

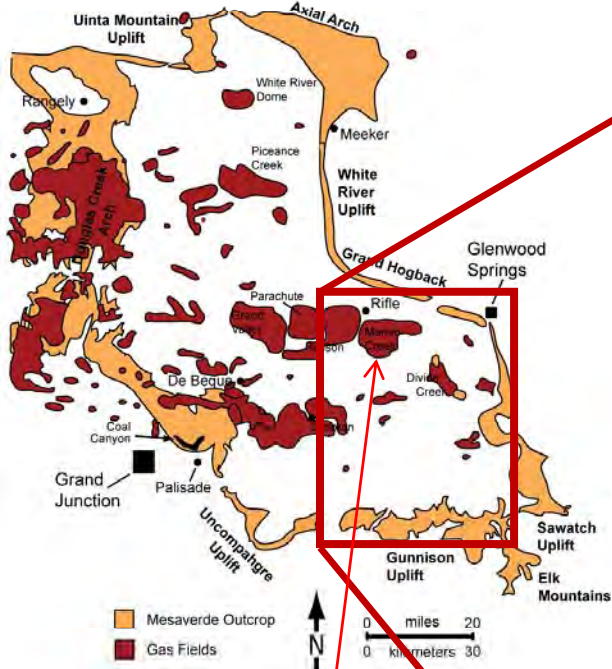
Reservoir Connectivity, Mamm Creek Field

Jim Gilman, Huabing Wang and Reinaldo J Michelena*
iReservoir.com, Inc.

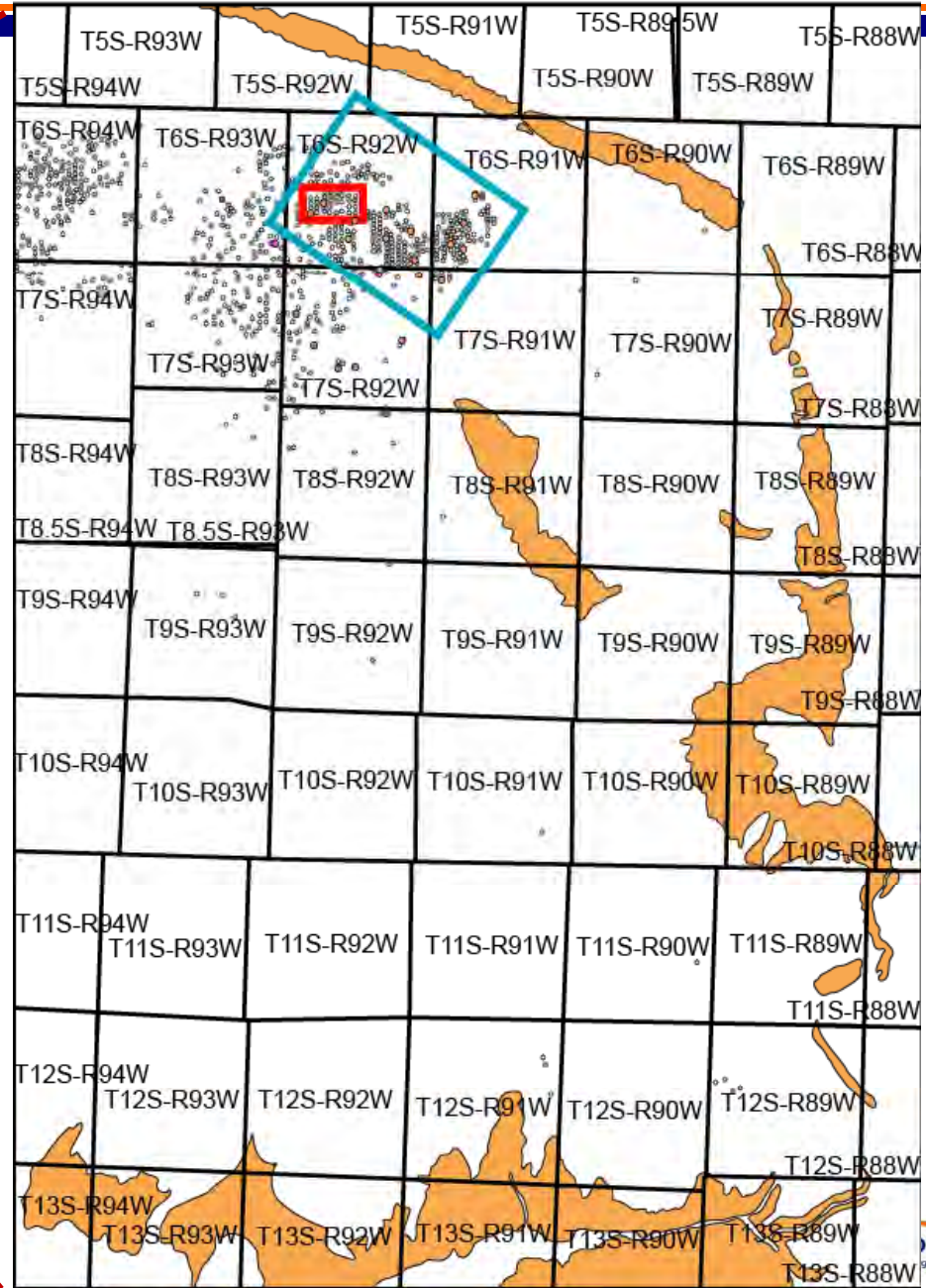
Matt Pranter and Alicia Hewlet
University of Colorado, Boulder

