

OS13B-1522 NEW GENERATION OF FREE-FALL OBS SYSTEMS WITH ACOUSTIC TELEMETRY

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1. INTRODUCTION

Current cabled OBS solutions are financially and logistically challenging, while typical free-fall OBS do not provide users with seismic data until after the system has been recovered and leave doubt surrounding deployment conditions. The Güralp Aquarius provides the solution: an ultra-low-power, free-fall OBS system, operational at any angle with the ability to transmit seismic data in near-real-time from the seafloor without re-surfacing or use of cables.

2. THE SENSOR

- > 120 s-100 Hz Seismometer
- > Tilt tolerance $\pm 90^\circ$
- > Up to 24-month battery life
- > 128 GB dual redundant memory
- > Optional grades of hydrophone and pressure gauges

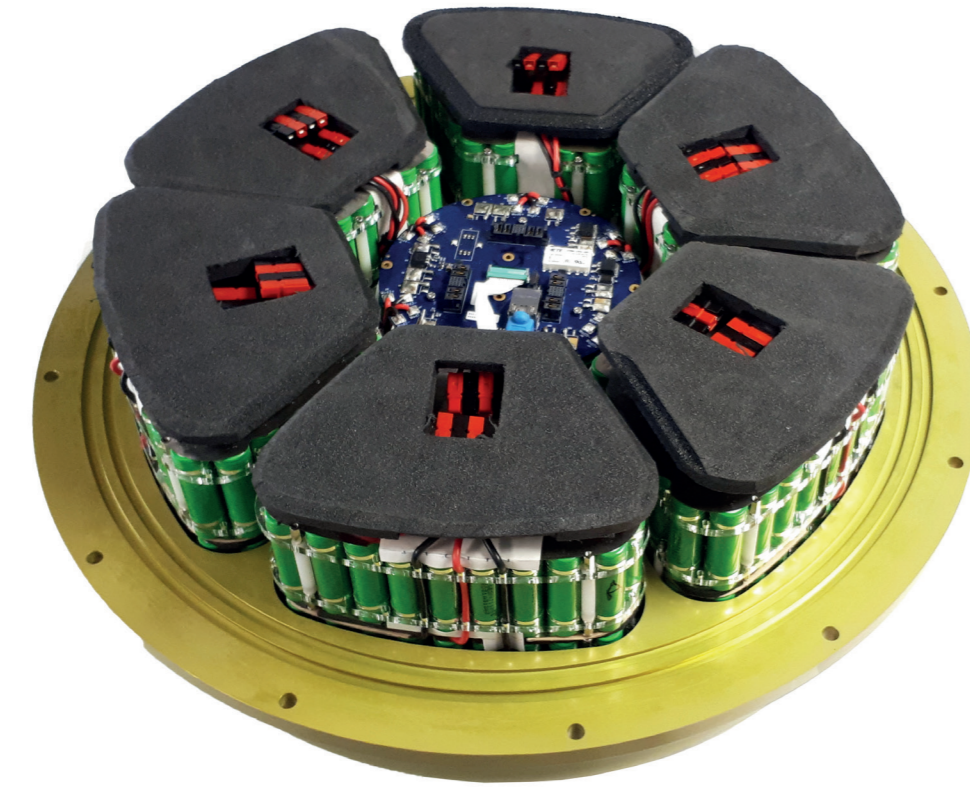


Fig. 1 Aquarius pressure vessel houses sensors, digitiser and battery packs

The digital feedback system within the sensor allows you to remotely configure the long-period corner of the sensor to suit the deployment environment and investigation requirements. Aquarius comes equipped with an absolute pressure gauge (APG) and sea temperature sensor as standard with additional options of a high-resolution APG and two grades of hydrophone. These additional sensors allow the OBS to form a micro-observatory incorporating seismic, hydrological and tsunami monitoring into one system.

