Integration of uncertain well data for seismic reservoir characterization

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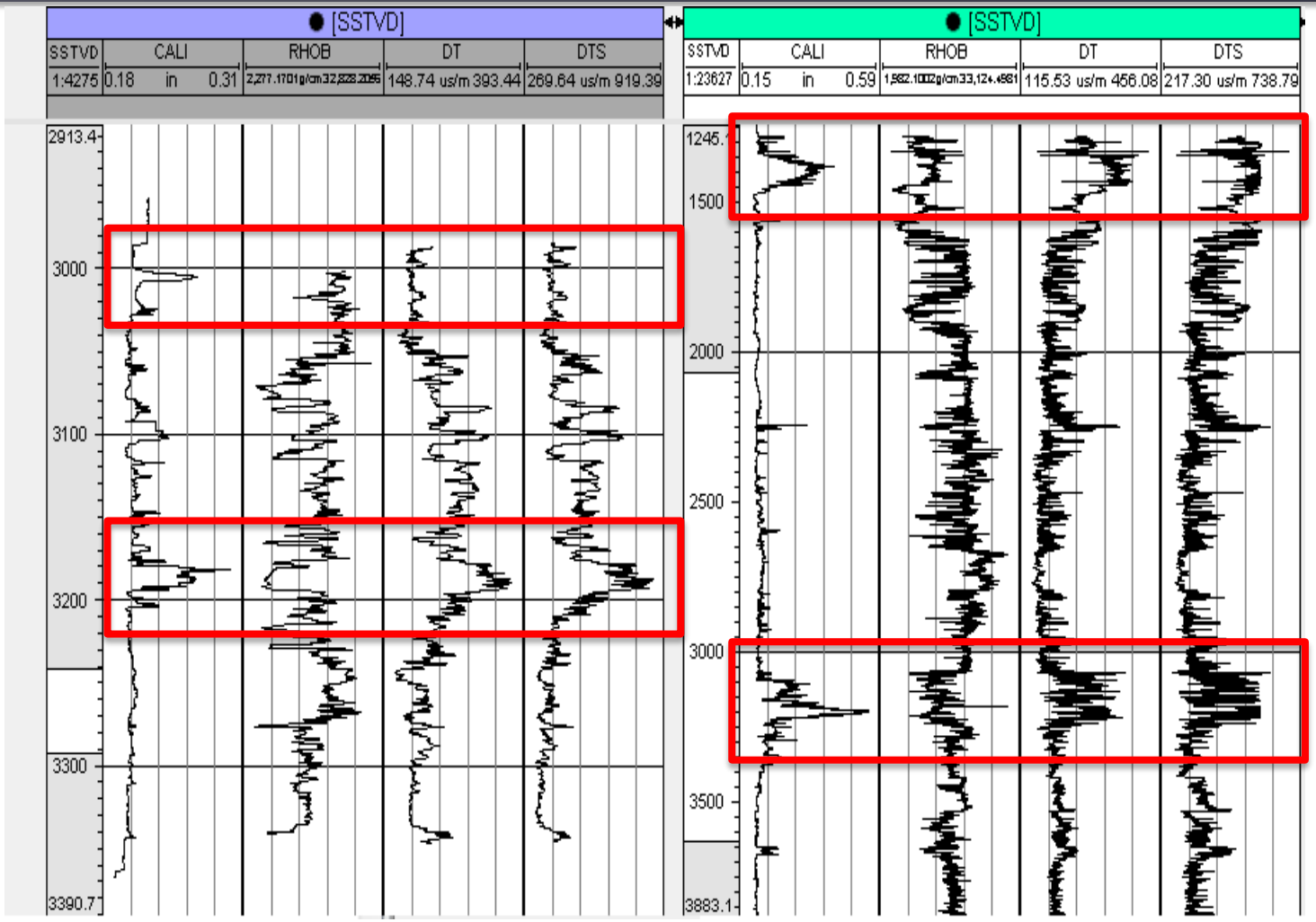
Summary

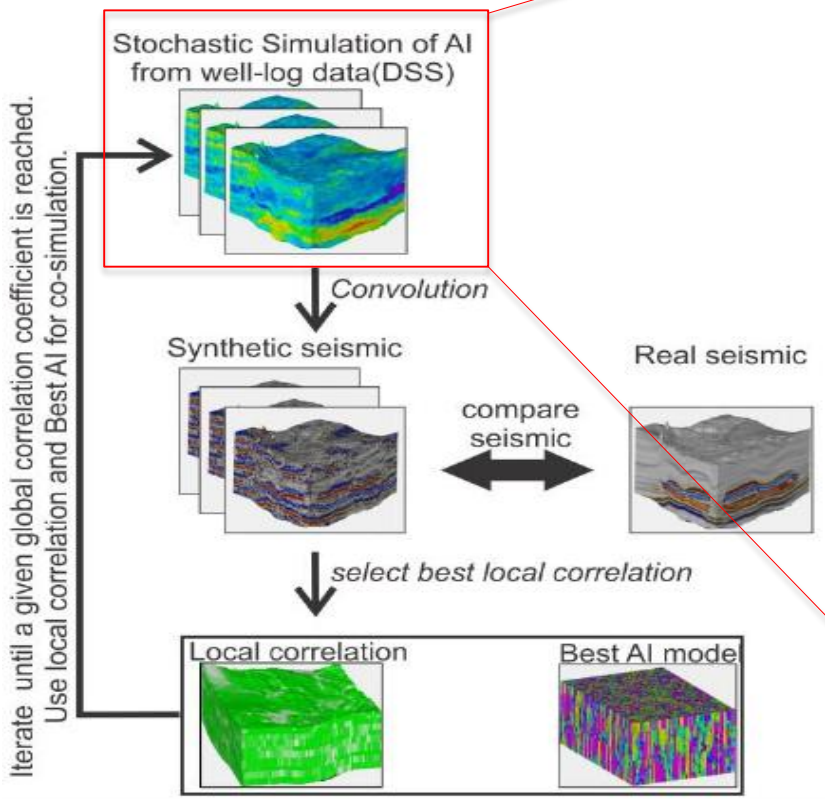
- Motivation
- Methodology
- Real Case Application
- Conclusions

