

# Managing Risk around Offshore Installations during Exploration Activities using Autonomous Marine Vehicles

**Sudhir Pai**  
**Managing Director**  
**Schlumberger Robotics Services**

[pai2@slb.com](mailto:pai2@slb.com)  
[www.slb.com](http://www.slb.com)



# Background

## Schlumberger Robotics Services

Liquid Robotics Oil and Gas, previously a joint venture between Liquid Robotics and Schlumberger, became wholly owned by Schlumberger on August 29, 2016, and has been renamed Schlumberger Robotics Services.

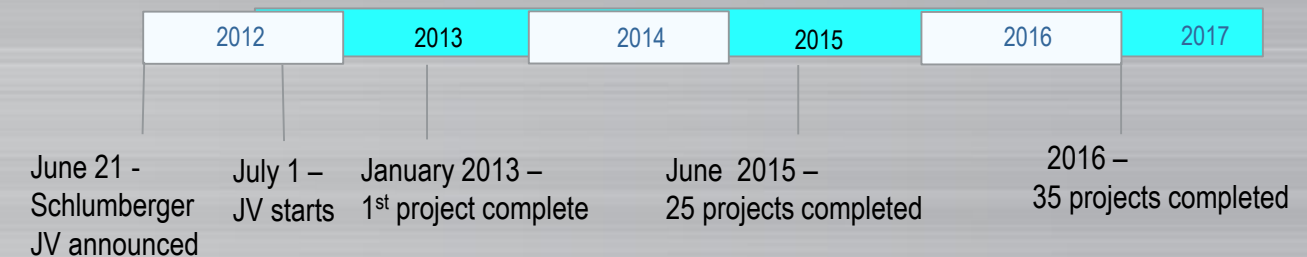
## Key Statistics

- Total projects to date: 36
- Total days at sea: 3,733
- Total Clients: 17
- Repeat Clients: 9

A wholly owned Schlumberger company

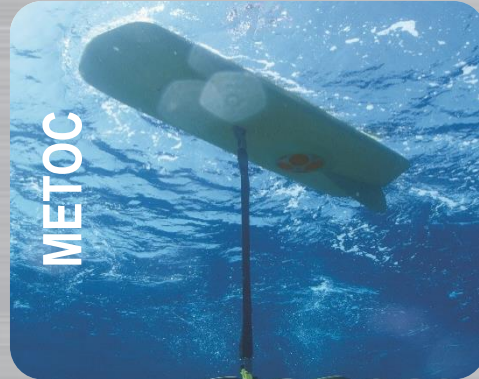
- Schlumberger Robotics Services
  - Based in Houston, TX, USA
- Technology: Ability to use various autonomous technologies – from subsea to space including the Schlumberger owned Wave Gliders
- Engineering customization and integration
- Data acquisition and data management for exploration and production customers