April 19th, 2011

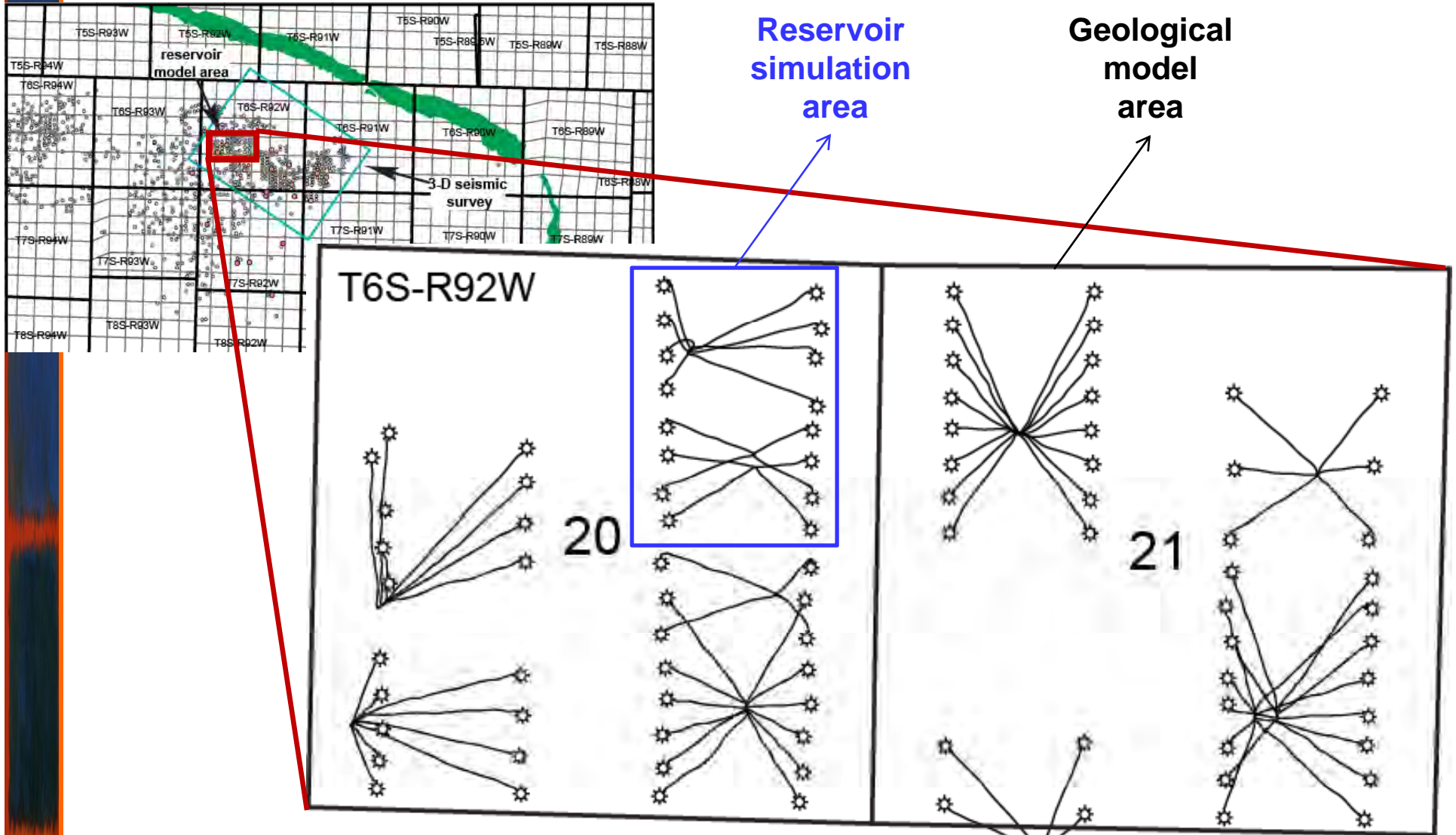
Location of Mamm Creek field



Mamm Creek



Area of interest



Reservoir simulation area

Geological model area

0 miles 0.4
0 kilometers 0.64



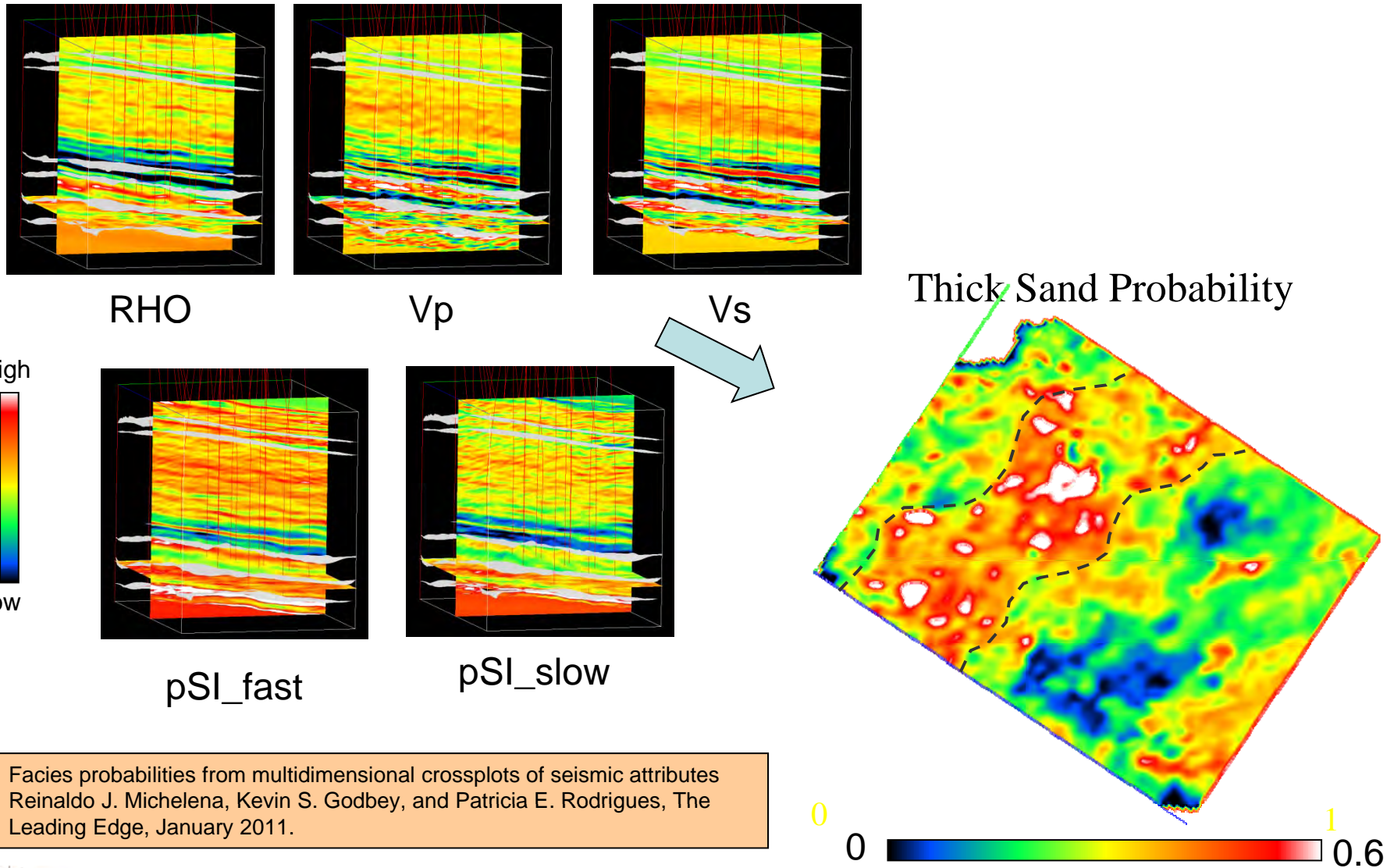
Objective