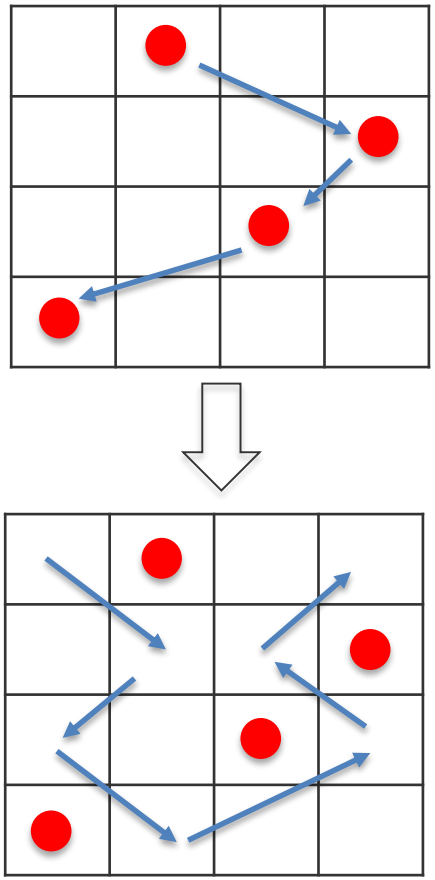
Motivation


[SSTVD]
SSTVD
CALI
RHOB
DT
DTS
1:4275
0.18 in 0.31
148.74 us/m 393.44
269.64 us/m 919.39
2913.4
3000
3100
3200
3300
3390.7
[SSTVD]
SSTVD
CALI
RHOB
DT
DTS
1:23627
0.15 in 0.59
115.53 us/m 456.08
217.30 us/m 738.79
1245.1
1500
2000
2500
3000
3500
3883.1

Methodology

Stochastic sequential simulation with point distributions

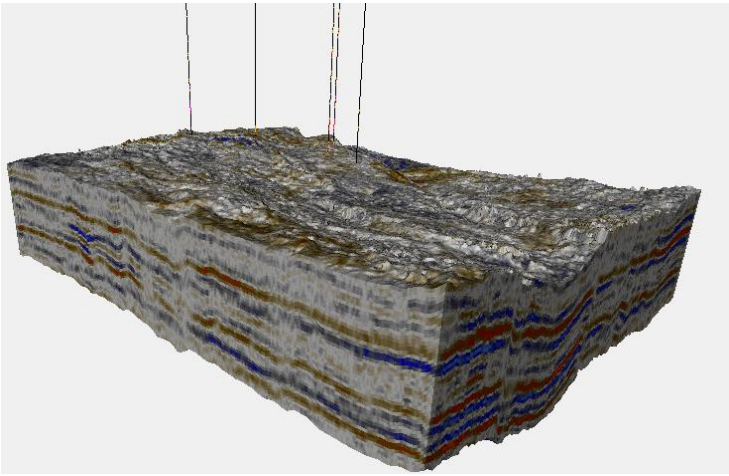


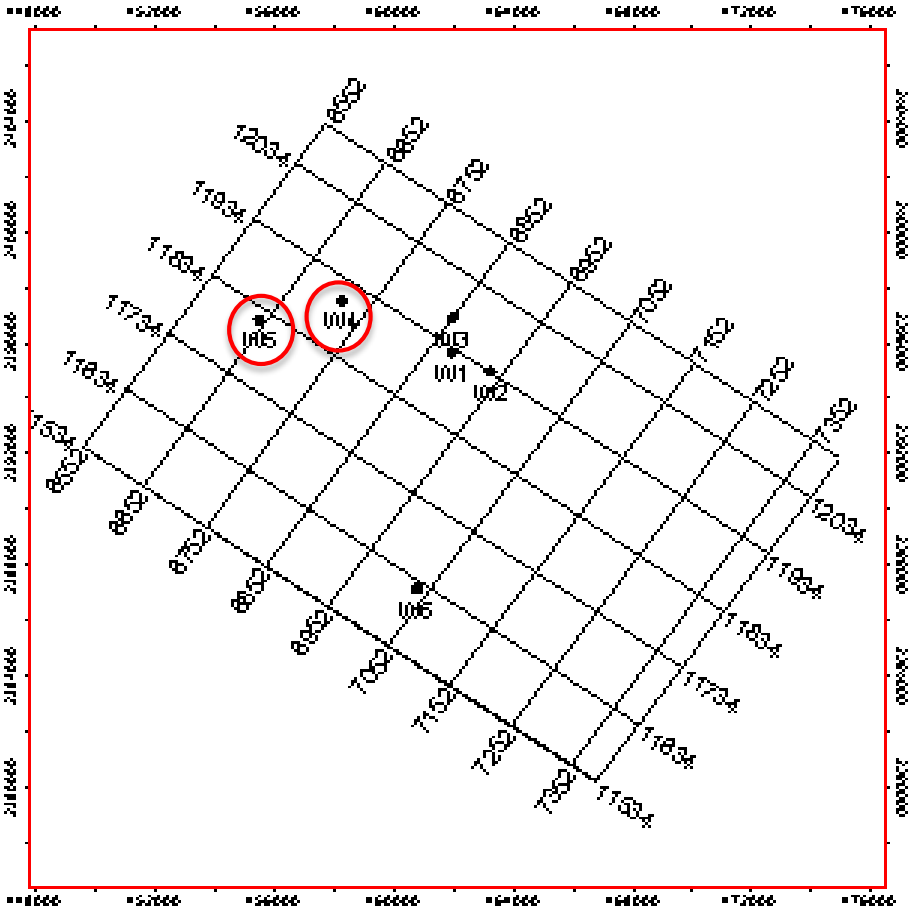


Real Case Application

Case Study Dataset

- Simulation grid size: 840x567x49;
- 6 available wells with Ip logs;
- Post-stack seismic reflection data (fullstack).





Real Case Application

(Global Stochastic Inversion Tests)

Tests with hard-data

TEST 1
GSI without point distributions

TEST 2
Bayesian inversion (low variability)

TEST 3
Uniform distributions

TEST 4
Bayesian inversion (high variability)

Tests without hard-data

TEST 1
GSI without point distributions

TEST 2
Bayesian inversion (low variability)

TEST 3
Uniform distributions

TEST 4
Bayesian inversion (high variability)