## Milestones





# Technology Applications



**Metrology and  
Oceanography**



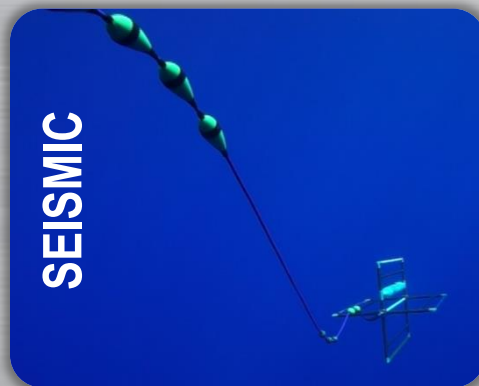
**Hydrocarbon  
Monitoring**



**Subsea Data  
Communications**



**Water Quality and  
Particle Suspension**



**Complement Towed  
Streamer Surveys**



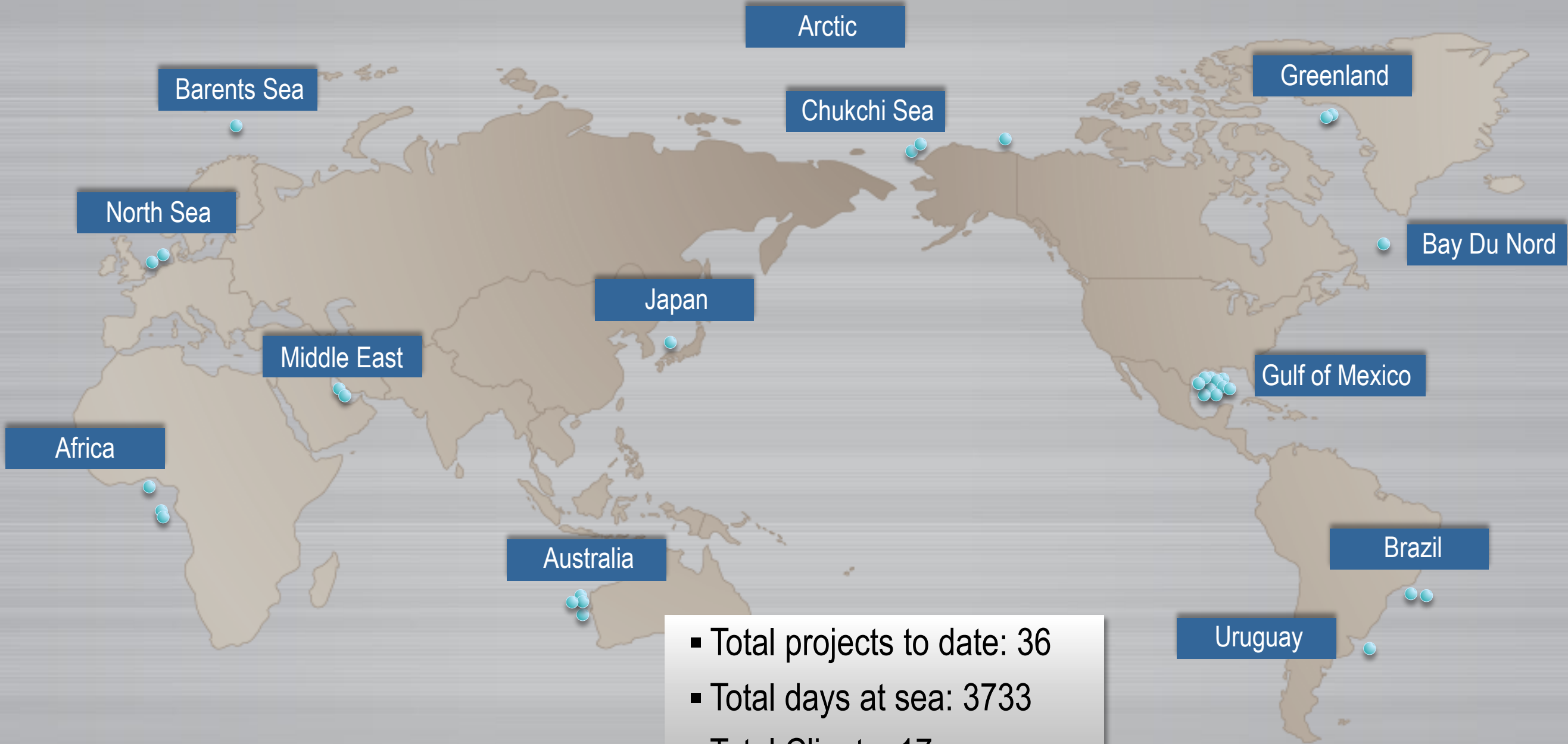
**Offshore Magnetic  
Measurements**



**Marine mammal  
Monitoring & Fisheries**



# Proven Operational Capability



- Total projects to date: 36
- Total days at sea: 3733
- Total Clients: 17
- Repeat Clients: 9



# Wheatstone Dredging Project – METOC & Turbidity Monitoring

## What is it?

Baseline survey (phase-1) to map current profile and estimate particle suspension in water prior to commencing the downstream and upstream dredging operation.