3. PHYSICAL CHARACTERISTICS AND INSTALLATION

- > 1m diameter
- > Low profile
- > 4000m and 6000m depth options
- > 35kg in water
- > USBL and GPS-A compatible
- > LED strobe light and satellite tracker

The compact and low-profile shape of Aquarius minimises noise interference from seabed currents while reducing transportation and installation costs. Durable syntactic buoyancy foam houses the main pressure vessel containing the seismometer and sufficient batteries to meet budget requirements and deployment periods up to 24 months.

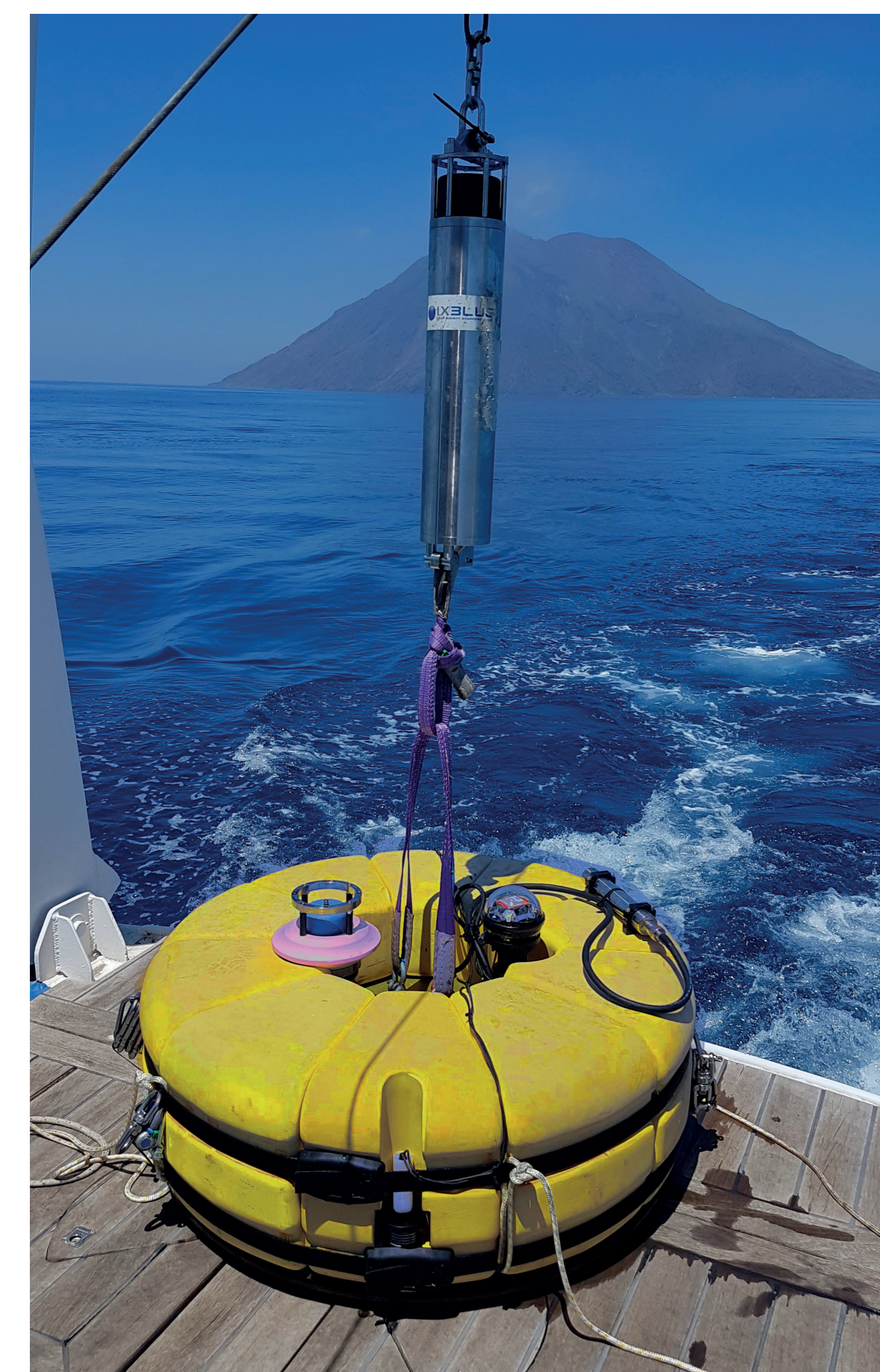


Fig. 2 Test deployment of Aquarius near Stromboli

