Subsea Positioning and Communication Solutions
Sea Tech Week - October 2018

iXblue expertise is positioning and navigation

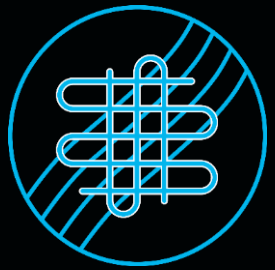
Photonics

Inertial navigation

Underwater acoustics

Mechatronics

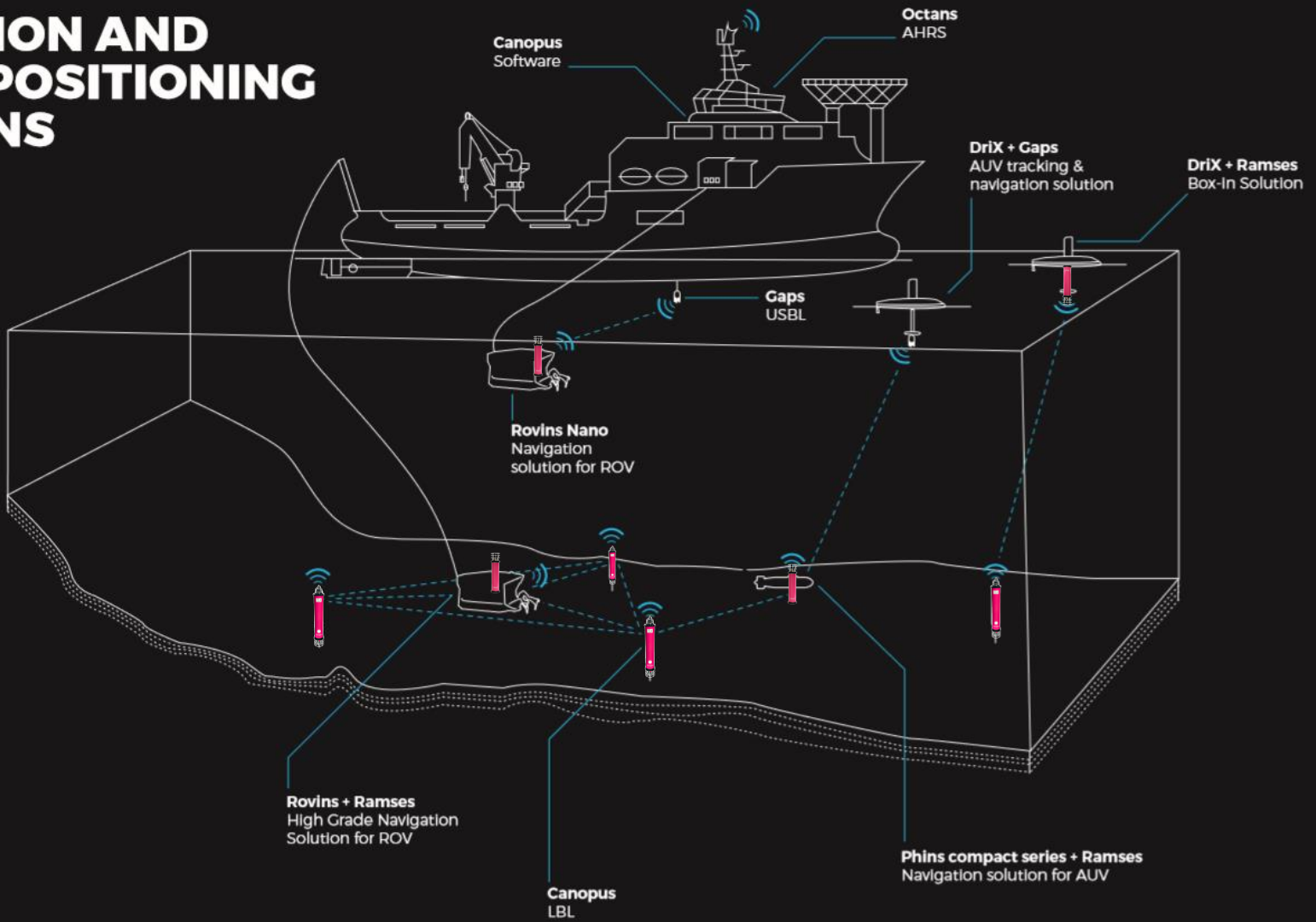
Ship building

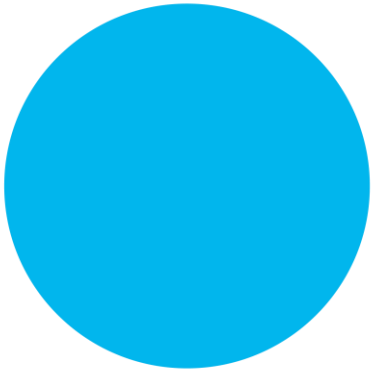


Survey operations

Where are u ?

