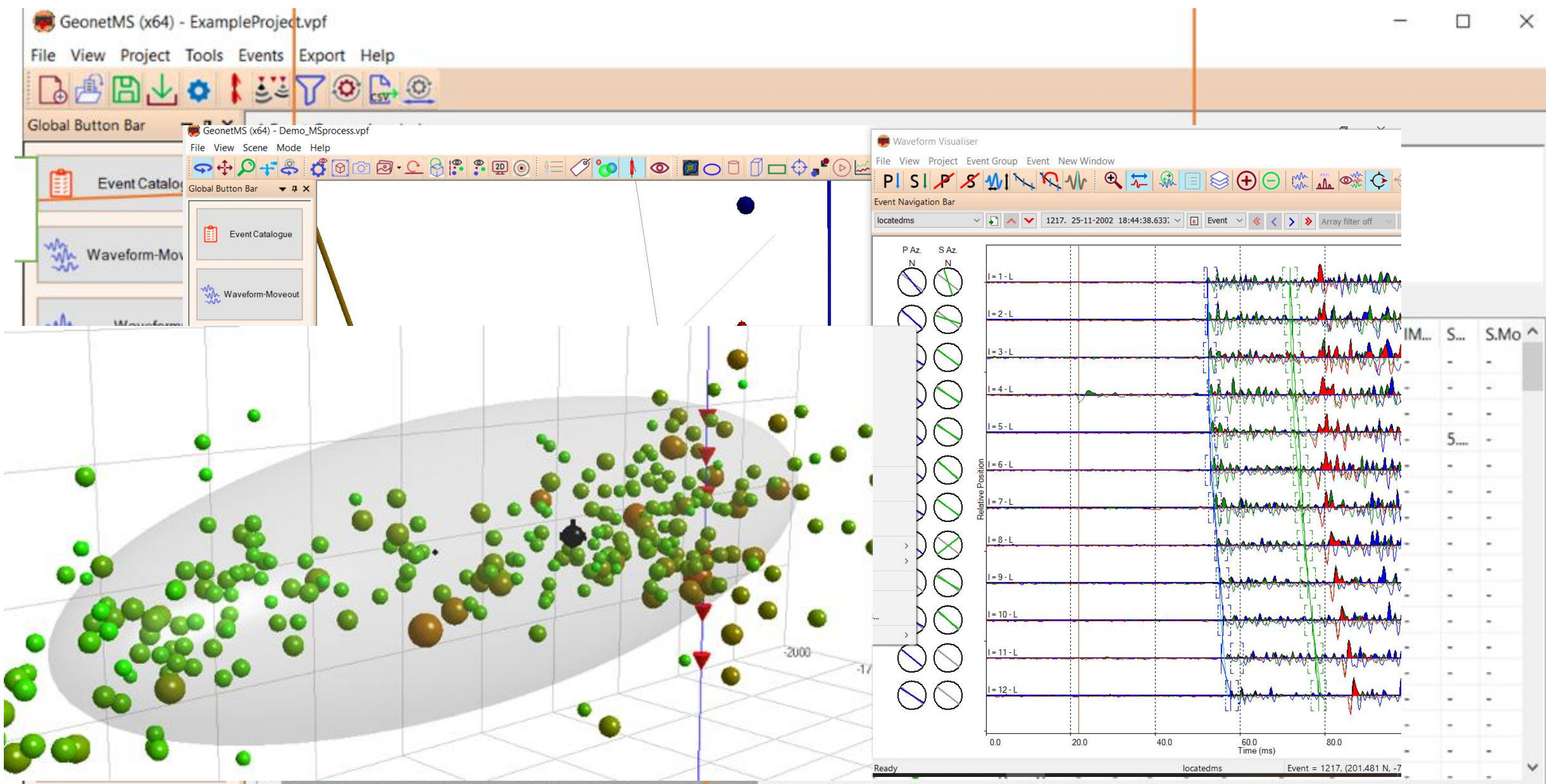


Downhole Microseismic Monitoring

VSP, Production Profile and Fracture Monitoring



GEOFRAC Fracture Monitoring System:

Vinci's fracture monitoring system brings together the latest development in the downhole tools a surface acquisition system "GEONET" which includes:

- The power supplies, the telemetry interface interconnection boxes (GPS in option)
- The acquisition software for the system and tools control, the QC software and the Process software.