Multidimensional scaling

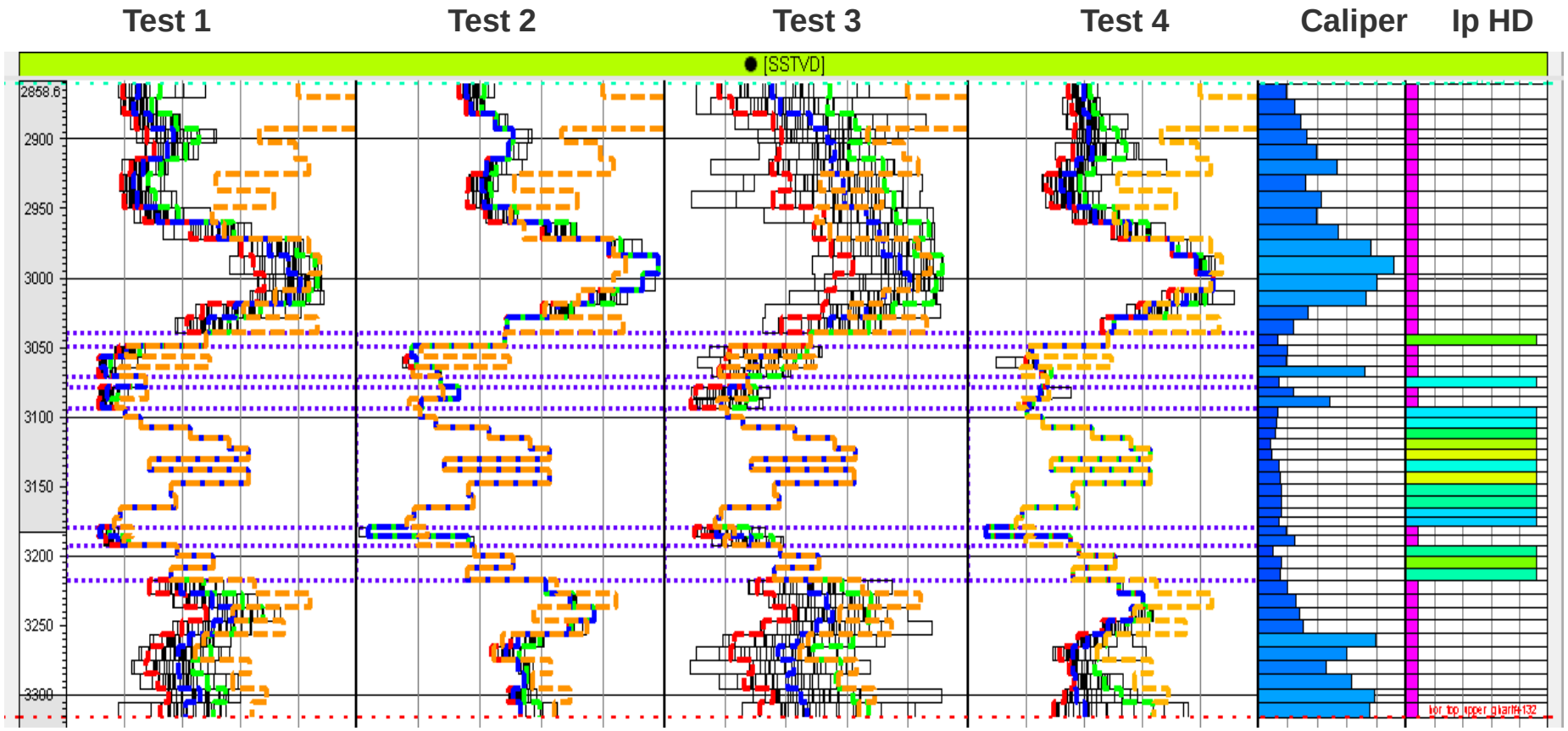
GSI with point distributions

Real Case Application

(GSI Tests with HD)

Results display scale: (6000-18000 kPa.s/m)

Well 4

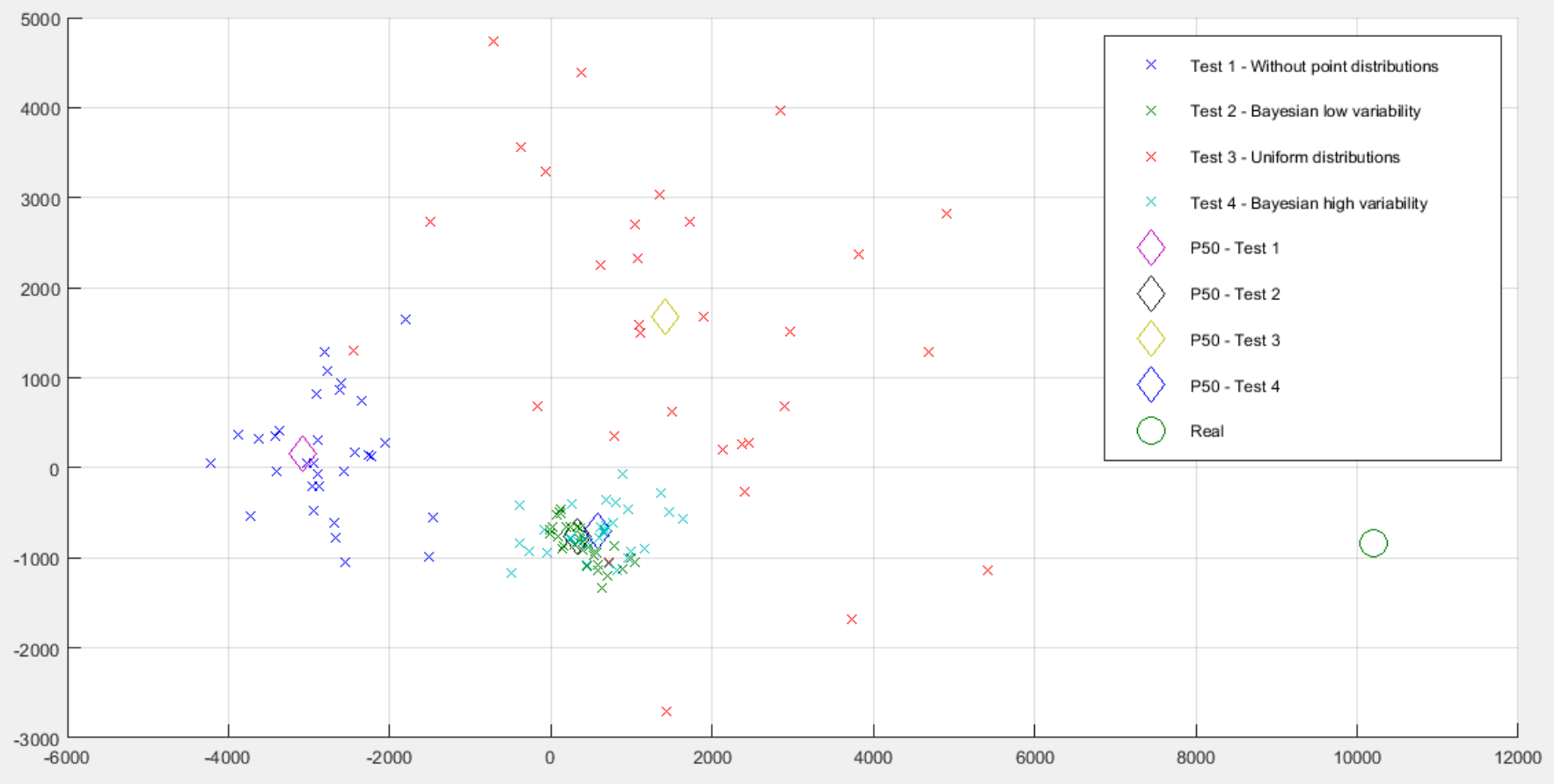


Real Case Application

(GSI Tests with HD)