- The overall objective of the reservoir characterization and flow simulation project in Mamm Creek field is to understand the reservoir volumetrics and connectivity
 - Use integrated approach to create a 3D dynamic simulation model that capture the main geological complexities of the field.
 - Use all petrophysical, geological, seismic, and engineering information available

Characterization and simulation workflow

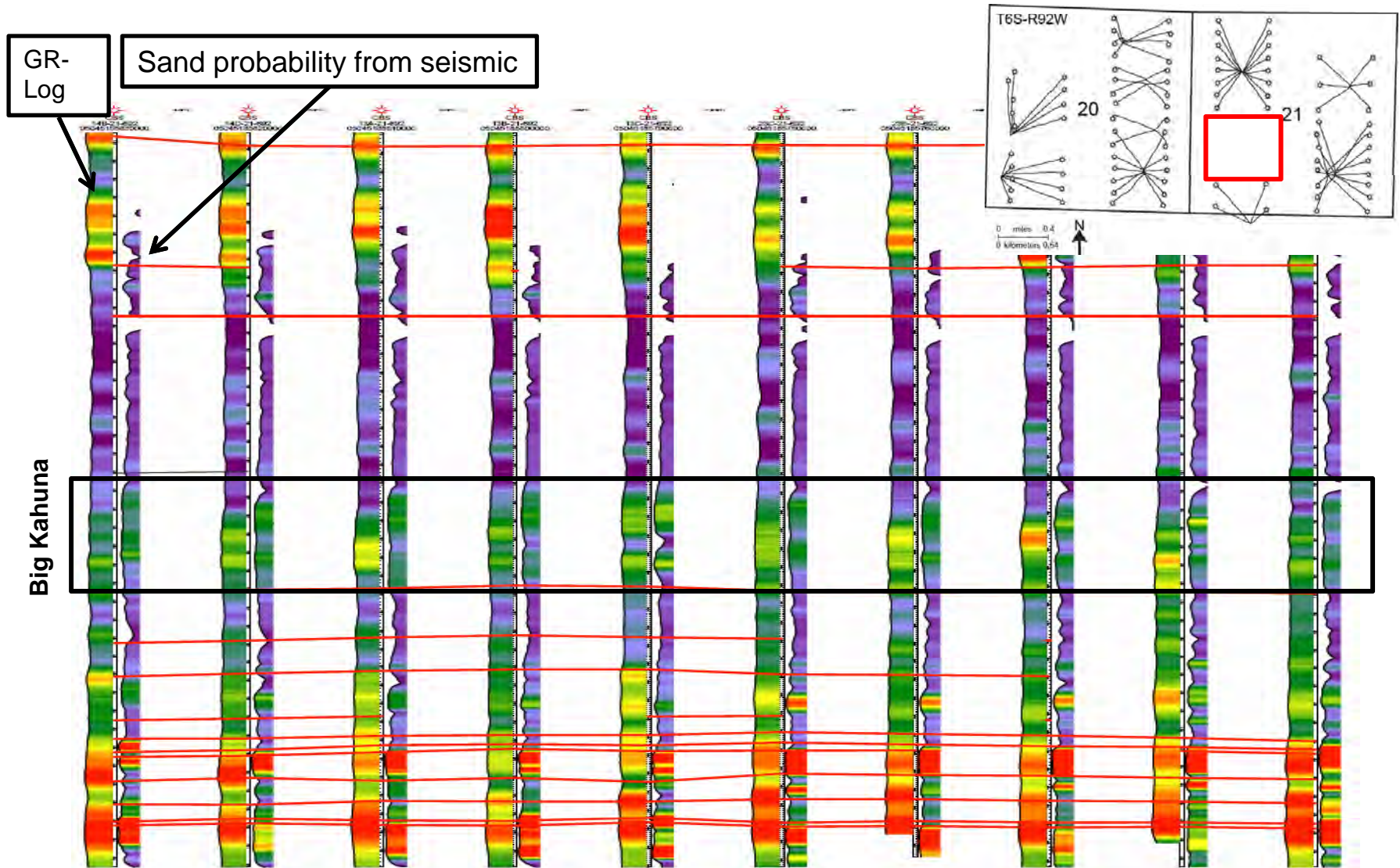
- Petrophysics and rock physics modeling
- Facies definitions
- Geological interpretation
- Seismic analysis for facies prediction
- Geological model building
- Dynamic simulation

