



# Jason Upgrades Personnel



- User feedback very positive regarding new EL Akel Sterling (long time former nav contractor)
- *Jason* ops team continues to cross train to build flexibility for every position
- Integrating several new WHOI technical staff into *Jason* Ops
- Utilized several *Alvin* team members in 2013 and we are continuing to cross train *Alvin* & *Jason* for 2014



# Jason Upgrades Manipulators



- In response to ongoing issues with manipulator reliability, addition of a Titan 4, 7-function, position-controlled manipulator in March 2014
- Provides option of two Titan 4 or one force-reflecting Kraft Predator and one Titan 4
- Titan 4 specs:
  - Titanium construction to eliminate corrosion
  - Weight in water: 78 kg (172 lb)
  - Lift at full extension: 122 kg (269 lb)
  - Maximum lift, nominal: 454 kg (1,000 lb)
  - Standard gripper opening: 99 mm (3.9 in)
  - 4-finger intermeshing option
  - Grip force, nominal: 4,092 N (920 lbf)
  - Wrist torque, nominal: 170Nm (126 ftlb)
  - Integrated Wrist Camera
    - Image sensor: 1/3 color Super HAD CCD
    - Horizontal resolution: 480 TV lines minimum
    - Illumination: 0.3 lux at F2.0





# Jason Upgrades Other



## Elevators

*As a result of implosions of glass flotation, upgrades include:*

- Syntactic foam
- Increased payload
- Redesigned base/release to increase reliability and use USBL
- Easier assembly during mobilization

## New science sampling equipment built

- Two new major samplers
- Smaller, multi-chamber slurp to reduce air weight and offer other payload options for users

## Navigation

- USBL upgraded to new Sonardyne beacons to save weight also integrated into elevators
- Purchased new test equipment for easier prep and troubleshooting

## Purchased new monitors for control van upgrade

## Upgrades to the *Jason* web pages

- [www.whoi.edu/ndsfVehicles/Jason](http://www.whoi.edu/ndsfVehicles/Jason)



## Single-channel NDSF design successfully prototyped this summer

- Control is well integrated with *Jason* workflows and behavior, as is metadata capture
- Display of video and metadata is supported by common video playback standards
- Video quality is high (Blu-ray) while file volumes are about 10% of commercial recorders
- Purchased components for a 3-channel system and will continue development and testing with transition completed in 2014





# Jason Upgrades Active Heave Comp Winch



- Rapp Inc. winch is complete
- Three cruises scheduled in 2014:  
*Chadwell, Toomey on the TGT in June-July; Butterfield on the Brown in August*
- All electric
- Provides motion compensation
- Heavyweight instrument deployments and recoveries now possible
- Weather window improved for difficult operations
- Better control and alarms





*Jason Upgrades*

# Active Heave Comp Winch



## Problems Encountered and Resolved

### Motor encoder had insufficient resolution to provide the style of control required

- Drive could not determine rotor position @ low speed creating mismatch in the driving magnetic field resulting in a runaway condition
- The fix for this problem was twofold:
  - Parameters in control algorithm shifted to not ignore position encoder under any circumstances
  - Encoder changed to one with greater resolution (2X)

### Additionally

- Control program modified to automatically shift to encoder on one of the other motors in turn if the primary encoder fails. There are three drive motors, each with an encoder.
- Automatically activate emergency stop if winch rotates without appropriate command
- Cable attenuation due to compressive loads results in FO attenuation and will prevent use of this arrangement for dives 4,000 m and deeper
- SIO portable traction winch will be used at North Pond (4,500m) on the Merian
- Alternate cable options to allow use of this winch beyond 4000m being researched