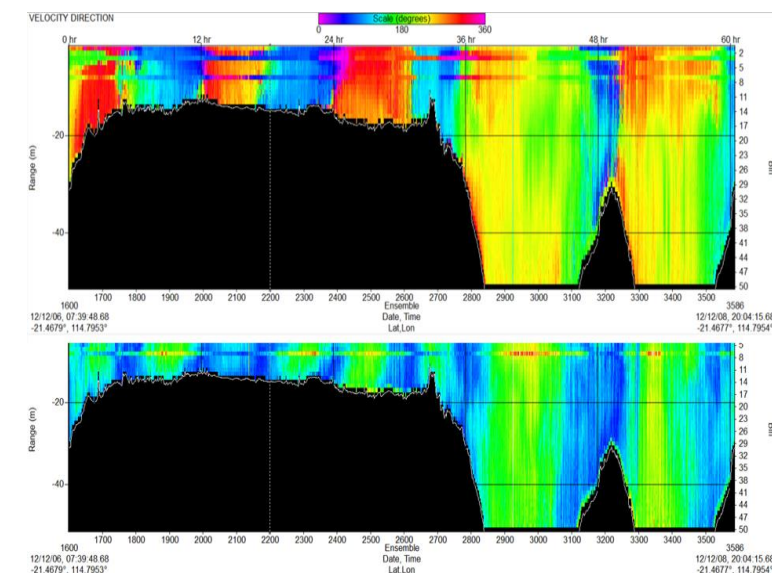
Time lapse technique used for phase-2 and 3 dredging and backfill.

## Where is it being applied?

- Wheatstone dredging project around Thevenard island off the coast of Onslow, West Australia.
- Proximity of conservation areas.



Wave Glider way points for navigating around Thevenard Island.



ADCP bottom tracker feature allows the sea-floor bathymetry.

## Results

- Operational excellence in execution; no lost time incidents.
- 3 Missions, 4 Sorties, 230 days, 3,424 nm cum area mapped.
- Operation weathered cyclone Narelle (hit during survey).

# METOC: Currents Monitoring during Close Pass Seismic USA

## What is it?

Provide metrological and oceanographic data support to a towed marine seismic operation during close passes to obstructions .

