# RMC AT A GLANCE

USC Viterbi School of Engineering

**RMC**

USC University of Southern California

**The Reservoir Monitoring Consortium**

## What is RMC?

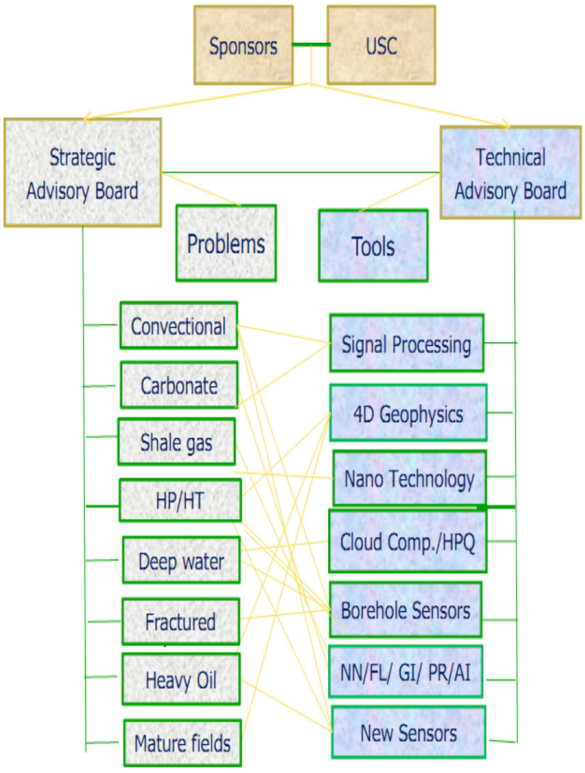
The Reservoir Monitoring Consortium (RMC) focuses on developing new methods to monitor changes in the reservoir. Reservoir Monitoring is accomplished in different stages from Drilling to development and from Production to Well Stimulation (EOR and Hydraulic Fracturing). It integrates concepts and data from Geology, Petrophysics, Geophysics (3D /4D Seismic), Geomechanics, Petroleum Engineering, Computer Science and other disciplines for optimum results.

### Objectives

- Develop specific workflows for different types of reservoirs
- Focus on multi-disciplinary aspects of reservoir monitoring
- Maintain a balance between short and long term, high impact research goals, and the immediate and foreseen industry needs.

## What can RMC do for You?

- Integrated reservoir model updating and history matching.
- Fracture characterization with a focus to increase SRV.
- Advanced $CO_2$ monitoring with Foam.
- Special issues for reservoir monitoring of mature oil fields, carbonate reservoirs & unconventional reservoirs.
- 4D inversion for pressure, saturation, and permeability
- Optimizing hydraulic fracturing
- Integrating geomechanics and seismic to map stress field

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## The Reservoir Monitoring Consortium

# RMC Hybrid Structure

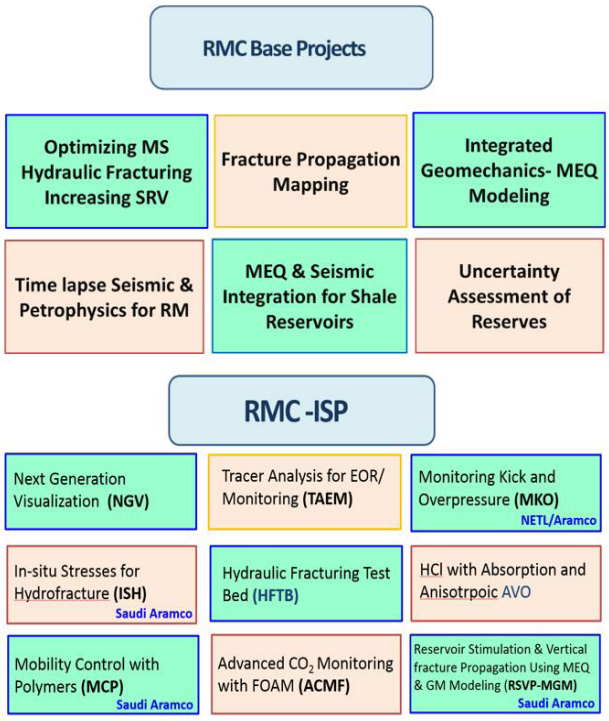
### RMC Base Projects

- Member's access to general results of RMC Base Projects
- Prioritization of Base Project Mix
- Partial Access to ISP projects (with ISP member concurrence)

