USC University of Southern California

RMC

Reservoir Monitoring Consortium (RMC)

Semi- Annual Project Review Meeting

A Novel Approach to Tracer Analysis: Dynamic 3D Geomodeling of Tracer Blobs in EOR Operations

Noha Najem, Kuwait Oil Company

Los Angeles, CA
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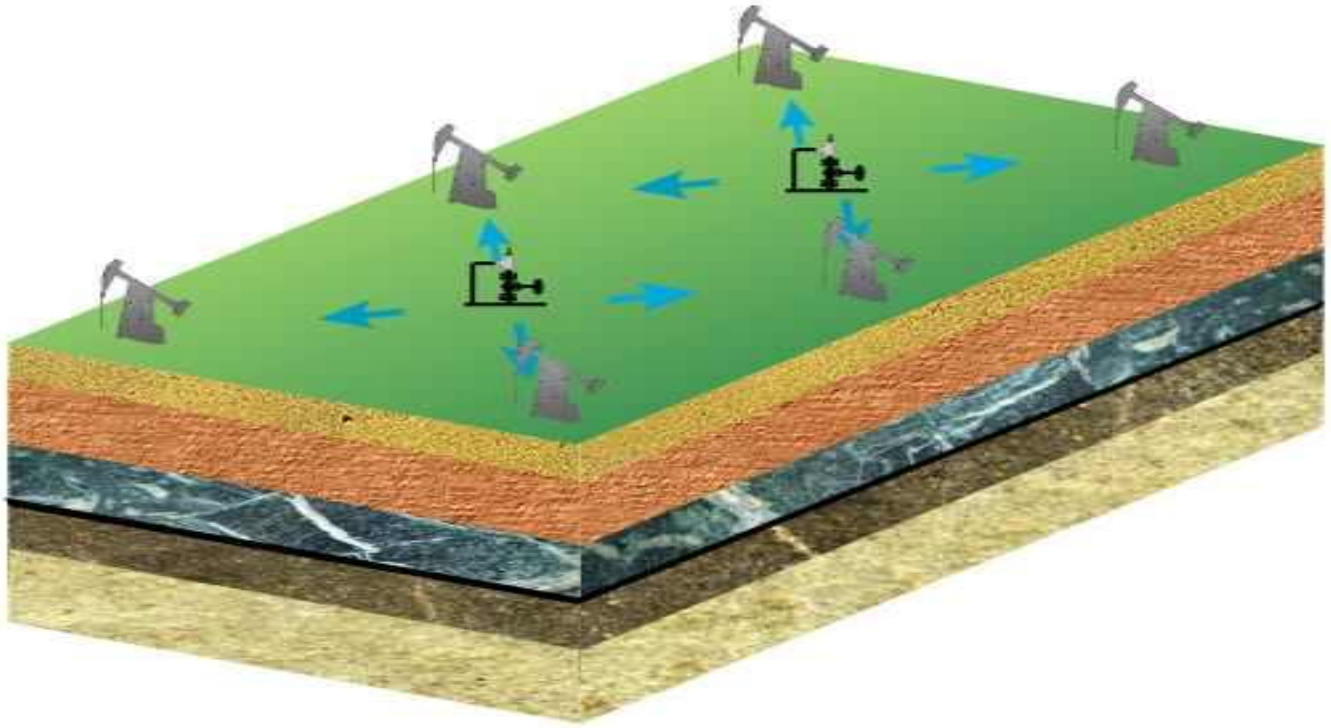
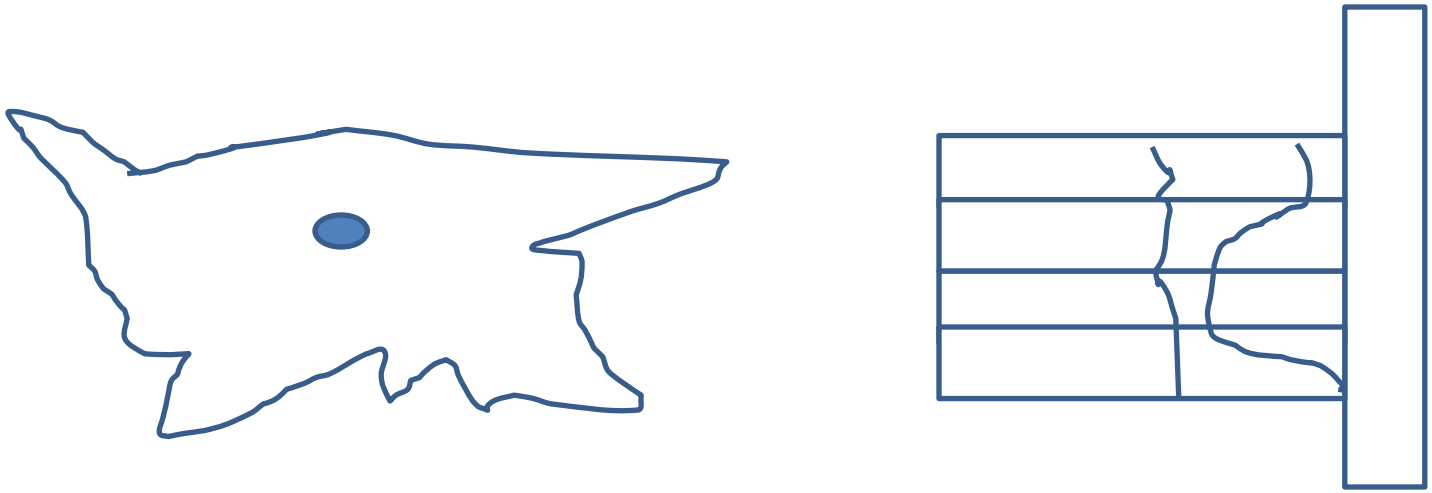
Statement of Problem



