

# VENATIC ENERGY PTY LTD

ABN 38 620 296 764

PRESENTATION

JUNE 2018



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### Venatic Energy Pty Ltd

“Venatic” from Latin: *venaticus*, of hunting < *venatus*, hunting < *venari*, to hunt < *venison*, nervous deer

- Perth-based private petroleum exploration and production (“E&P”) company
- Experienced petroleum E&P management
- Initial focus in the Asia-Pacific sector
- Company’s exploration focus includes marine geochemistry and seep sampling via a strategic relationship with industry-leading Blue Ocean Monitoring Pty Ltd
- Venatic will fund surveys to earn equity interest in permits in lieu of payment from operator
- Venatic provides complementary “value adding” role in providing state-of-the-art visualisation tools and analysis for Blue Ocean Monitoring seep surveys

### Seep Hunting

Marine seep hunting remains at the forefront of hydrocarbon exploration with recent advances in offshore geochemical technologies.

Venatic Energy can, through its alliance with Blue Ocean Monitoring, design and undertake a seep study for any offshore region up to 1,000m depth. It can be performed in single or multiple phases.

The study utilises state-of-the-art autonomous underwater vehicles (Slocum gliders) with zero environmental impact. The gliders can work continuously for up to around 21 days, 24 hours per day, in all sea-states and can be reconfigured in real time to pursue specific leads. A typical survey can cover up to around 500 km in water depths to 100m. Deeper dives will constrain the survey length, which remains dependent on battery life.

Generally, no government permitting is required.

# Offshore Petroleum Exploration

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**Strong Value-adding potential – no cost to Operators**

Venatic offers attractive proposition to Operators:

- ✓ No cost to existing permit holders
- ✓ Reportable operational activity (may assist in commitment negotiations with regulator)
- ✓ Study will assist in identifying potential hydrocarbon sources in water column
- ✓ Effectively ground-truths anomalies high-lighted by satellite and radar
- ✓ Nature of survey allows real-time re-configuration of survey to investigate specific anomalies
- ✓ In certain cases, surface water sampling can be added to survey program
- ✓ Confirmation of seep data reduces exploration risk and improves any marketing efforts
- ✓ Program brings in a technically proficient partner

# Hydrocarbon Seep Detection Program

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Blue Ocean Monitoring Pty Ltd

## Global leader in geochemical survey and seep detection using Teledyne “Slocum Gliders”

The Slocum Glider is a buoyancy-driven electric glider which enables long range and duration remote water column observation for a range of applications. The glider can be deployed and recovered from any size vessel with minimal time on station. Once deployed, it can easily be controlled from anywhere in the world through the use of web based piloting tools. Slocum gliders can run pre-programmed routes, surfacing to transmit real time data to shore while downloading new instructions at regular intervals. This allows fleets of gliders to be operated remotely with minimal personnel and infrastructure.

Slocum Glider



The buoyancy propulsion drive provides months of performance at sea and the optional thruster provides up to 2 knots of horizontal speed. This long endurance glider will expand the data collection range and/or situational awareness by providing real data over extended periods of time.

No matter the sea state, gliders are capable of continuous sampling without risking personnel or costly assets. Slocum gliders routinely operate around the world in extreme weather conditions.

The gliders are modular, with over 40 sensors and other options available to address a wide variety of ocean conditions and sampling requirements.

Slocum gliders enable high resolution sampling over transects that can be revisited during a single deployment. This enables resolution of sampled features over time and space at a substantially lower cost than with traditional methods.

For oil and gas seep detection surveys, the gliders are equipped with a Hydrocarbon Detection Package, including methane and oil-in-water sensors.

# Hydrocarbon Seep Detection Program

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## Slocum Glider

Deployment

Ultra-efficient, buoyancy propelled autonomous underwater vehicle

Slocum gliders use small changes in buoyancy to move through the water column this is converted to horizontal motion by wings, resulting in a saw-tooth dive profile

Communication by RF or Iridium & ARGOS position beacon

Near real time data access & control

Modular architecture

Modular sensor payload



Vessel-Free Operation – Deploy/Recover from vessel then operate independently

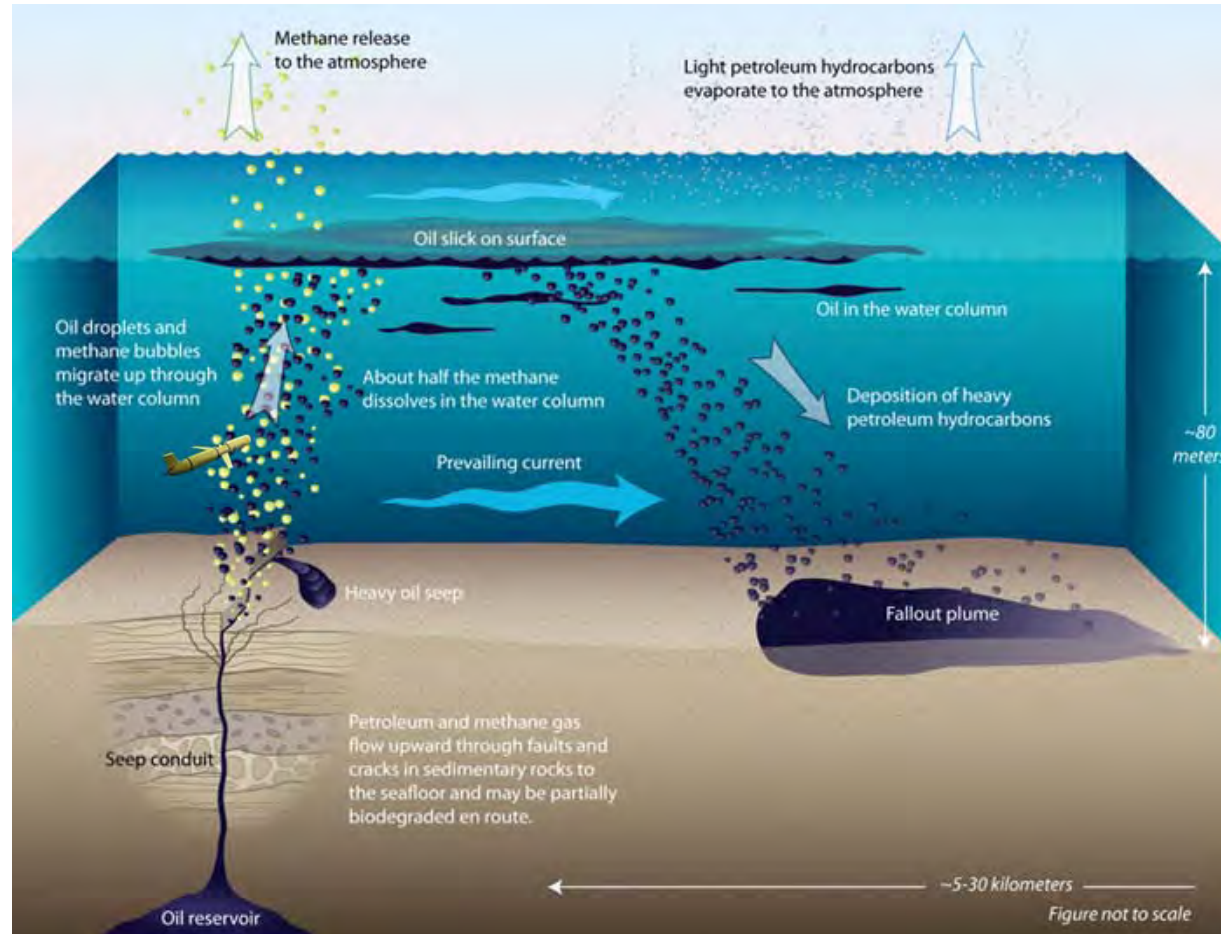
# Hydrocarbon Seep Detection Program

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## Hydrocarbon Seeps

This illustration shows the route traveled by oil leaving the subseafloor reservoir as it travels through the water column to the surface and ultimately sinks and falls out in a plume shape onto the seafloor where it remains in the sediment. (Illustration by Jack Cook, Woods Hole Oceanographic Institution).

The case study included later in this presentation shows how the glider, by extensively sampling the water column, can identify a seep.