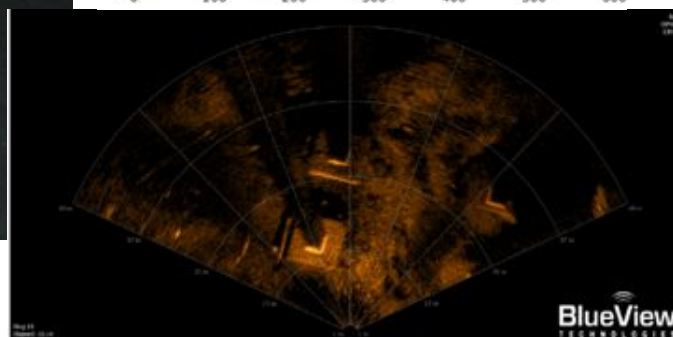
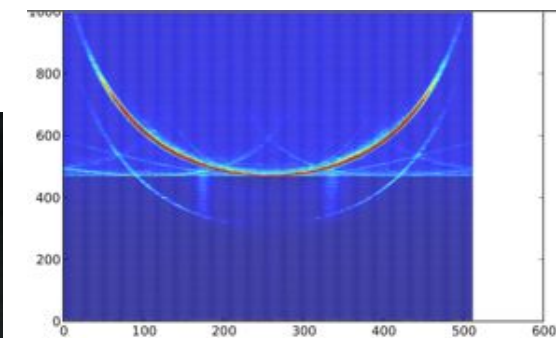
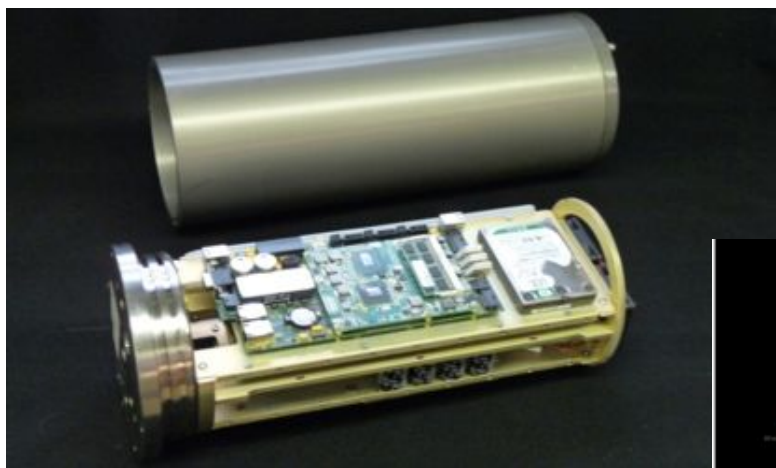
# Sentry Upgrades Personnel



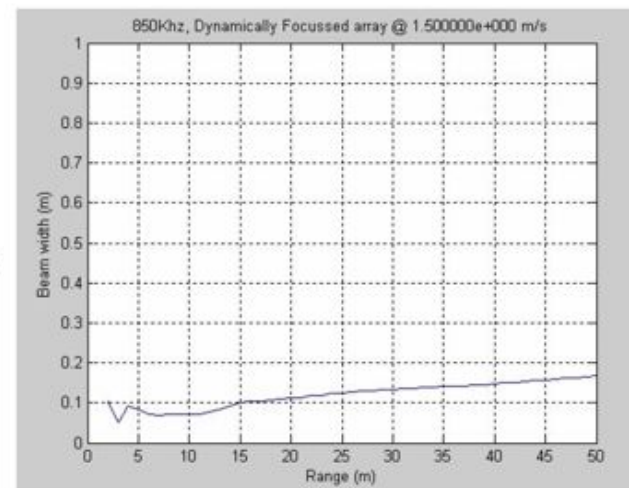
- Now two deep fully trained in every position. Working on 3<sup>rd</sup> level backups and cross training
- Sean Kelley
  - Regularly does pre- and post-dive checks
  - Starting on mission planning
  - Expected to become EL in Sep 2014
- New software engineer (Johanna Hansen) – Jan 2014
- New electrical contractor – Jan 2014
- New occasional mechanical tech, including cruises

# Sentry Upgrades Sonar Systems

- Reson AUV3 – dual freq, 1/3 power, 15 lbs lighter
  - New WHOI driver means full reconfigure and start up in water saves power and increases flexibility
- Blueview P900 forward looking – obstacle avoidance and science uses – no cost to NDSF
- Edgetech 2205 dynamic focus sidescan (8 cm beam width) – no cost to NDSF



Screen capture of the P900-130 showing bridge footers taken from an ROV in motion.