Np=N*Ea*EV*Ed

Objective

Dynamic Mapping of Ea and Ev

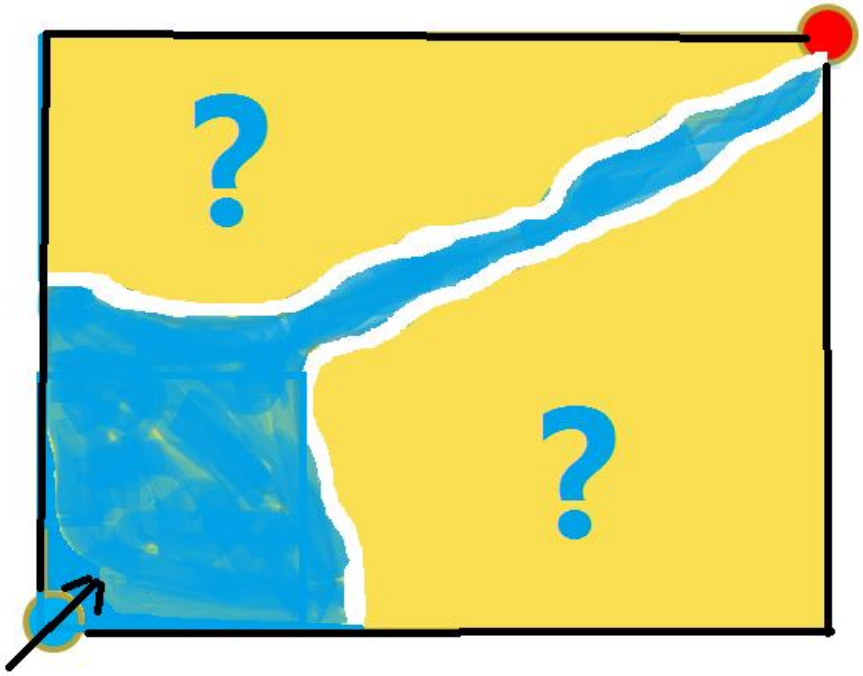


Solutions

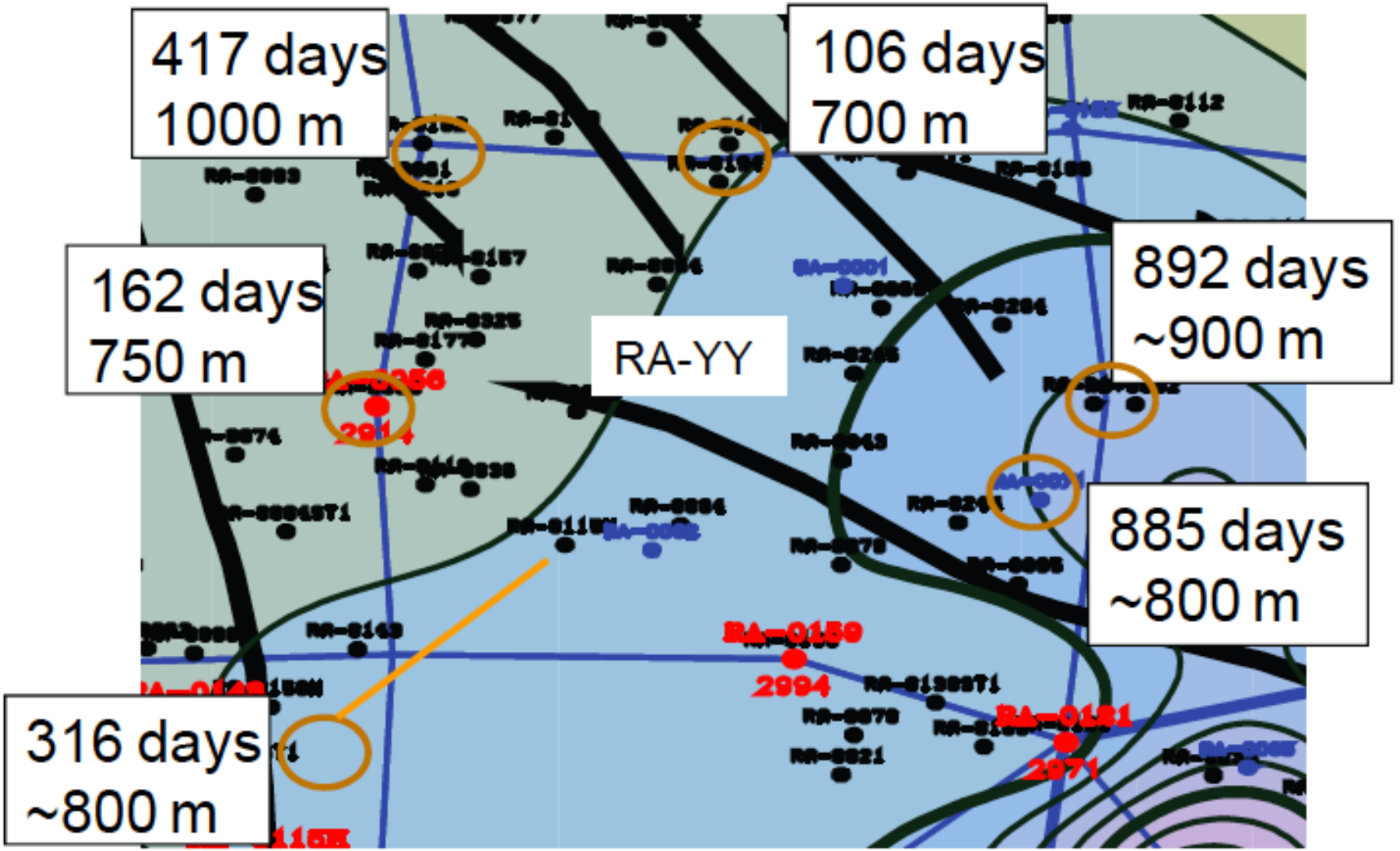
- 4D seismic
- Pressure Transient
- Performance Data
- ✓Tracers

About Tracers

- Conventional Thinking
  - Water Soluble Tracers
  - Gas Tracers
  - ✓Monitoring