Seismic to constrain geological models

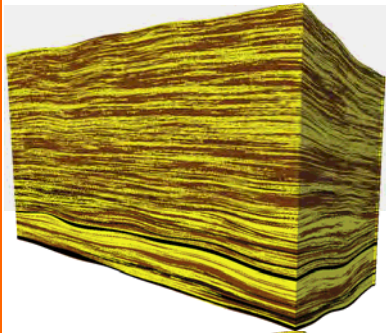


Facies probabilities from multidimensional crossplots of seismic attributes
 Reinaldo J. Michelena, Kevin S. Godbey, and Patricia E. Rodrigues, The Leading Edge, January 2011.

Predicted sand probabilities in newer wells

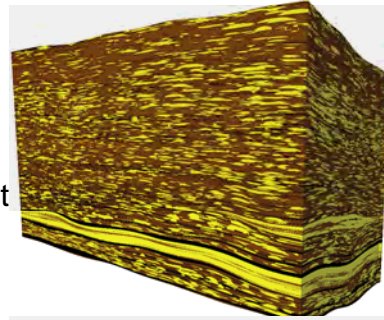


Geologic model choices



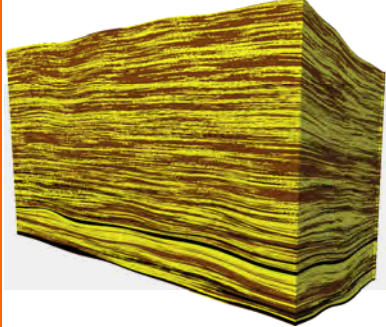
Case A

- SIS
- basic lithology
- no seismic constraint



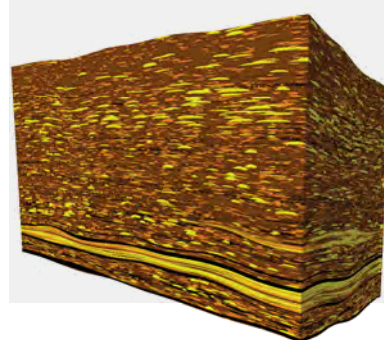
Case D

- OBS
- basic lithology