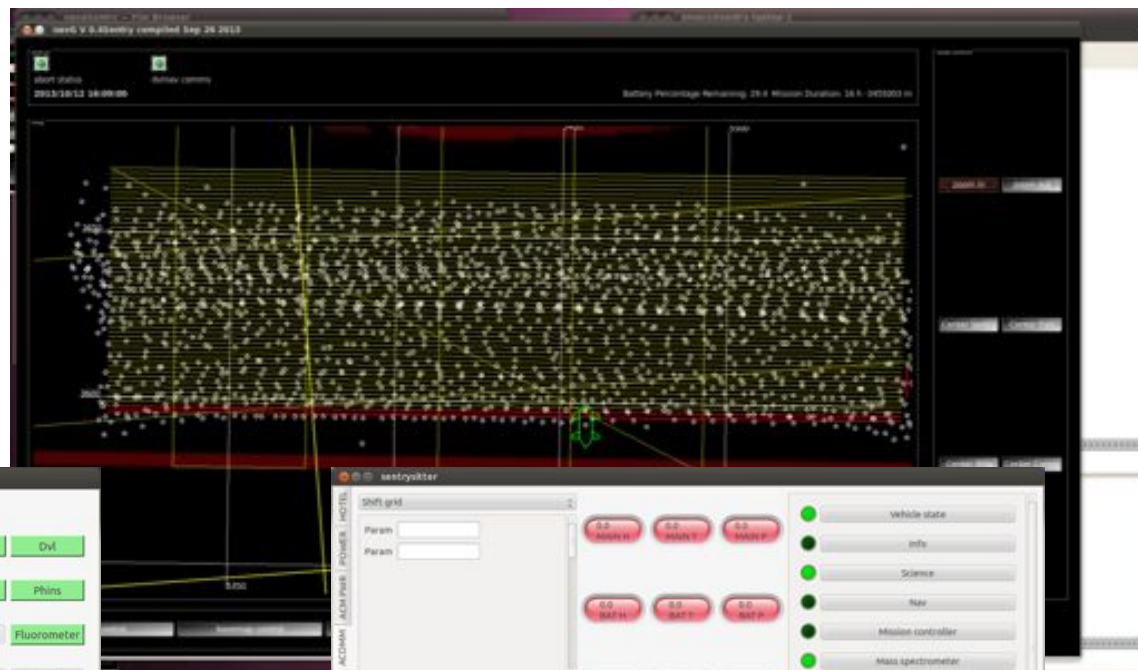




# Sentry Upgrades User Interfaces



- NavG interface
  - More situational awareness for operators
  - Science interface mode, including predicted dive durations, etc.
- Sentry Sitter upgrades
  - Integrated GUI tool – during dive and on deck
  - Enables most tasks without software expert



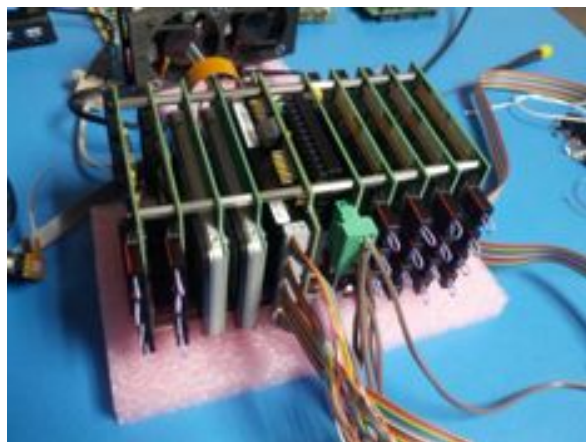


## Sentry Upgrades

# Computing & Mob/Demob



- New server racks, workspace, storage
  - Mob still takes only two days with substantial added capability
  - Reduces errors and mistakes
- New computing
  - Massively parallel and high capacity for new camera and water column sensors
  - Much faster and redundant
- New vehicle computer
  - Replaces c2006 model, more capable





## Sentry Upgrades

# Battery System & Data Pod

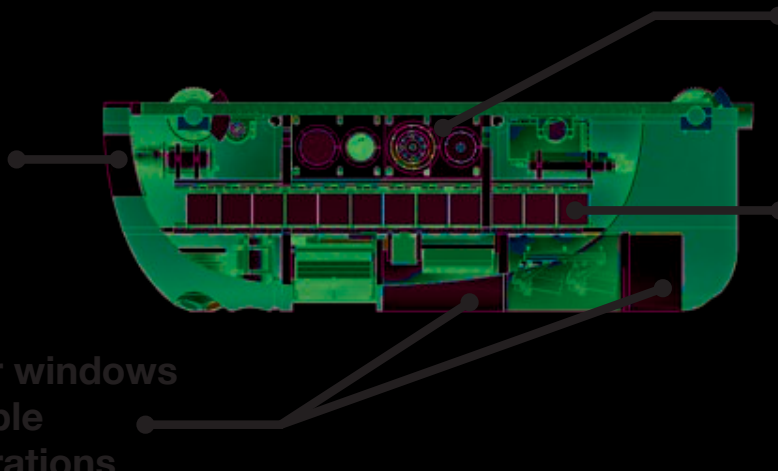


- Three hour turnaround with 20-48 hour dives
- Datapod complete and in use
- Battery upgrade underway
  - 2013 – 50% design
  - 2014 – design, build
  - 2015 – install at first overhaul