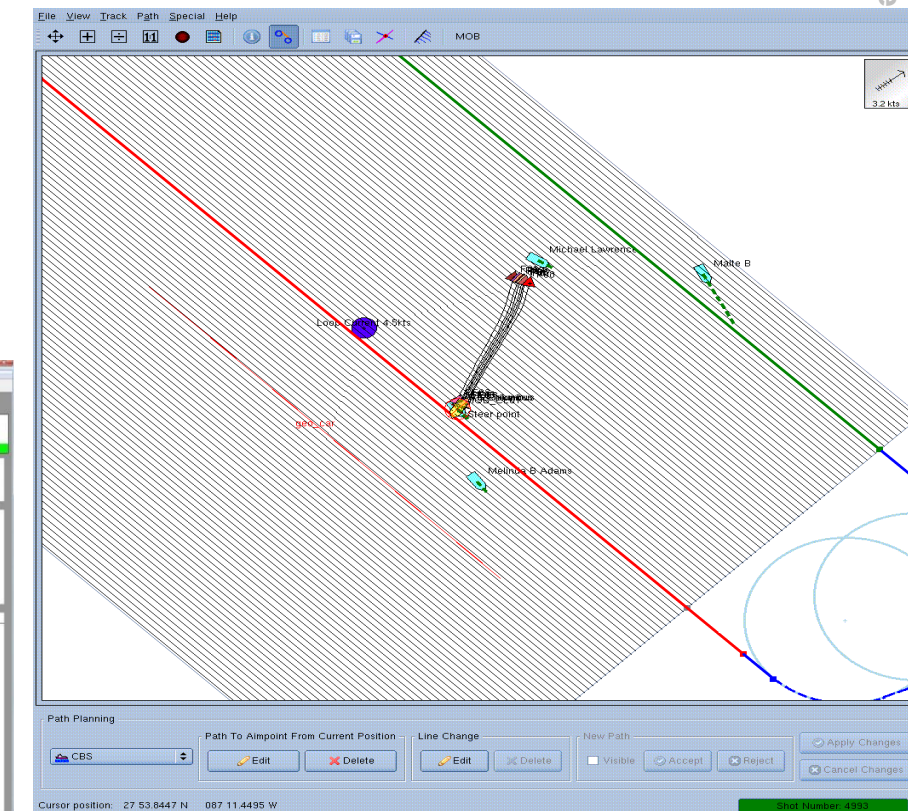
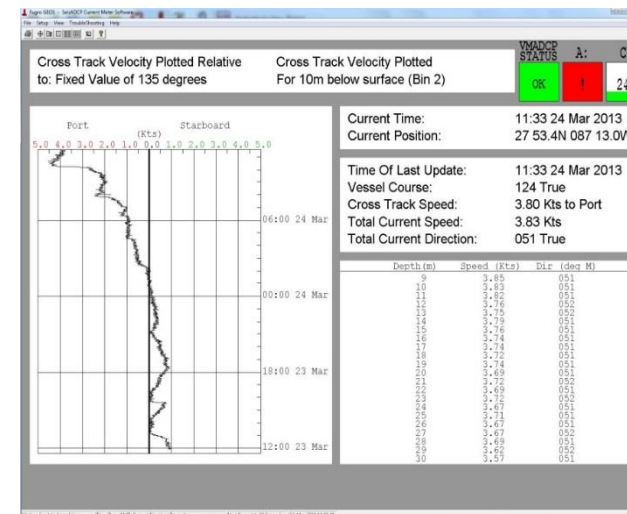
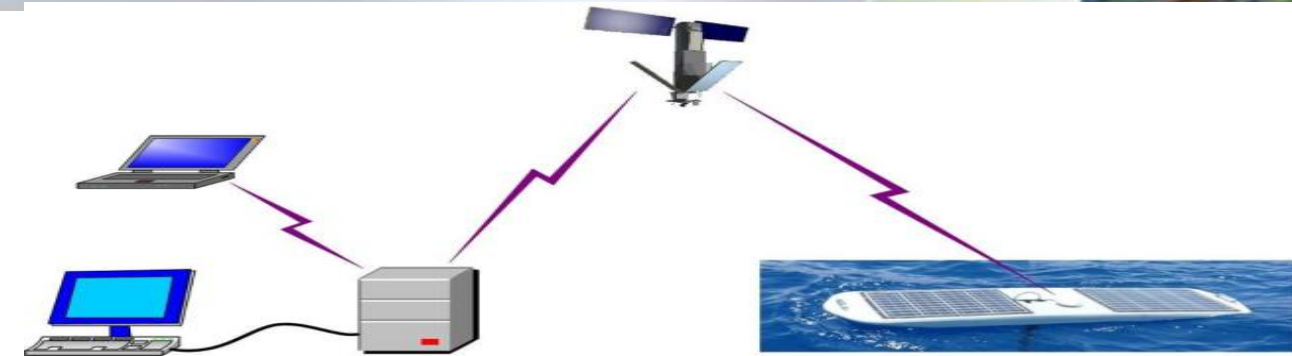
## Where is it being applied?

- Proximity of obstructions like rigs and platforms.
- Other areas where navigation is challenging



## Results and future steps

- This technique released the chase vessel so it can take care of area integrity.
- Data helped navigation team run an optimized production operation
- Savings in total time needed to conduct operations.