# Hydrocarbon Seep Detection Program

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## Hydrocarbon Detection Sensor Payload

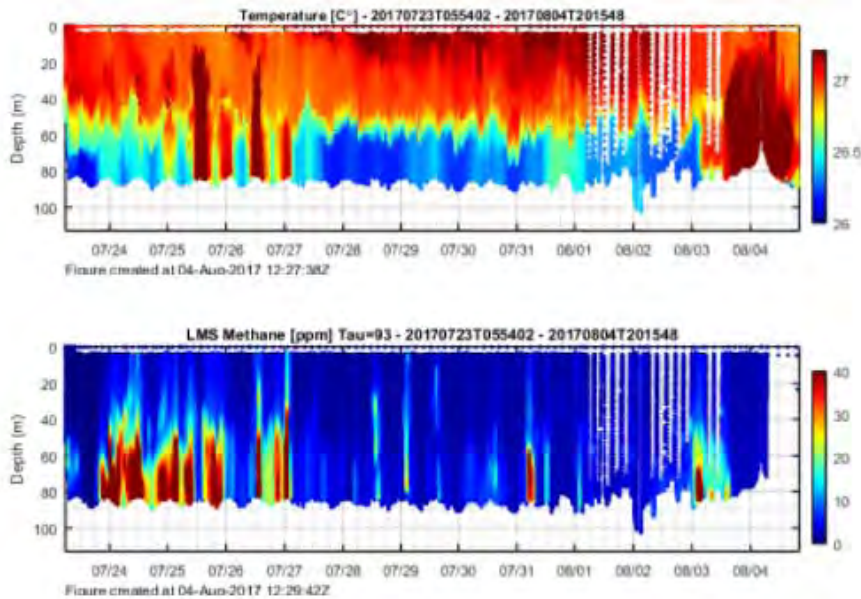
Sensor	Measurements	Data
GPS	WGS84 Latitude and Longitude (deg)	<ul style="list-style-type: none"> <li>• Depth Averaged Currents [m s-1]</li> <li>• Surface Currents [m s-1]</li> </ul>
Compass	Pitch Heading Roll	
Altimeter	Glider Altitude (m)	<ul style="list-style-type: none"> <li>• Water Depth (m)</li> </ul>
Pressure	Pressure (dB)	<ul style="list-style-type: none"> <li>• Depth (m)</li> </ul>
Sea Bird Electronics GPCTD	<ul style="list-style-type: none"> <li>• Conductivity (S/m)</li> <li>• Temperature (°C)</li> <li>• Pressure (dB)</li> </ul>	<ul style="list-style-type: none"> <li>• Salinity [PSU]</li> <li>• Density [kg m-3]</li> <li>• Depth [m]</li> </ul>
Franatech Laser Methane Sensor	Dissolved methane concentration [ppmv]	<ul style="list-style-type: none"> <li>• As measured</li> </ul>
WET Labs SeaOWL UV-A	<ul style="list-style-type: none"> <li>• Chlorophyll-a fluorescence [counts]</li> <li>• FDOM fluorescence [counts]</li> <li>• 700nm backscatter [counts]</li> </ul>	<ul style="list-style-type: none"> <li>• Chlorophyll-a Concentration [ug/L]</li> <li>• FDOM Concentration [QSED]</li> <li>• Turbidity [NTU]</li> </ul>
Aanderaa Oxygen Optode	<ul style="list-style-type: none"> <li>• Dissolved oxygen concentration [ug/L]</li> <li>• Dissolved oxygen saturation [%]</li> </ul>	<ul style="list-style-type: none"> <li>• As measured</li> </ul>

# Hydrocarbon Seep Detection Program

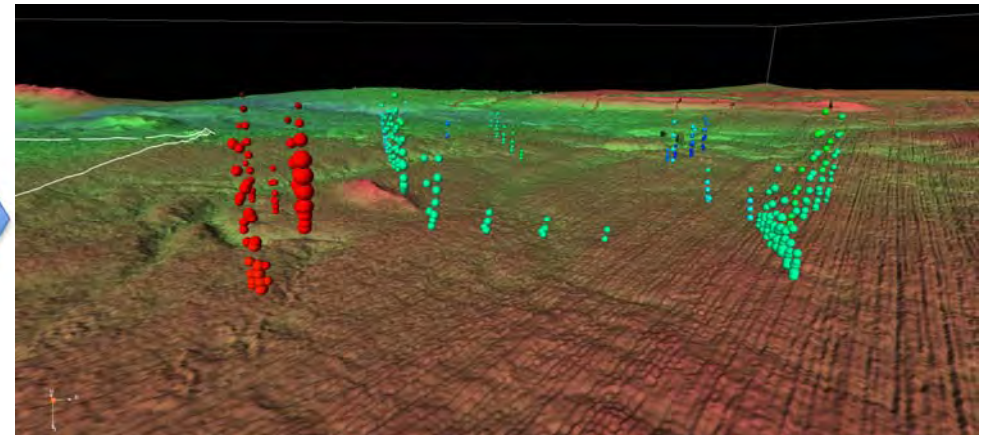
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## Venatic's value-adding capabilities

Convert 2D data into multi-variate 3D images



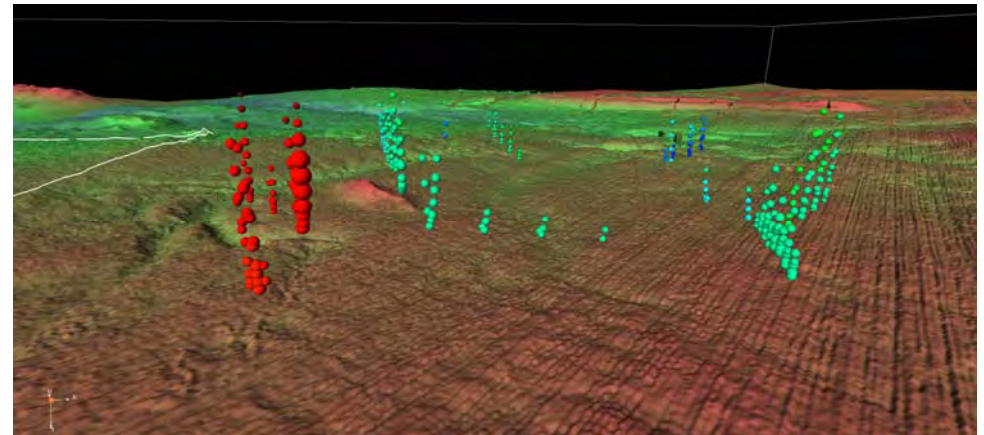
Standard Time series display



Gas seep revealed: data filtered, scaled and imaged in 3D on sea-floor

Case Study:

2017 Yampi Shelf Survey  
(Cornea field area)  
Browse Basin, WA



# Hydrocarbon Seep Detection Program – Case Study

## 2017 BOM Yampi Shelf Survey

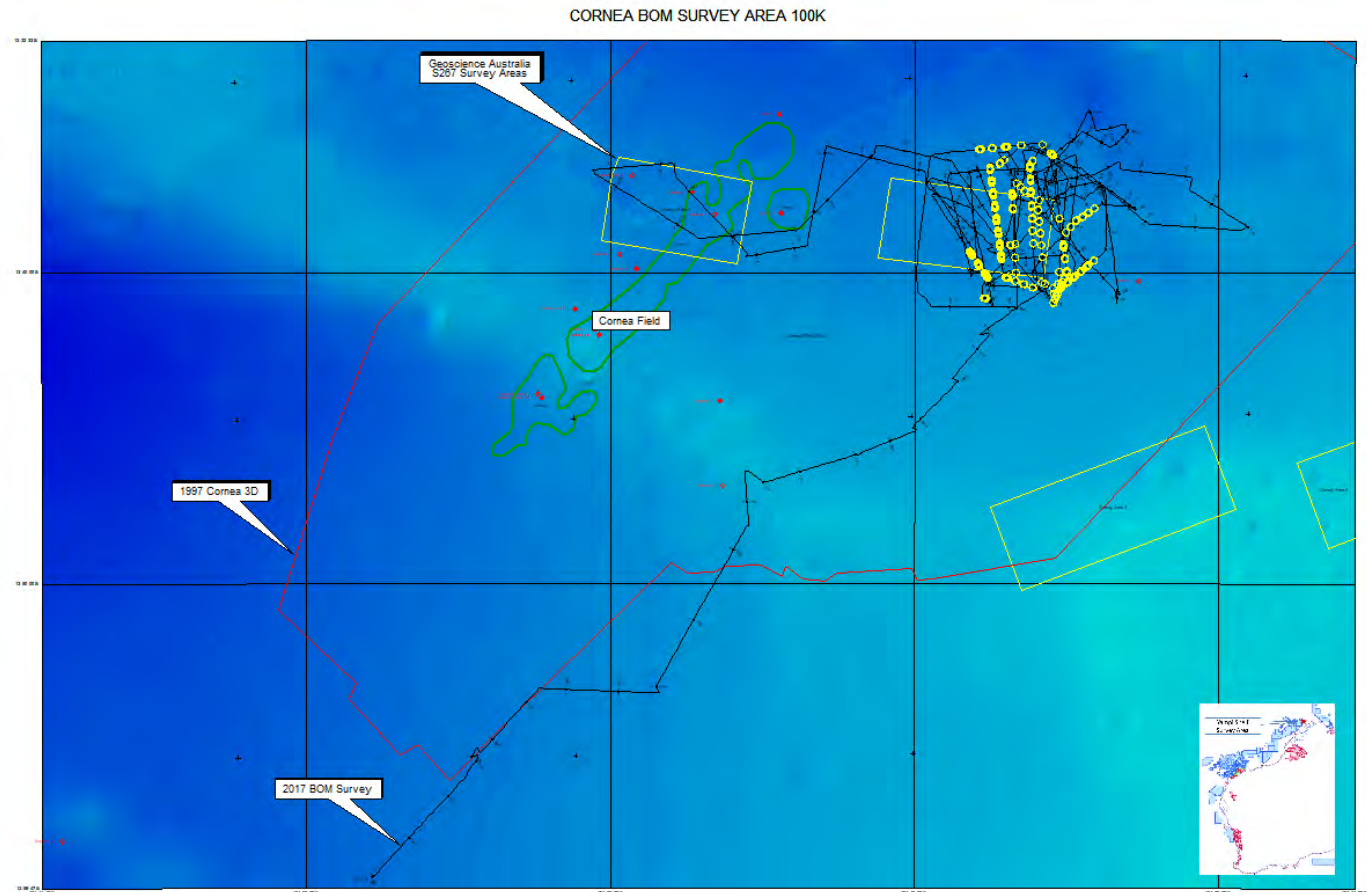
In July 2017, BOM undertook a calibration survey over a known seep just east of the Cornea Oil Field in the Browse Basin off the coast of Western Australia.

The glider was deployed approx 20 km east of the north-east tip of the accumulation.

In the following 15 days, it covered 438 line kilometres, (horizontal and vertical) before being recovered 30 km ssw of the field area.

During that period the glider was in continuous and fully autonomous operation and easily confirmed seep location as it recorded anomalous Methane readings (> 4 times background); the glider track is shown in black on the adjacent map and the anomalies are shown in yellow.

Survey Area with Methane Anomalies

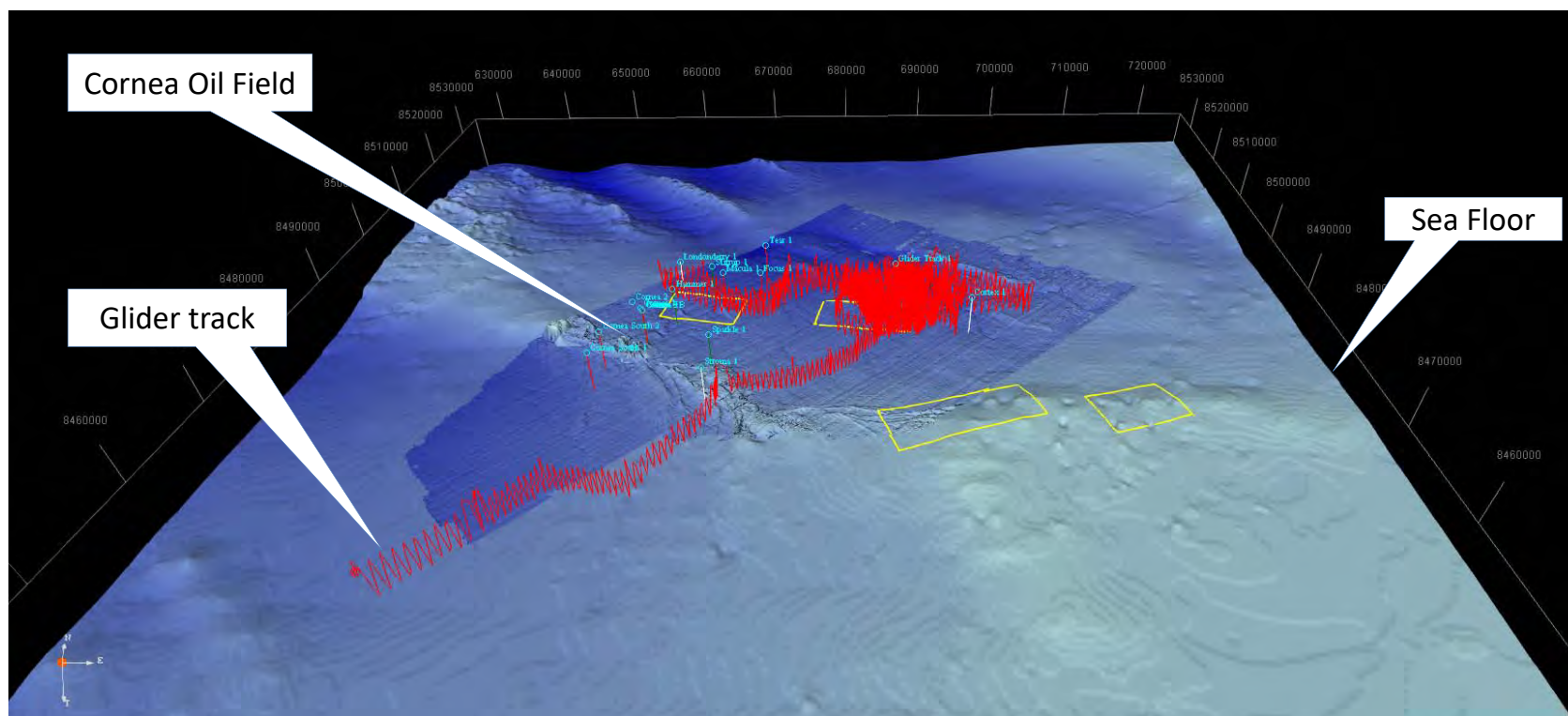


# Hydrocarbon Seep Detection Program – Case Study

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## 2017 BOM Yampi Shelf Survey – In 3D