+Hydrodynamic acoustic window for FWD looking sonar

+Modular windows for flexible configurations



+Instrument Bottles mounted Sideways for Ease of Access

+Can hot swap 8-12 Bluefin Batteries

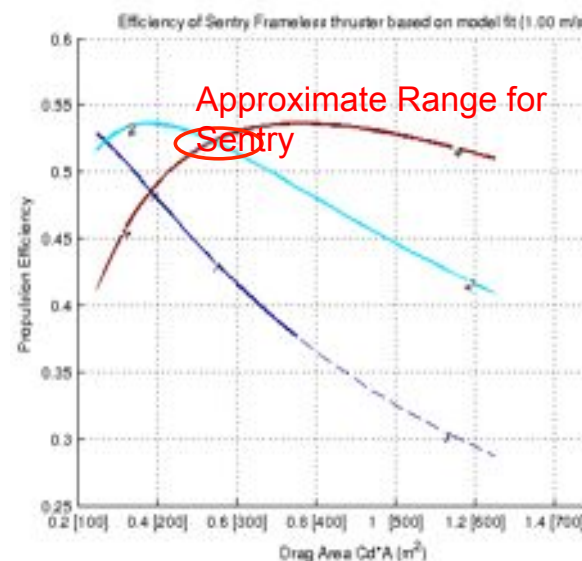




# Sentry Upgrades New Thruster



- ~20% improvement in efficiency → longer dives
- Should give 3 kt sprint capability
- Planned integration 2Q2014
  - Preliminary design and prototype 2012
  - On hold after successful deep use of current thruster
  - Used by PROV in 2013, including extensive testing
  - Redesigned and new prototype for lighter weight system now complete and under test



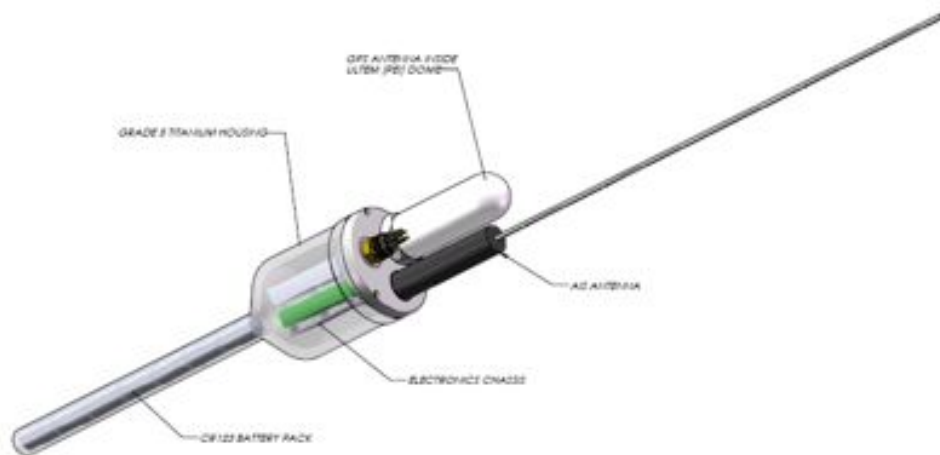


## Sentry Upgrades

# Operational Capabilities



- Joint ops with *Jason* currently require the ROV to leave the bottom for ~45 min during each launch and recovery
- Fly away descent
  - Can now launch *Sentry* without interrupting *Jason* bottom activities
  - Tested successfully
- Automated surface drive
  - Will allow recovery of *Sentry* without interrupting *Jason* activities
  - Ready as soon as AIS is online
- AIS (locator beacon) – shows up on ship radar, greater range than RDF
  - Under construction, installation expected Jan 2014





# Sentry Upgrades Anchoring



- Small, variable buoyancy device
- Multi-stage drop weight
- Lab experiments and 20% design complete 2013
- Projected installation in late 2014