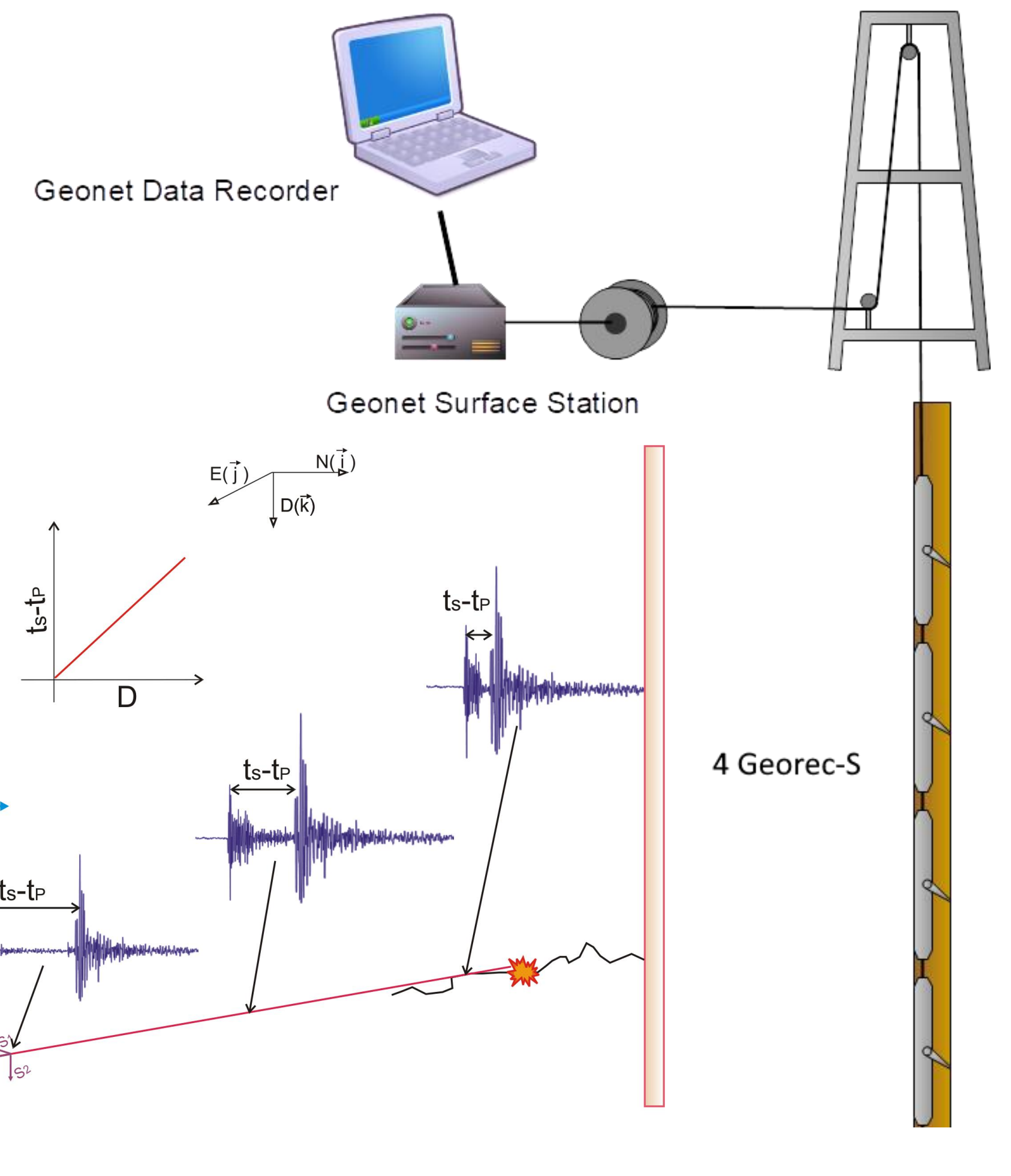
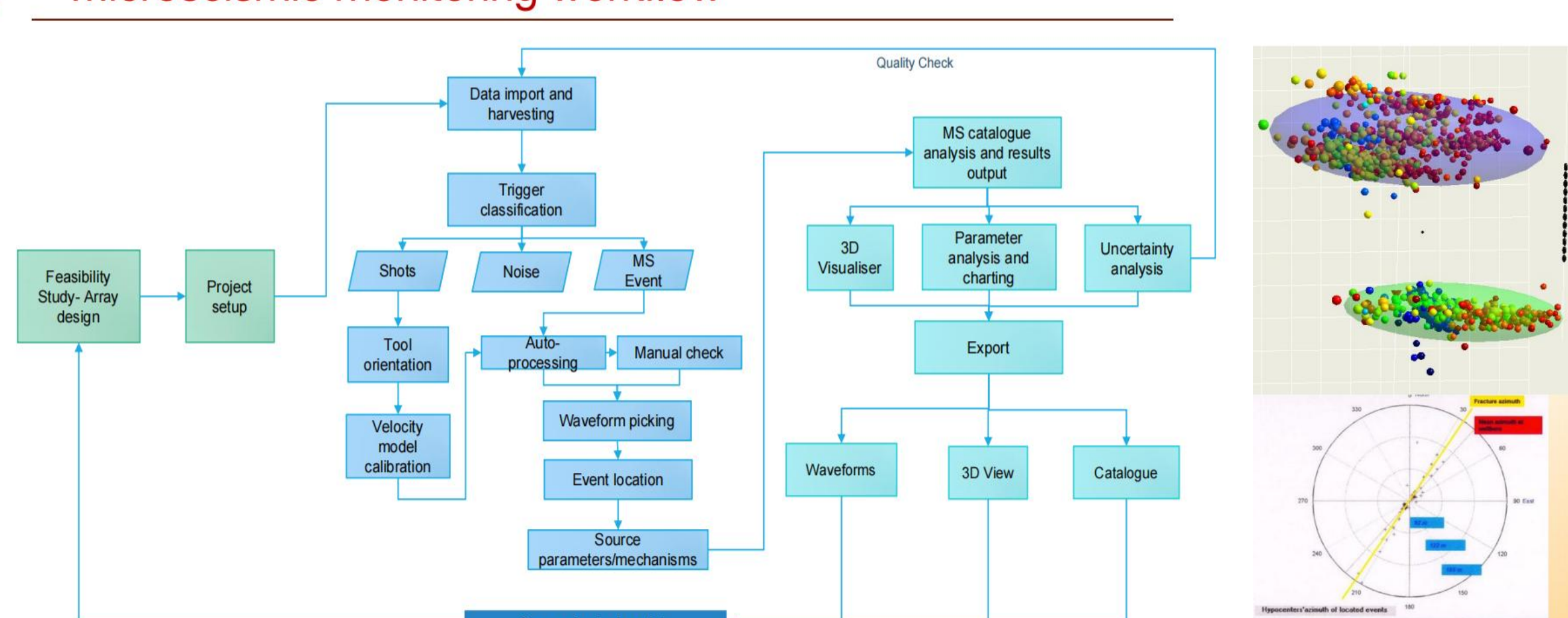
Vinci's fracture monitoring system GEOFRAC can be used in multiple configurations:

- ✓ as a single level downhole tool in the treatment well
- ✓ in the observation well, by using a multi-level downhole tool.
- ✓ It can be used in open or cased holes.
- ✓ It has a small diameter design, 2", to be operated through the well completion. The tool can be located at the reservoir level, i.e. below the Packer.
- ✓ The sensors used are accelerometers (high bandwidth).
- ✓ Transmission is operated by using a mono, bi a hepta conductor cable when operated with BOP at highly pressurized wells. High sampling rate (0.2ms) can be selected for higher accuracy.

Vinci's downhole fracture monitoring tool is the only system that includes in a unique level the sensors, the anchoring arm, the power supply and the telemetry.

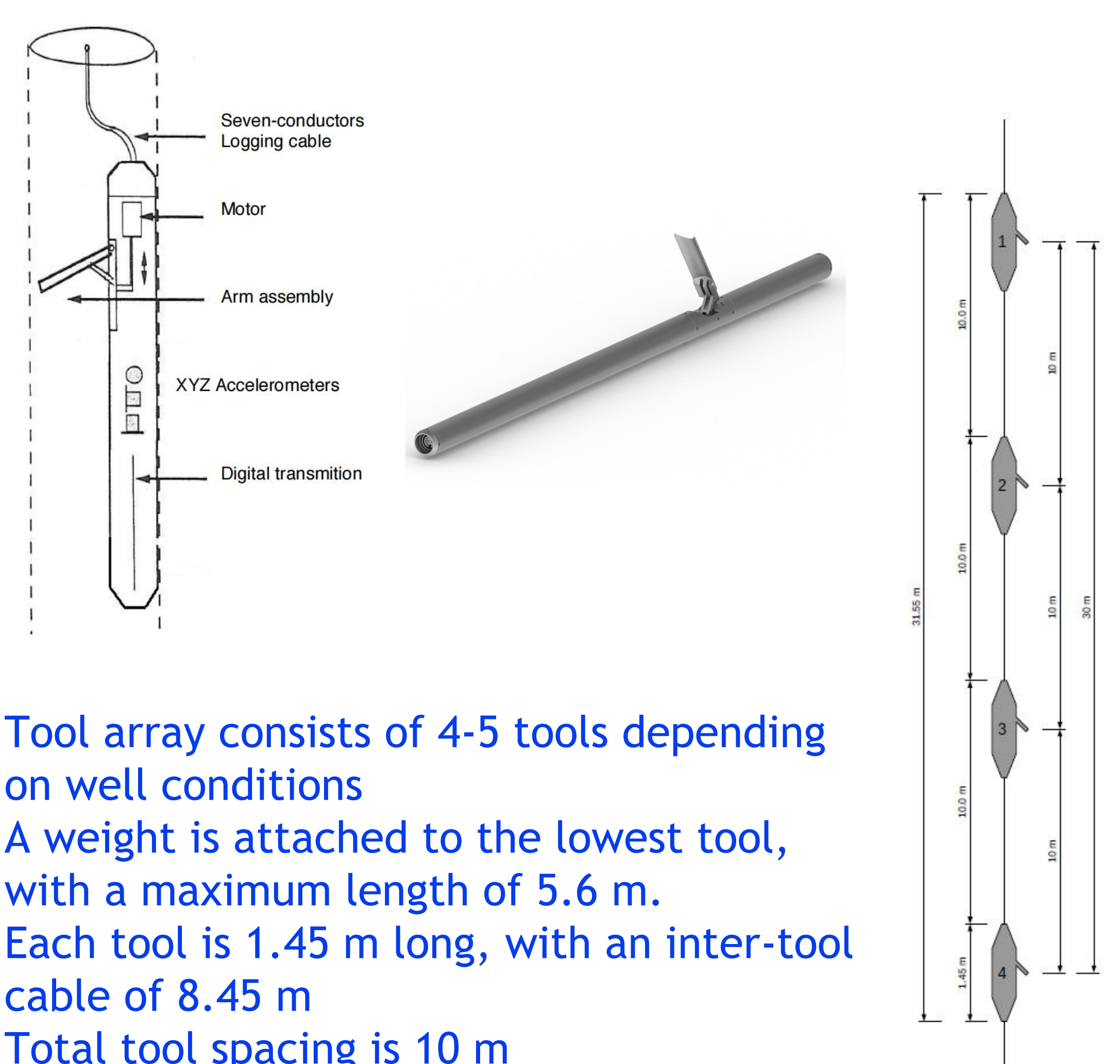
Vinci's downhole fracture monitoring tool works at up to 180° C continuously without any cooling system and at up to 150MPa.

Microseismic monitoring workflow



GEOREC-S Key Features:

- High Temperature Slim 24-bit Digital Tool
- Working Temperature up to 356 F (180° C)
- Working Pressure up to 21,500 psi (1,500 bar)
- Independent power supply and telemetry on each level
- 2" (50 mm) diameter. 57" (1,450 mm) length
- Accelerometer sensor
- Connected using a 9mm diameter cable



- ① Tool array consists of 4-5 tools depending on well conditions
- ② A weight is attached to the lowest tool, with a maximum length of 5.6 m.
- ③ Each tool is 1.45 m long, with an inter-tool cable of 8.45 m
- ④ Total tool spacing is 10 m

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Distributed Fiber Optical Sensing

