

«Reservoir Live»

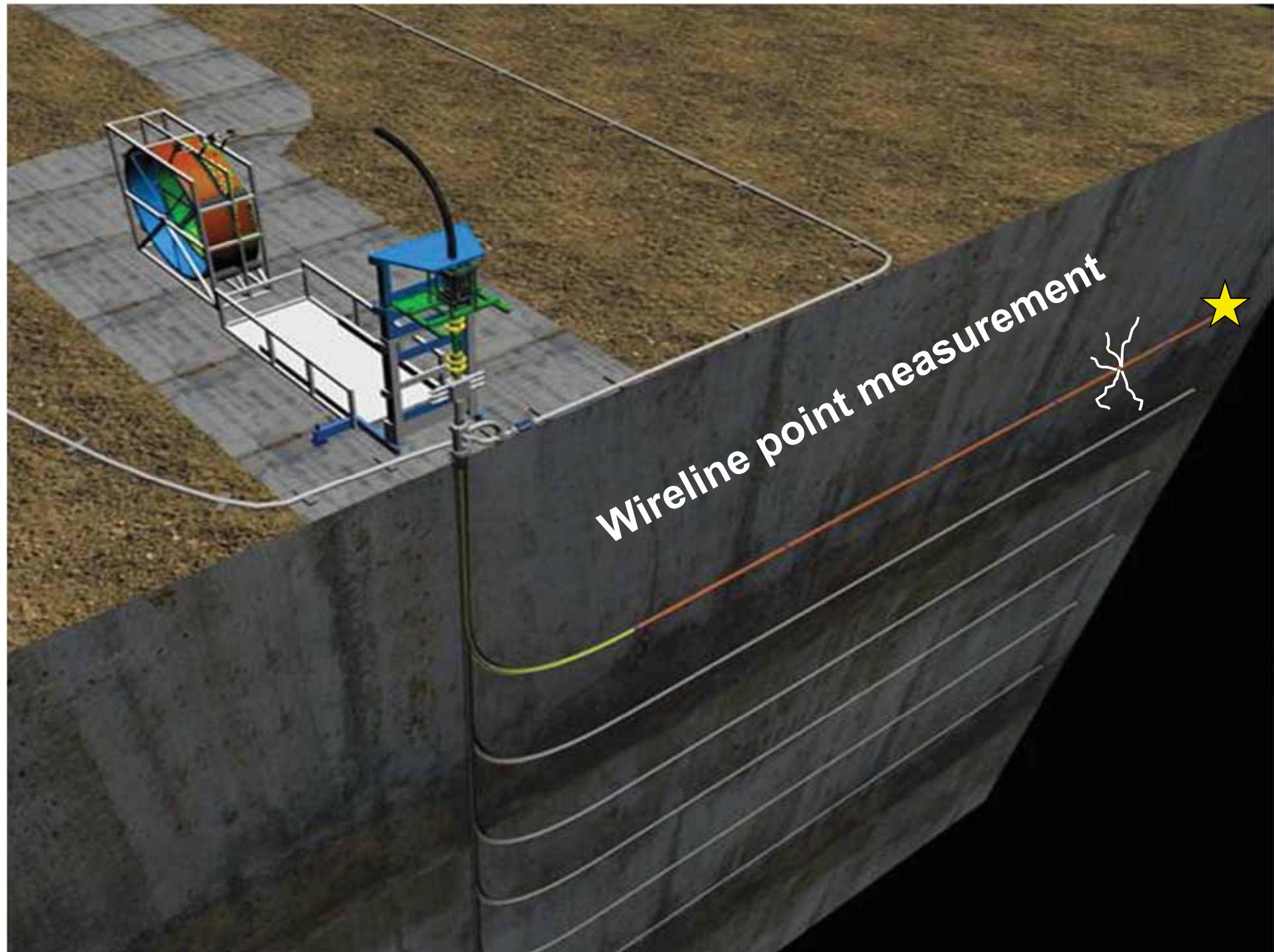
A paradigm shift in reservoir management

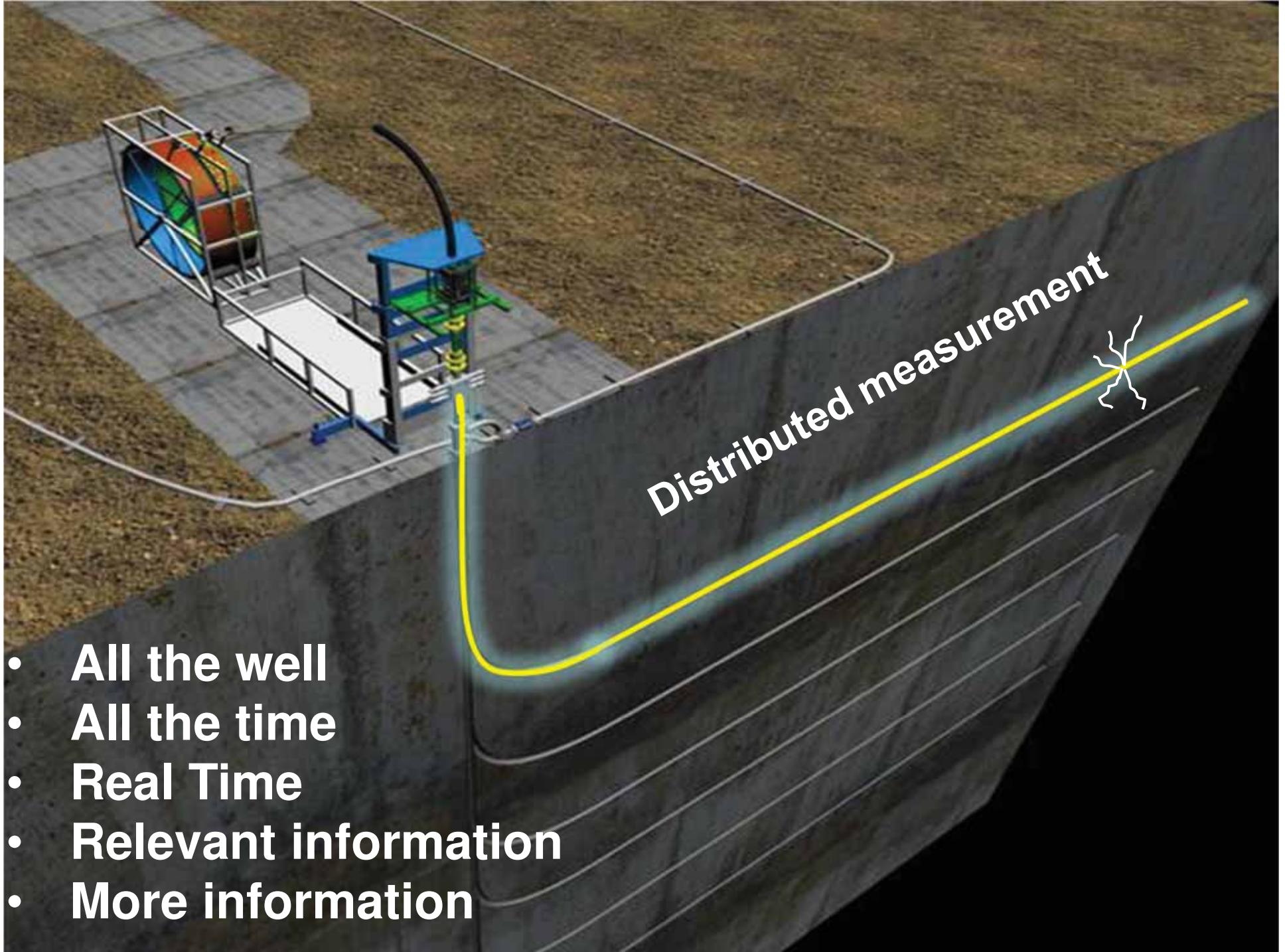
Hans Kristian Hegland

VP Sales & Business Development

Agenda

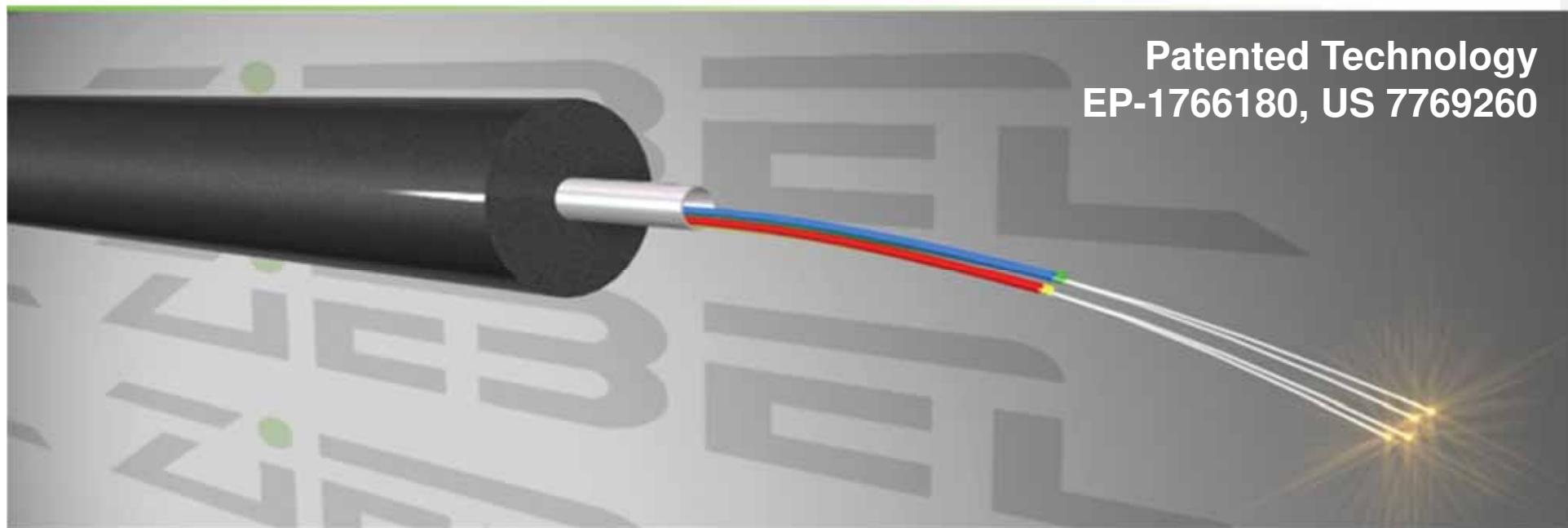
- Set the stage
- Description of the technology
- Examples
 - Injection – flow allocation
 - Leaking packer in the B-annulus
 - Restrictions in the well bore
 - Fracturing during injection
- Summary