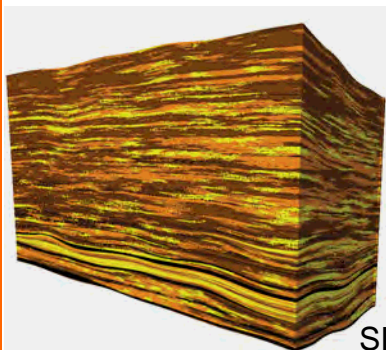
Case B

- SIS
- basic lithology
- constrained to seismic



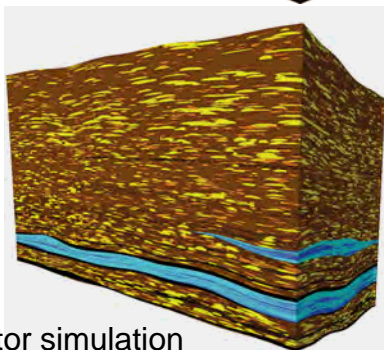
Case E

- OBS
- refined lithology



Case C

- SIS
- refined lithology

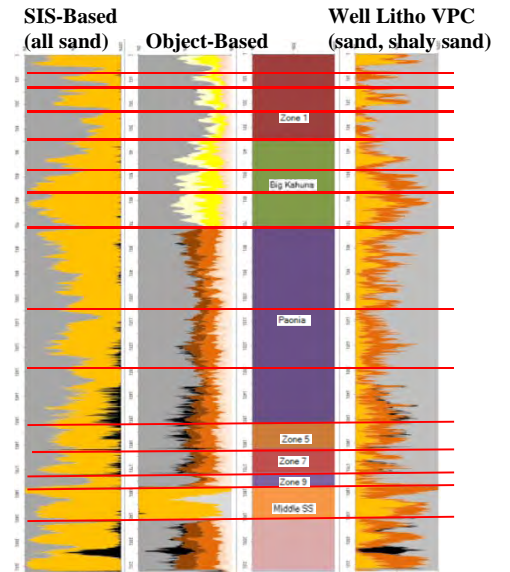


Case F

- OBS
- architectural elements

SIS: Sequential-indicator simulation
OBS: object-based simulation

Facies Proportions

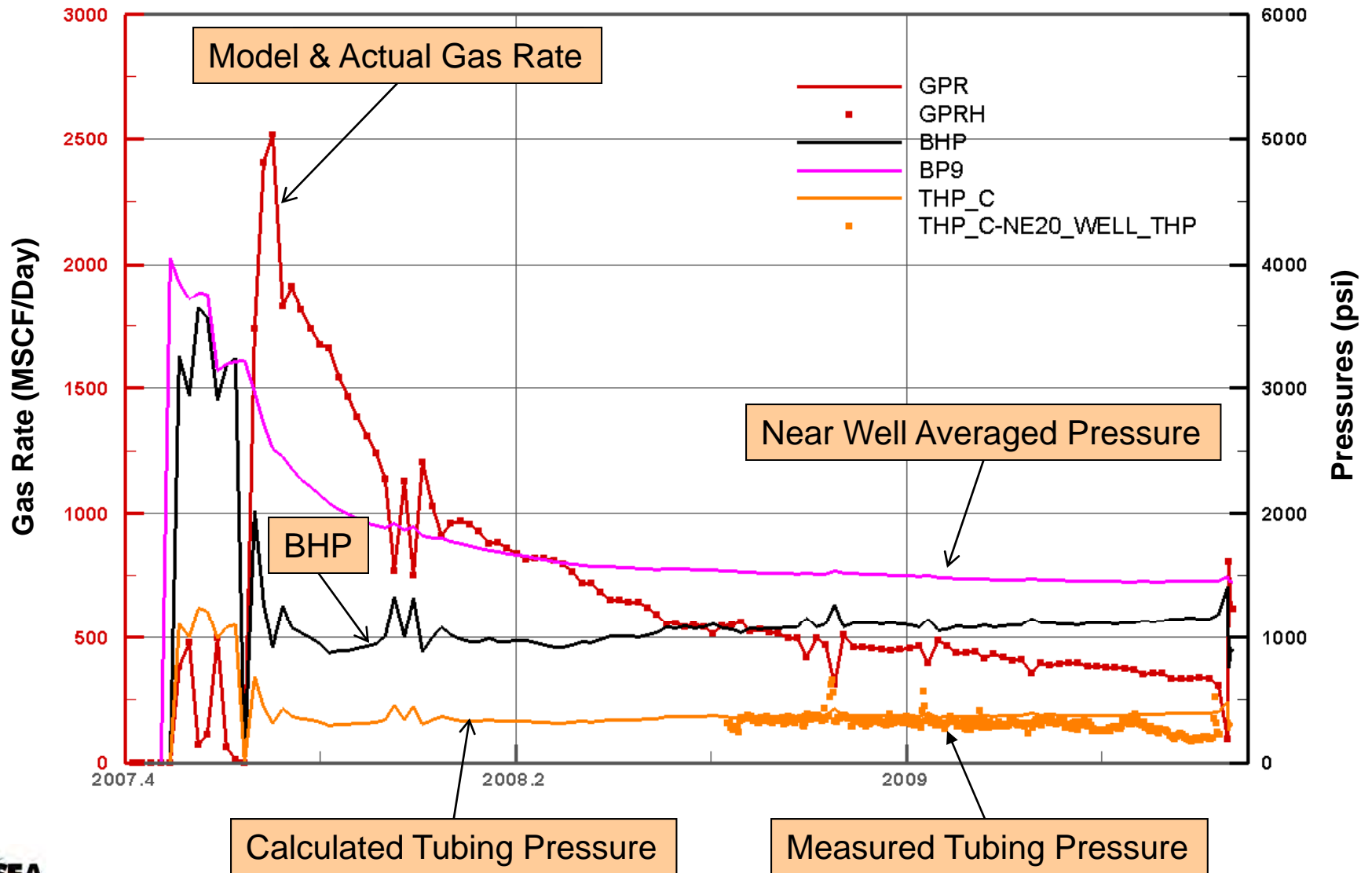


- Facies9: MarineShale
- Facies8: MarineSands
- Facies7: CrevasseSplayB
- Facies6: CrevasseSplayA
- Facies5: ChannelBarB