Survey Location



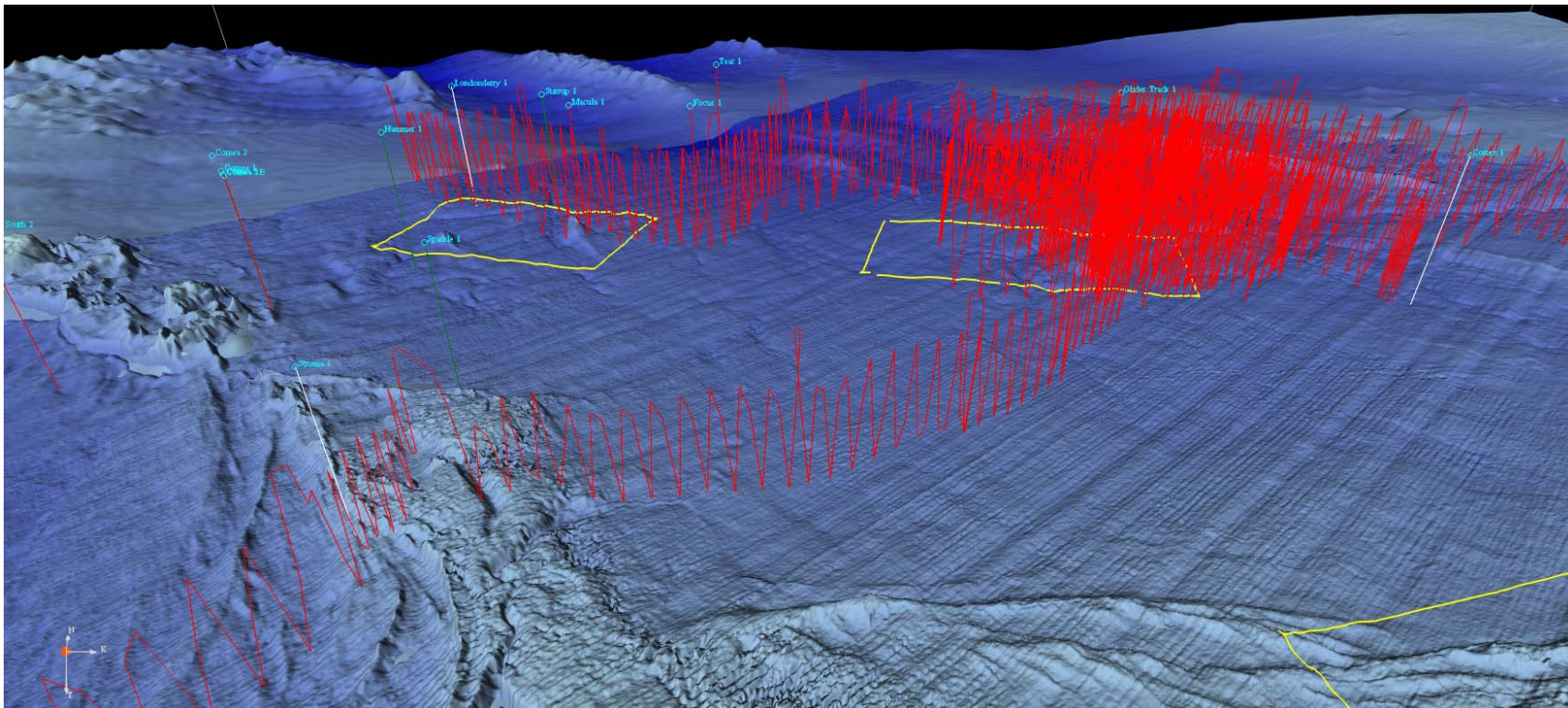
- Map shows sea floor, looking north.
- Glider track shown in red.
- Geoscience Australia S267 Survey Areas and locations of petroleum wells associated with the Cornea Field also shown.

# Hydrocarbon Seep Detection Program – Case Study

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## 2017 BOM Yampi Shelf Survey – In 3D

Survey Location – Close up



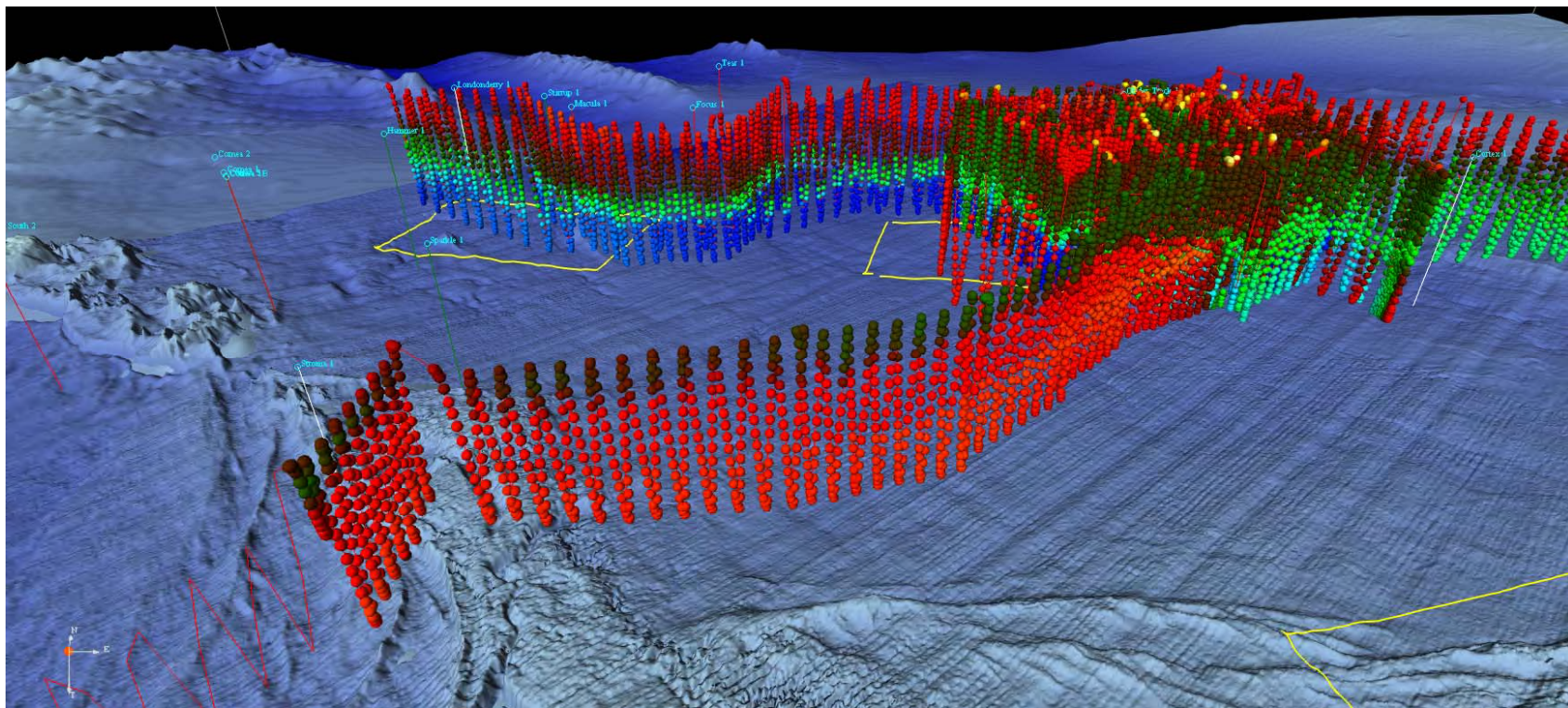
- Map shows sea floor, looking northnorthwest.
- Glider track shown in red.
- Geoscience Australia S267 Survey Areas and locations of petroleum wells associated with the Cornea Field also shown.

# Hydrocarbon Seep Detection Program – Case Study

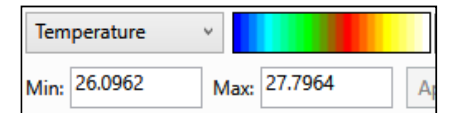
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## 2017 BOM Yampi Shelf Survey – In 3D

Survey Data - Temperature



- Map shows sea floor, looking north.
- Glider sample colours representing temperature.