Well 4

MDS Space

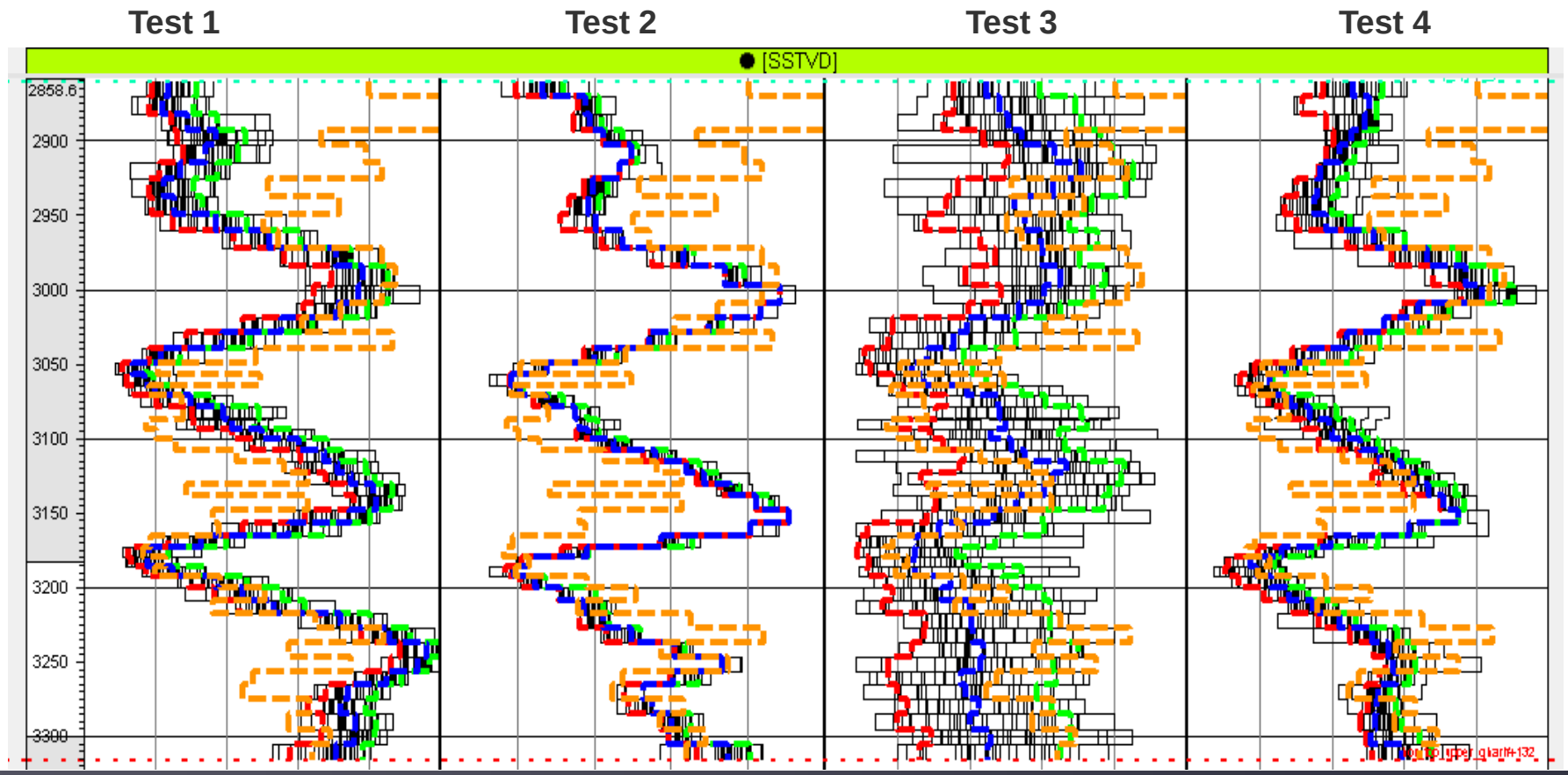


Real Case Application

(GSI Tests without HD)

Results display scale: (6000-18000 kPa.s/m)