NAVIGATION AND SUBSEA POSITIONING SOLUTIONS





CANOPUS system

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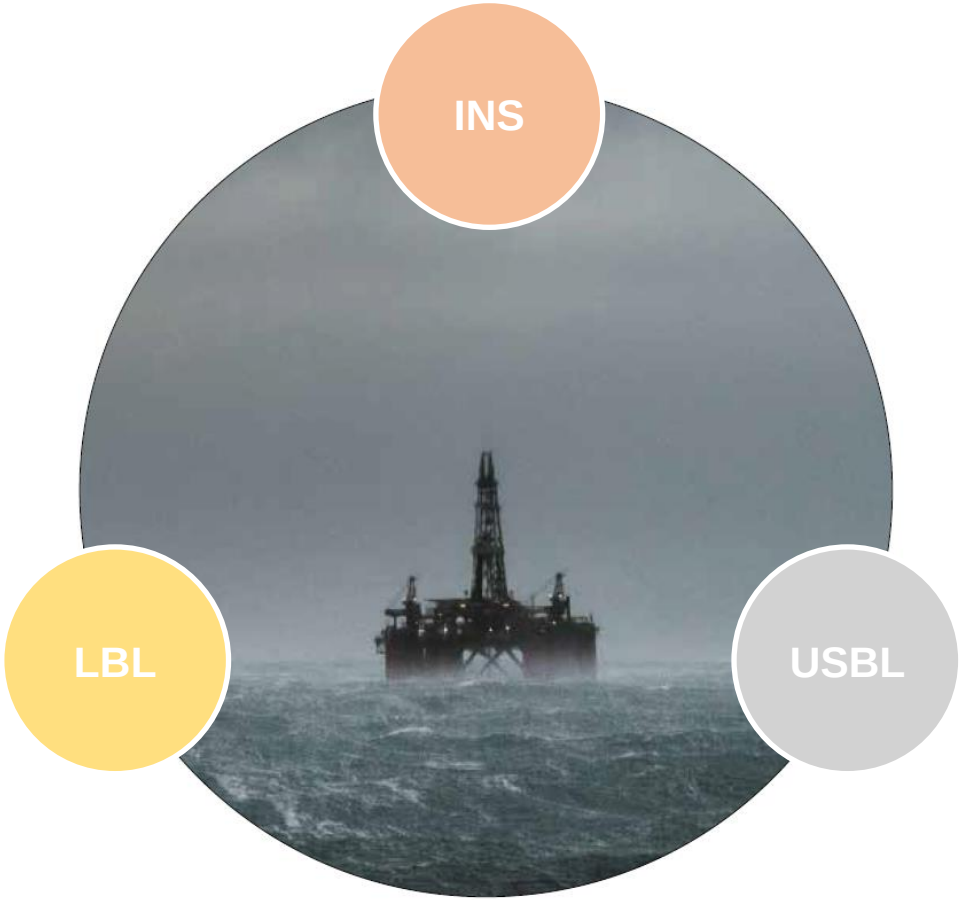
CANOPUS system

Principles of subsea positioning

- INS, Inertial Navigation Systems
- LBL, Long BaseLine acoustic positioning systems
- USBL, Ultra Short BaseLine positioning systems



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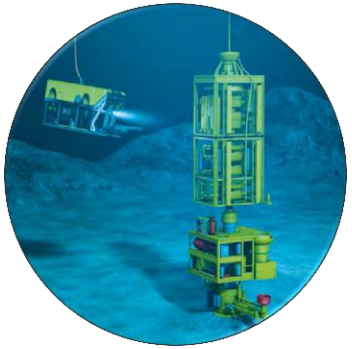
QUADRANS OCTANS PHINS

M3 M5 M7
MARINS SERIES

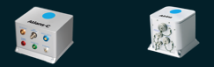
C3 C5 C7
PHINS COMPACT SERIES



OCTANS NANO | OCTANS 3000G4 | ROVINS NANO | ROVINS | PHINS 6000

URSA LYRA VEGA
ADVANS SERIES

1090 120 200
ASTRIX SERIES



ATLANS C AIRINS

INERTIAL PRODUCTS RANGE

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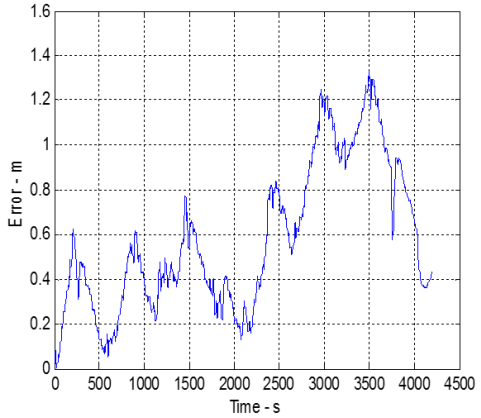
CANOPUS system

Principles of subsea positioning

	PHINS COMPACT C3	PHINS COMPACT C5	PHINS COMPACT C7
			
	Pure inertial mode	Pure inertial mode	Pure inertial mode
Heading *(rms)*	0.15deg	0.05deg	0.01deg
Roll & Pitch *(rms)*	0.05deg	0.01deg	0.01deg
Position With DVL *(CEP50)*	0,3% DT	0,2% DT	0,1% DT

- INS performance depends on:
  - Inertial sensor class
  - Aiding sensor nature (USBL, LBL, DVL…)
  - Travelled distance / trajectory (DVL, sparse)
- INS-DVL position accuracy is specified in percent of the travelled distance (% TD)



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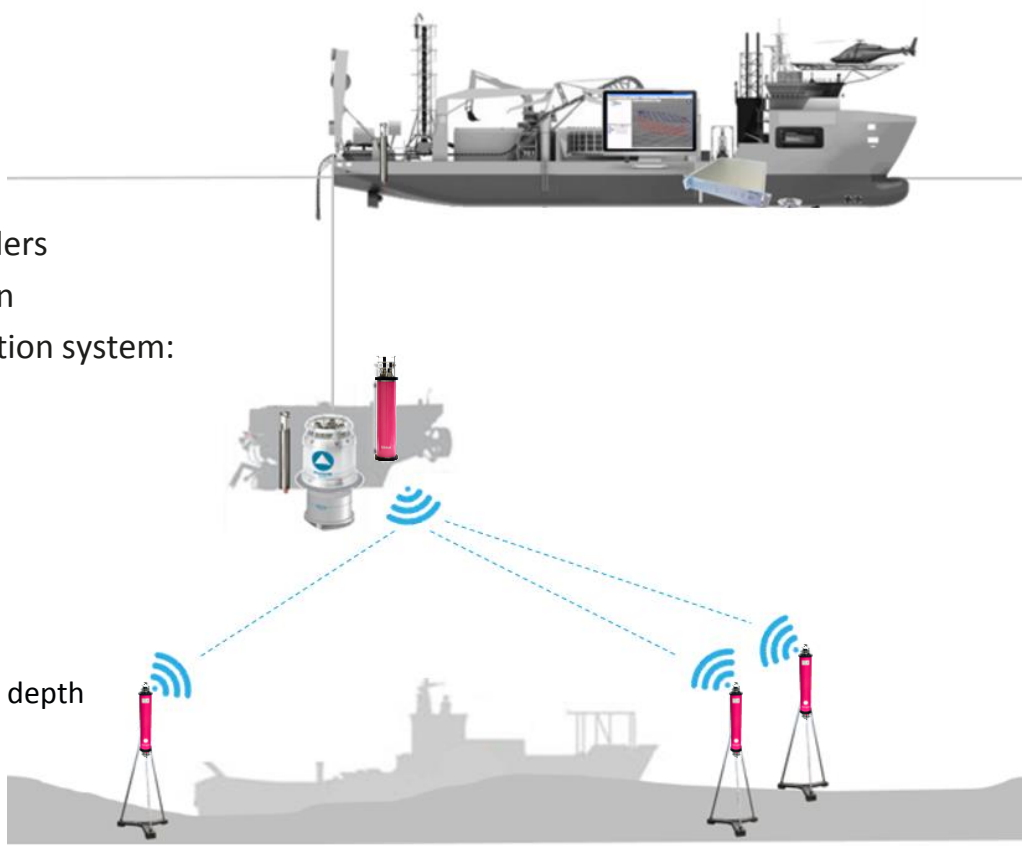
CANOPUS system