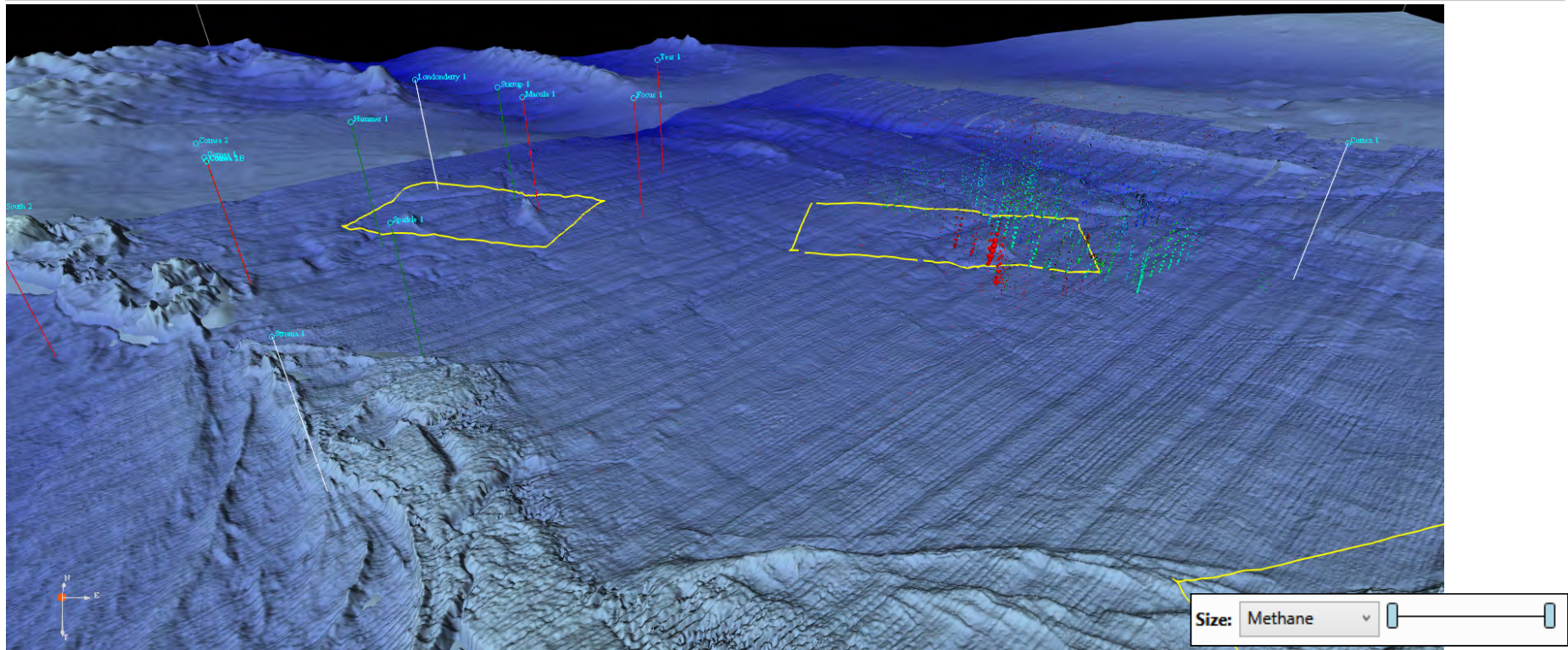


# Hydrocarbon Seep Detection Program – Case Study

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## 2017 BOM Yampi Shelf Survey – In 3D

Survey Data – Scaled to Methane Readings



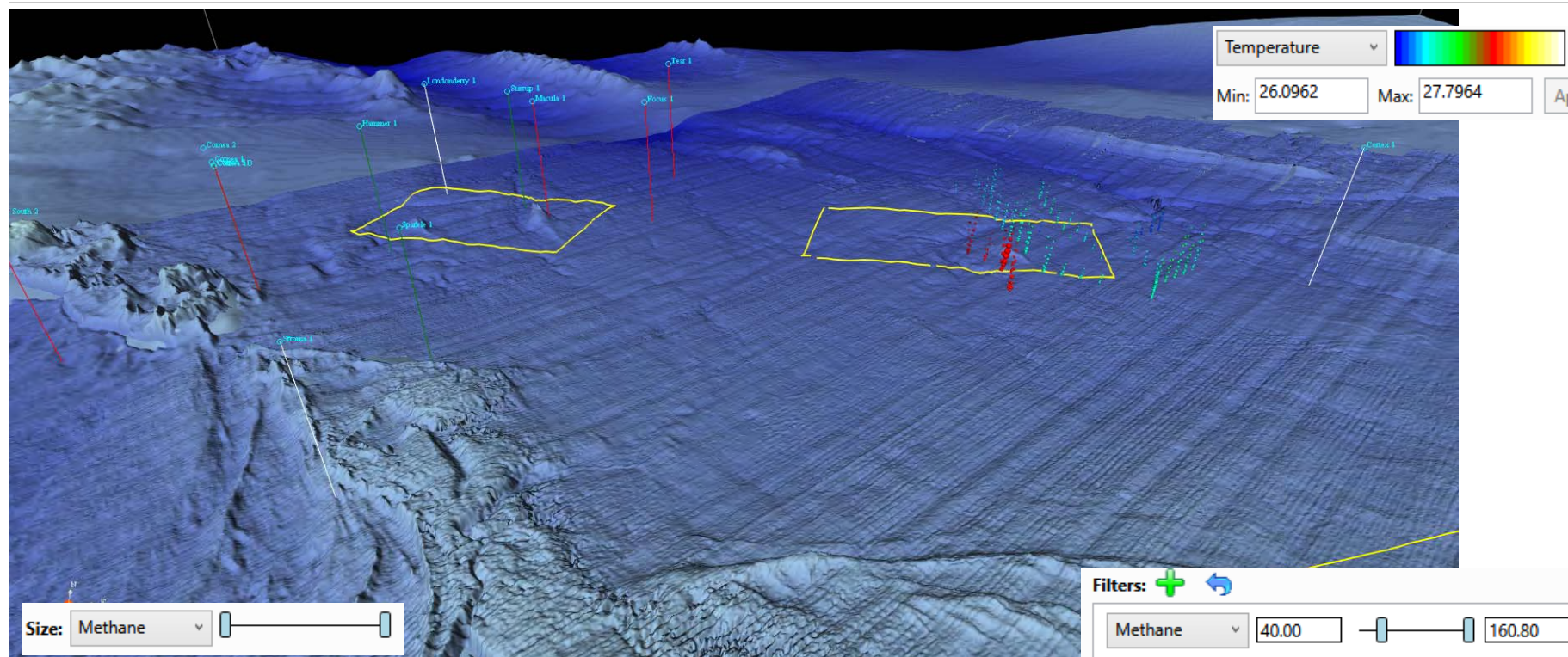
- Map shows sea floor, looking north.
- Glider sample colours representing temperature
- Glider sample size proportional to Methane reading (from 2 – 168 ppm). Seep area becoming evident.

# Hydrocarbon Seep Detection Program – Case Study

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## 2017 BOM Yampi Shelf Survey – In 3D

Survey Data – Scaled to Methane Readings / Methane Readings <40 ppm Filtered Out



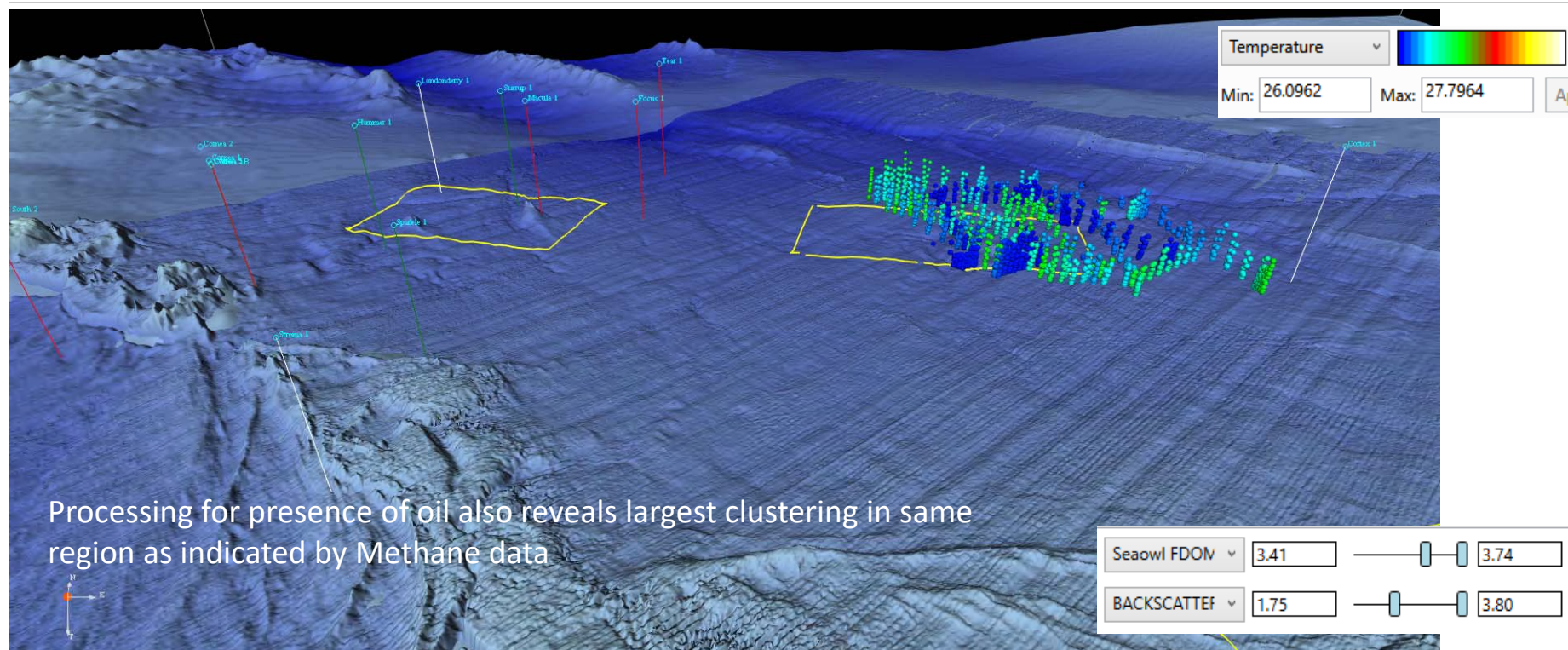
- Map shows sea floor, looking north.
- Glider sample colours representing temperature
- Glider sample size proportional to Methane readings (from 2 - 168 ppm). All methane samples < 40 ppm filtered out.