Data from all sensors and State-of-health (SoH) parameters including tilt angle and power spectral density graphs can be viewed during installation via the acoustic modem to ensure confidence in site conditions before leaving the area. USBL compatibility provides fast and accurate OBS location on the seafloor, thereby minimising ship time and installation costs.

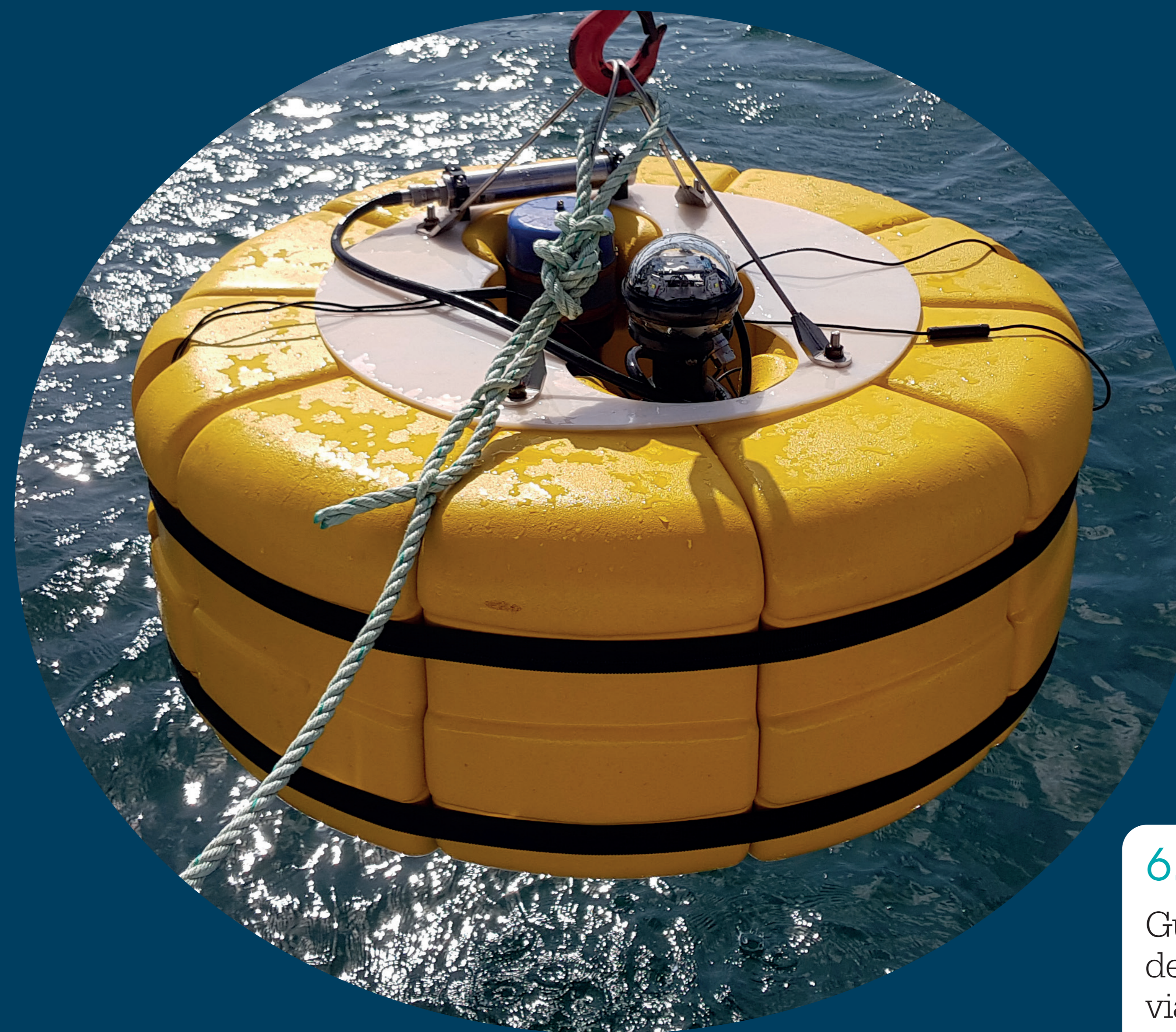
The steel ballast ring is released upon acoustic command, pre-programmed timeout limit or critical battery level trigger. Satellite tracking and automated email/SMS alerts allow tracking of the sensor before recovery. Once recovered, Gigabit Ethernet data download and system configuration operates simultaneously alongside battery recharging to minimise redeployment time.