# Sentry Upgrades Documentation



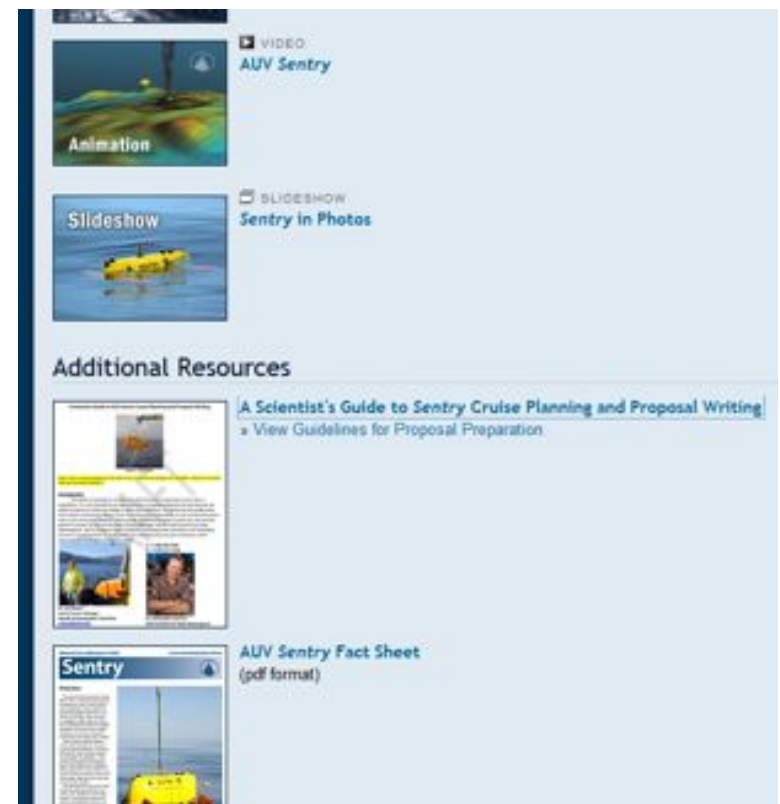
- Scientists Guide to *Sentry* Cruise Planning” on website
- Major upgrades to *Sentry* website
  - ~50% of envisioned content now live
- All drawings now fully up to date in modern cad packages
- Revision control system almost fully implemented

Main Sentry Page:

<http://www.whoi.edu/main/sentry>

Planning Guide:

<http://www.whoi.edu/filesserver.do?id=159424&pt=10&p=39047>



# Acoustic Tethering: Blessing and a Curse

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Circa 2004...