# Hydrocarbon Seep Detection Program – Case Study

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## 2017 BOM Yampi Shelf Survey – In 3D

Survey Data – Scaled to Oil Readings – top 30% shown with top 50% of backscatter (particle size)



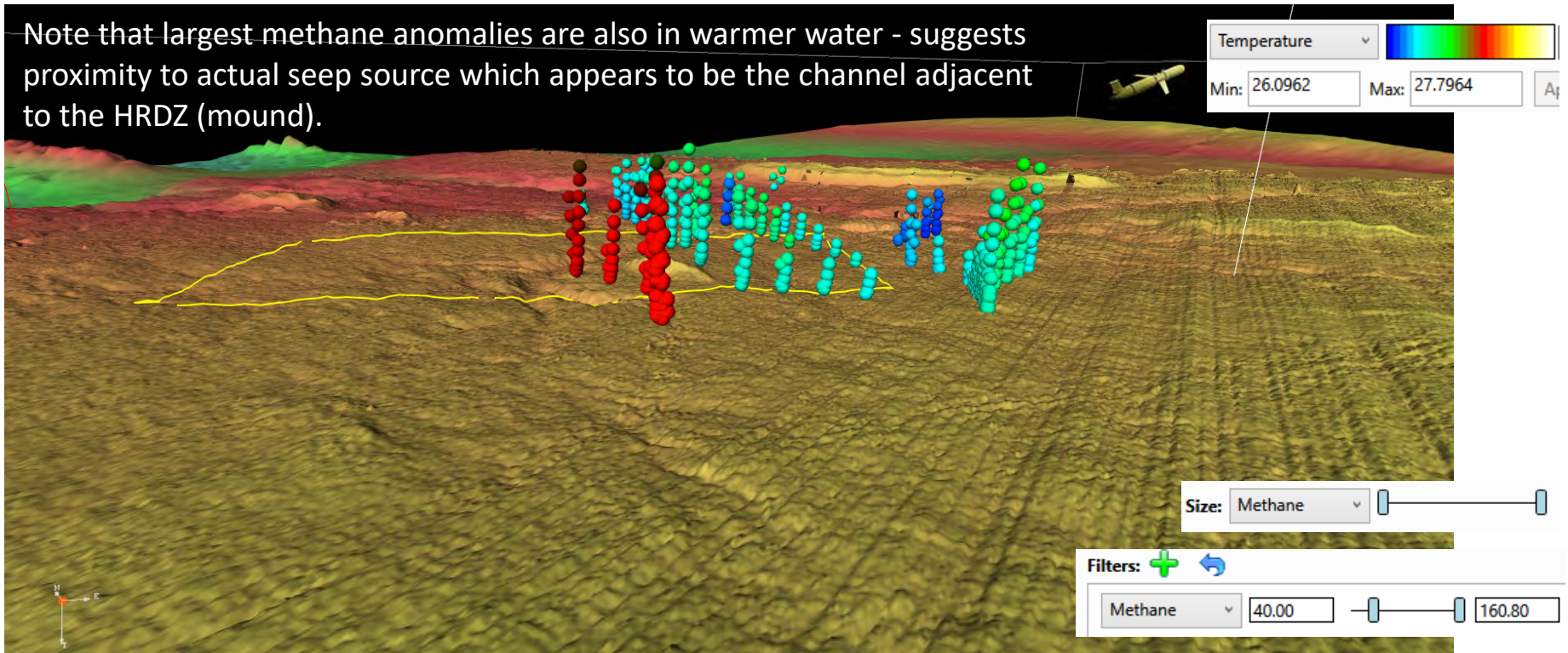
- Map shows sea floor, looking north.
- Glider sample colours representing temperature; size proportional to crude oil fluorescence. Samples in lowest 70% of fluorescence and/or lowest 50% of particle size filtered out.

# Hydrocarbon Seep Detection Program – Case Study

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## 2017 BOM Yampi Shelf Survey – In 3D

Survey Data – Scaled to Methane Readings / Methane Readings <40 ppm Filtered Out



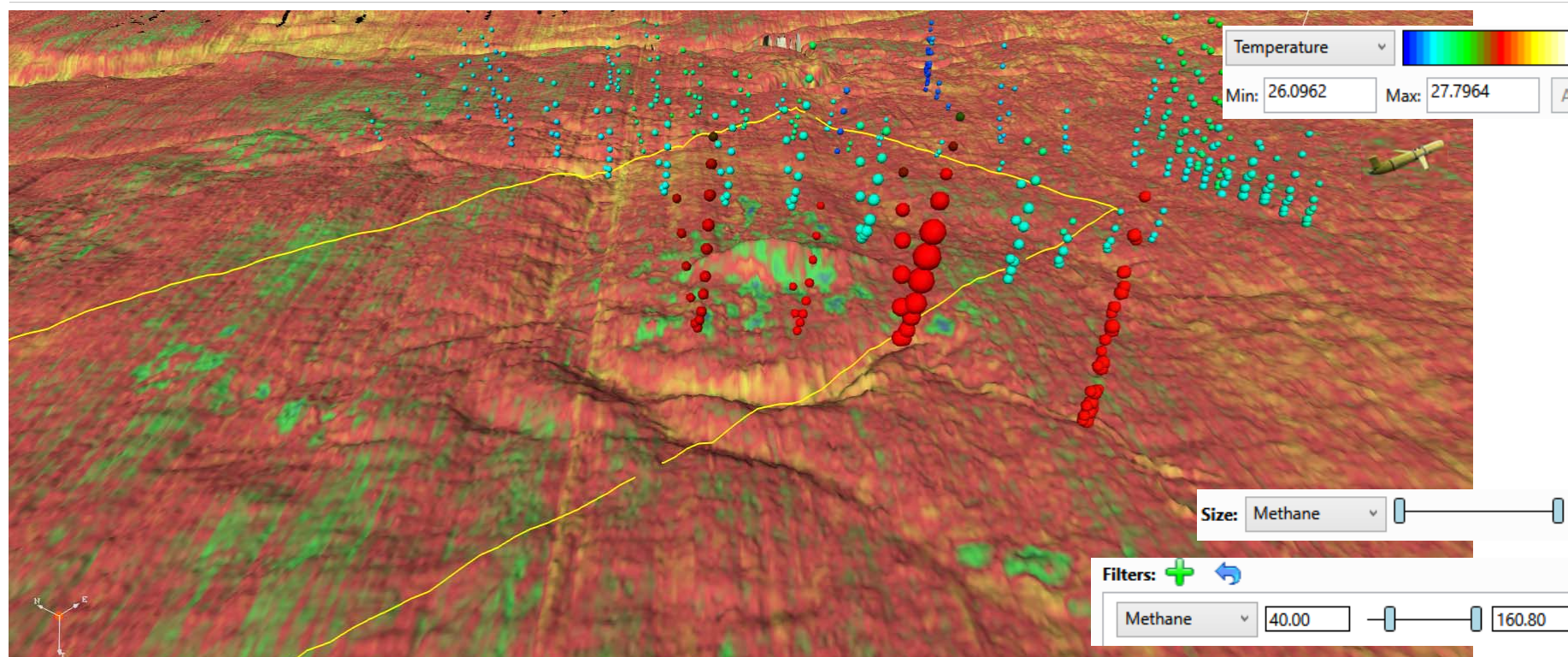
- Close – up; enhanced color palette for seafloor
- Glider sample colours representing temperature; size proportional to Methane readings (from 2 - 168 ppm). All methane samples <40 ppm filtered out.