Well 4

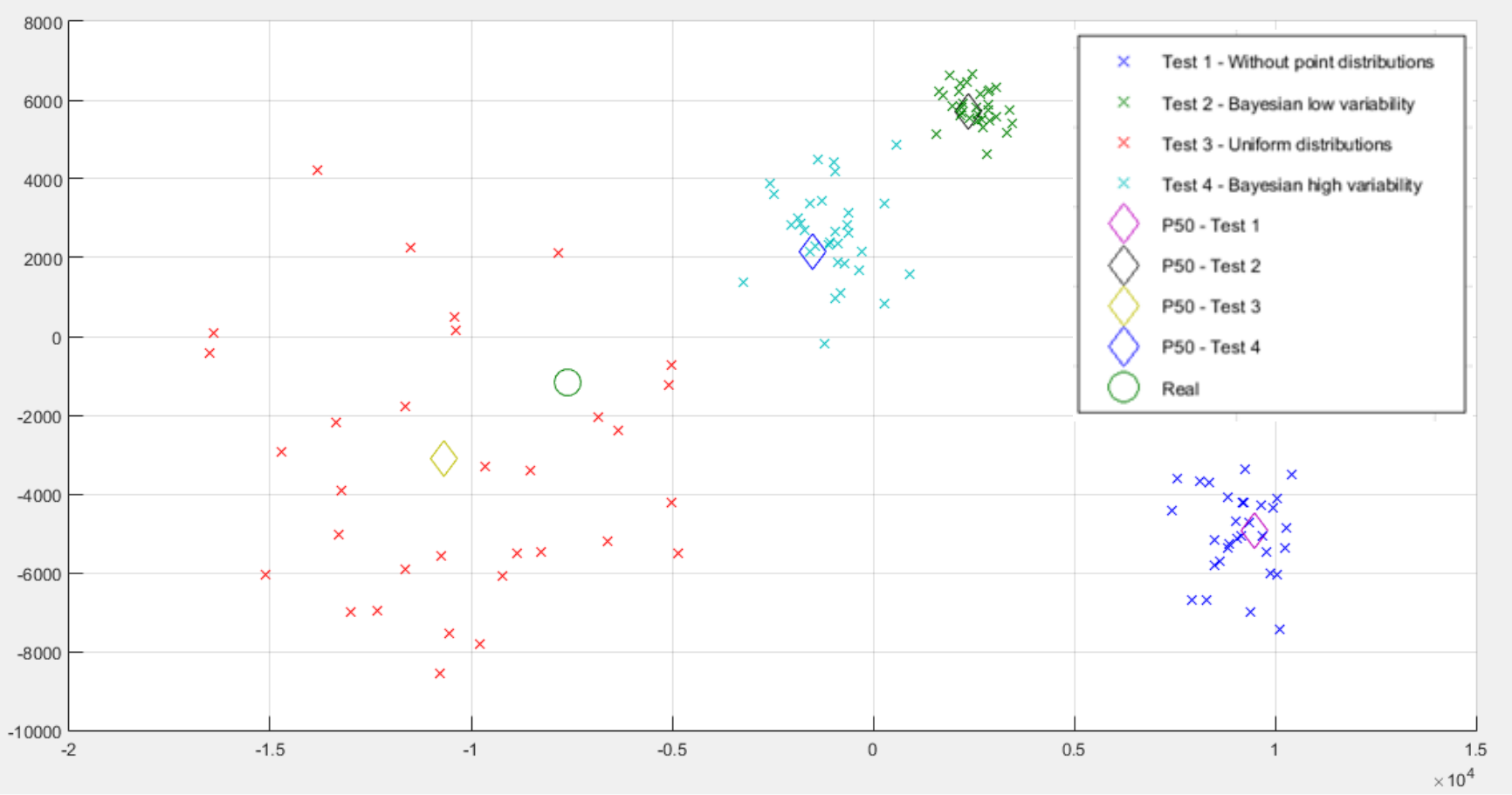


Real Case Application

(GSI Tests without HD)

Well 4

MDS Space

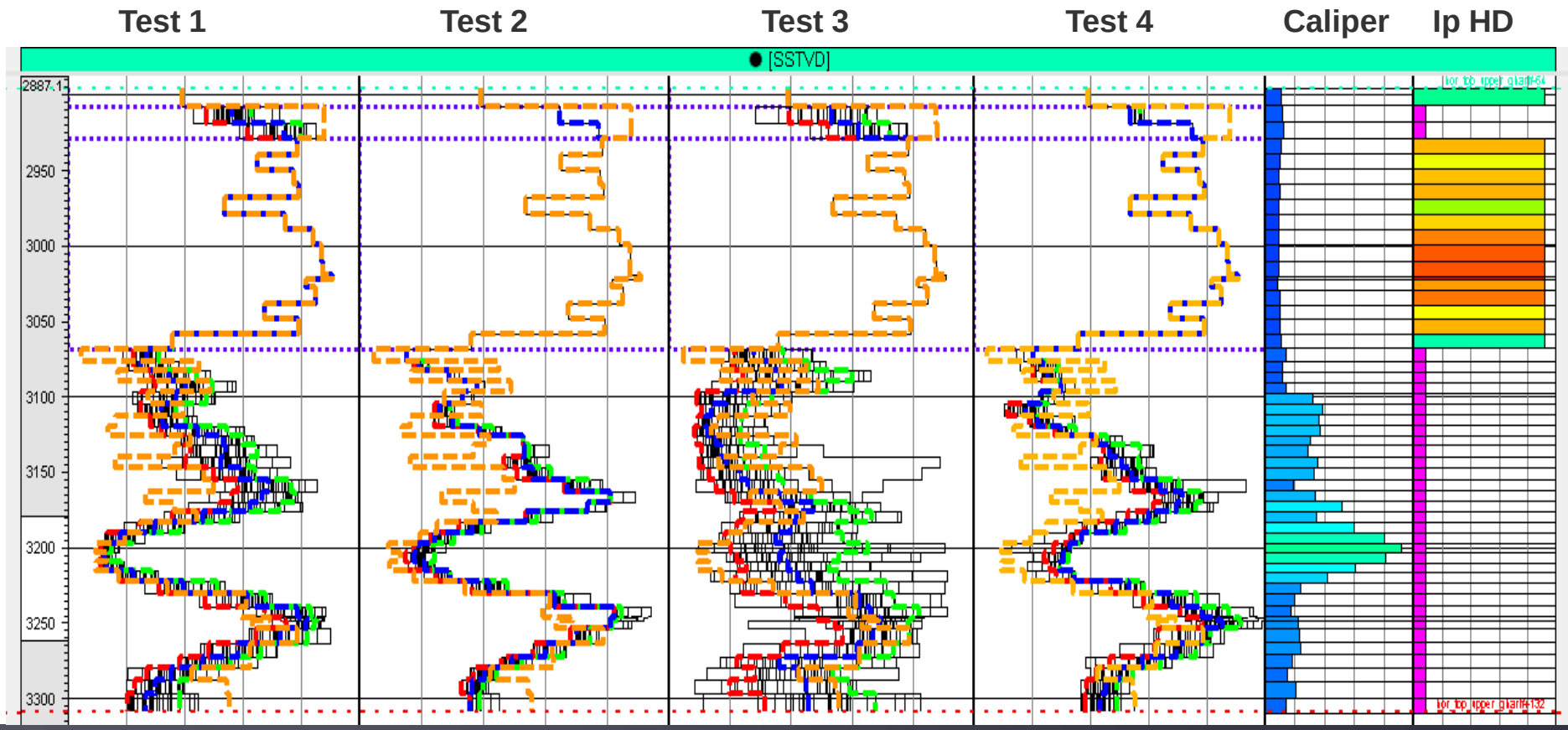


Real Case Application

(GSI Tests with HD)

Results display scale: (6000-18000 kPa.s/m)