Principles of subsea positioning

- In **LBL** mode…
  - ✓ Ranging measurement to fixed transponders
  - ✓ Algorithm calculates the resulting position
  - ✓ Possible combination with inertial navigation system:
    - Robustness
    - Sparse array navigation
    - Increase positioning accuracy

- ☹ Require to deploy fixed transponders on the seabed
- ☹ Require to box-in the fixed transponders
- ☺ **Decimetric** positioning accuracy whatever the water depth
- ☺ **Autonomous** positioning method



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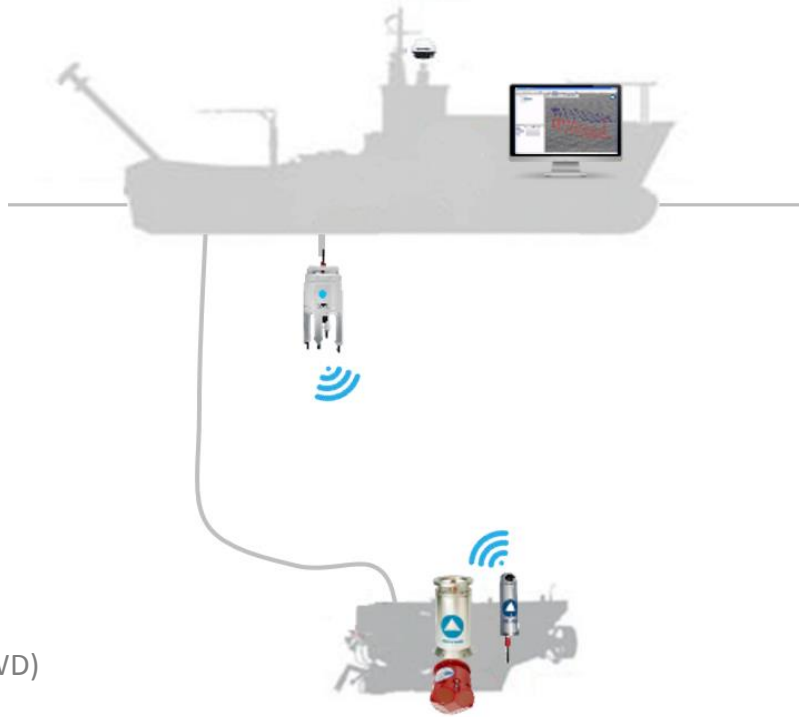
CANOPUS system

Principles of subsea positioning

- In **USBL** mode …
  - ✓ Slant range + bearing estimation
  - ✓ Estimation of the position of the transponder
  - ✓ Possible combination with inertial navigation system:
    - Robustness
    - Increase positioning accuracy



- ☺ Does not require to deploy fixed transponders on the seabed
- ☺ Does not require to box-in the fixed transponders
- ☹ Positioning accuracy is a % of slant range (typically 1m at 1,000m WD)
- ☹ Position of the transponder is known remotely

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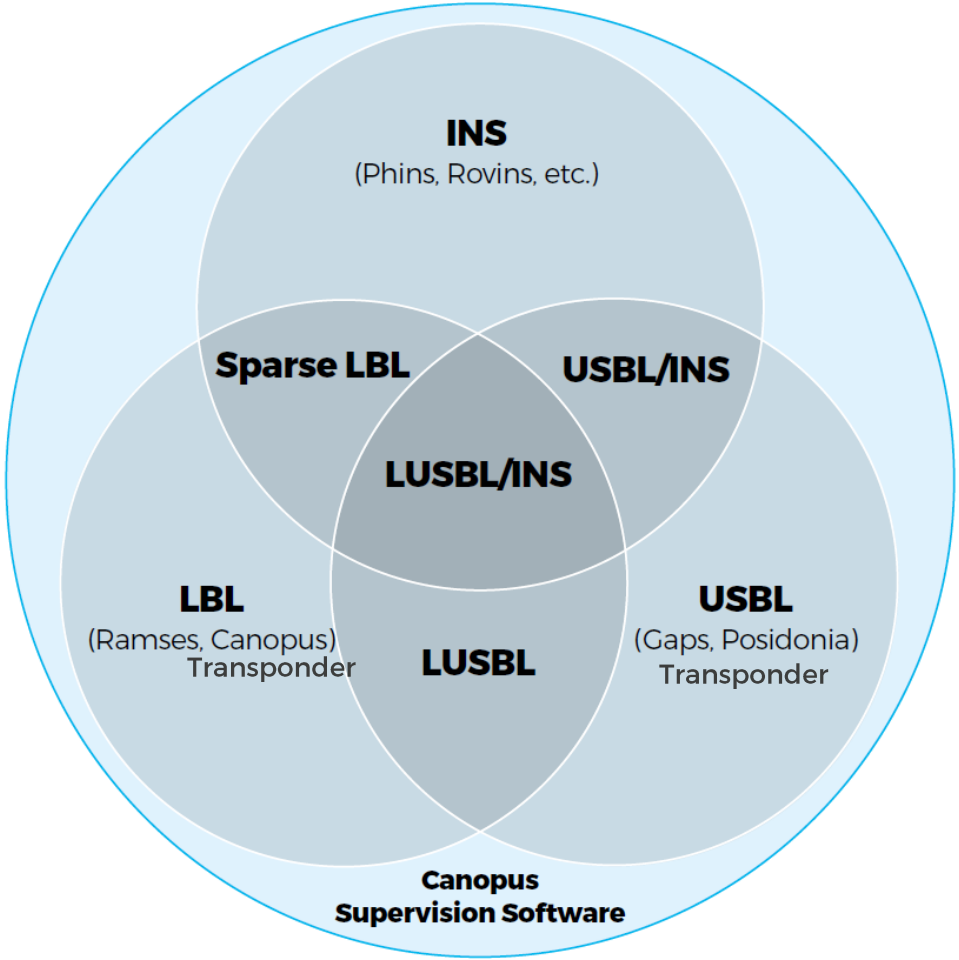
CANOPUS system