# Hydrocarbon Seep Detection Program – Case Study

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## 2017 BOM Yampi Shelf Survey – In 3D

Survey Data – Scaled to Methane Readings / Methane Readings <40 ppm Filtered Out



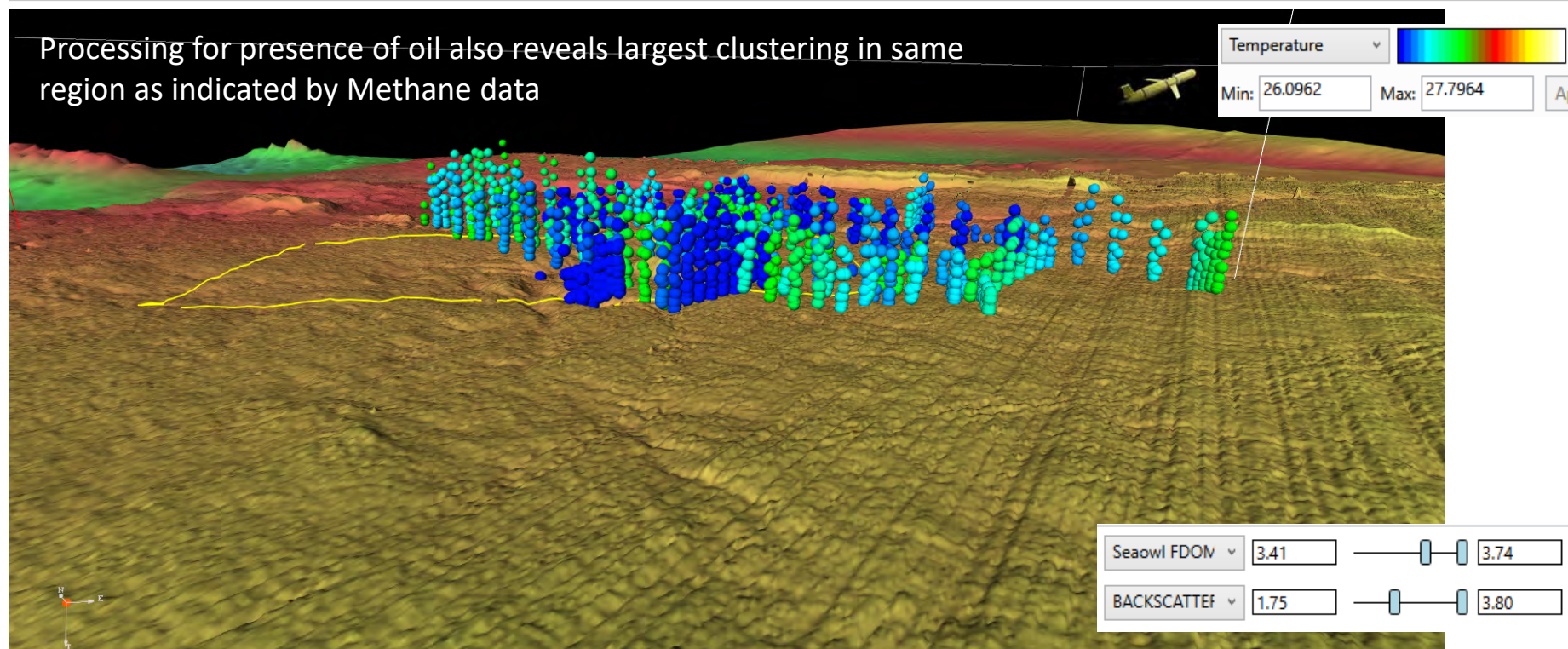
- Alternate view looking NE with enhanced color palette for seafloor amplitudes
- Note higher amplitudes associated with HRDZ (mound) in image centre. Some seepage from mound, but primarily from adjacent channel(s).

# Hydrocarbon Seep Detection Program – Case Study

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## 2017 BOM Yampi Shelf Survey – In 3D

Survey Data – Scaled to Oil Readings – top 30% shown with top 50% of backscatter (particle size)



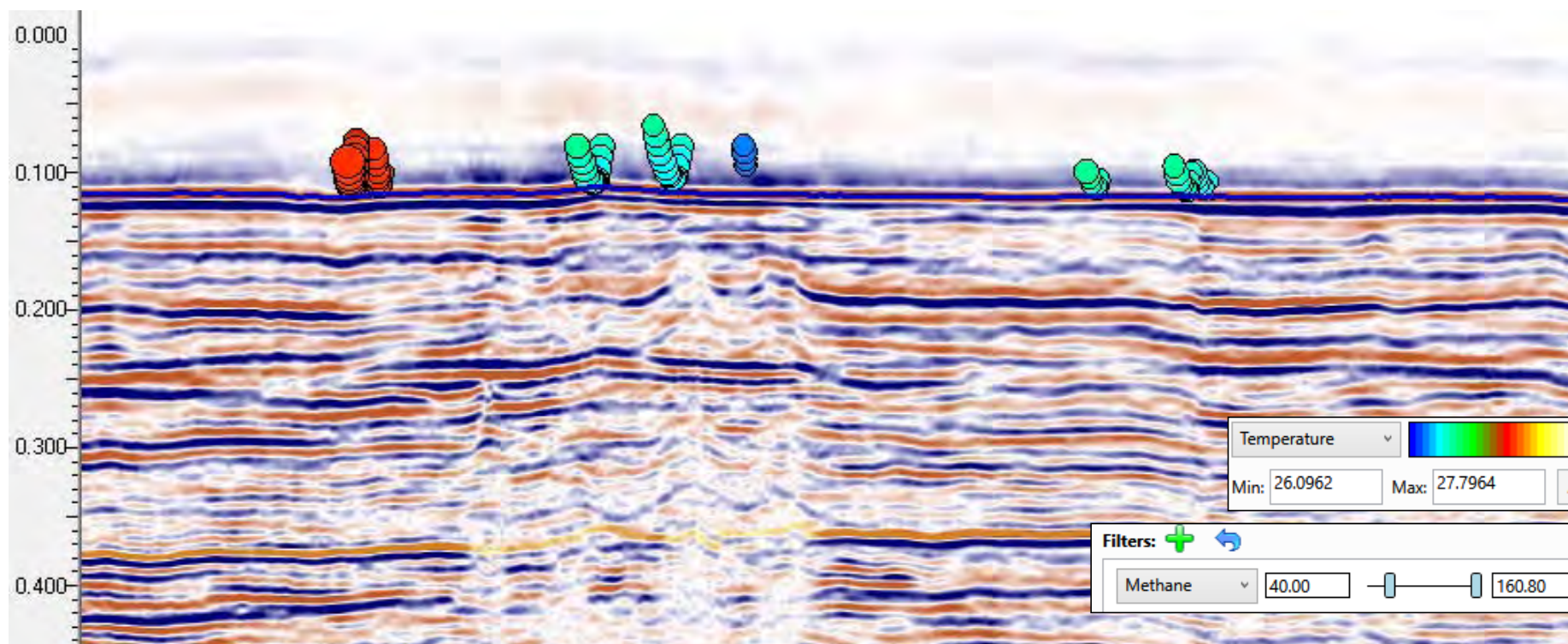
- Close - up
- Glider sample colours representing temperature; size proportional to crude oil fluorescence. Samples in lowest 70% of fluorescence and/or lowest 50% of particle size filtered out.