VSP, Production Profile and Fracture Monitoring

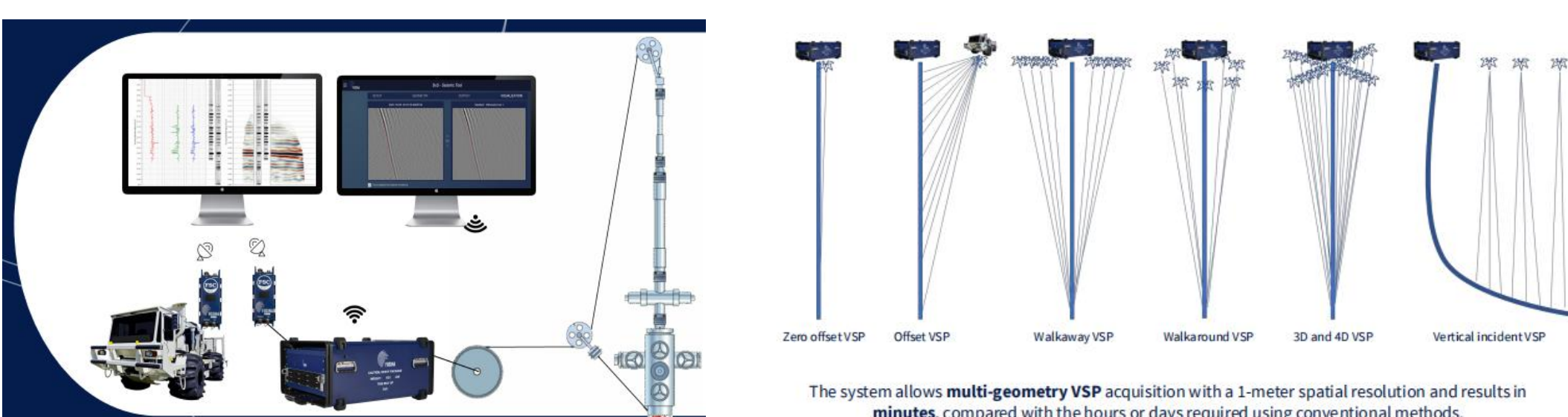
DISTRIBUTED FIBER OPTIC SENSING:

FOR OIL & GAS APPLICATIONS



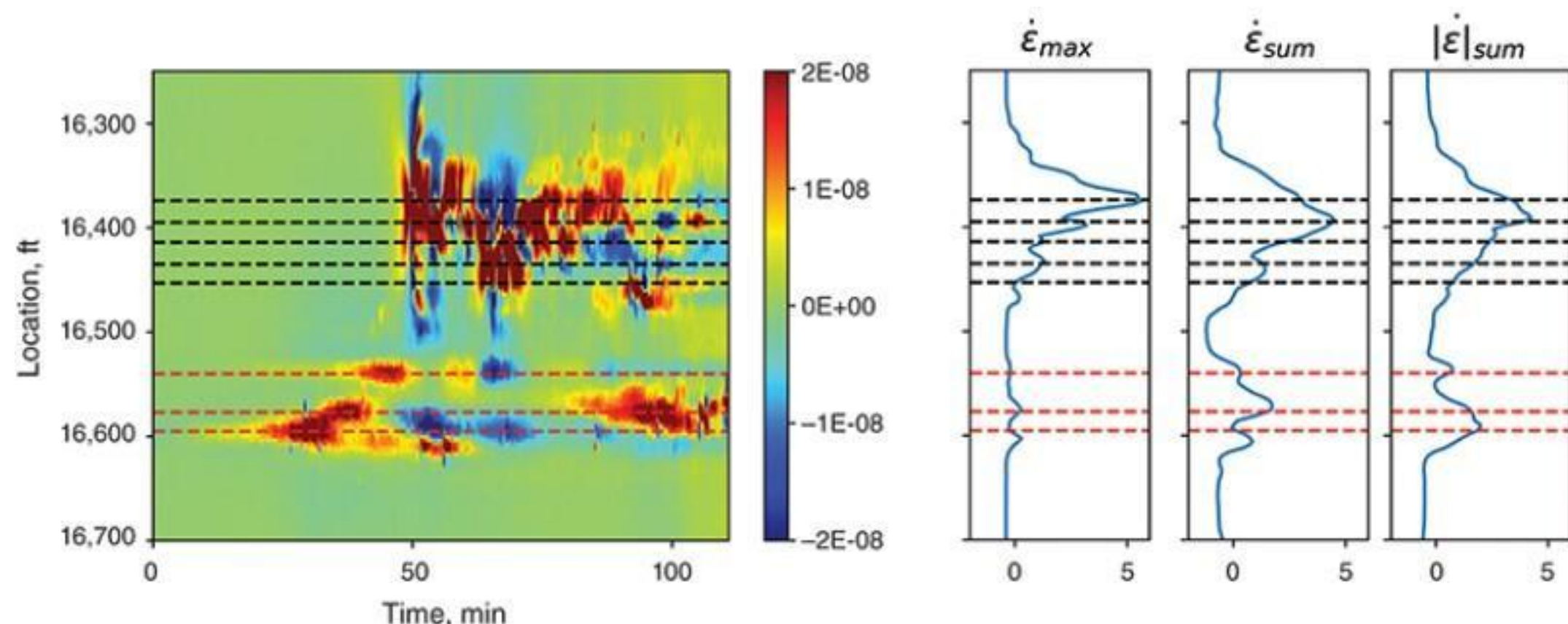
Borehole Seismic Application:

“Efficient acquisition of the entire borehole seismic profile in a single operation for land and marine environments”

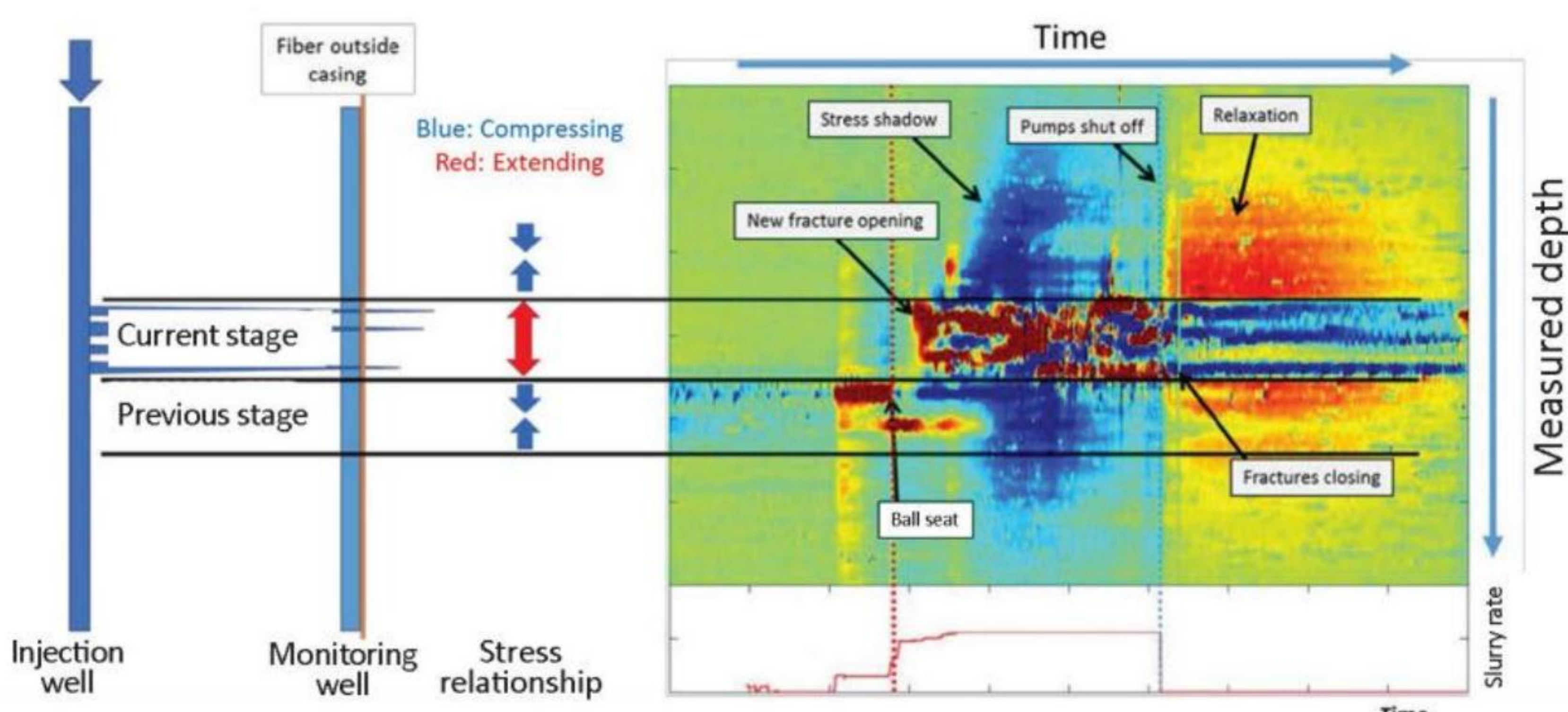


Injection and Fracture Application:

“Optimizing reservoir stimulation through fracturing using fiber optic multi-parameter monitoring”