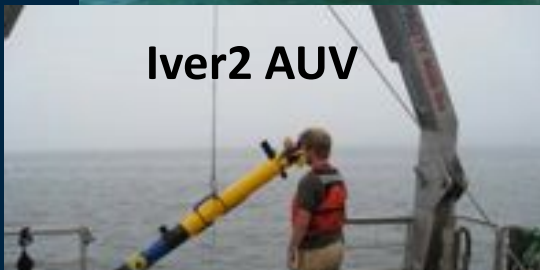


# Pilot Demonstration, Buzzards Bay

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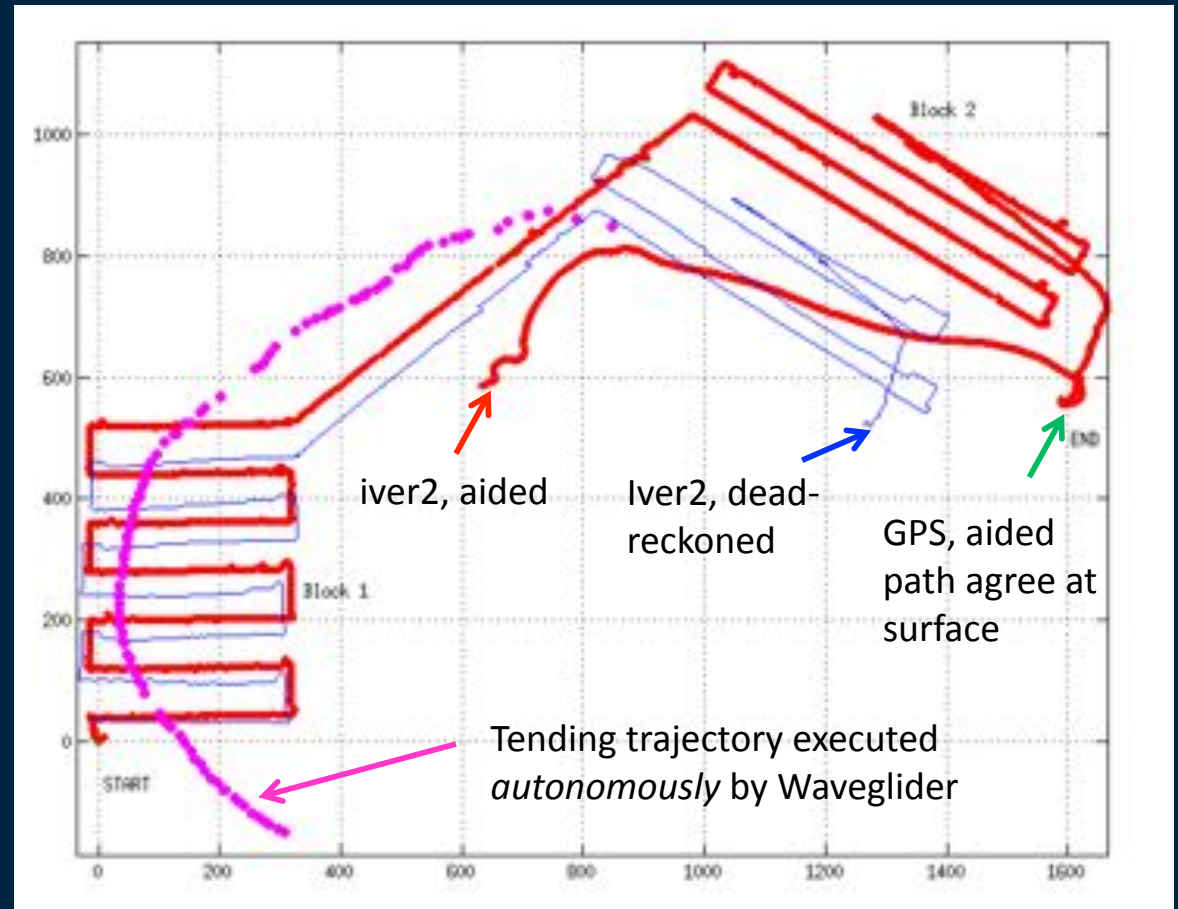
R/V Tioga