Tracer Response in A Field



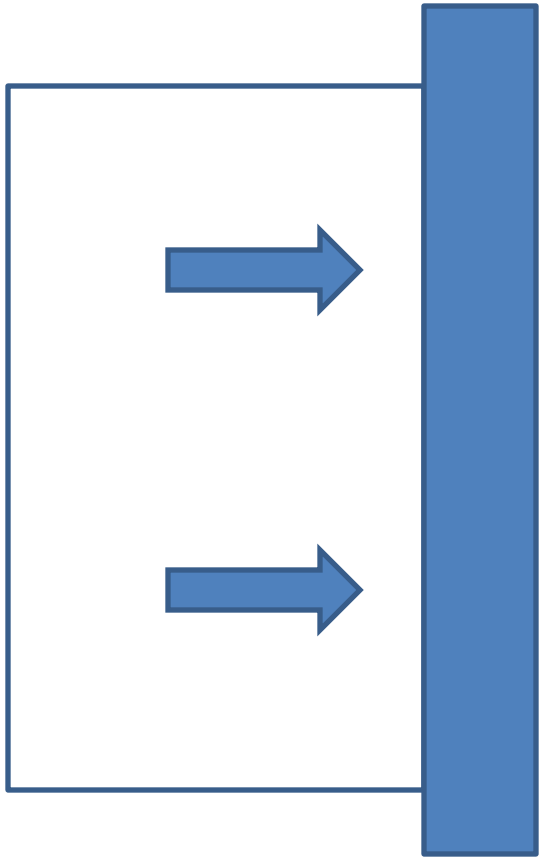
Problems with Conventional Thinking

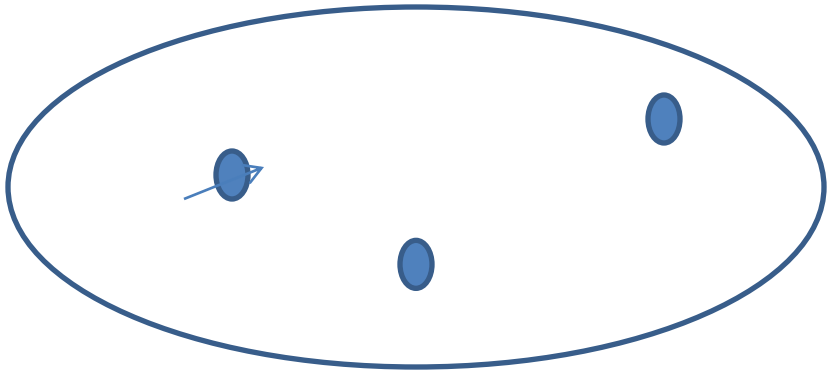
- Expensive
- Cost of Sampling
- Time of Sampling
- Adsorption
- Detection Sensitivity
- Modeling