- Facies4: ChannelBarA
- Facies3: PointBarB
- Facies2: PointBarA
- Facies1: Coal

Floodplain

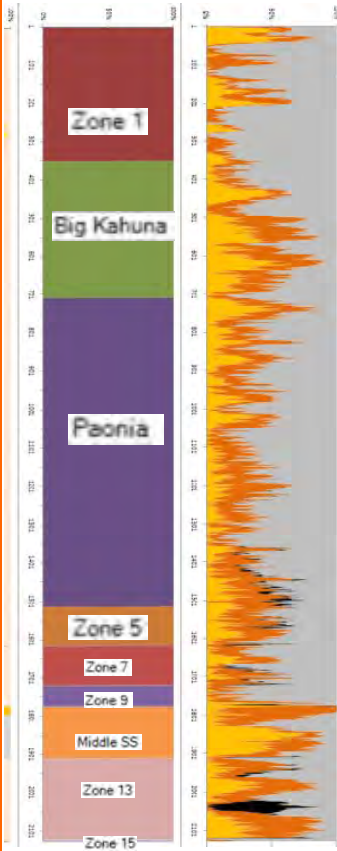
Pranter, M. J., *A. C. Hewlett, R. D. Cole, H. Wang, and J. R. Gilman, in review, Fluvial architecture and connectivity of the Williams Fork Formation: use of outcrop analogues for stratigraphic characterisation and reservoir modelling, in T. Good, J. Howell, A. W. Martinus, eds., Sediment body geometry and heterogeneity: analogue studies for modelling the subsurface, The Geological Society of London, Special Publication.