4. SEAFLOOR TO SURFACE ACOUSTIC TELEMETRY

Deployments in marine environments are complex, expensive and risky. The use of free-fall OBS provides a relatively simple and quick deployment method, however operators cannot usually be certain of data quality until recovery several months later. Güralp has addressed this inherent problem with the introduction of two grades of acoustic communication to ensure operators are confident of site quality before leaving.

Aquarius incorporates seafloor-surface communication technology that allows SoH and noise performance interrogation during installation followed by retrieval of seismic data throughout the deployment period. The operator can choose to download event-specific or time-window data during deployment to maximise energy efficiency and battery-life.

This use of acoustic communication dramatically increases the range and scope of deployment options for OBS units around the world geographically, logistically and financially for all applications.



7 APPLICATIONS

- > Local and regional seismic research
- > Energy exploration
- > Noise surveys
- > Aftershock monitoring
- > Local and regional seismic research
- > Earthquake/Tsunami Early Warning
- > Temporary or permanent seismic monitoring via acoustic link connection with buoys or rigs

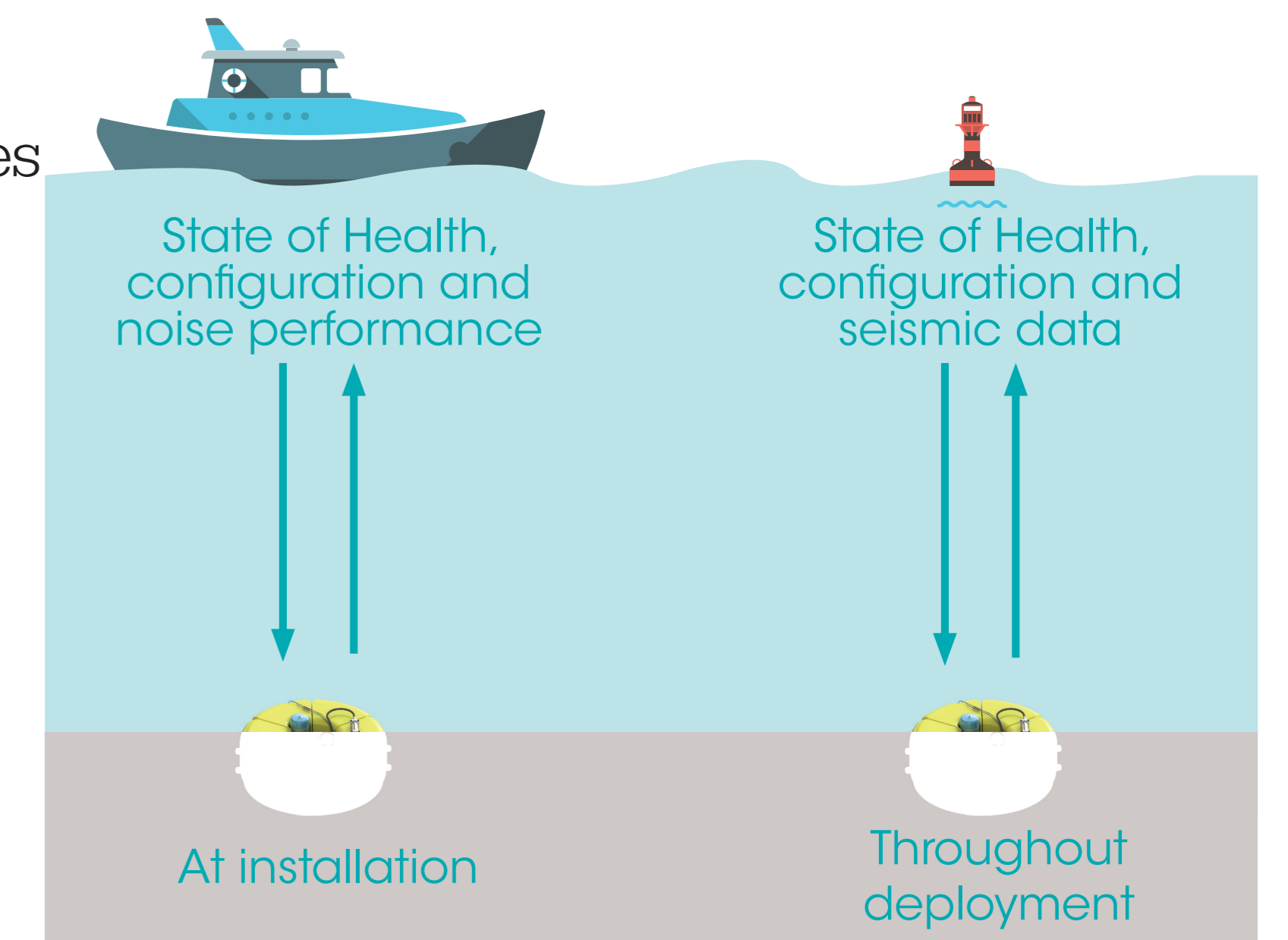


Fig. 3 Telemetry capabilities for Aquarius

5. KEY FEATURES

- > 4,000m or 6,000m depth options
- > 12-month battery life with up to 15MB/month data transfer or 24 month battery life in recording mode
- > SoH and noise performance data during installation
- > Up to 9000bps data transmission rate
- > On-demand event-specific or time-window data transmission
- > Data retrieval via ship, buoy or wave glider
- > Satellite tracking, LED strobe light, acoustic localisation for ease of recovery
- > Simple ballast replacement for rapid re-deployment
- > Lithium-ion batteries for fast re-charging (1 hour to re-charge per 1 month deployment)
- > GPS-A for seabed deformation analysis
- > USBL compatibility for fast and accurate OBS location

6. DISCOVERY SOFTWARE INTERFACE

Güralp's new Discovery software is operated via the deck unit onboard the deployment vessel or remotely via satellite link if the Aquarius is communicating with a tethered buoy. As well as being used to locate the position and timing accuracy of the unit, Discovery allows fast analysis of data downloaded from the OBS and configuration of parameters such as STA/LTA triggering, long-period cut-off frequency and gain during initial deployment and in return trips to the site if project requirements change.

The calendar view in Discovery allows the operator to easily identify seismic events during deployment and select event or time-window specific data to download. The compressed event table gives users a preview of all candidate events in Discovery before full data retrieval to ensure optimum battery-life.