Carbon Rod and fiber technology

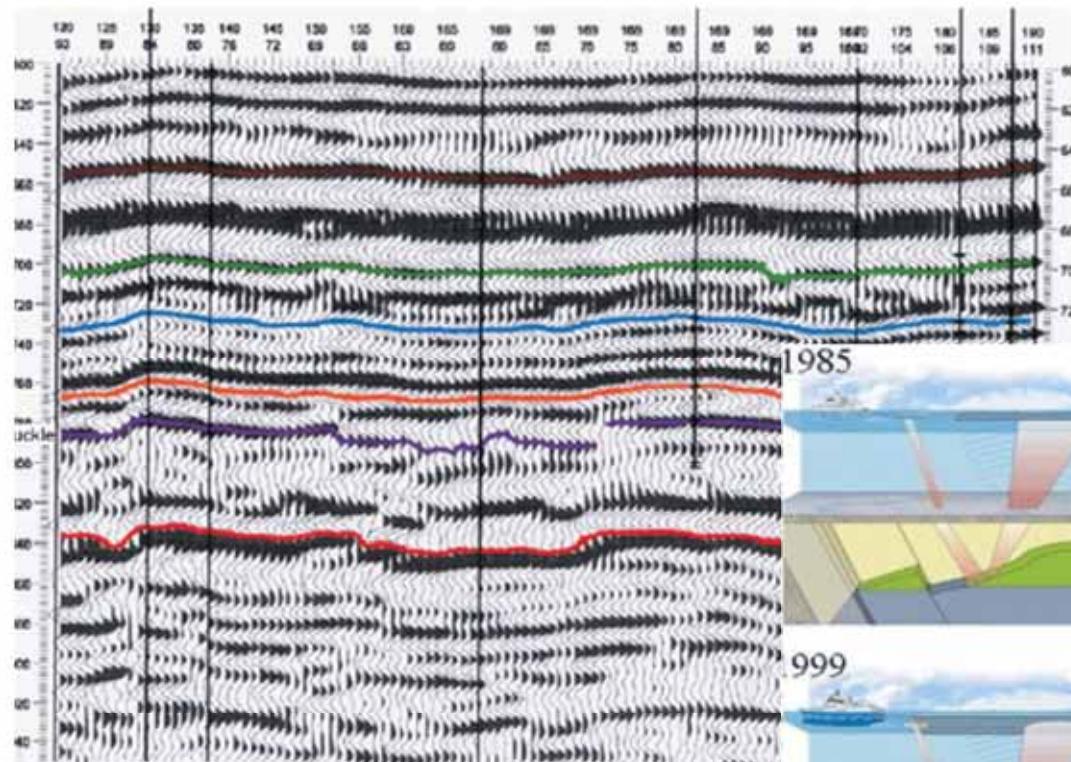
Patented Technology
EP-1766180, US 7769260



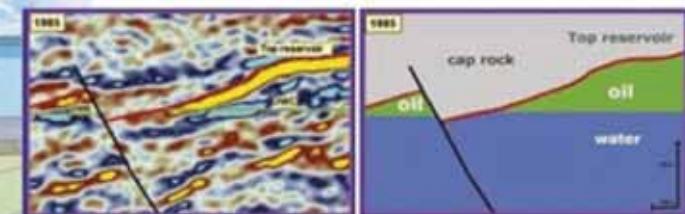
ZIEBEL

Logging vs Sensing - In the footsteps of seismics

2D seismic



3D seismic

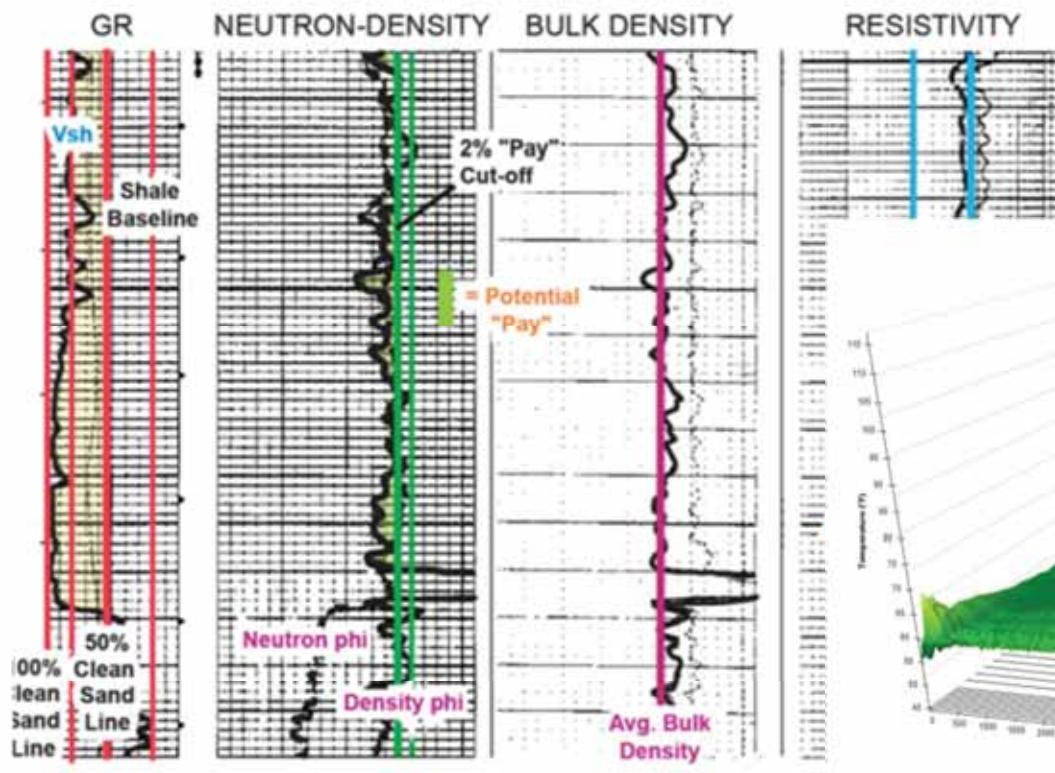


4D seismic



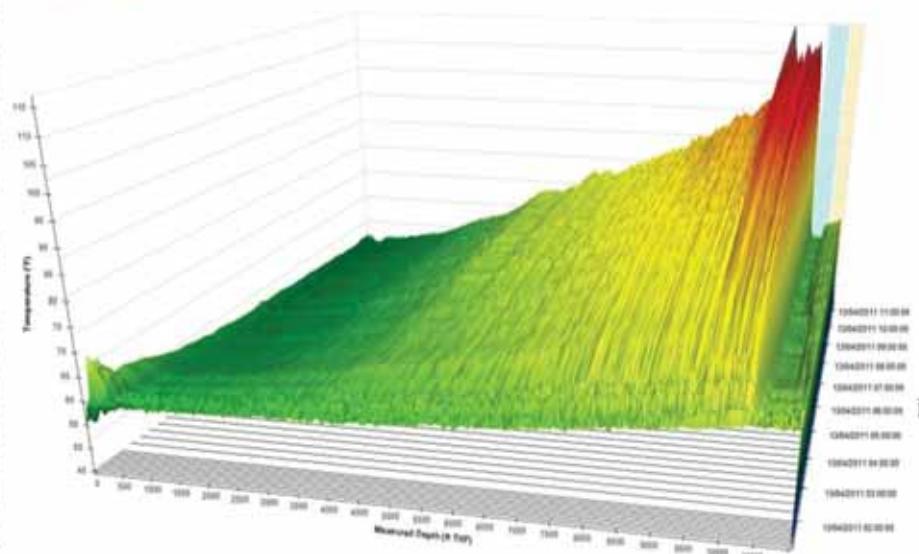
Logging vs Sensing - In the footsteps of seismics

2D Logging



Data points vs depth (2D)

Ziebel's 4D Sensing



Data points vs depth vs all depths vs time (4D)