Well 5

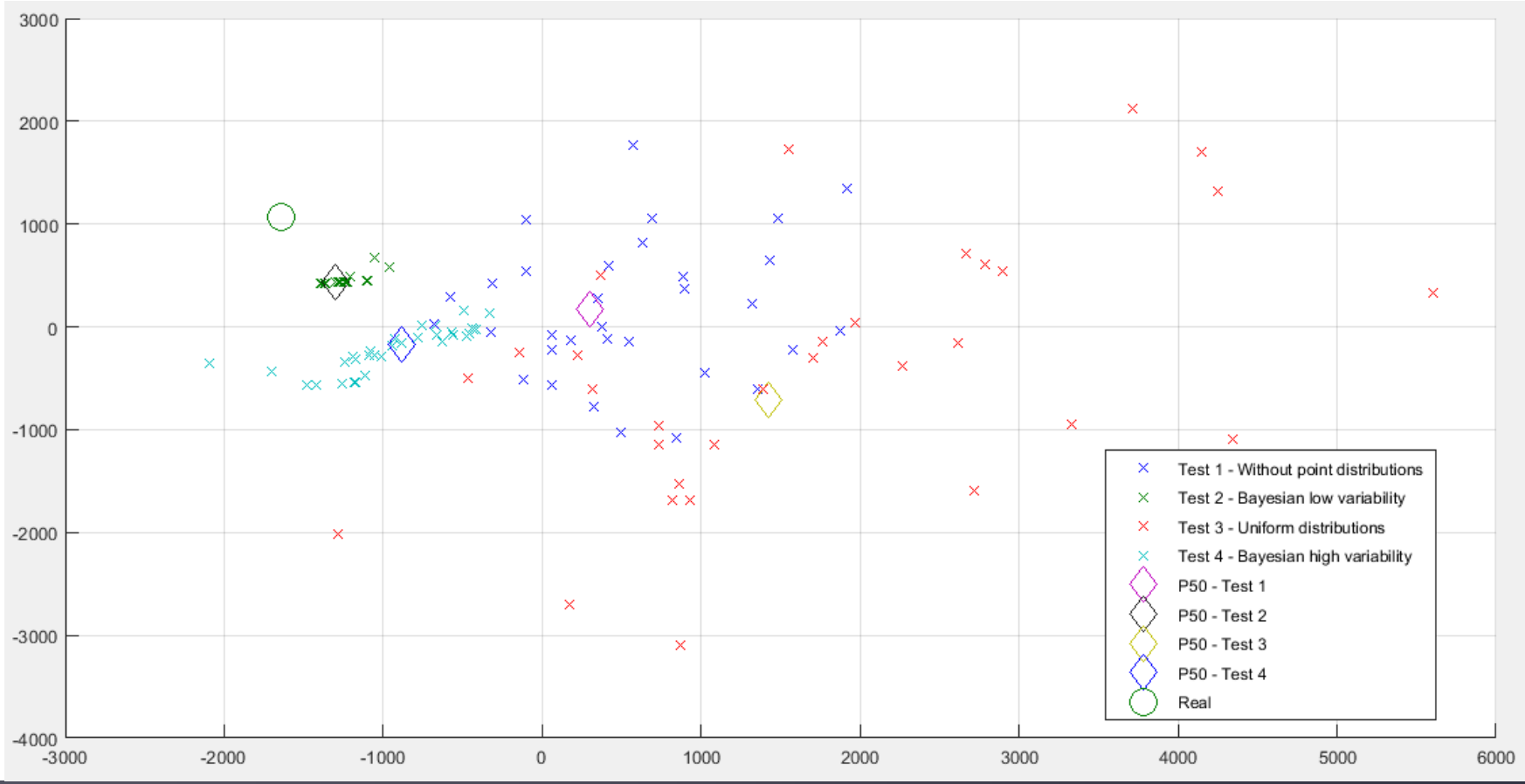


Real Case Application

(GSI Tests with HD)

Well 5

MDS Space

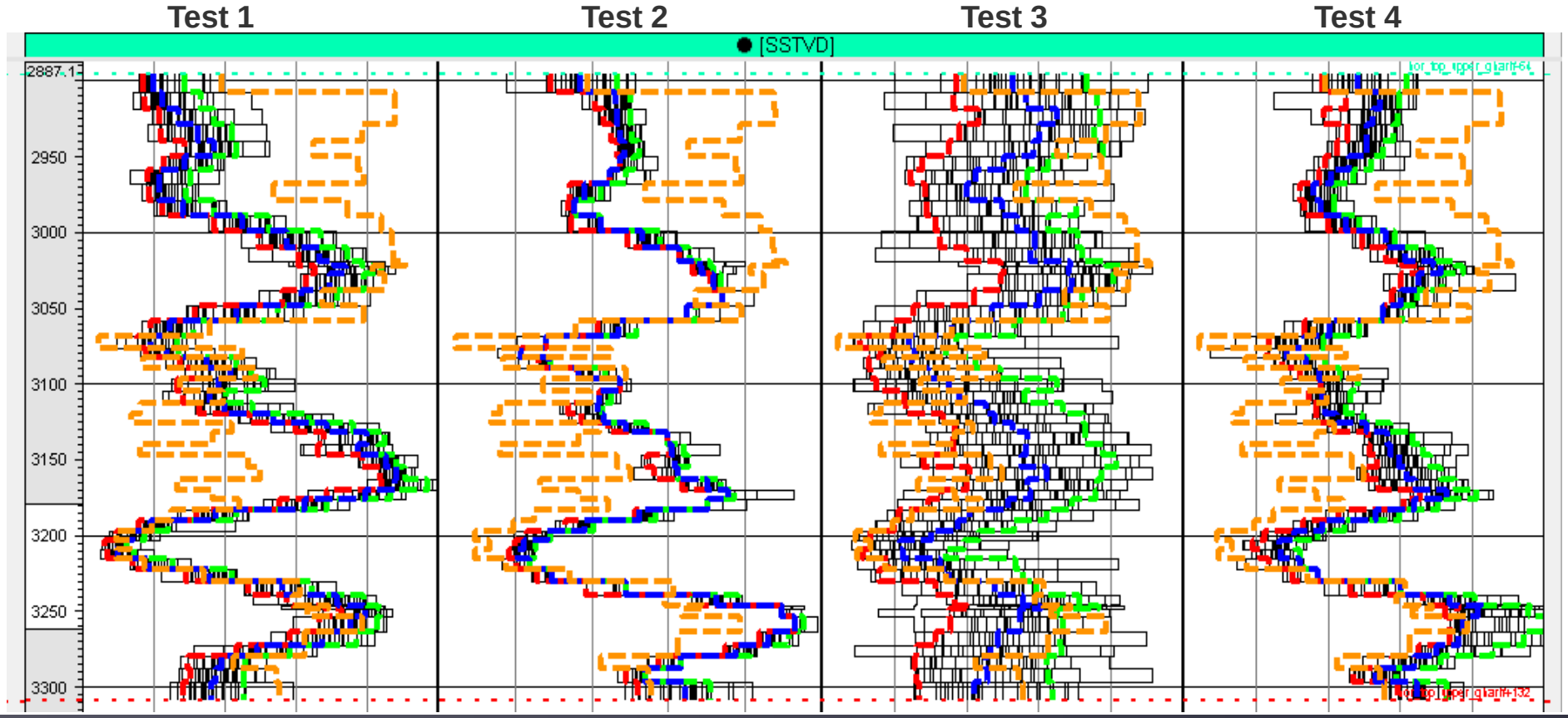


Real Case Application

(GSI Tests without HD)

