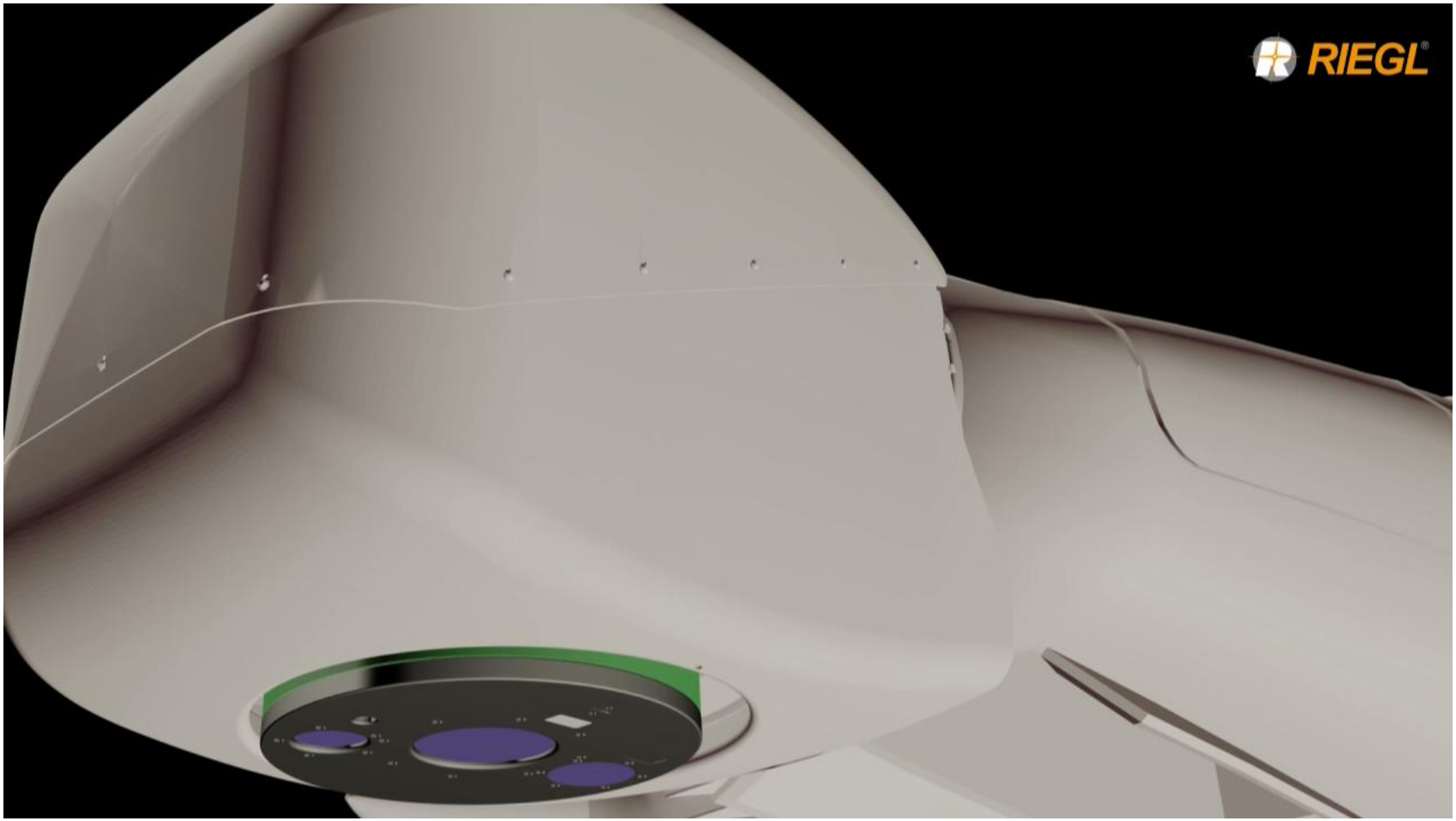
- power consumption: 600W
- weight: 62 kg
- dimensions: 444 x 444 x 615 mm³

VQ-880-G
System configuration & interfaces

- Gbit Ethernet
- high-speed fiber link to *RIEGL* DR1560 data recorder
- 18-32 V DC power supply