Applications today and near future

Flow allocation

Zonal definitions

3-phase flow

Gas Lift Optimization

Flow behind casing

Stimulation

Leak Detection

Mechanical operations

Scale squeeze

Top of Cement

2-phase flow

Sand Detection

Fracturing

Water breakthrough

Heavy oil detection

Conveyance

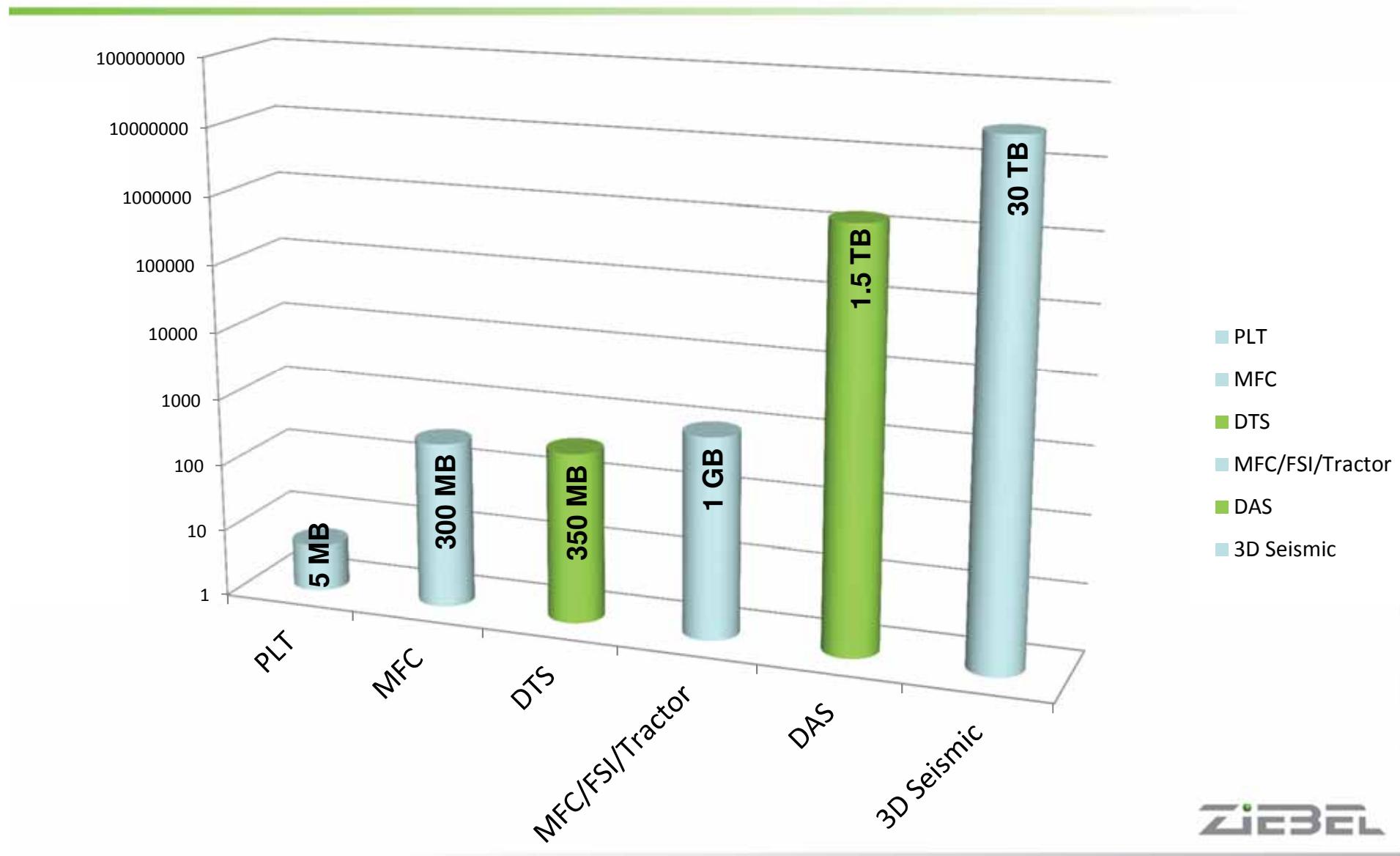
Flow pattern recognition

VSP

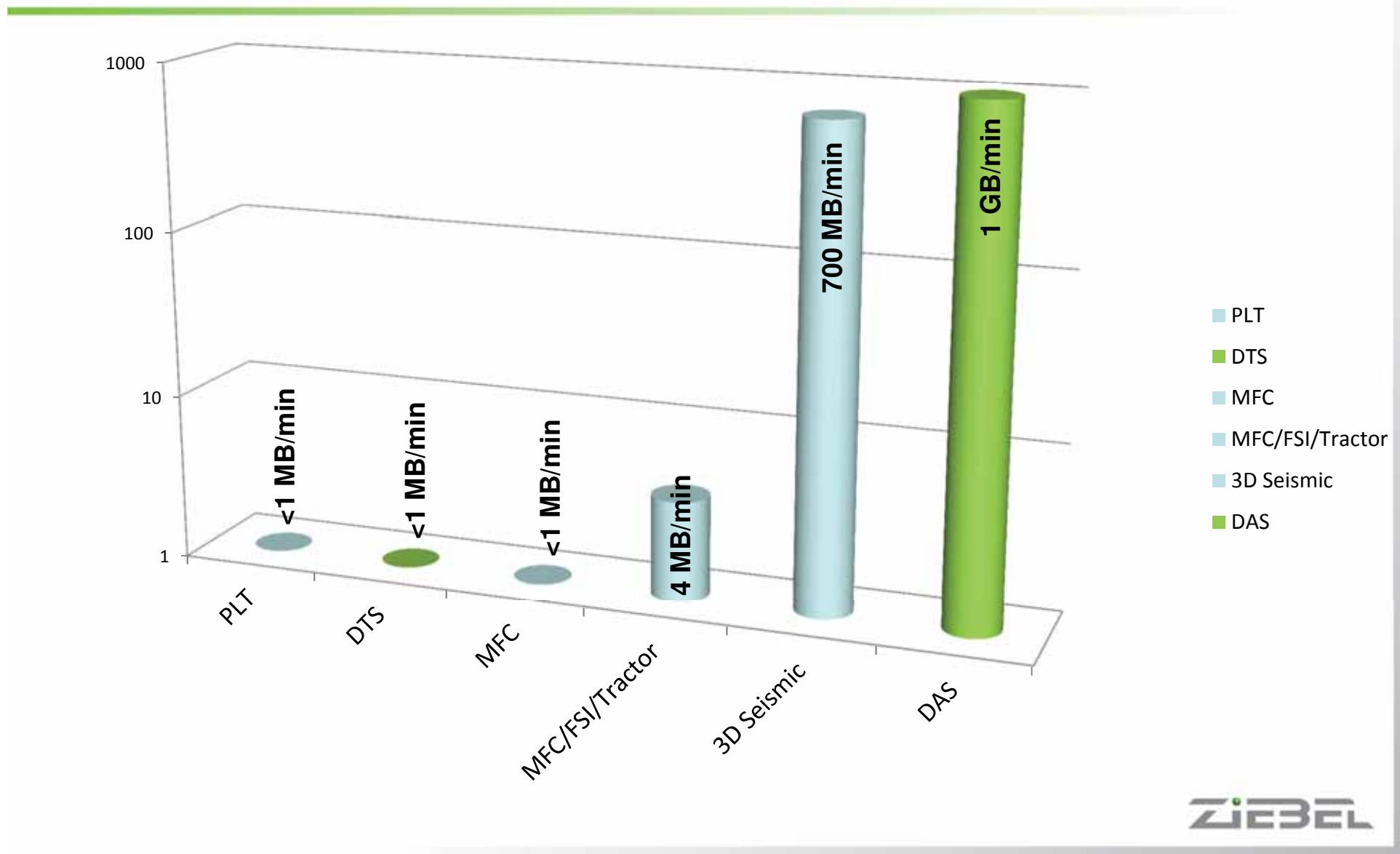
Dynamic reservoir management optimization tool