iXblue offer

- Master each technology individually
- Combine them and provide a robust system
- Reach simplicity and performance



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Canopus System

Hardware Components

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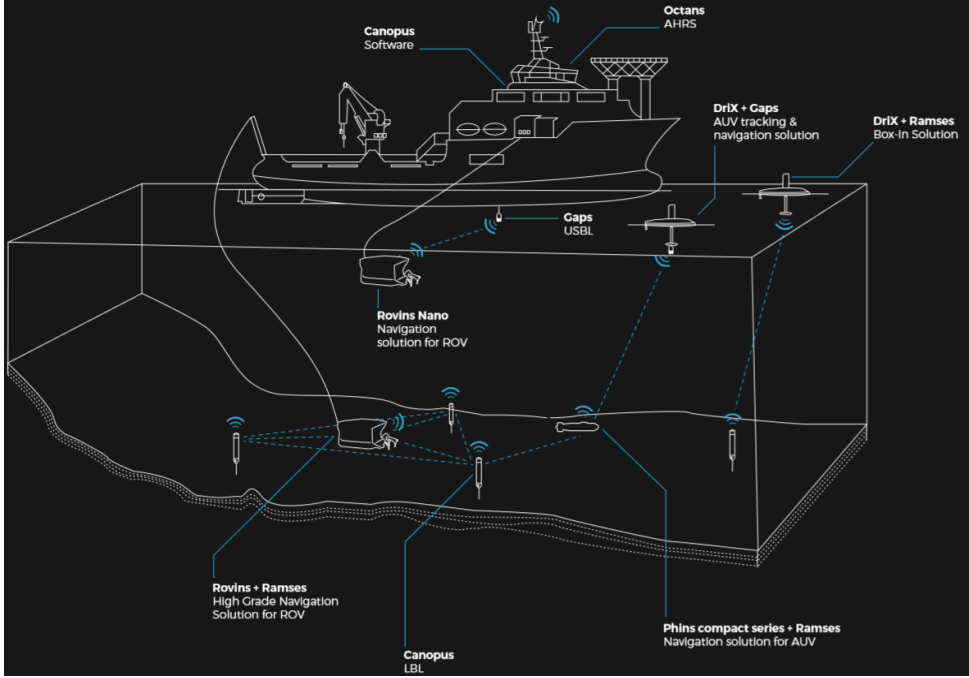
CANOPUS system

A range of sensors



INS — Full range INS for all applications

POSIDONIA — Long range USBL positioning system

GAPS — The fully integrated, portable and pre-calibrated USBL for universal applications

RAMSES — An Acoustic Synthetic BaseLine positioning system, a complementary approach to LBL

Transponders — Low or medium frequency transponders to operate with iXblue acoustic systems

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A new smart transponder for all applications

- ✓ Ranging and communication capability (telemetry : 500bits/s interlaced with positioning cycle ; modem : 10kbits/s apart from positioning cycle)
- ✓ 4,000 m water depth, deeper optional, corrosion resistant
- ✓ Extremely low-power consuming for extended deployments (2-year listening life or in excess of 1,000,000 acoustic pings)
- ✓ Compatible with iXblue products range (GAPS, RAMSES)
- ✓ Internal / external environment sensors and embedded data logger
- ✓ Configuration through WiFi communication / embedded Web_MMI software

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CANOPUS

A new transceiver : RAMSES gen II

- ✓ Positioning system: full LBL or sparse LBL (INS interfacing)
- ✓ Decimeter accuracy
- ✓ 4,000 m water depth, deeper optional, corrosion resistant
- ✓ Acoustic telemetry
- ✓ Embedded data logger
- ✓ Battery backup
- ✓ Internal / external environment sensors included in base configuration + optional sensors
- ✓ User interface (Web_MMI software) through WiFi communication

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CANOPUS

MTBx2 – The OEM transponder for AUV integration

FEATURES

- Gaps USBL positioning, with easy INS USBL aiding
- Robust acoustic data telemetry (500 bits/s)
- External sensor interface
- 3 interrogation channels (2 channels for USBL and 1 for wake-up)
- Hemispherical transmission and reception transducer
- WIFI wireless communication for remote programming and setting to work
- Embedded web-MMI for the configuration
- 4 communication ports (Serial Link and Ethernet)
- Responder and external power supply input
- Low power consumption

BENEFITS

- Simultaneous tracking and acoustic communication
- Platform with multiple input/output ports
- Easy integration in vehicles
- Unified iXblue web-based user interface

Mechanical

Length	380 mm (without connectors)
Diameter	fits in a 120 mm diameter
Weight	2.5 kg with remote transducer
Water depth	4,000 m (transducer head)

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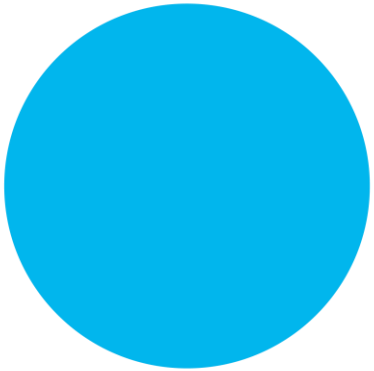