Calibration of models to rate performance

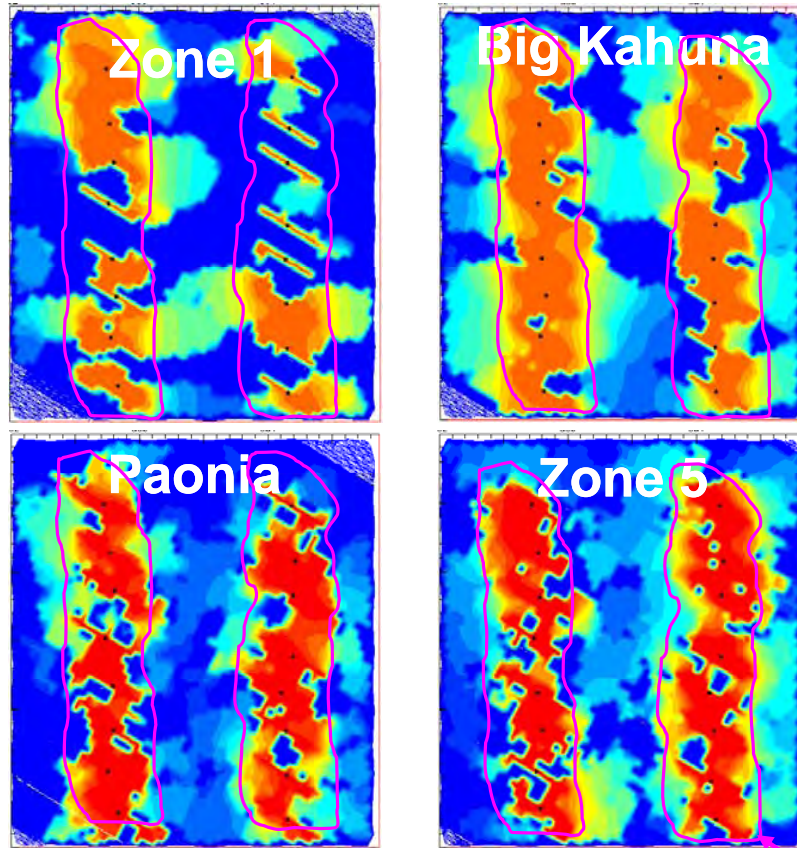


30-Year Recovery

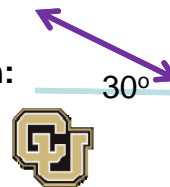
Facies Proportion



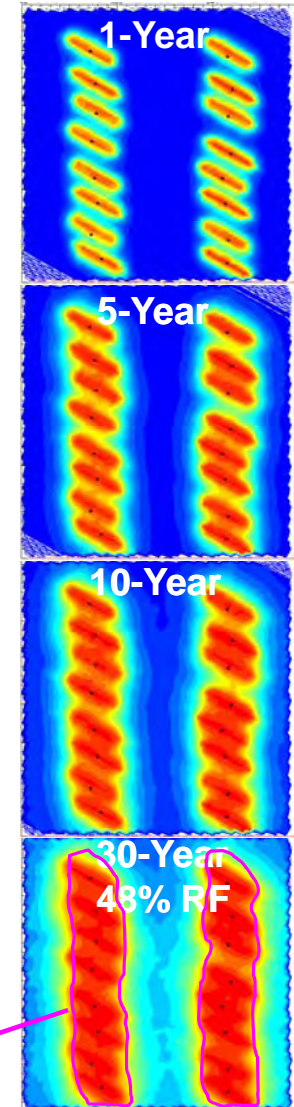
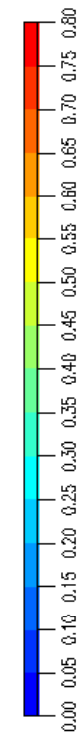
Recovery after 30 years, "optimal" hydraulic fractures, 25~30 ft thickness



Hydraulic Fracture Orientation:



Avg. all layers by year →



Approx 30-year high recovery area

Conclusions

- Geologic models created at Mamm Creek Field were the result of a complex workflow of known concepts and a careful data analysis and interpretation rather than a single algorithm that integrated all the data automatically
- This integrated approach to characterization and simulation yielded good matches to the character of pressure decline while still ensuring consistency with petrophysical, geological, geophysical, and engineering interpretations.
- The models are not simplistic which allows a non-uniform distribution of pressure depletion and more realistic assessment of infill well potential and long-term recovery as compared to other engineering methods.
- The integrated characterization and simulation approach used in this project shows the importance of geologic controls on long-term recovery, providing a data constrained methodology to assess optimal infill well spacing.

Acknowledgments

- The authors acknowledge RPSEA (Research Partnership to Secure Energy for America) for financial support
- Thanks also to Bill Barrett Corporation (BBC) for providing the data used for this study
- Thanks to Steve Cumella from BBC for valuable geological insight about Mamm Creek Field