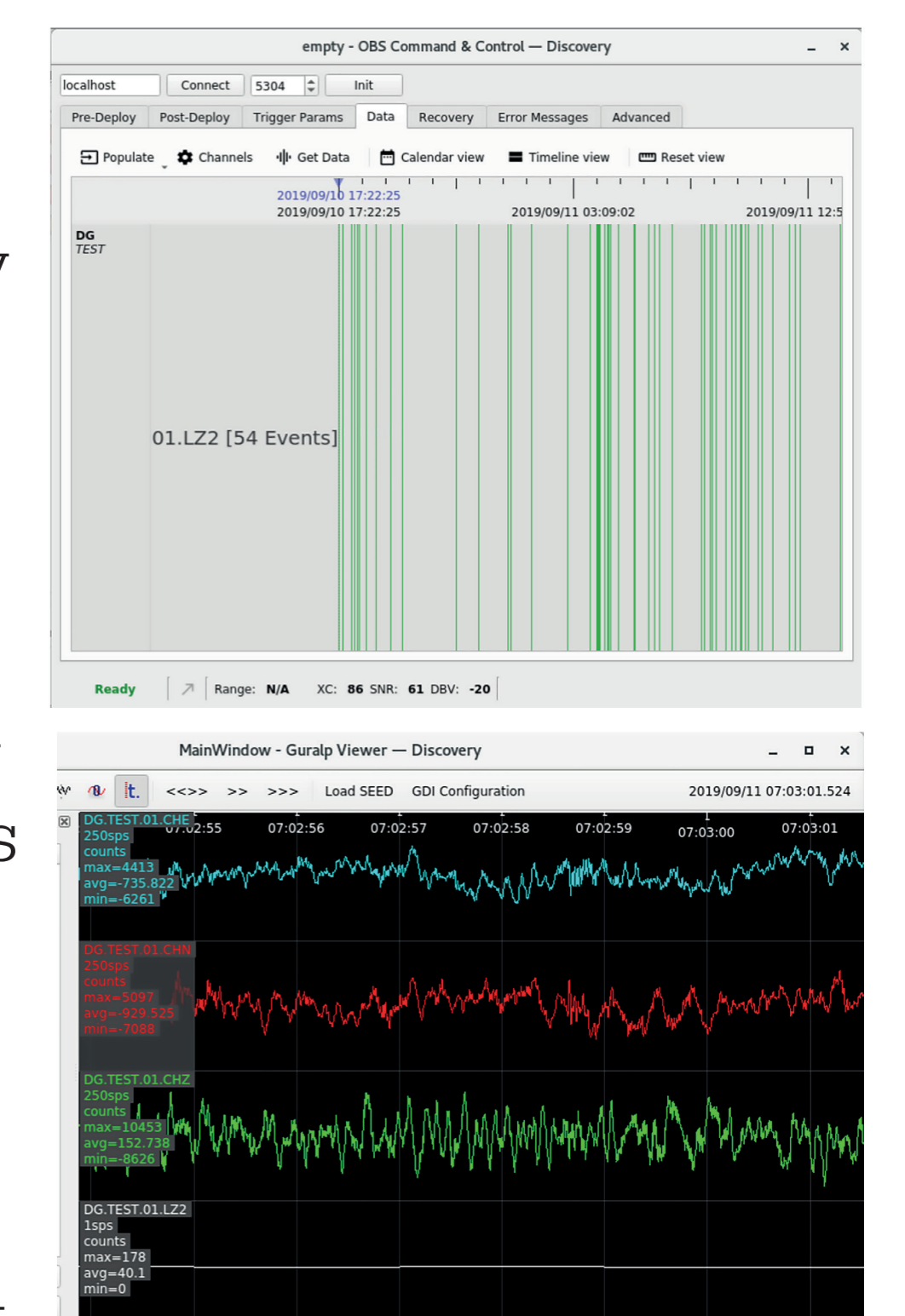


Fig. 4 Remote selective data download and analysis in Discovery during deployment