### Individually Sponsored Projects (ISP)

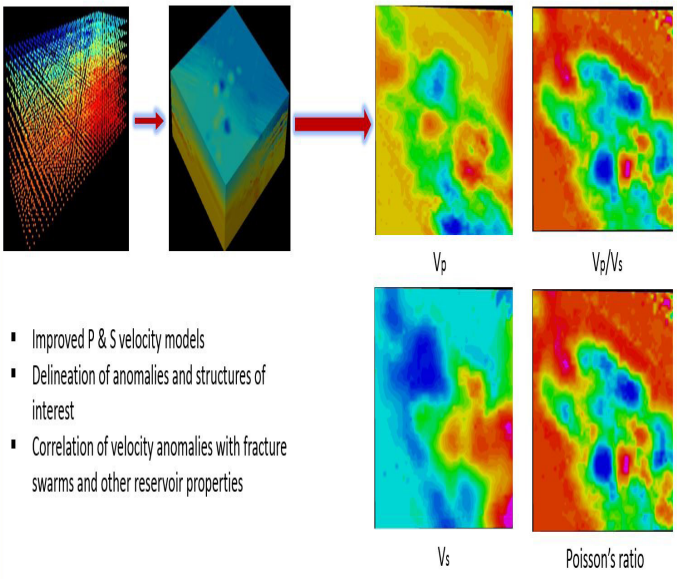
- Access to RMC Base Project Results
- ISP Member focused project
- Limited distribution of data and results
- Increased interaction between ISP member and USC

Combination of RMC BASE and ISP is a unique structure for University Consortia, maximizing the benefits to sponsors and ensuing quick dissemination of information and sponsor data confidentiality .




# Base Projects

### Reservoir Property Prediction

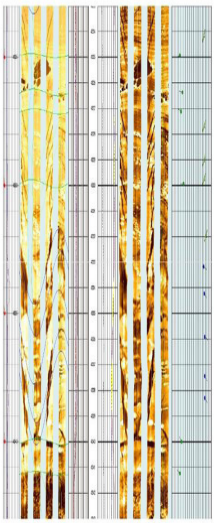



- Improved P & S velocity models
- Delineation of anomalies and structures of interest
- Correlation of velocity anomalies with fracture swarms and other reservoir properties

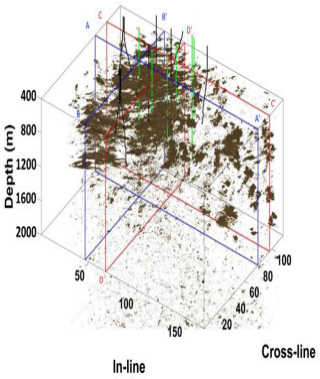
Aminzadeh, F., Tafti, T. A. and Maity, D., 2013, Computer and Geosciences journal, Vol. 39, Issue 2.

# Base Projects

### Fracture Mapping using MEQ, Seismic and Petrophysical Data



Identify fractures & generate fracture logs




HYBRID FZI ATTRIBUTE MAPPING (ANN)

$$FZI_N = F\{\phi_N, Z_N, V_{P_N}, V_{S_N}, \rho_N, V_{EN_N}\}$$

Maity, and Aminzadeh, 2015: Interpretation, 3(3), T155–T167.

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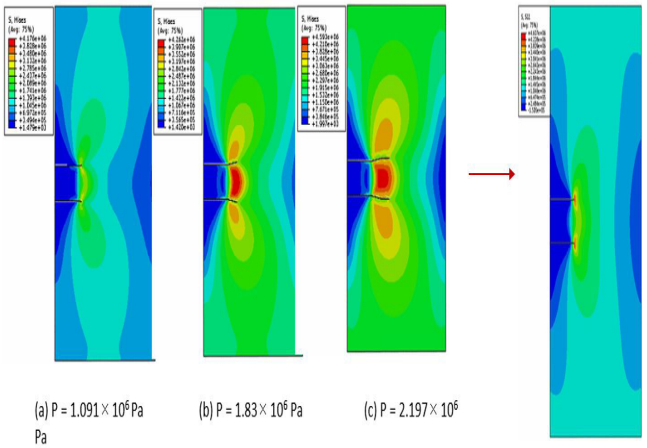
## The Reservoir Monitoring Consortium