LF (Low-frequency) – DAS



- ◆ Unique solution providing strain (DSS), acoustic (DAS), temperature (DTS) and thermal gradient (DTGS) measurements from a single optical interrogator
- ◆ Accurate micro-seismic event location down to 1.5 m
- ◆ Simplified and robust installation with no operational maintenance of in-field equipment
- ◆ Remote monitoring and surveillance through a web-based application
- ◆ Longest range with 100+ km using a single-end access to the fiber for long umbilical applications

FOSINA FIBER OPTIC SYSTEMS ACQUIRE

- ① Borehole seismic
- ② Cement evaluation
- ③ Perforation monitoring
- ④ Injection
- ⑤ Flow profiling
- ⑥ Microseismic
- ⑦ Production
- ⑧ Well integrity

Production Application:

“Inference of the inflow profile from distributed sensing data”

Different frequency bands of data from a single DAS (Distributed Acoustic Sensing) measurement can contain distinct information:

Low Frequency:

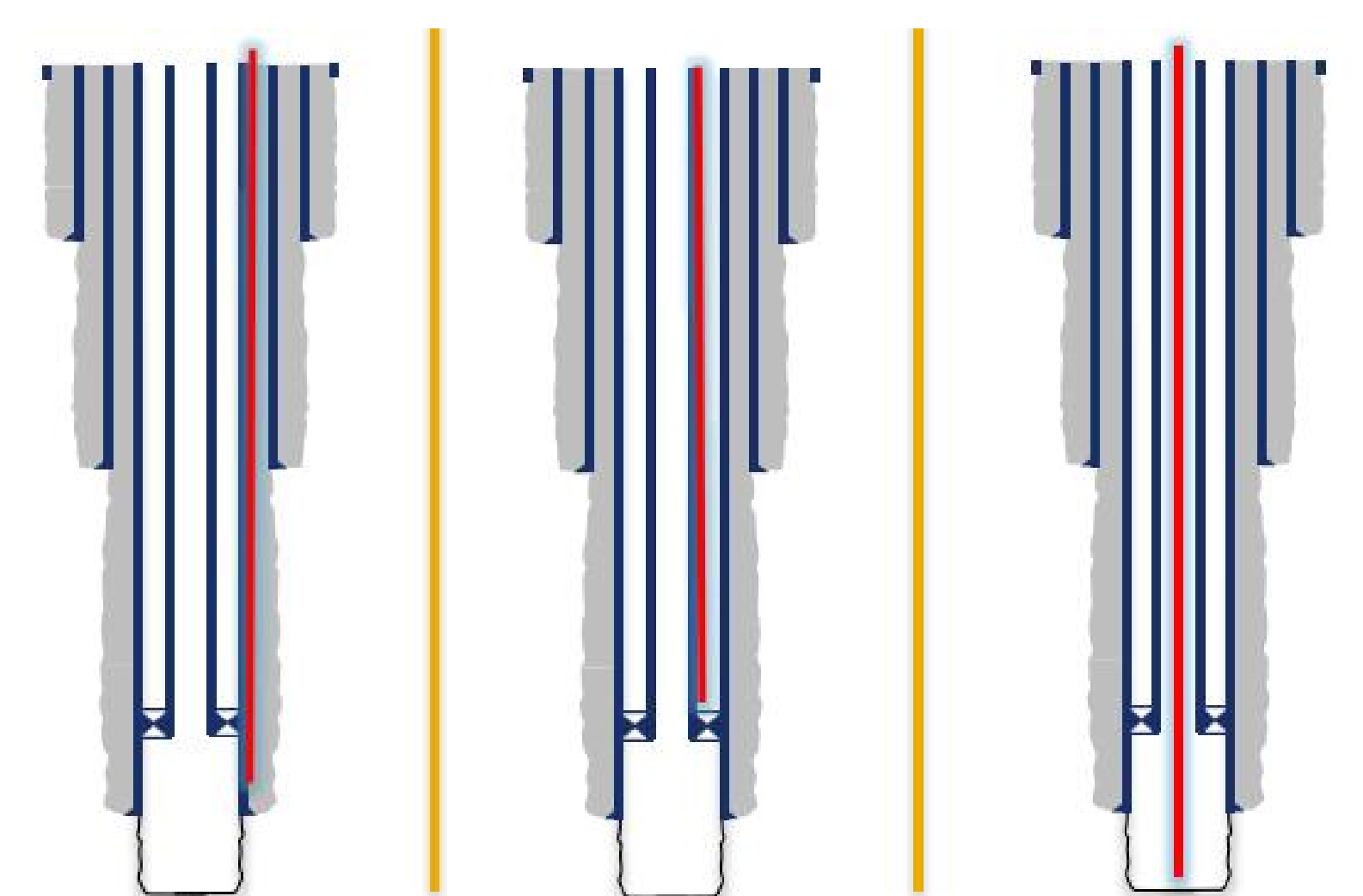
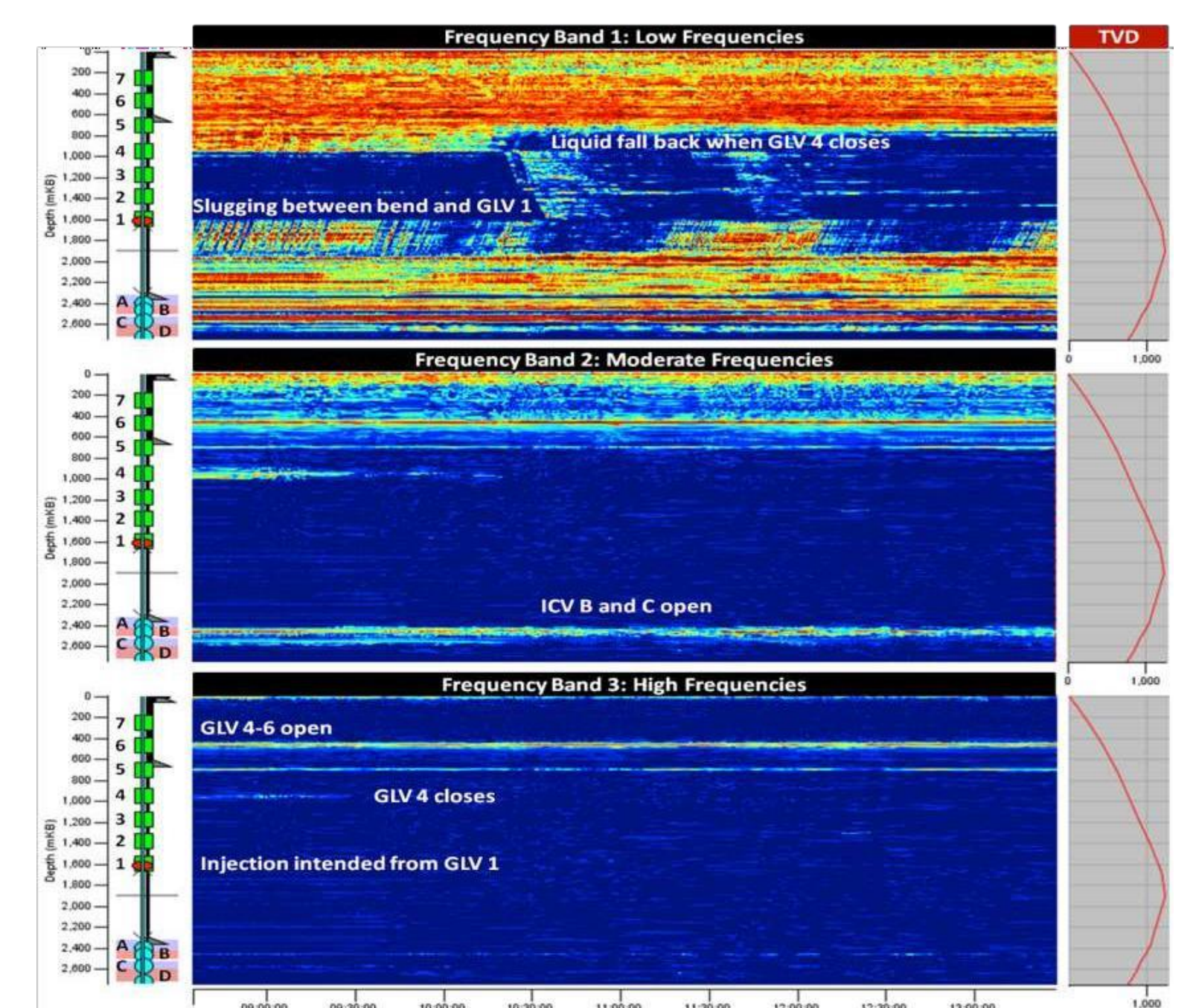
- Liquid transport
- Fluid interfaces
- Thermal disturbances

Mid Frequency:

- Flow through ICVs (Interval Control Valves)
- Flow around obstacles

High Frequency:

- Flow through GLVs (Gas Lift Valves)



Deployment of Optic Fiber

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