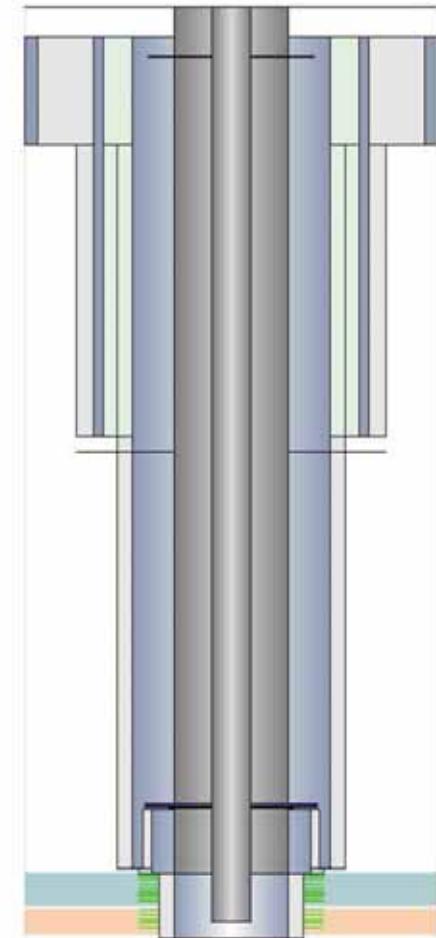
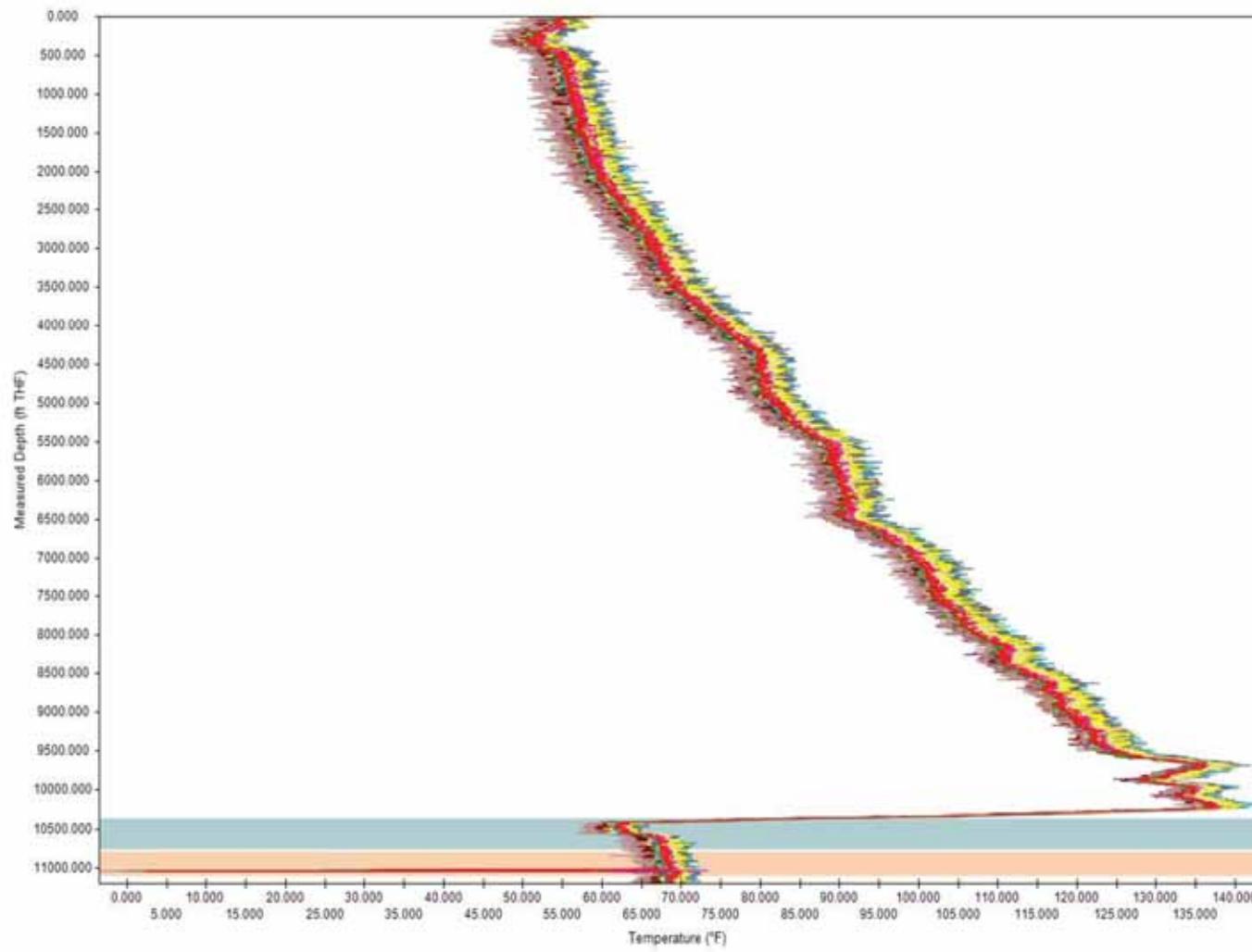
File size per job



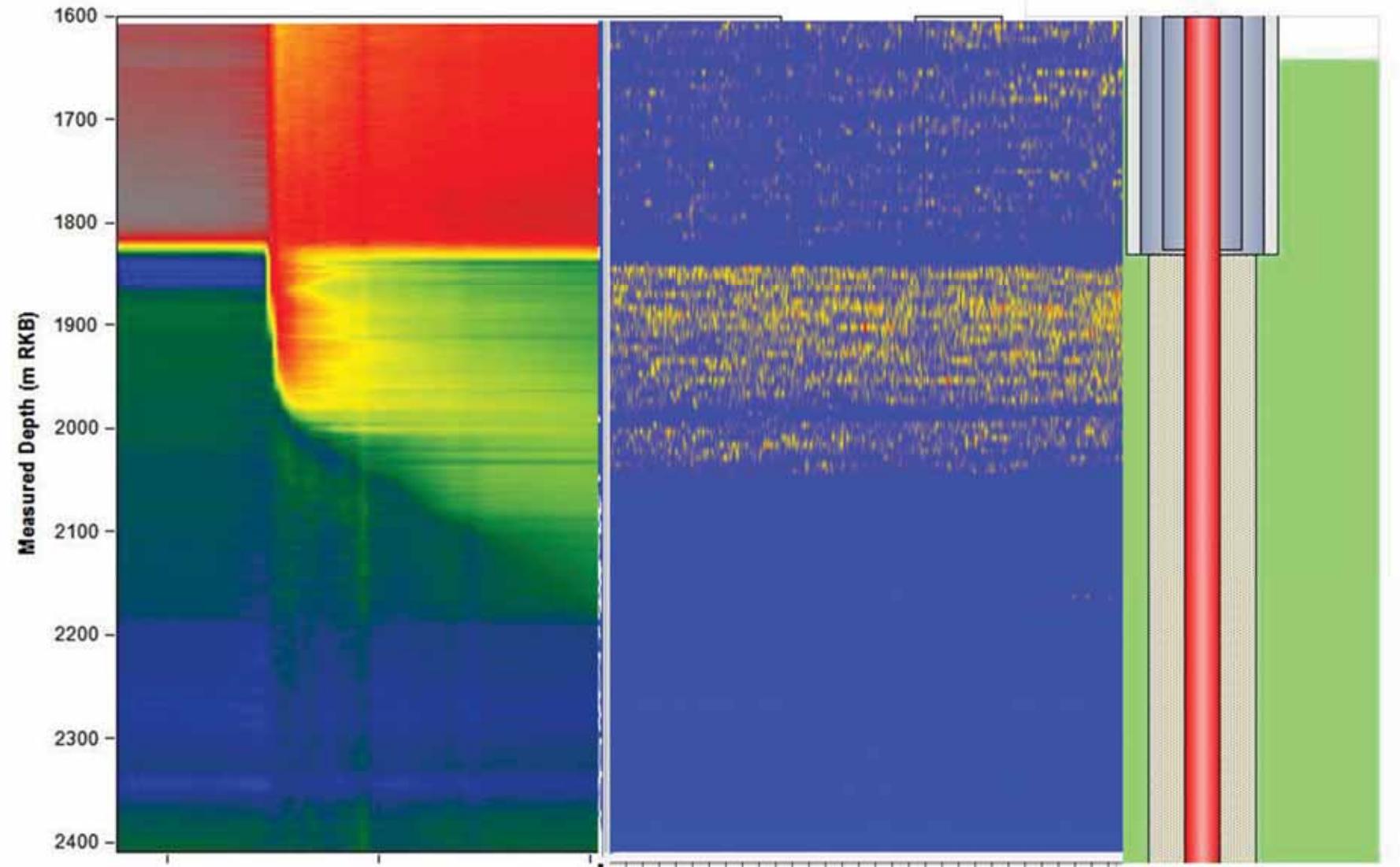
File size per acquisition time (MB/min)