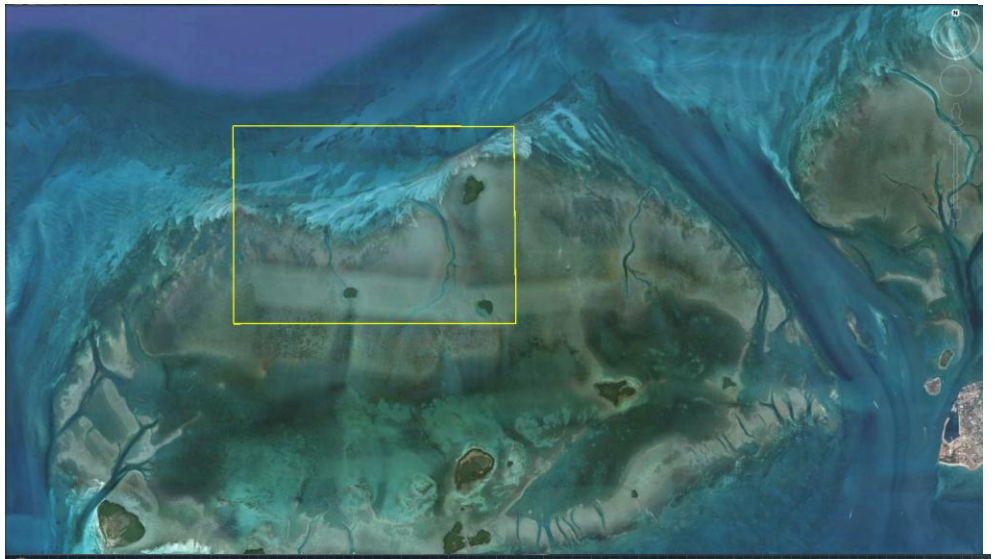
- integrated RGB camera
- integrated IMU/GNSS
- *RIEGL* DR1560 for data storage

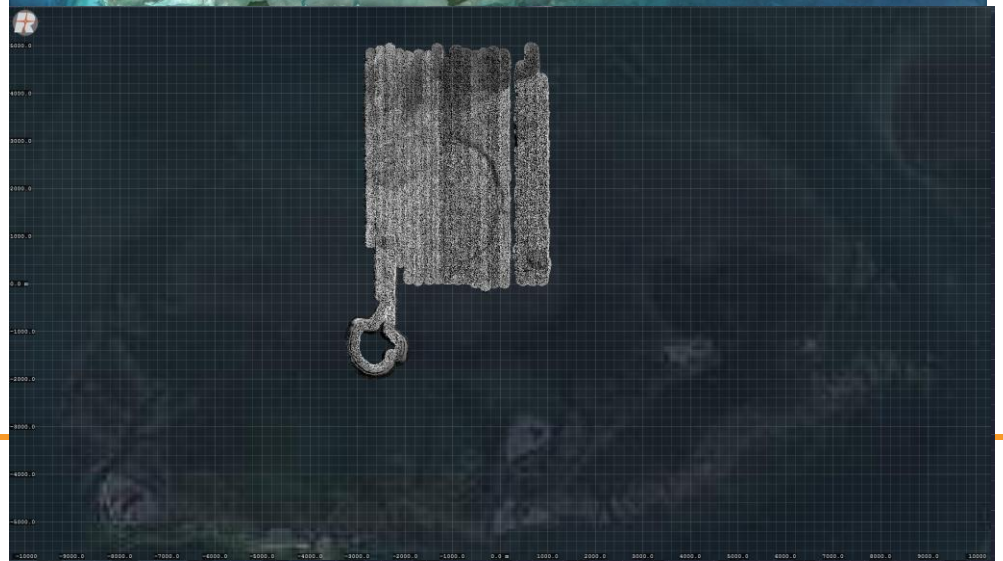
Integration and scan pattern



VQ-880-G Campaign in Florida

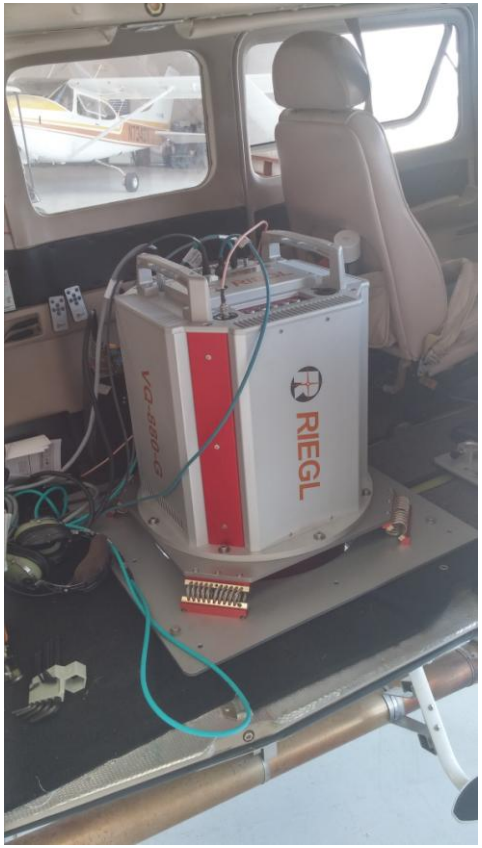
- Areas of Interest
  - Marathon
  - Ft. Desoto
  - North Key Largo
  - Summerland Key
  - Crocker Reef
  - Mullet and Cottrell Keys
  - Ft. Lauderdale