Results display scale: (6000-18000 kPa.s/m)

Well 5

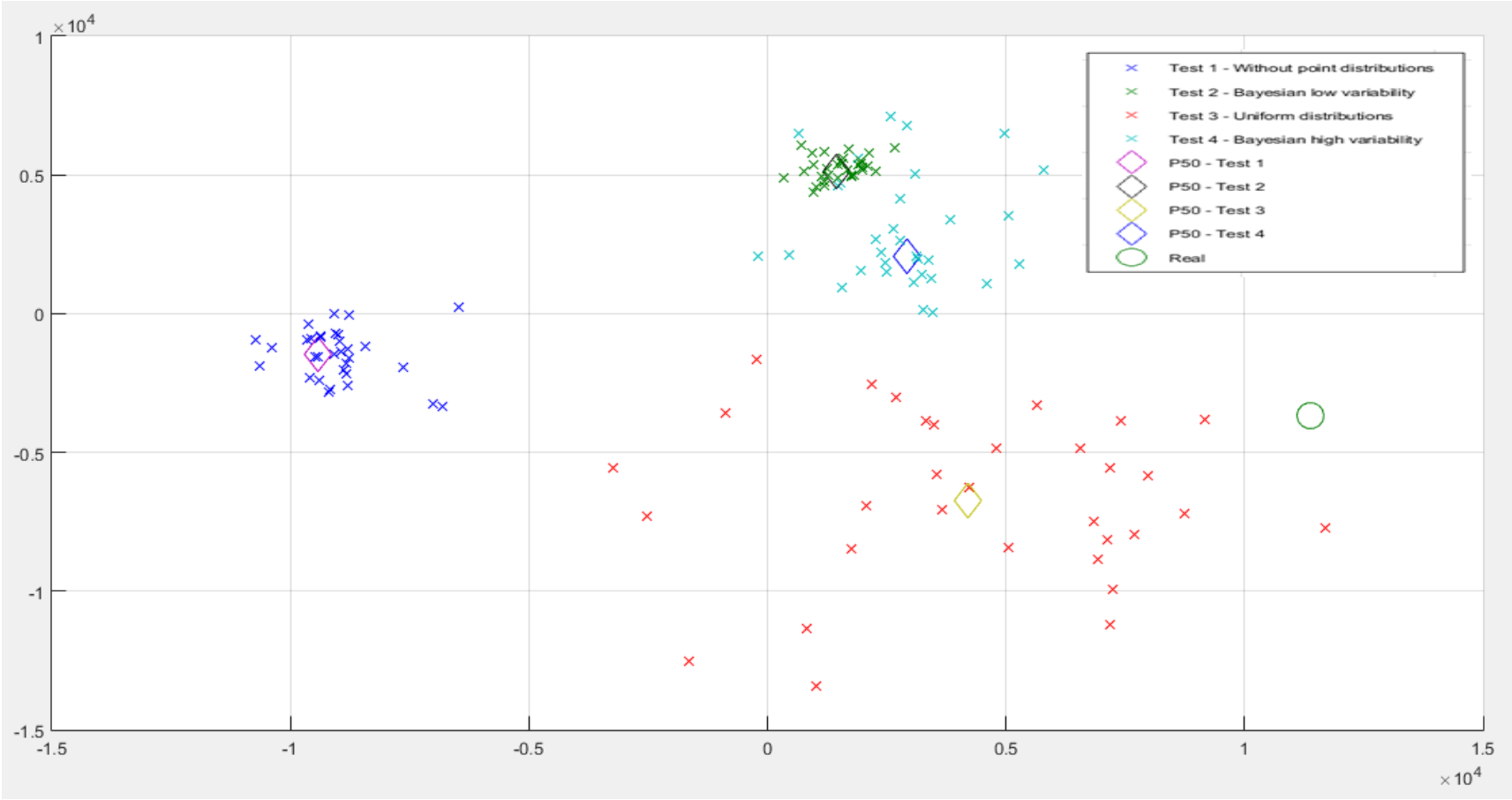


Real Case Application

(GSI Tests without HD)