Iver2 AUV

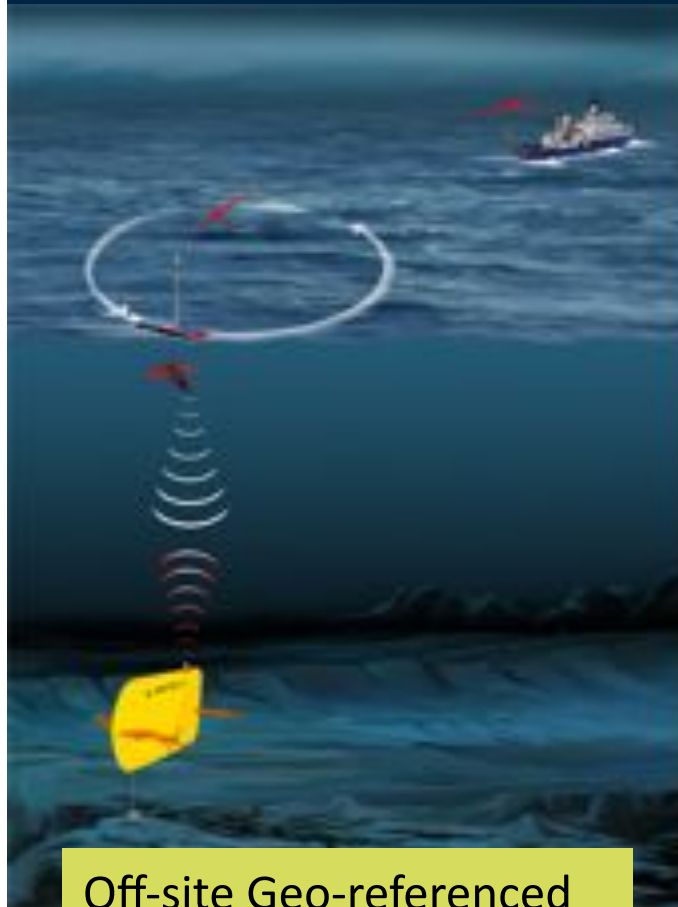


Waveglider

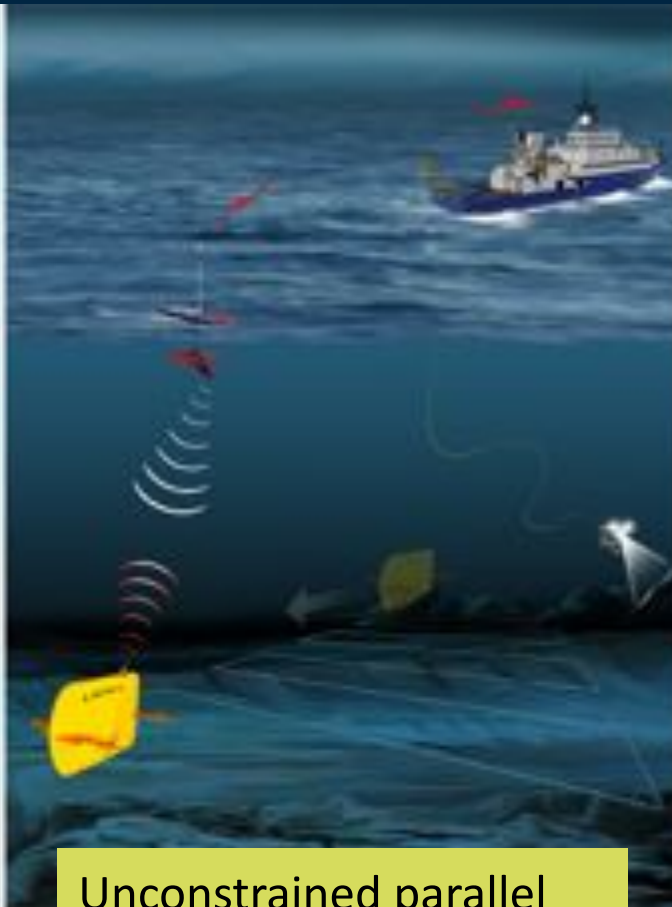


# Enabled Concepts

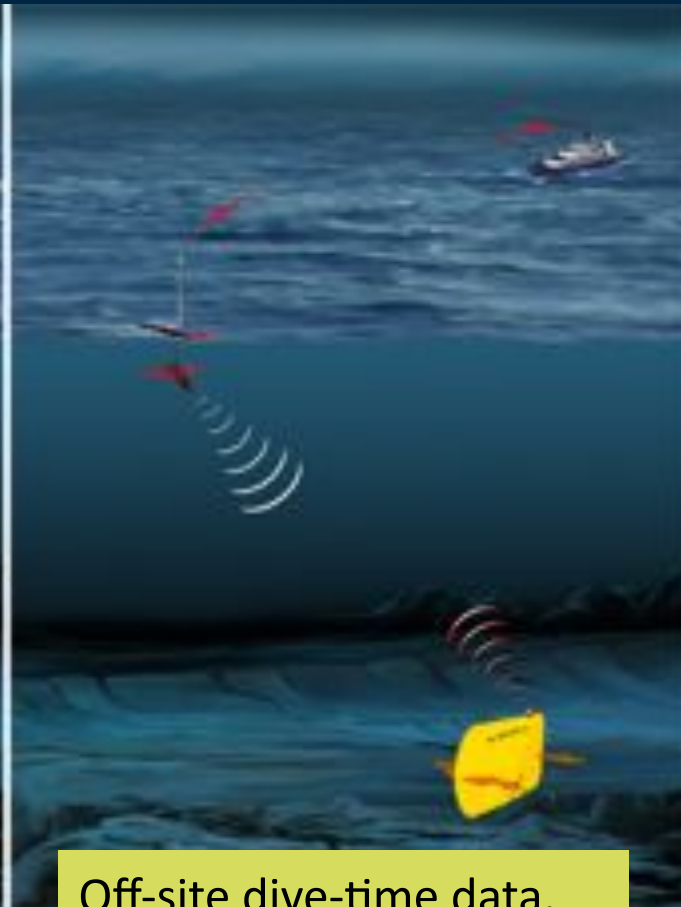
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Off-site Geo-referenced descent



Unconstrained parallel multi-vehicle operations



Off-site dive-time data, retasking and monitoring