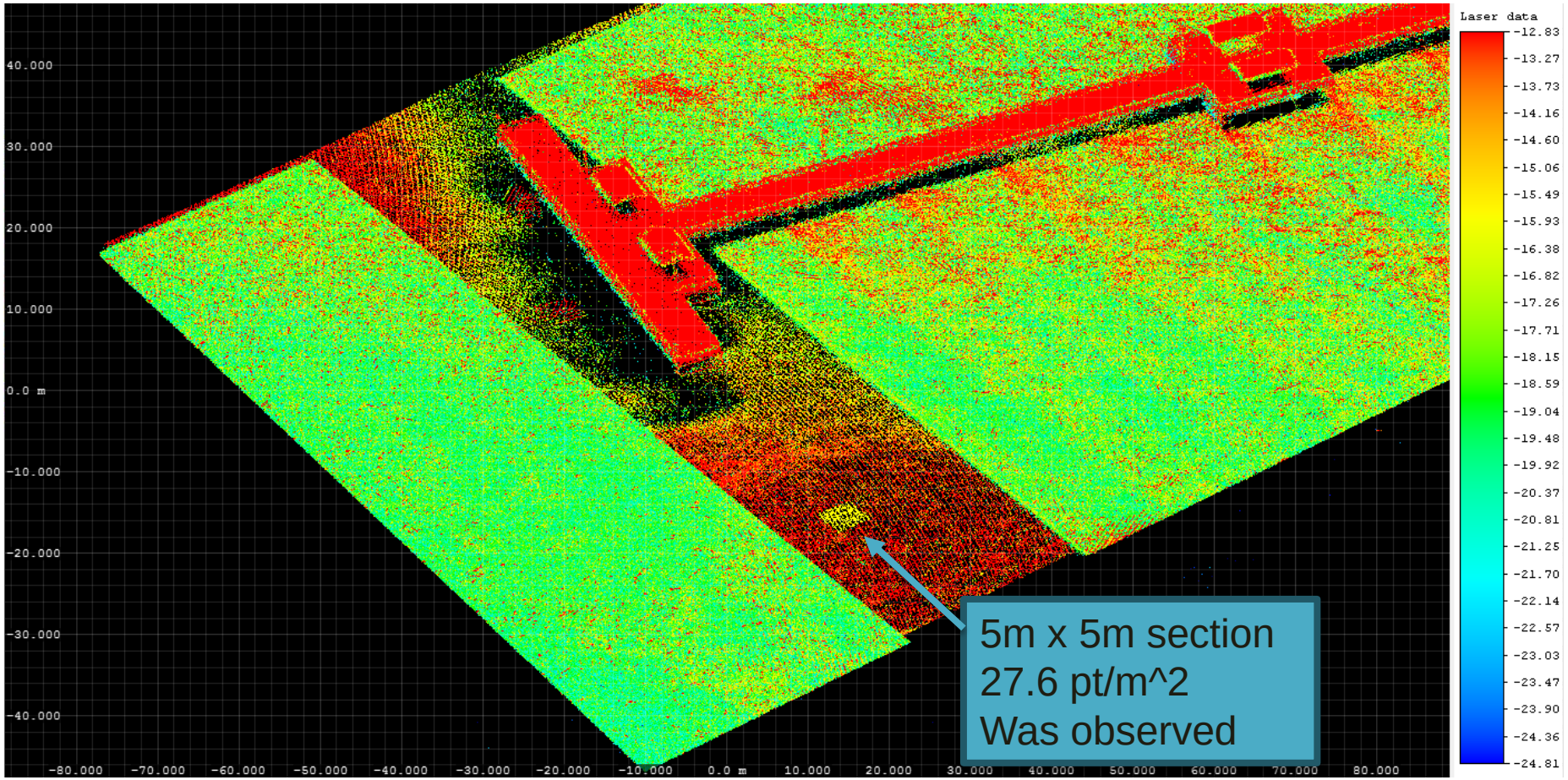
VQ-880-G Campaign in Florida - Sensor Installation