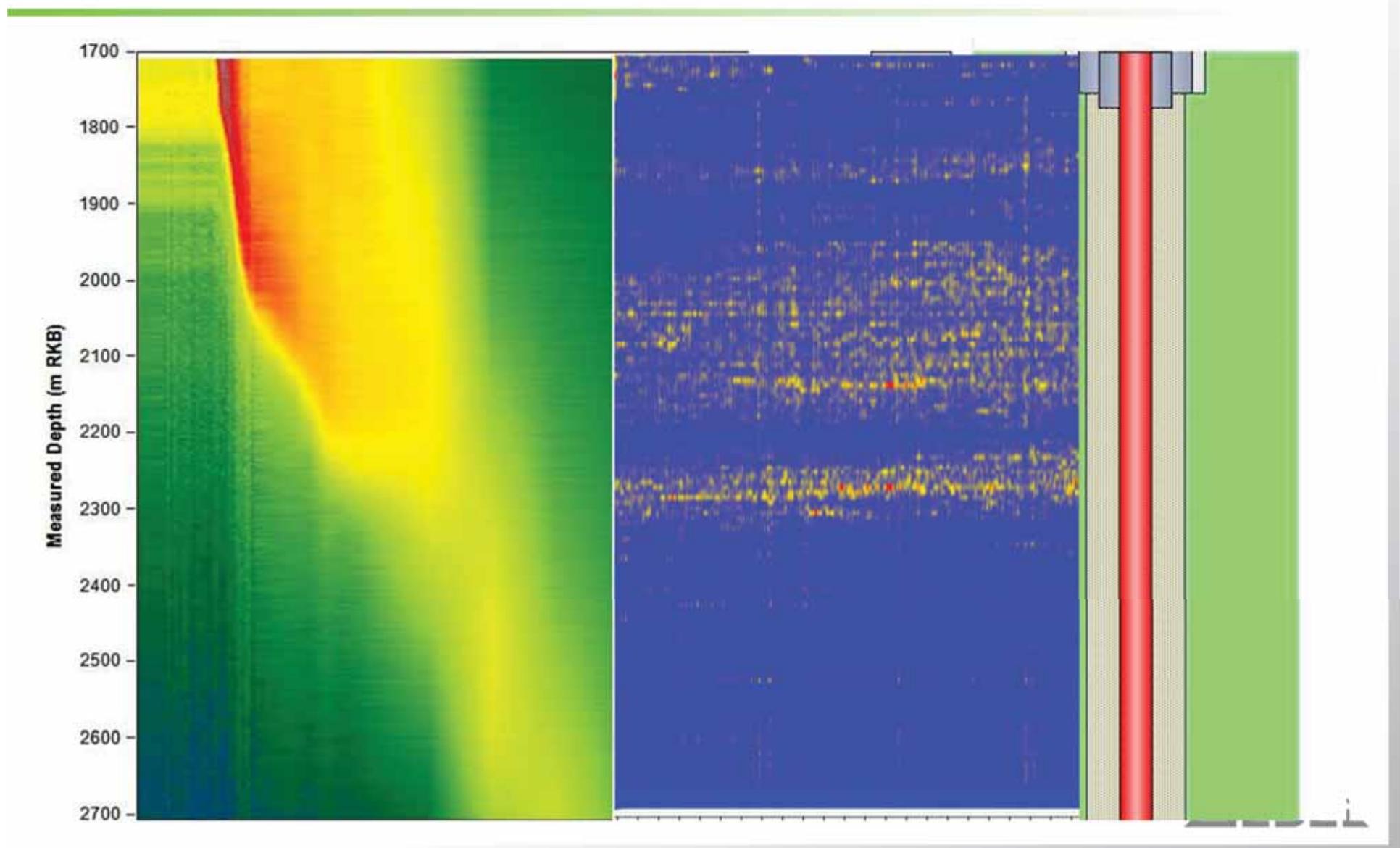
Start injection – DTS information



DTS and DAS - Zonal definition – Hot slug example

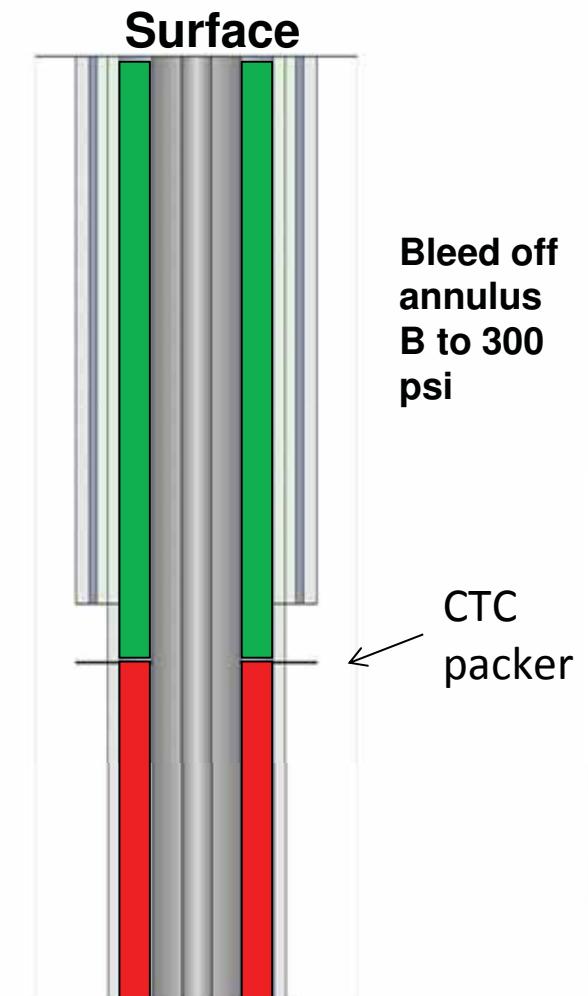
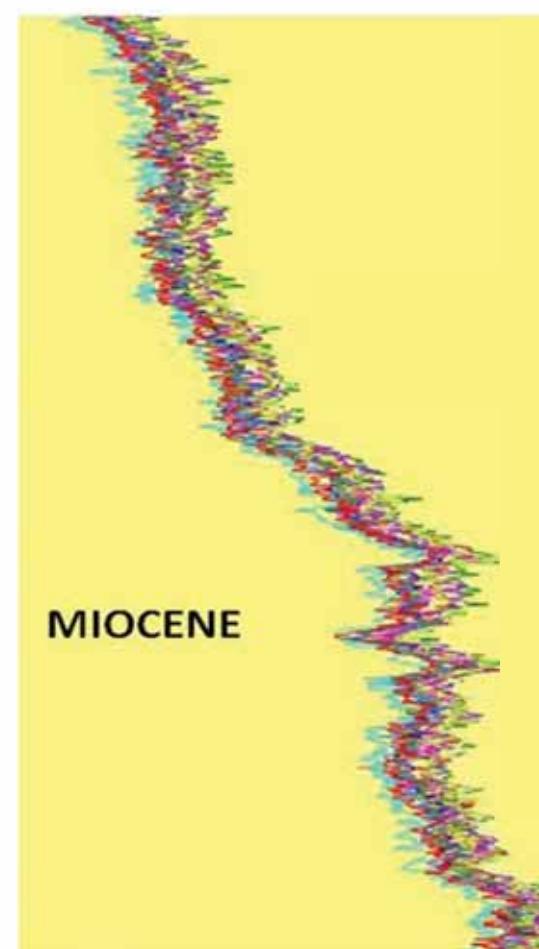


DTS and DAS - Zonal definition – Hot slug example



Pressure in the B-annulus - DTS

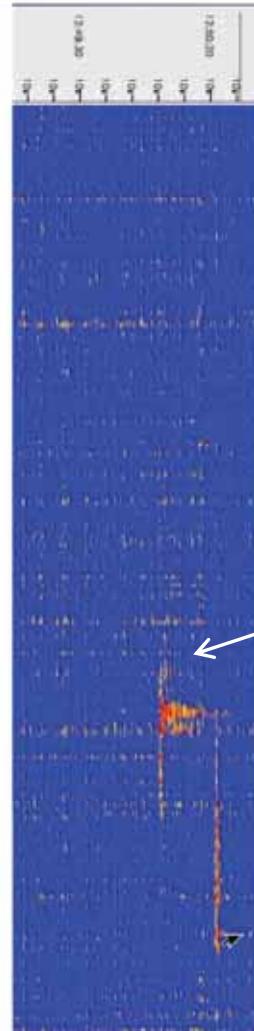
Finding the needle
in the haystack.....



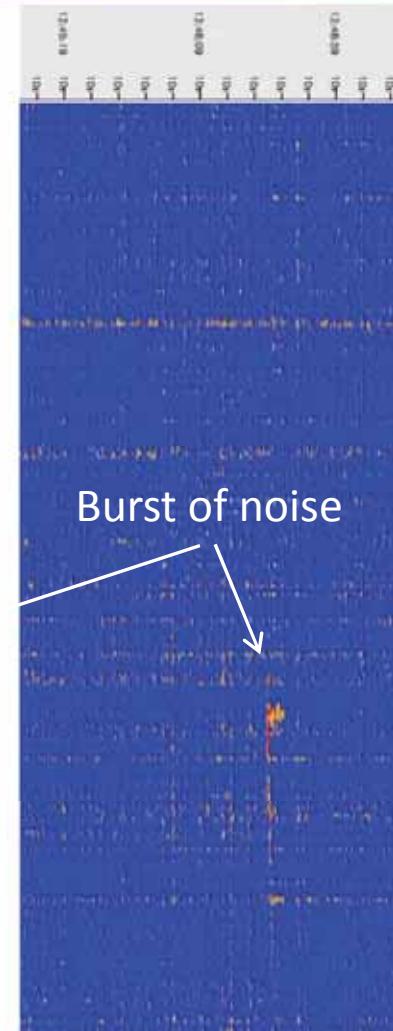
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Pressure in the B-annulus - DAS

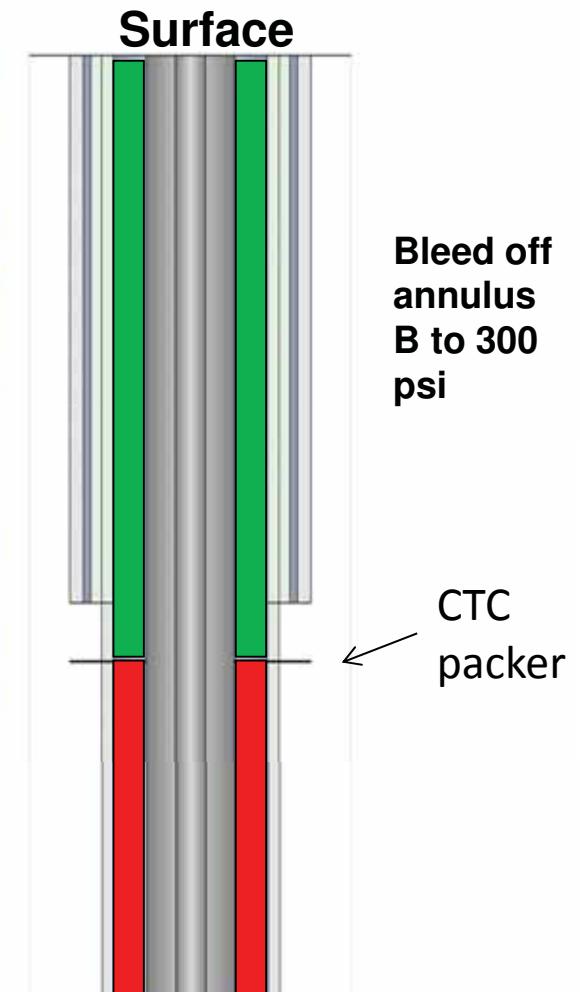
Finding the needle
in the haystack.....