# Seismic Acq complementing OBC offshore Abu Dhabi UAE

OBC

## Challenge

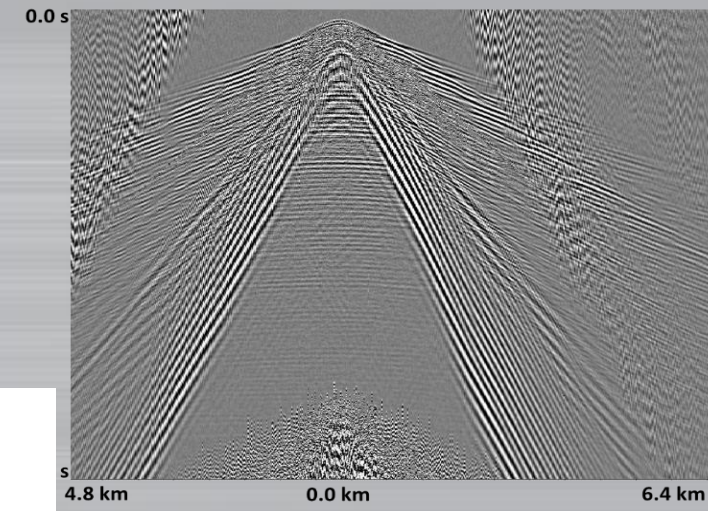
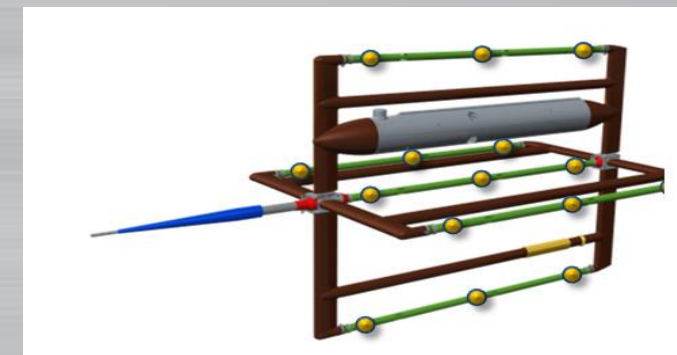
To acquire seismic data and increase operational efficiency in areas where water depth and sea-floor topography or operational constraints due to in-situ infrastructure and obstructions arise.

## Solution

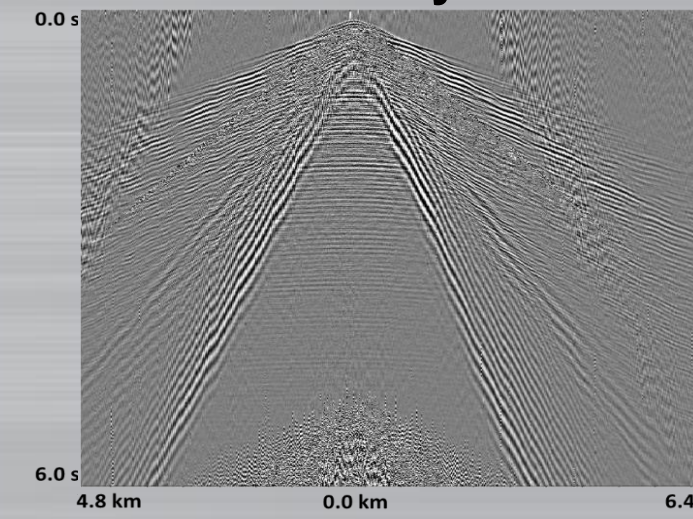
Deploy a three Wave Gliders with a 3D sensor array recording unit via a motional isolating cable to record pressure seismic data and information about array orientation and positioning via multi-measurement sensors located on each arm of the array.

## Results

The field test demonstrated the successful and safe deployment, seismic data acquisition and retrieval of the Wave Glider and the 3D sensor array. The evaluation criteria indicate consistent performance of the AMV and 3DSA, and that the recorded data are comparable to the OBC p-component data in terms of signal-to-noise and frequency bandwidth.