- ACA Cessna 206

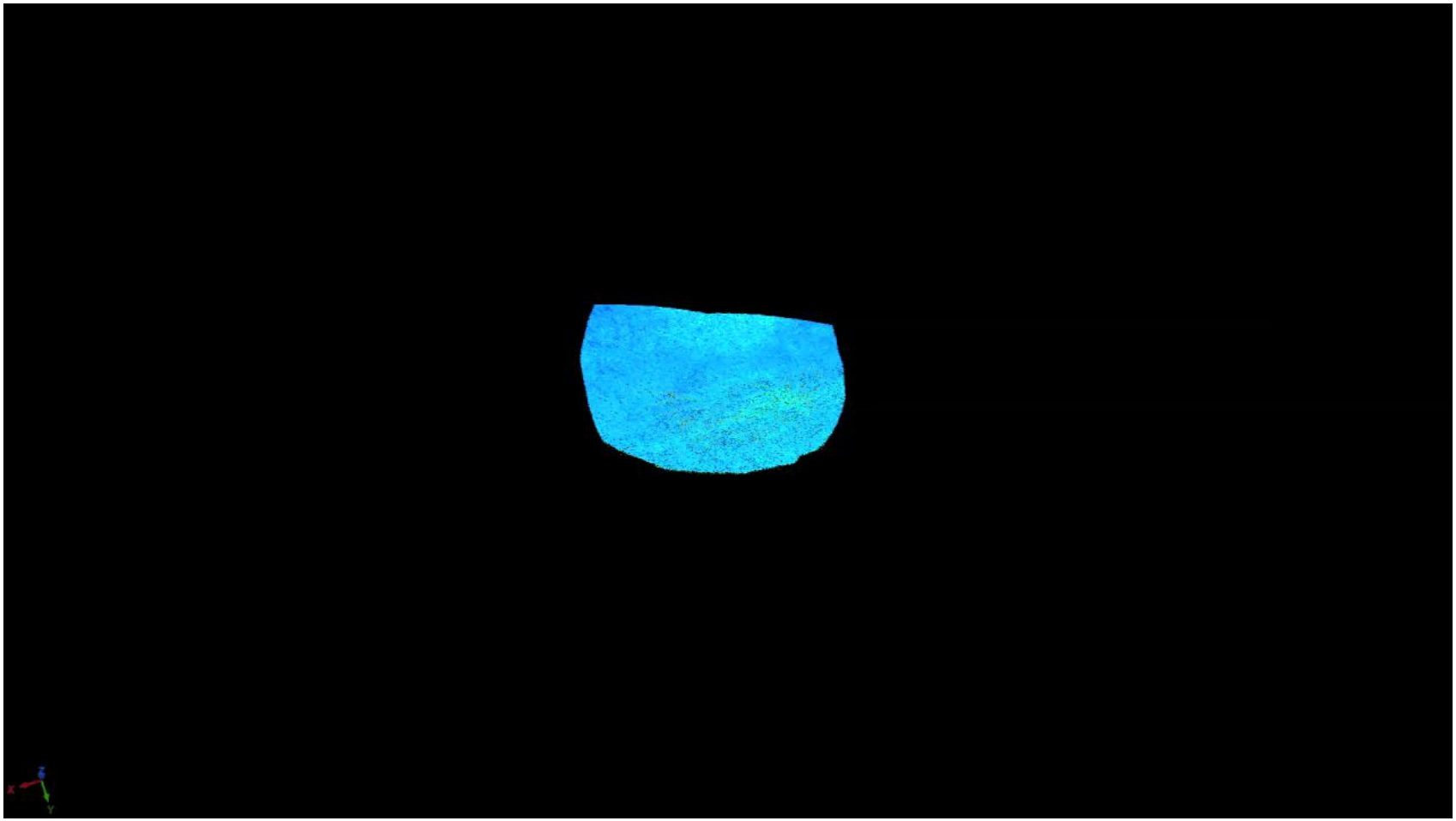


- NOAA Twin Otter

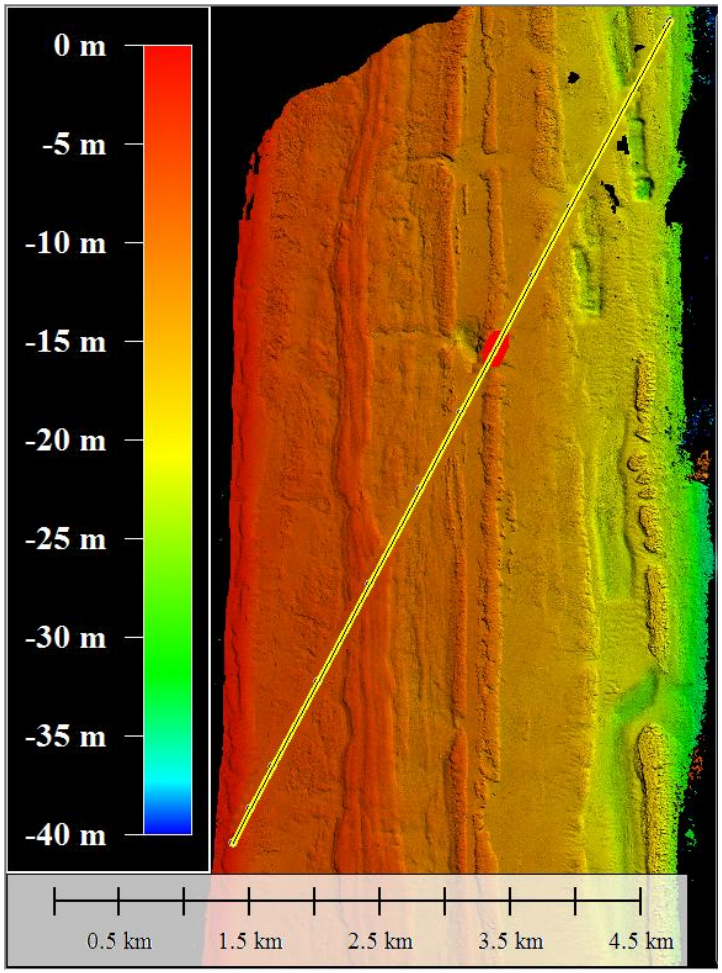
Project Highlights – Ft Desoto



Project Highlight – Coral Feature



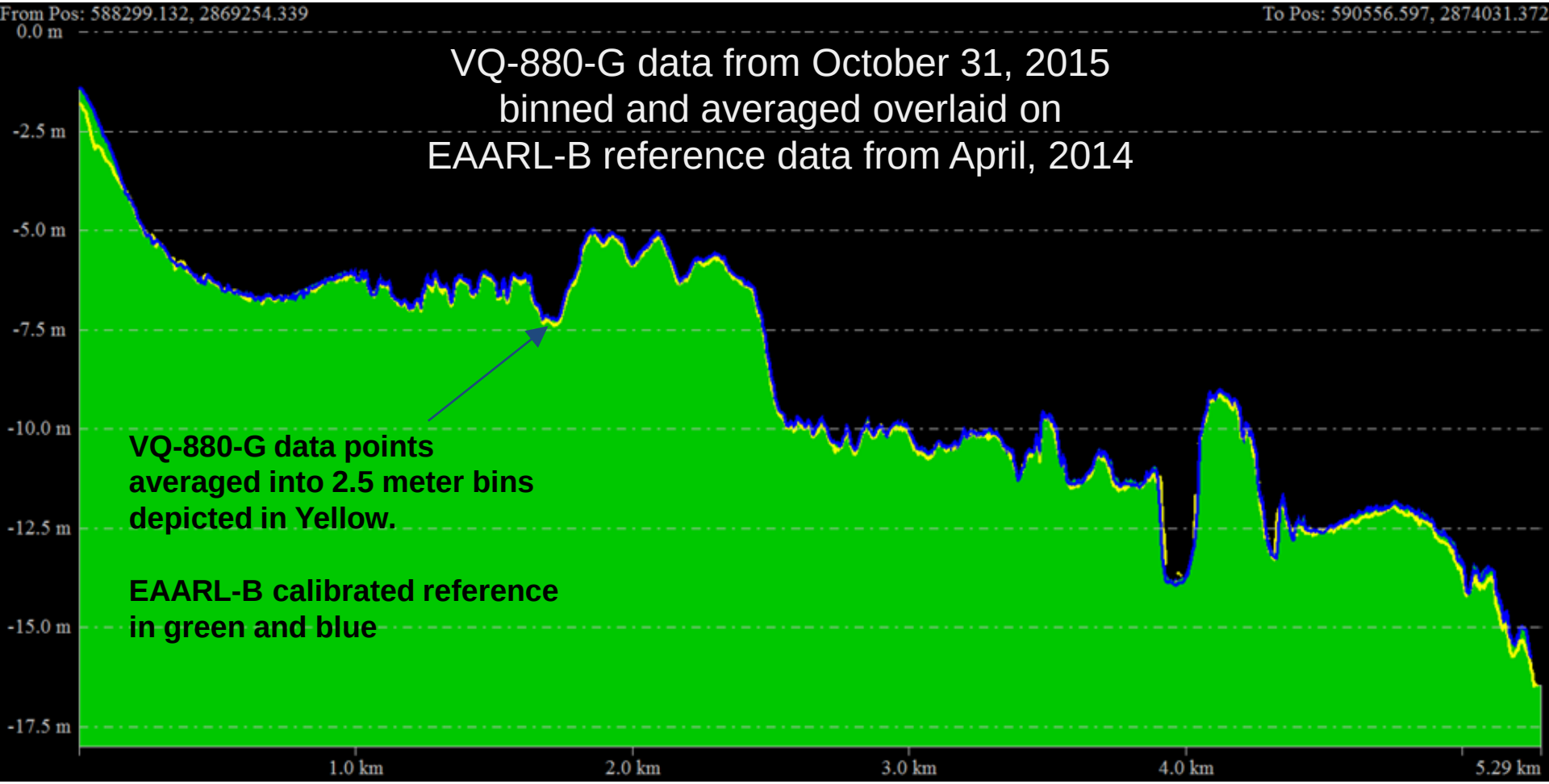
Comparison with reference data



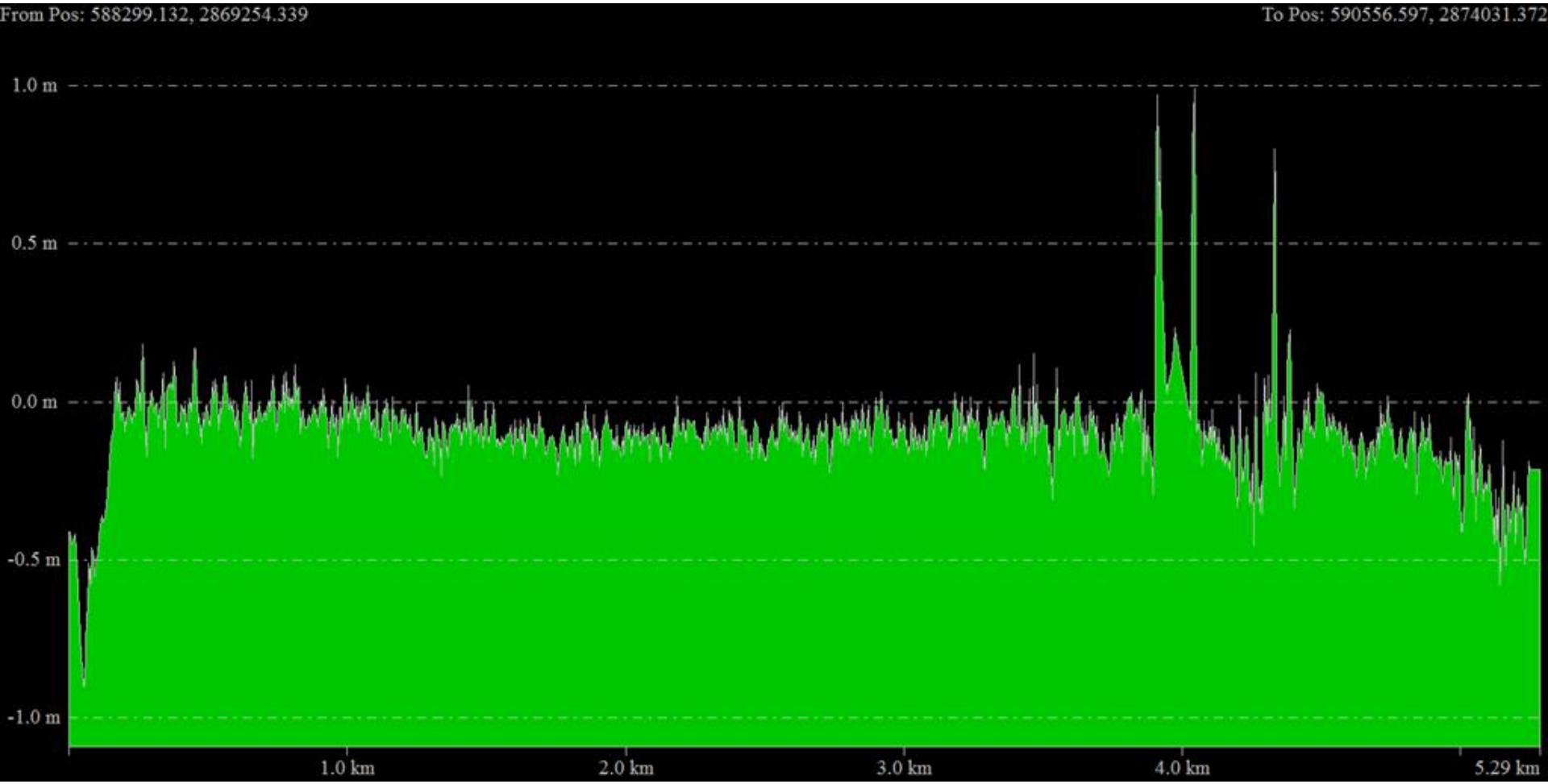
- Bathy-Lidar reference site Ft. Lauderdale, FL
- VQ-880-G data from October 2015
- EAARL-B reference data from April 2014

- Flights conducted by NOAA
- data analysis performed by Wayne Wright, NOAA affiliate

Comparison VQ-880-G vs. EAARL-B reference data



Difference between EAARL-B and VQ-880-G data



BathyCopter

world's first small UAV-based surveying system for hydrographic applications

At a glance

- BathyCopter is world‘s first small UAV-based surveying system capable of measuring underneath the water surface
- Ideally suited for generating profiles of waterbodies
- Fully integrated solution:
  - Laser rangefinder
  - INS
  - Camera
  - Data storage
- Designed to be operated from RiCOPTER

Key specifications

- Operation altitude: 10 – 30 m
- Penetration: > 1 Secchi depth
- Laser Class: 2M
- Predetection averaging
  (performance improvement at adverse conditions)
- Echo digitization, waveform recording