Canopus

Supervision software

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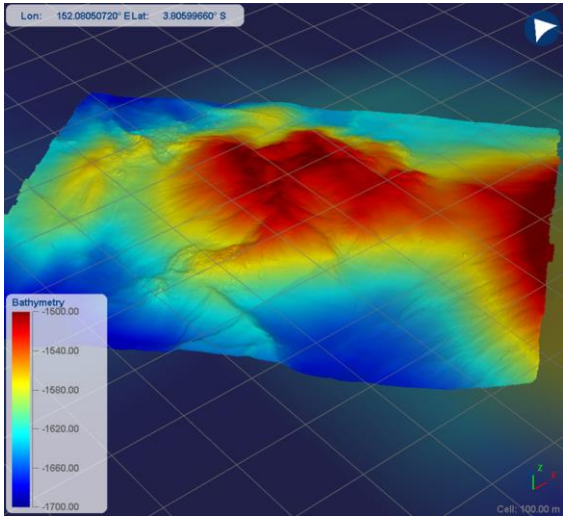
CANOPUS Software

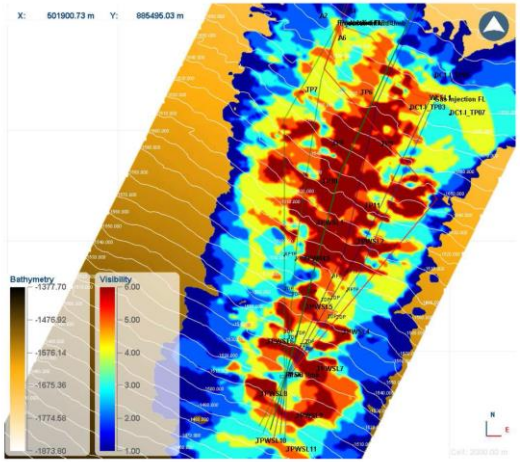
Plan
Prepare the job (how many TP's, where, expected performance, etc).

Deploy and calibrate
Configure and calibrate.

Operate and monitor
Produce QA/QC, reach expected performance. Raise alarms.

Post-process
Improve performance and additional QC.





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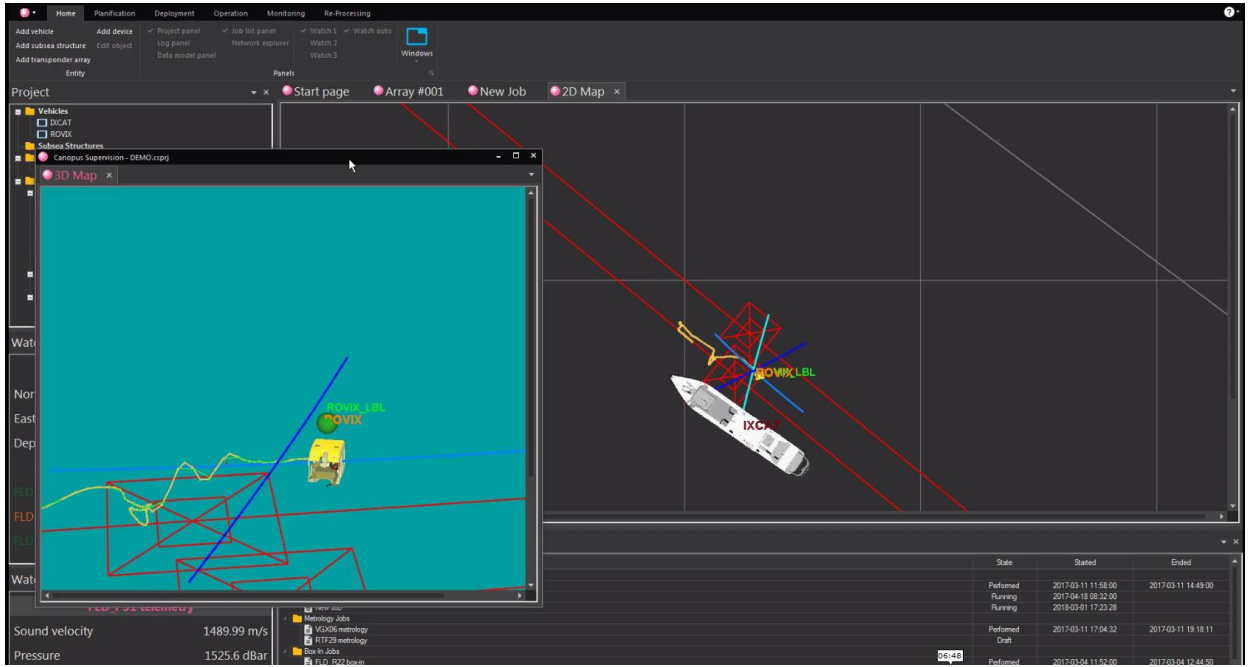