Well 5

MDS Space

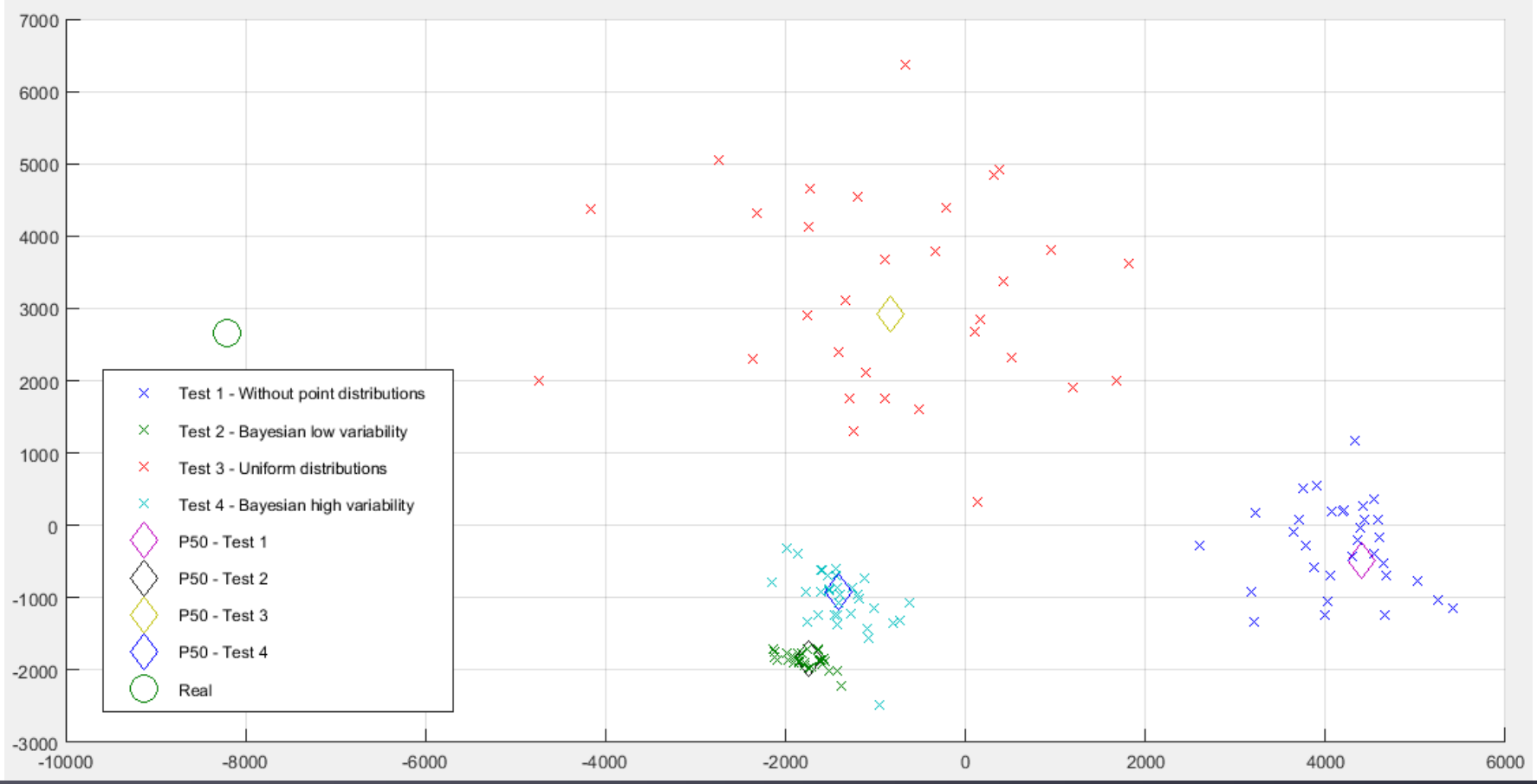


Real Case Application

(GSI Tests with HD)

All Wells (6)

MDS Space

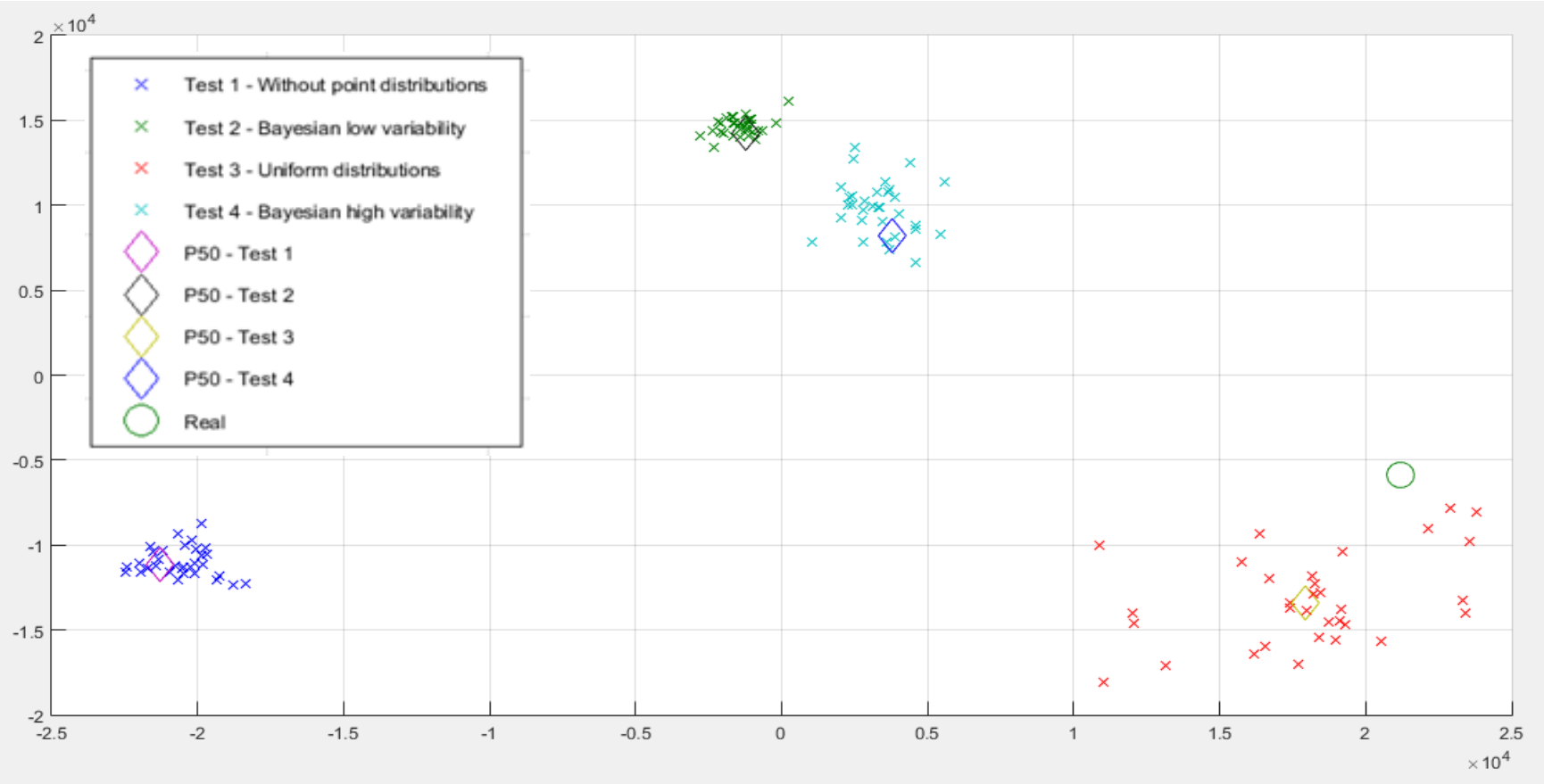


Real Case Application

(GSI Tests without HD)

All Wells (6)

MDS Space



Conclusions

- The stochastic sequential simulation with point distributions:
  - allows the **integration of uncertain experimental data** and the **estimation of the petro-elastic properties** measured along the well path;
  - offers a better alternative for accounting for the **collapsed sections uncertainty** compared to removing those sections;
  - provides a framework to **add information at the problematic zones** and a **better guide of the inversion procedure** near the wells.

- The inclusion of uncertainty on the experimental data **increases** considerably the **exploration of the model parameters space**, **reducing the uncertainty** of the properties at the well-logs.

Thanks for your attention

QUESTIONS?