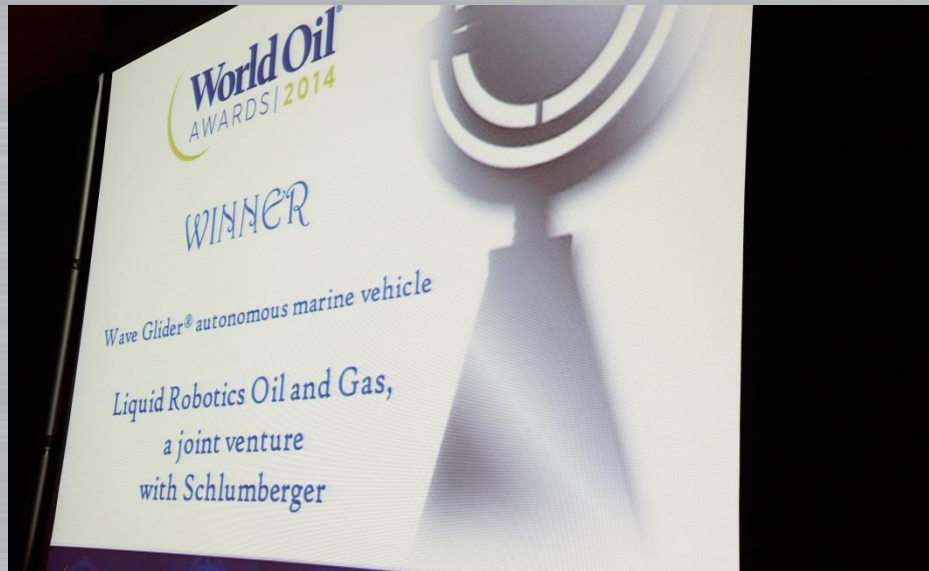


3D Seismic Array



# Technology Awards and Recognition

2014



**World Oil Awards**  
New Horizons Idea  
Schlumberger



**2014 Harts E & P Meritorious Award**  
for engineering outstanding innovation in systems integration

## 2015 Innovation Pioneers

- IHS CERAWeek

## 2016 TOP-3 Innovative Technologies at OTC

- Technical Review Committee  
Houston Chronicle

**Schlumberger**



# Benefits and Conclusions

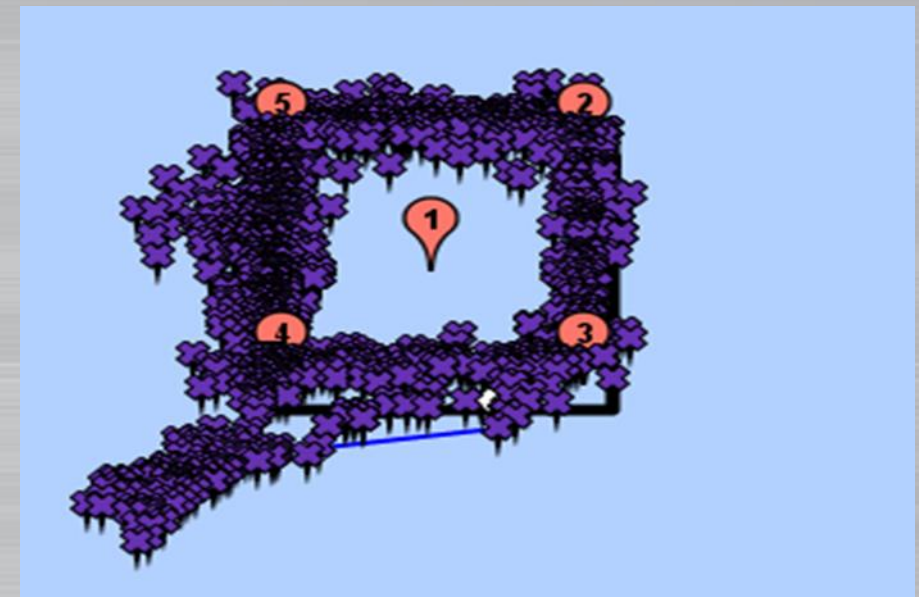
Low-risk, cost effective and environmentally friendly technology that:

- Lowers human footprint + exposure
- Much lower cost
- Flexibility and streamlined logistics
- De-risk projects
- Faster deployment and recovery
- Station keeping
- Schlumberger measurement expertise
  - Global footprint

**Reduce divers in the water and humans at sea**  
**Protect assets**

# Acknowledgements

- ADMA
- Chevron
- WesternGeco



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