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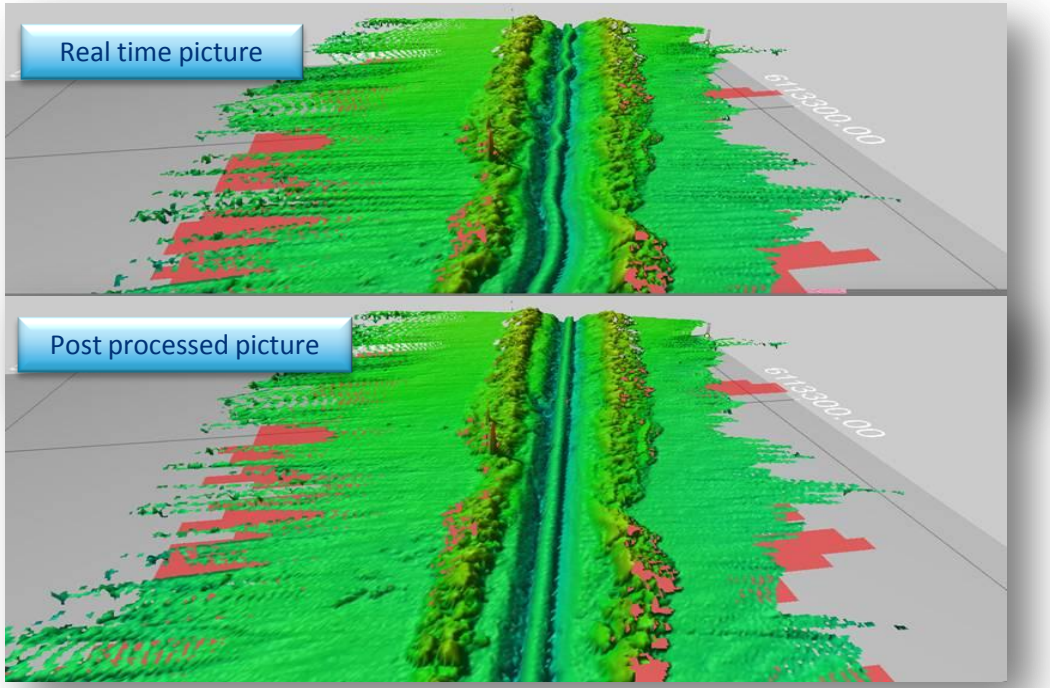

➔ Based on DelphIns short term and long term replay

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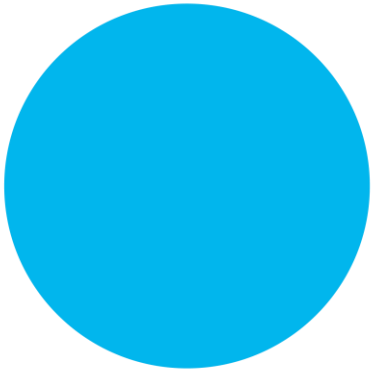
CANOPUS

- Reduction of the number of transponders on the seabed without compromise on performance
- Robust and efficient acoustic data link between subsea devices and from subsea to surface
- Performant and field proven hardware

Picture on the right : Drix



Canopus system

Applications

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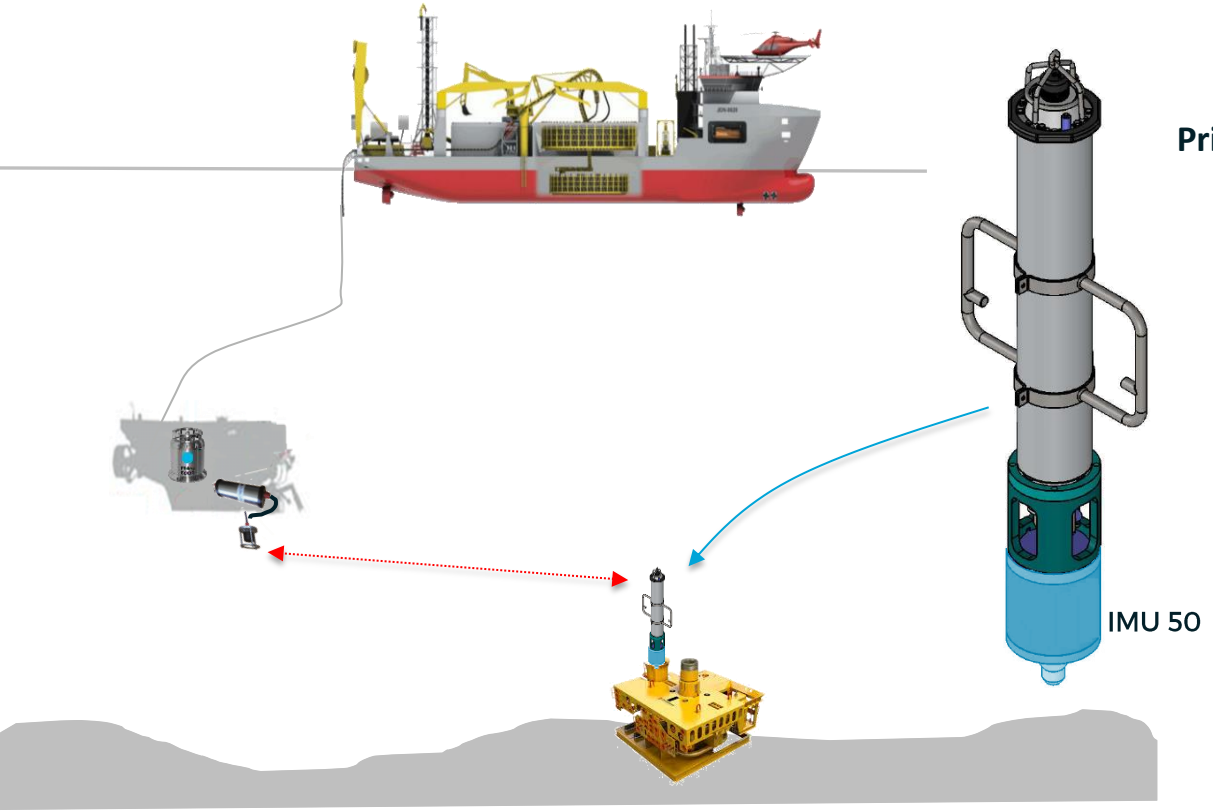
Structure monitoring

Measurement of heading, roll and pitch of a subsea structure



IMU 50

Principle

- Transponder fitted with docking interface
- Coupling with IMU 50
- Deployment on the structure
- Gathering of data (immersion, HRP,…)
- Recovery of the transponder