Smart Tracer Technology

- Chemical Based
- Sensor Based

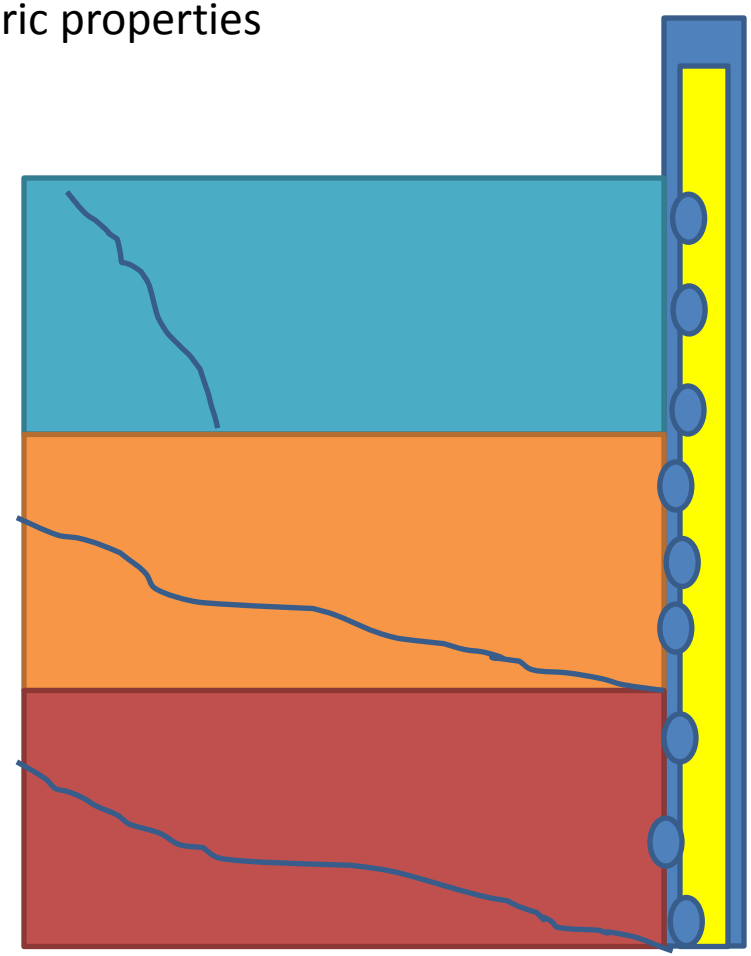
Smart Tracer Technology

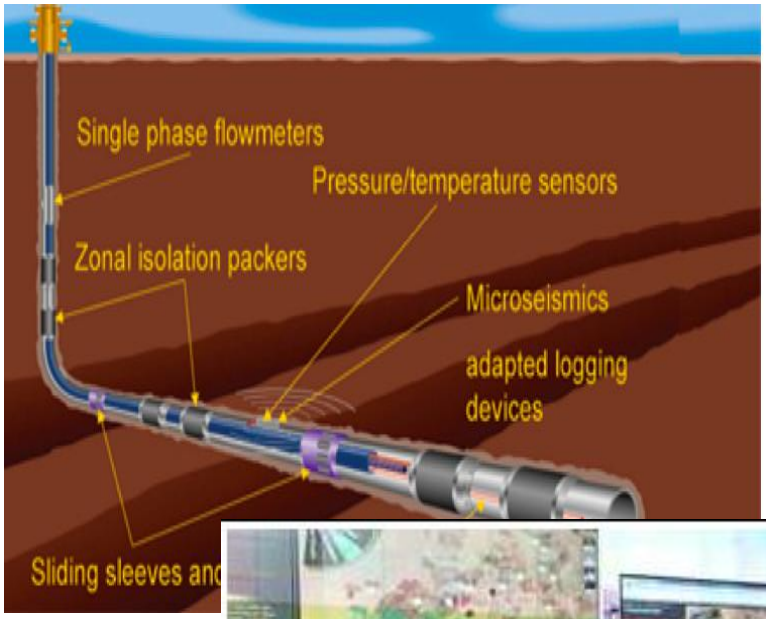