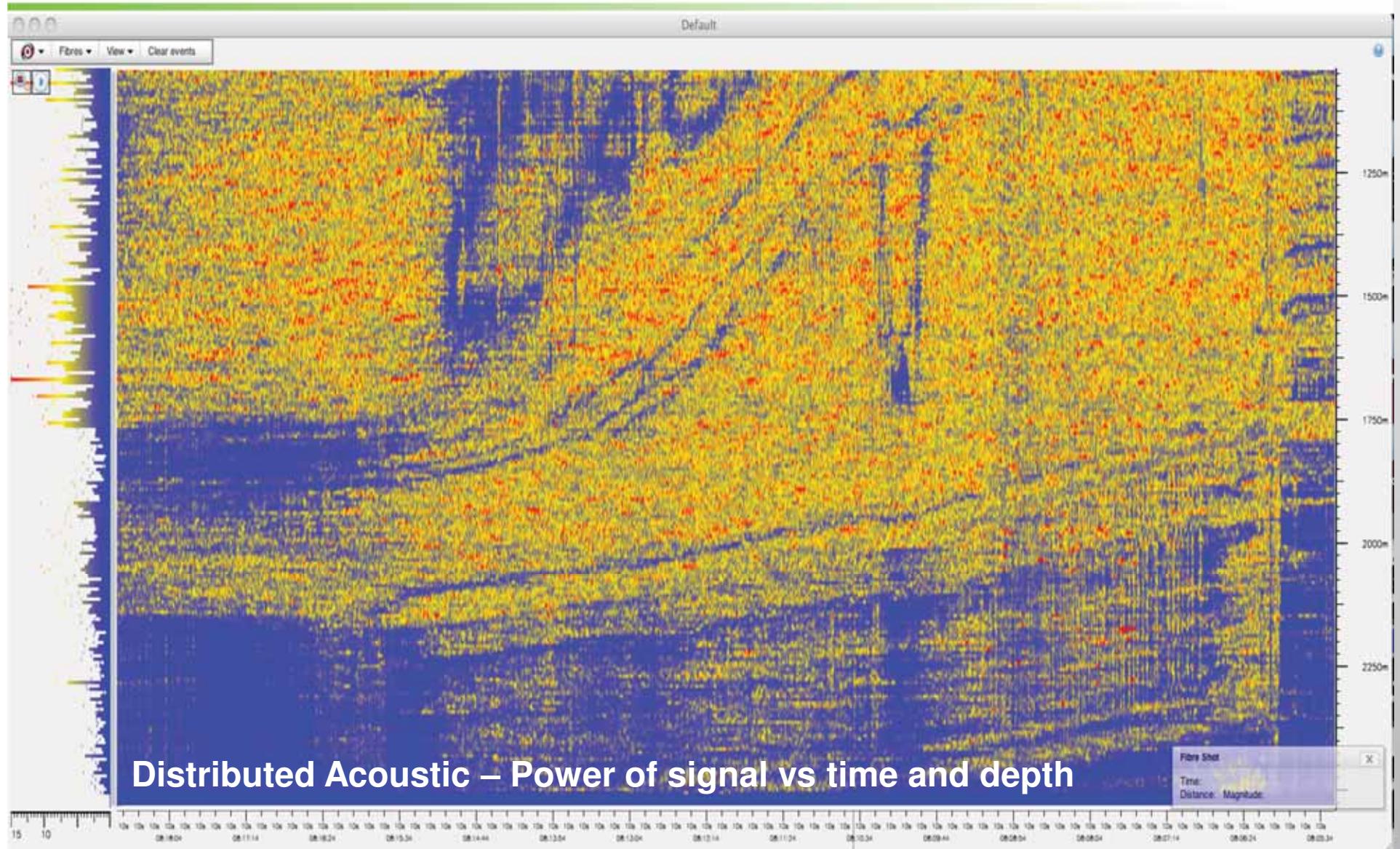
Leaking packer



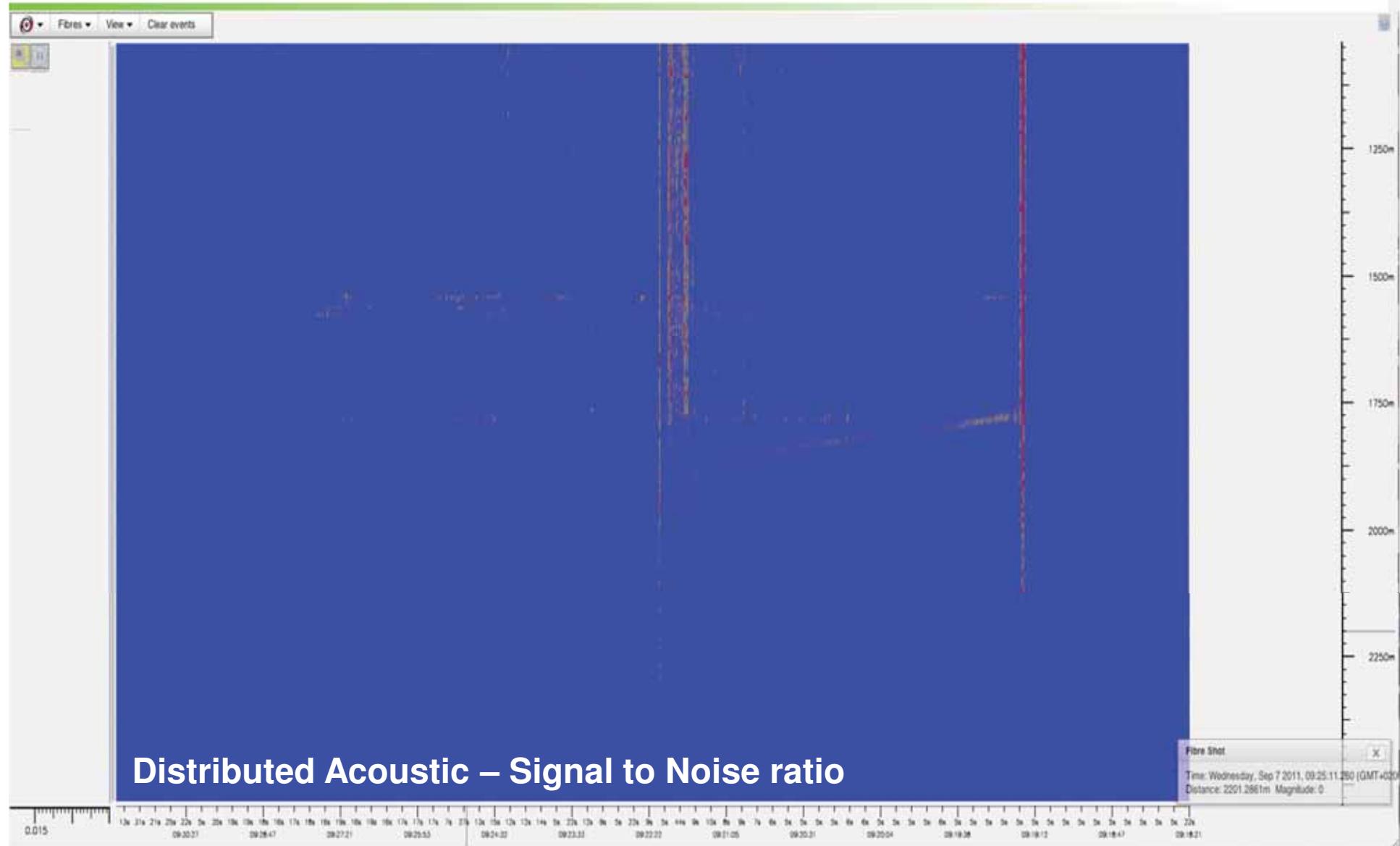
Burst of noise



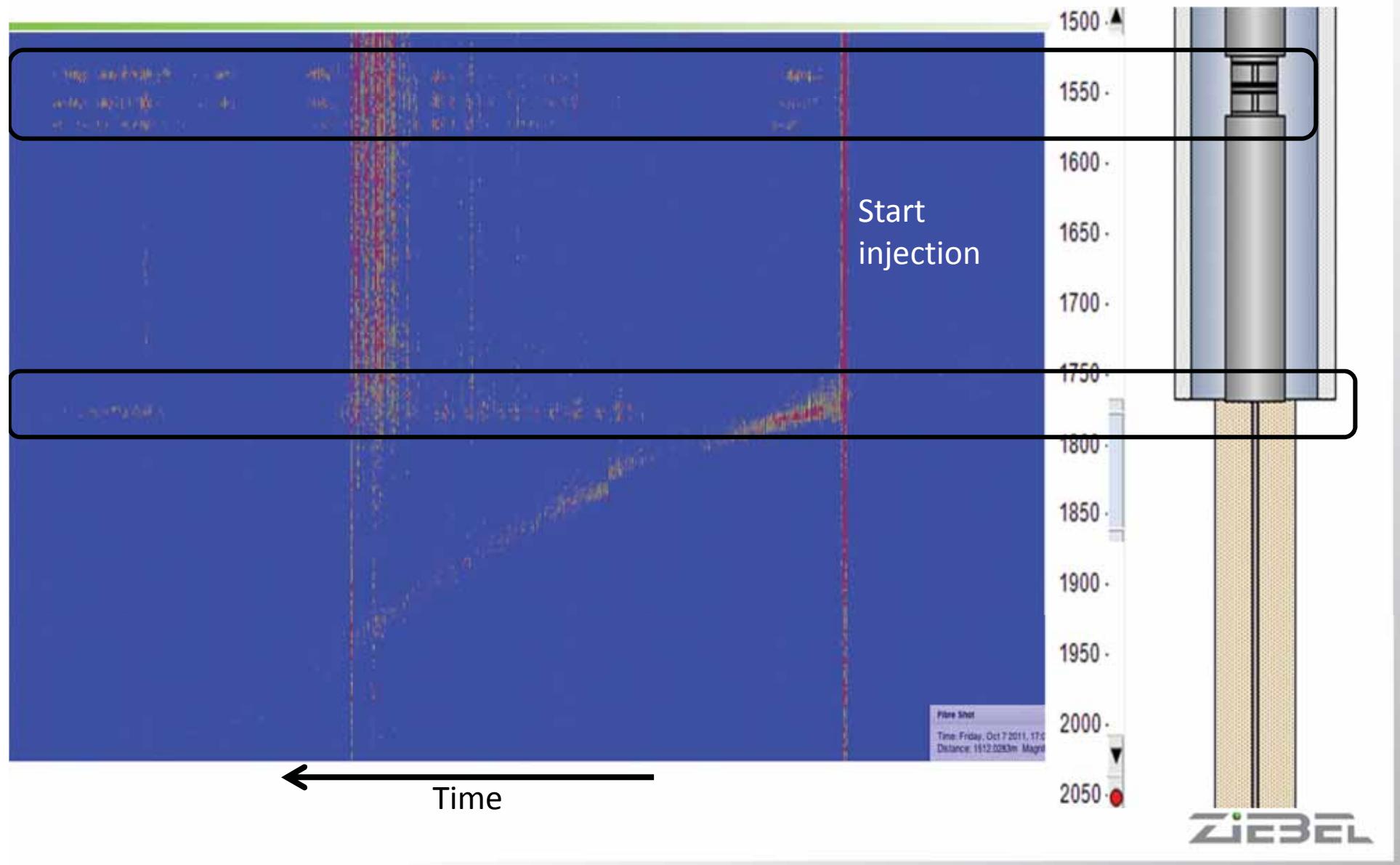
Restrictions in the well bore



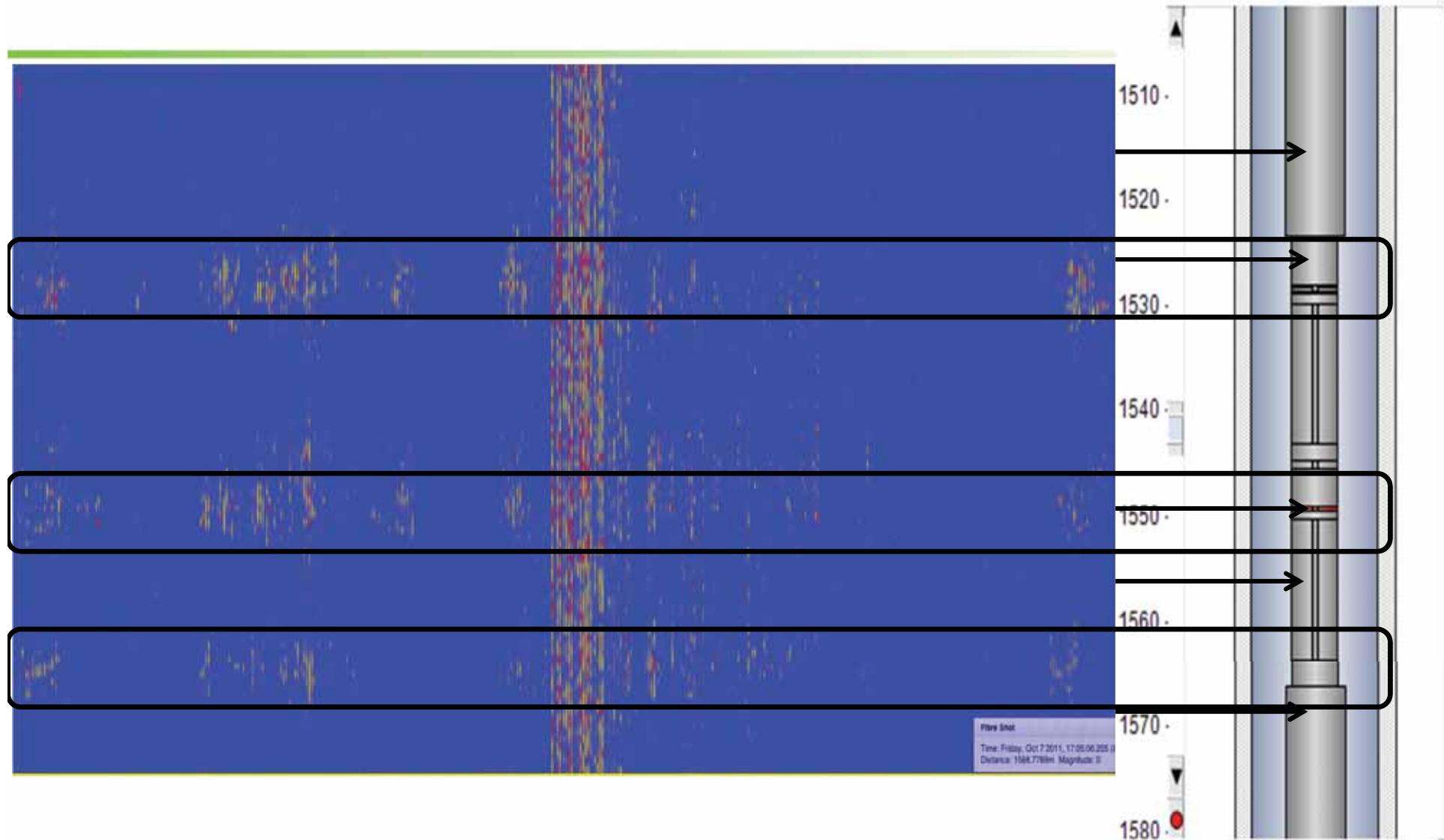
Restrictions in the well bore



Restrictions in the well bore

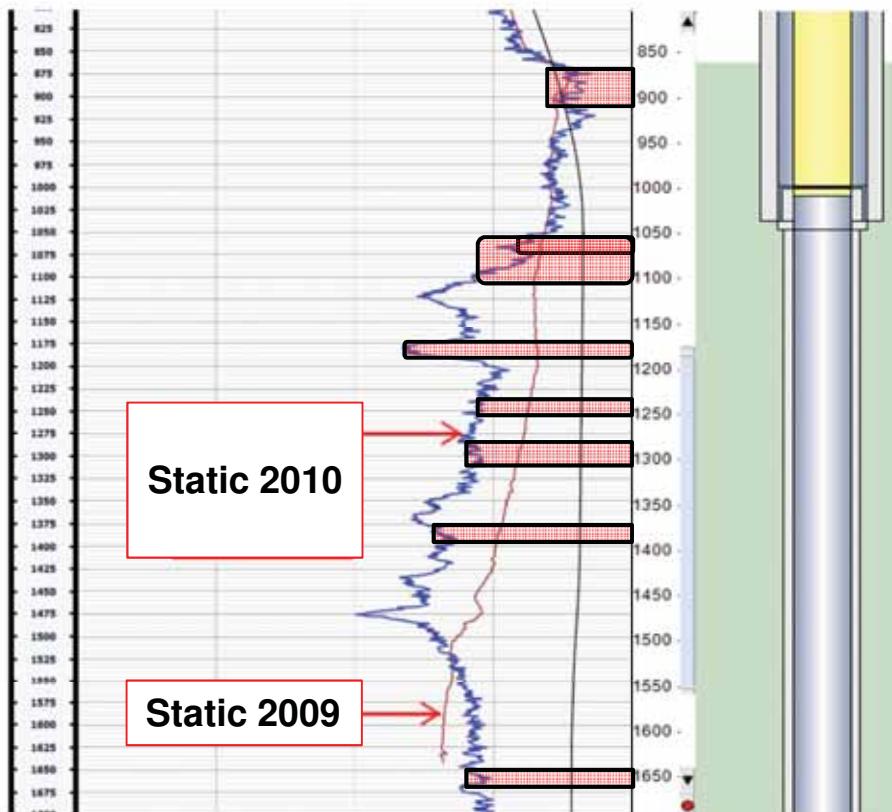


Restrictions in the well bore



Fracturing during injection