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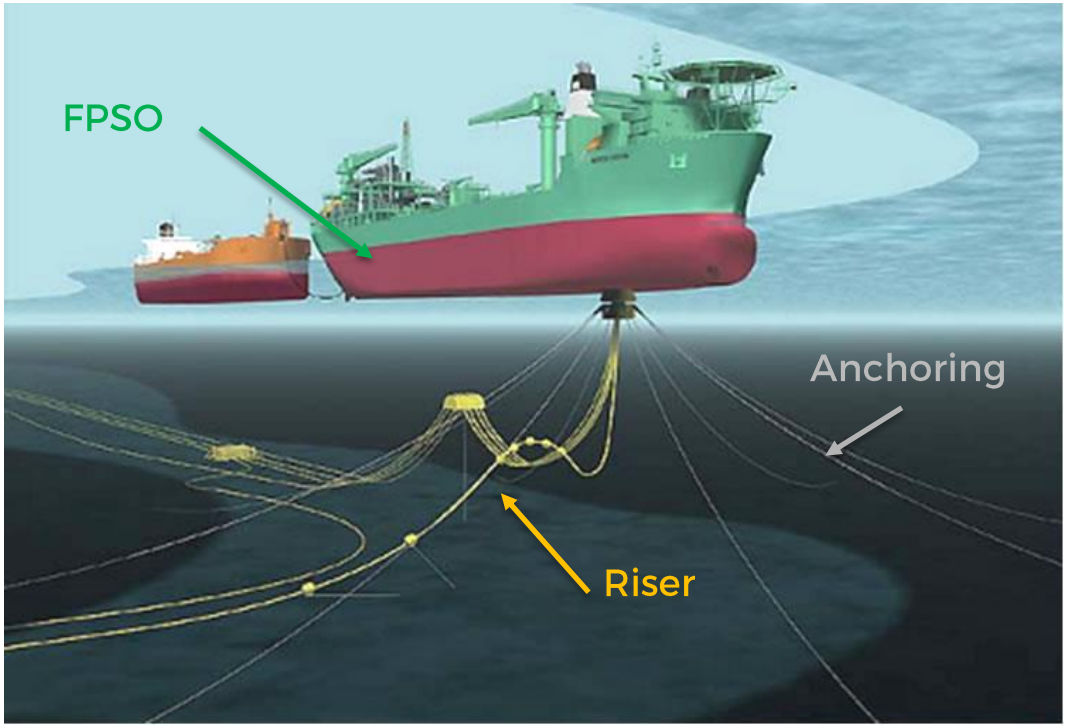
Riser monitoring



Context

- The FPSO collect the oil channelled by the riser
- The FPSO is anchored to the sea floor
- The riser is subject to movements of FPSO and current drag

Purpose

- Monitoring of riser movements

FPSO – Floating production storage and offloading

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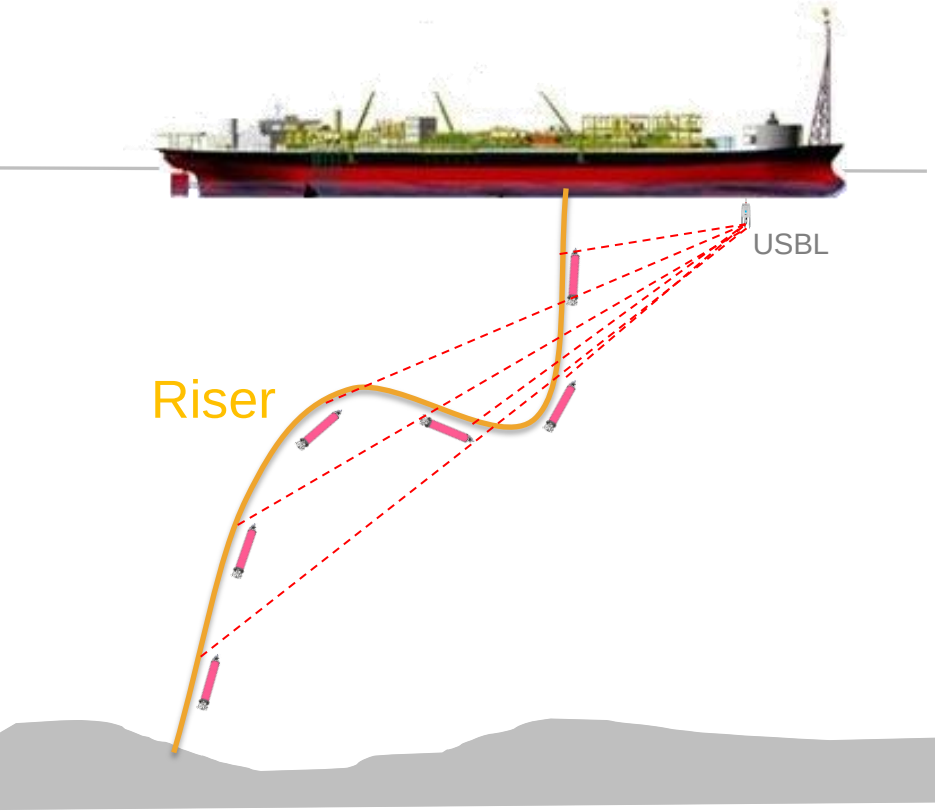
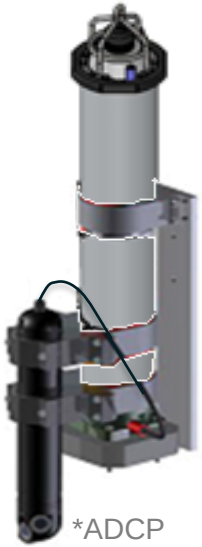
Riser monitoring





Principle

- Instrumentation of Riser (integration of ADCP)
- USBL positioning
- Data recovery :
  - Depth
  - Roll, Pitch
  - Current