## Base Projects

### Fracture Propagation Mapping



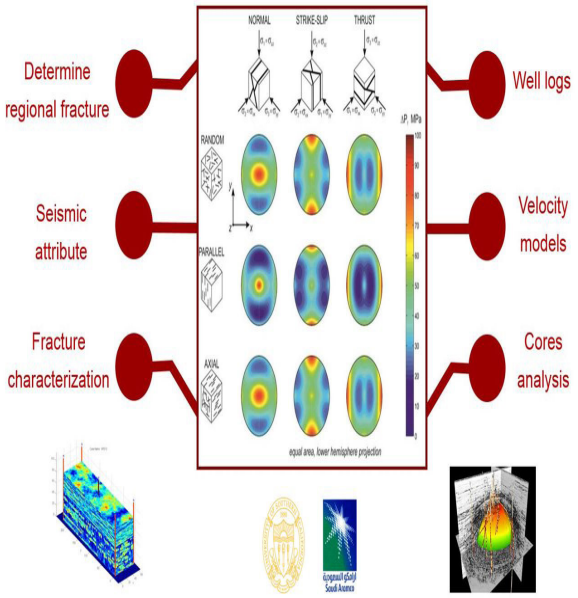
(a) P = 1.091 × 10⁶ Pa (b) P = 1.83 × 10⁶ Pa (c) P = 2.197 × 10⁶ Pa

- Stress field distribution in a 1 m by 0.5 m rectangular plate.
- Distance between two fractures is 10 cm.
- Normal stress distribution in Y-direction.

Khodabakhsh Nejad (2015)

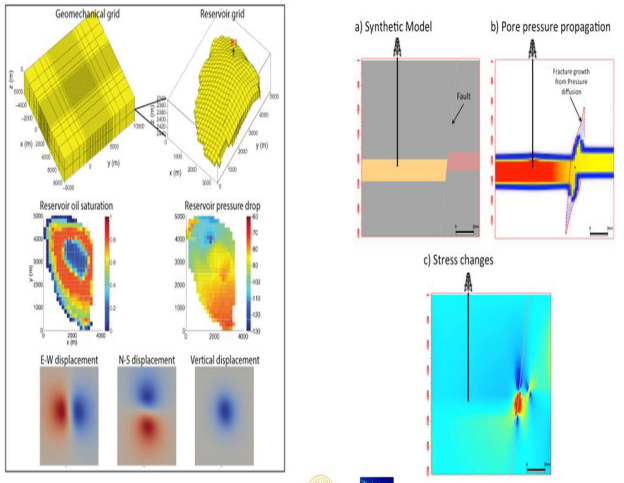
## Individually Sponsored Projects (ISP)

### In-situ Stress in Hydraulic Fracturing (ISH)




## Individually Sponsored Projects (ISP)

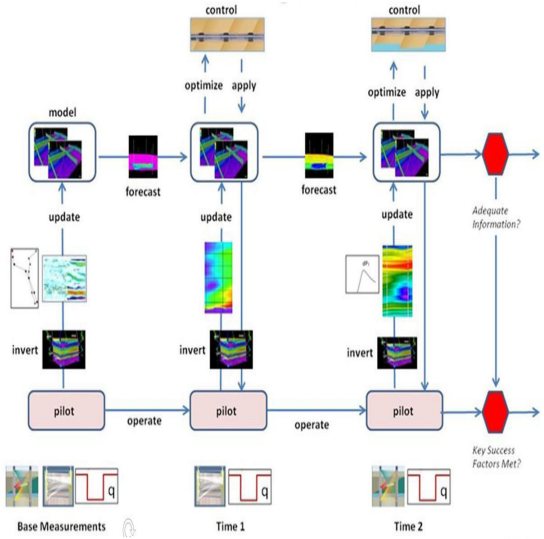
### Reservoir Stimulation and Vertical Fracture Propagation using Microseismic and Geomechanical Modeling (RSVP-MGM)*




* In the planning stage

## Individually Sponsored Projects (ISP)

### Advanced CO2 Monitoring (ACM) with FOAM*




* In the planning stage

With University of Bergen and The Petroleum Institute

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## The Reservoir Monitoring Consortium

## Benefits to sponsors

- Access to low-cost, leading-edge research results (software, workflow and technical reports) in sponsors' area of interest.
- A mechanism to leverage contributions from multidisciplinary RMC Base Project results in different forms including personal consultation and training.
- Networking with other members, short courses, annual review meetings and staff training for professional development.
- Priority access to the best talent with expertise in different areas including reservoir characterization and real time reservoir monitoring.

## How can you collaborate with RMC?

- Sponsorship for RMC Base can be in the form of gift contributions to GEN at gen.usc.edu/funding/ or research contracts. For details on different membership tiers please contact Prof. Fred Aminzadeh: faminzad@usc.edu
- For RMC ISP, a project plan could be jointly developed between USC and the sponsoring organization
- Option available to pay part of the fees in the form of direct student sponsorship or fellowship
- Period of Membership: October 1st – September 31st

For opportunities to support RMC please visit rmc.usc.edu/ or contact Fred Aminzadeh at faminzadeh@usc.edu and Michael D. Orosz at mdorosz@isi.edu