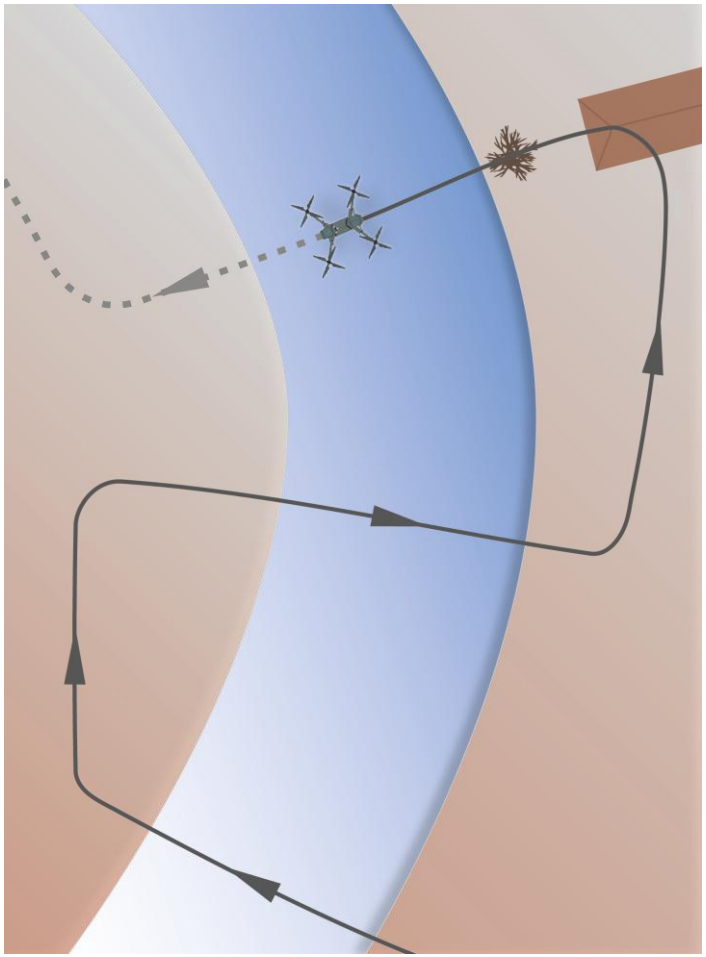
Sensor payload

- Measurement rate: 4 kHz
- Laser pulse duration: < 1 ns
- Measurement direction: fixed, 8° off nadir