# Hydrocarbon Seep Detection Program – Case Study

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## 2017 BOM Yampi Shelf Survey – Can also be displayed directly on seismic

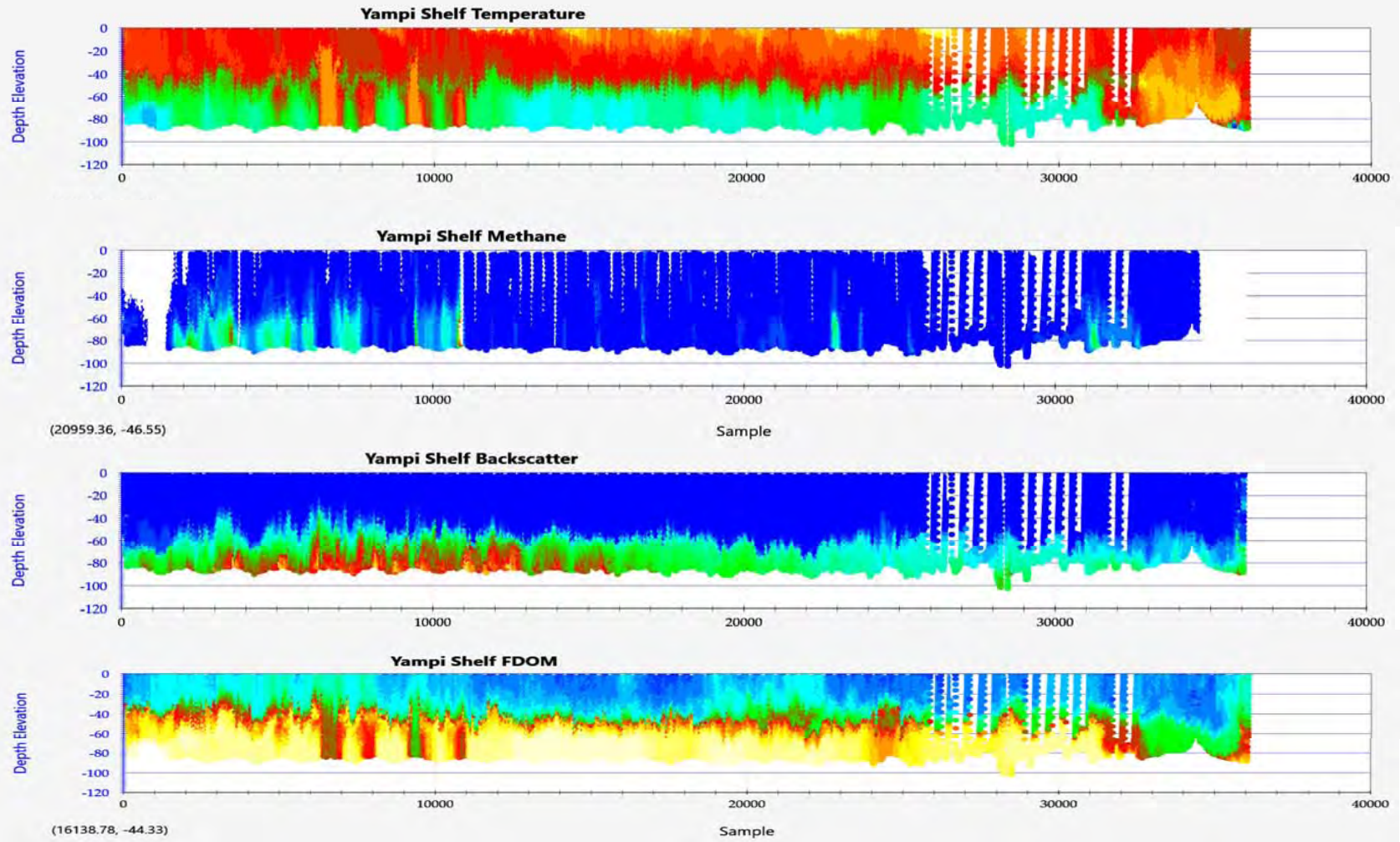
Survey Data – Scaled to Methane Readings / Background Methane Readings Filtered Out



- Cornea 3D Inline 2869 (partial)
- Glider sample colours representing temperature; size proportional to Methane readings (from 2 - 168 ppm). All methane samples < 40 ppm filtered out.

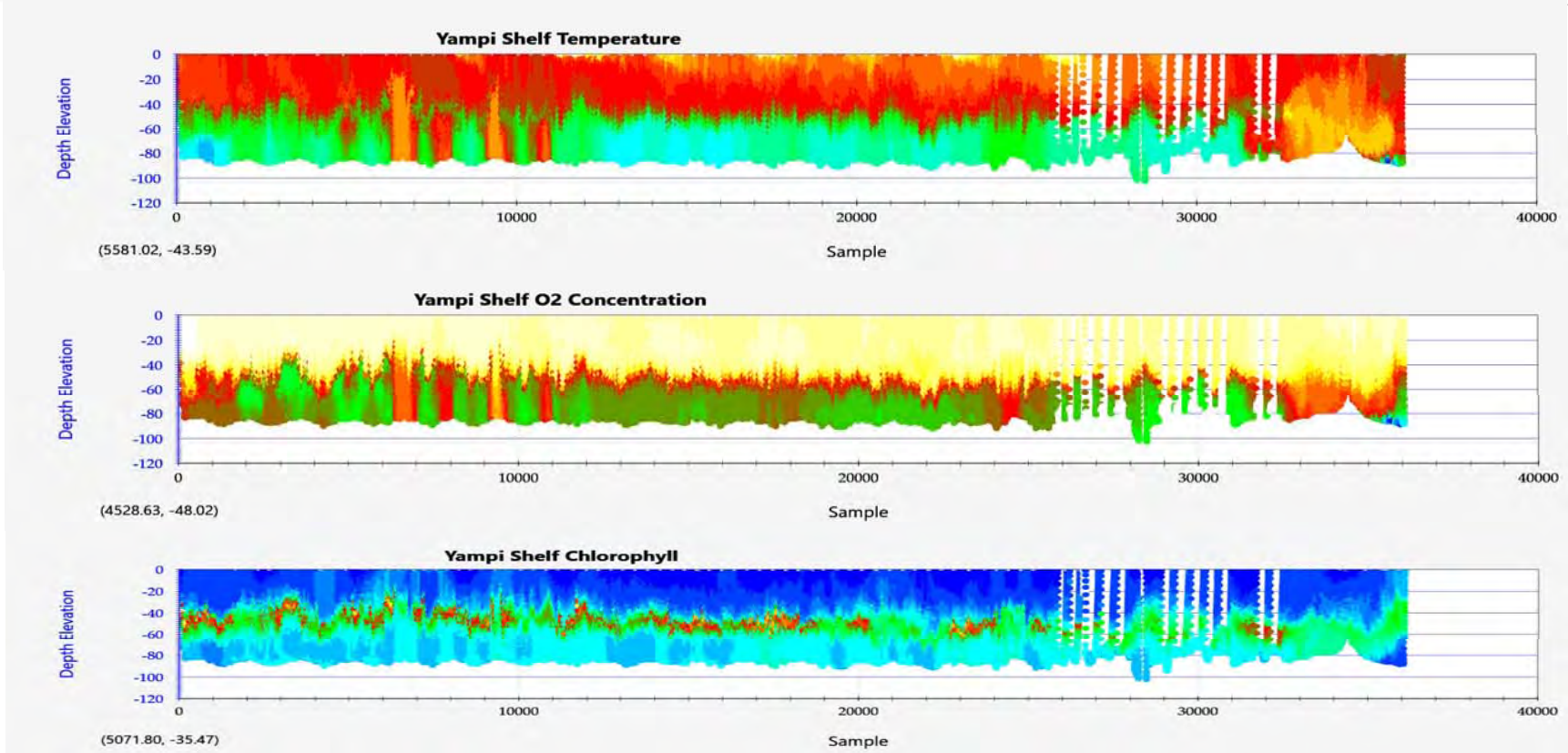
# Hydrocarbon Seep Detection Program – Case Study

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# Hydrocarbon Seep Detection Program – Case Study

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