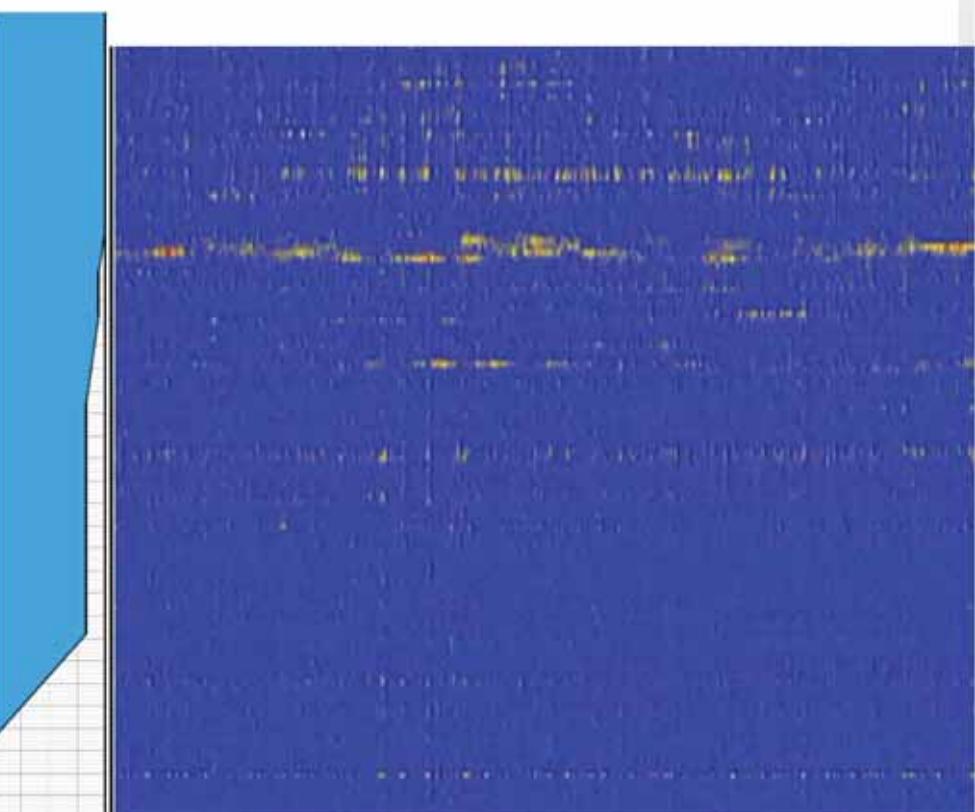
DTS survey



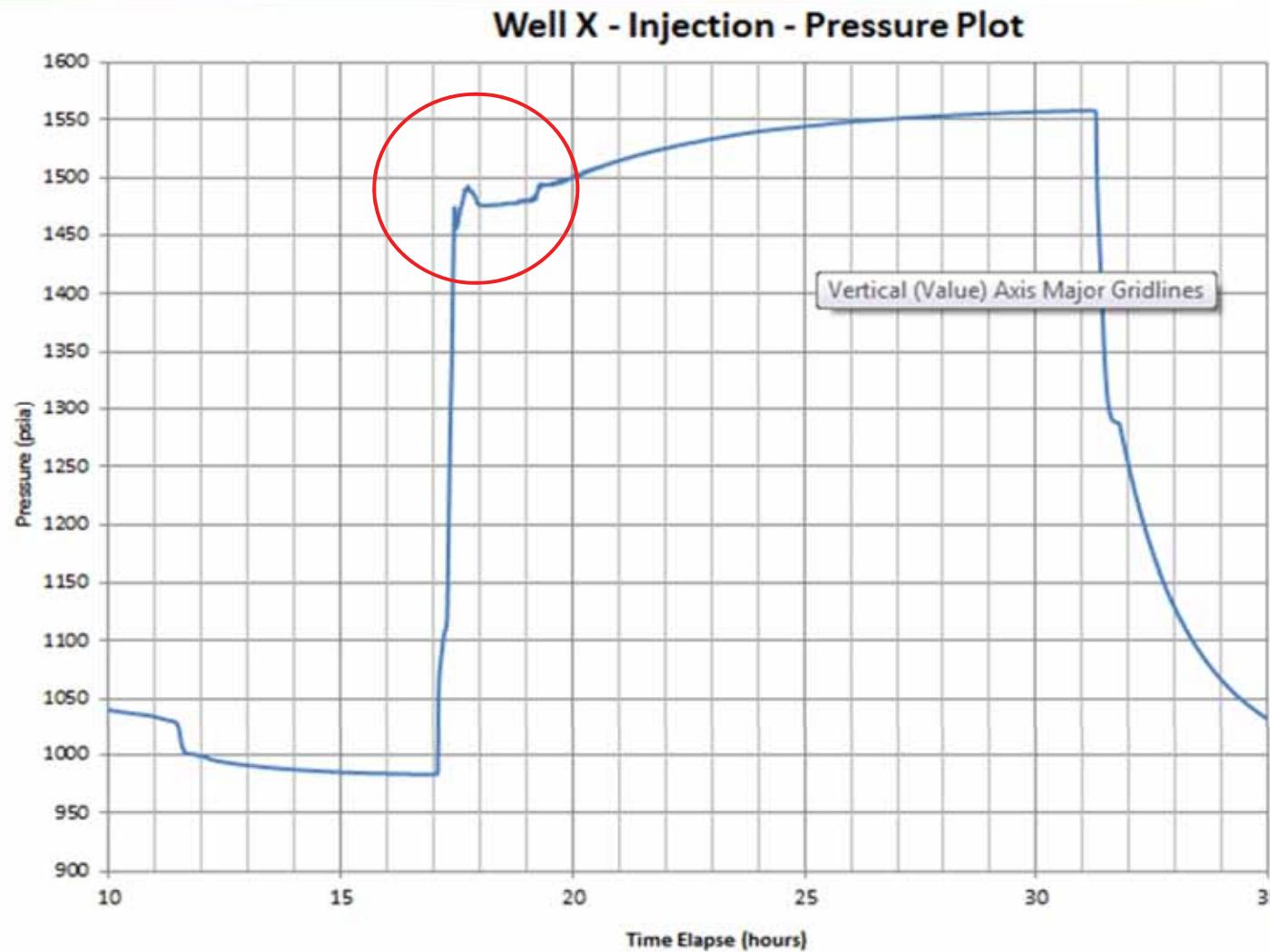
Completion



DAS Survey

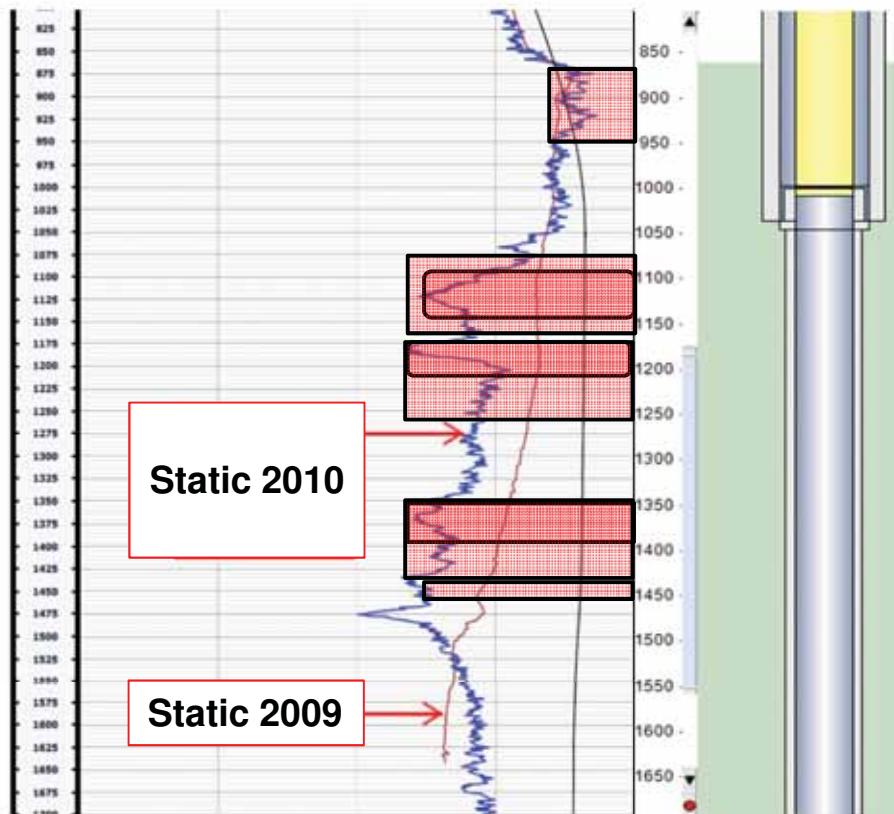


Fracturing during injection – Bottom hole pressure



3 hrs later – more fluid injected – zones opening

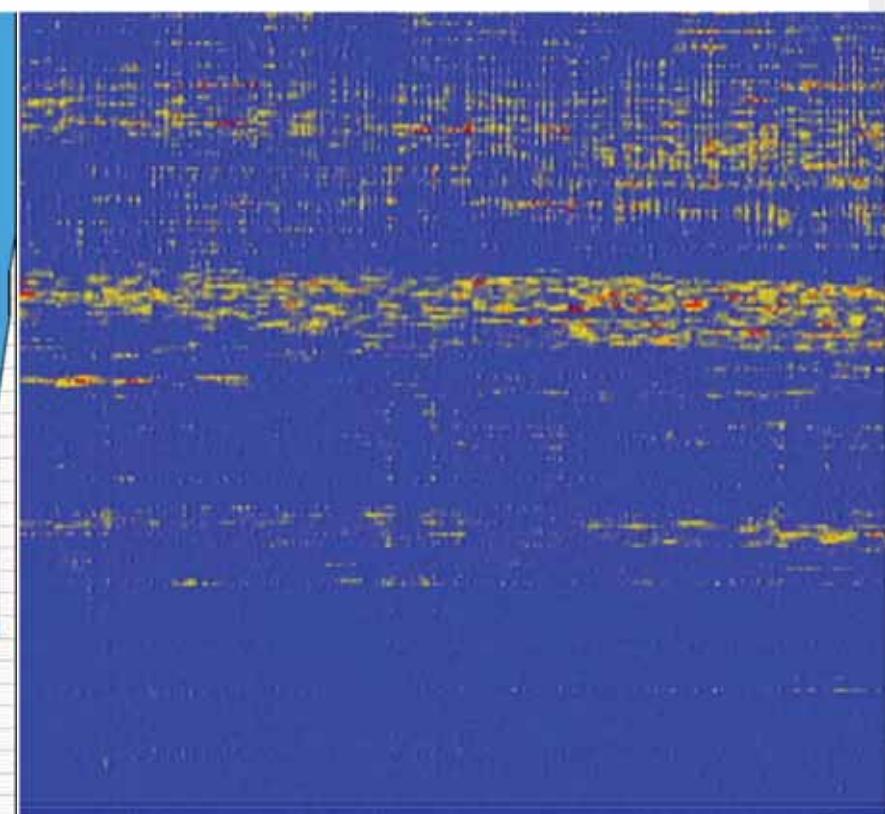
DTS survey



Completion



DAS Survey



Summary

1. Ability to access horizontal wells
2. Pulling strength of rod for mechanical work
3. Ability to access wells with restrictions
4. Negligible choking effect
5. Senses all the well, all the time
 - Reservoir management optimization
 - Integrity – wherever and whenever
6. Less deferred production during intervention work
7. Reliability of technology
8. Weight and foot print of offshore equipment
9. No grease injection – environmental friendly

Questions?