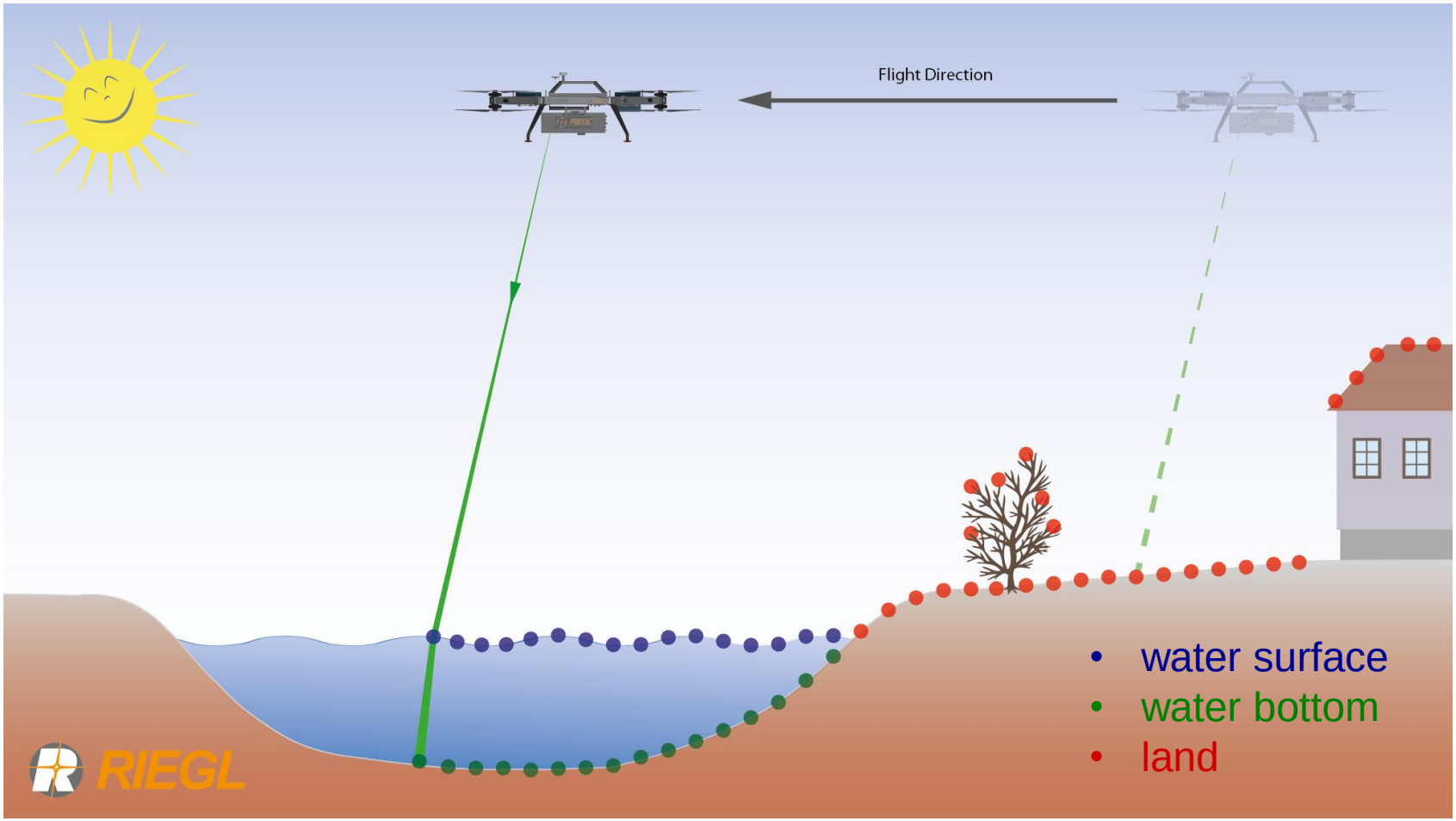
- IMU: APX15
- Camera: Sony Alpha 6000

- Weight: < 6.5 kg
- Power supply: 24 V, 2.6 A (65 W)

Mode of operation



Mode of operation



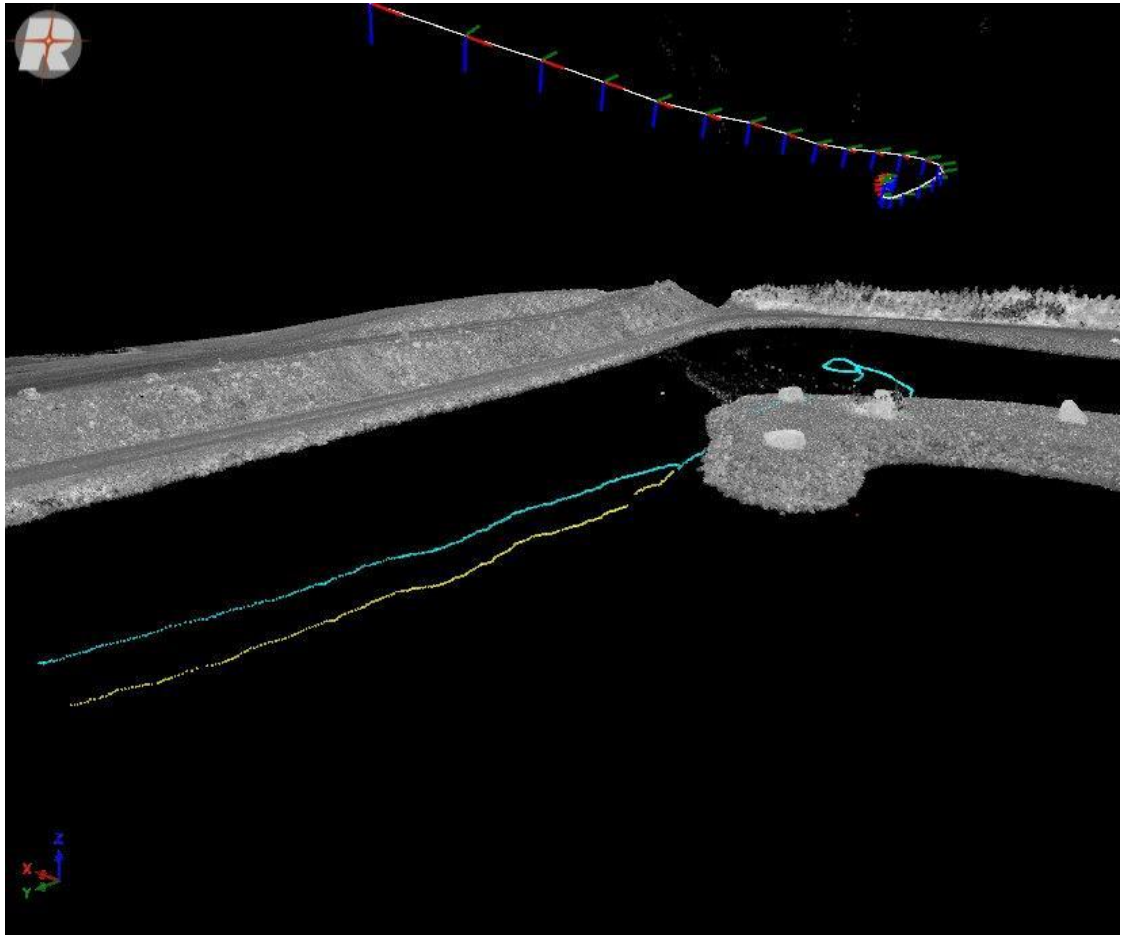
Applications

- Generation of river profiles
- Repeated survey of water reservoirs
- Surveying of canals
- Landscaping
- Support of construction works
- Surveys for planning and carrying out hydraulic engineering work

Profiling the waterbody

Profiling the waterbody

Data visualization



Conclusion

- RIEGL VQ-880-G:
  - High resolution area-wide shallow water mapping
  - 600 m typical flight altitude
  - Large area coverage
  - IR laser channel for improved capturing of water surface
- *RIEGL BathyCopter:*
  - Profiling of waterbodies
  - 20 m typical flying altitude
  - Full-waveform recording, predetection averaging
  - Supplementing area-wide surveying with IR laser scanner