**ADCP – Acoustic Doppler Current Profiler*

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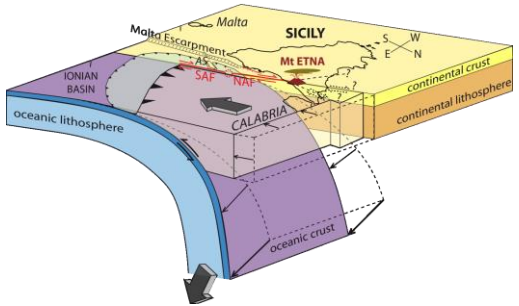
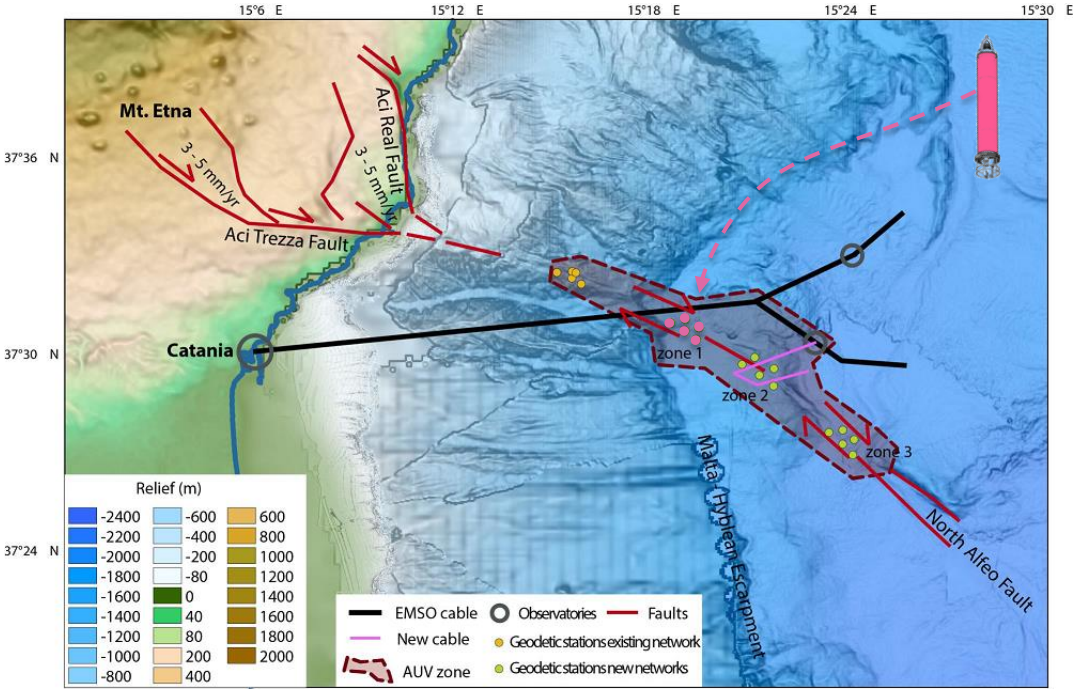
Subsea geodesy

Monitoring of seismic fault offshore Sicily





- Network made of 5 transponders
- Ranges measured between transponders every hour
- Data recovery : 1 to 3 times per year
- Measuring campaign : 3 to 4 years long

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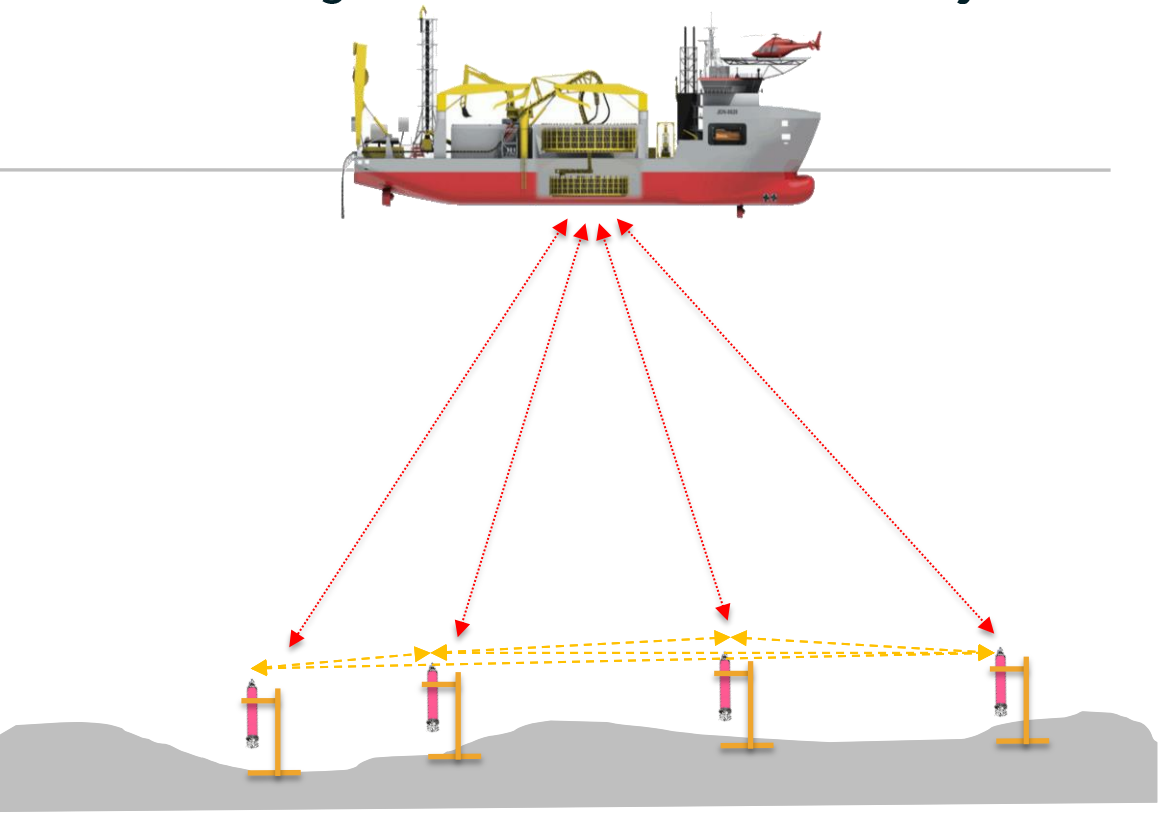
Subsea geodesy

Monitoring of seismic fault offshore Sicily



Principle

- Deployment of the transponders
- Network calibration
- Ranges measurement
- Data recovery
- Data processing
- Recovery of the transponders

Purpose

- Monitoring of tectonic shifts (a few mm per year)

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Thank you !