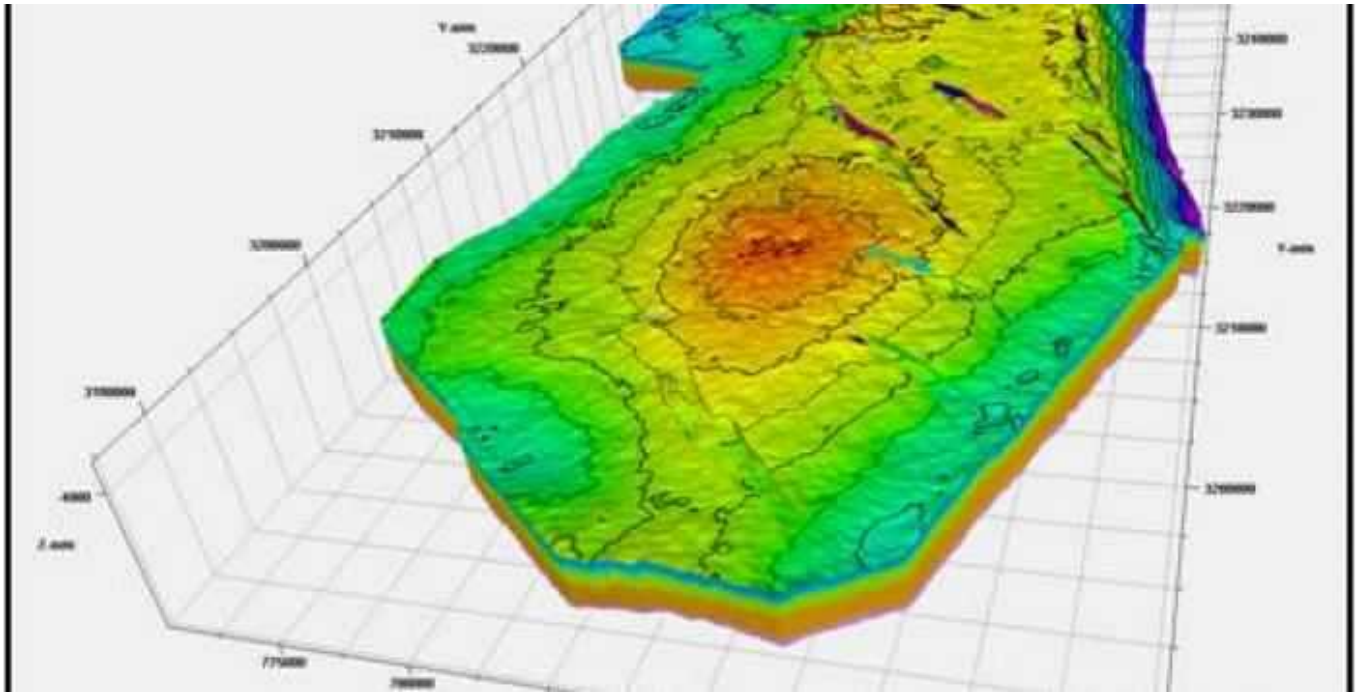
Smart Tracer Technology

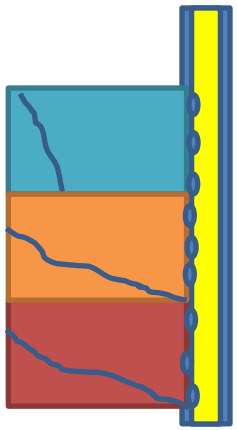
Detect water by measuring capacitance or dielectric properties



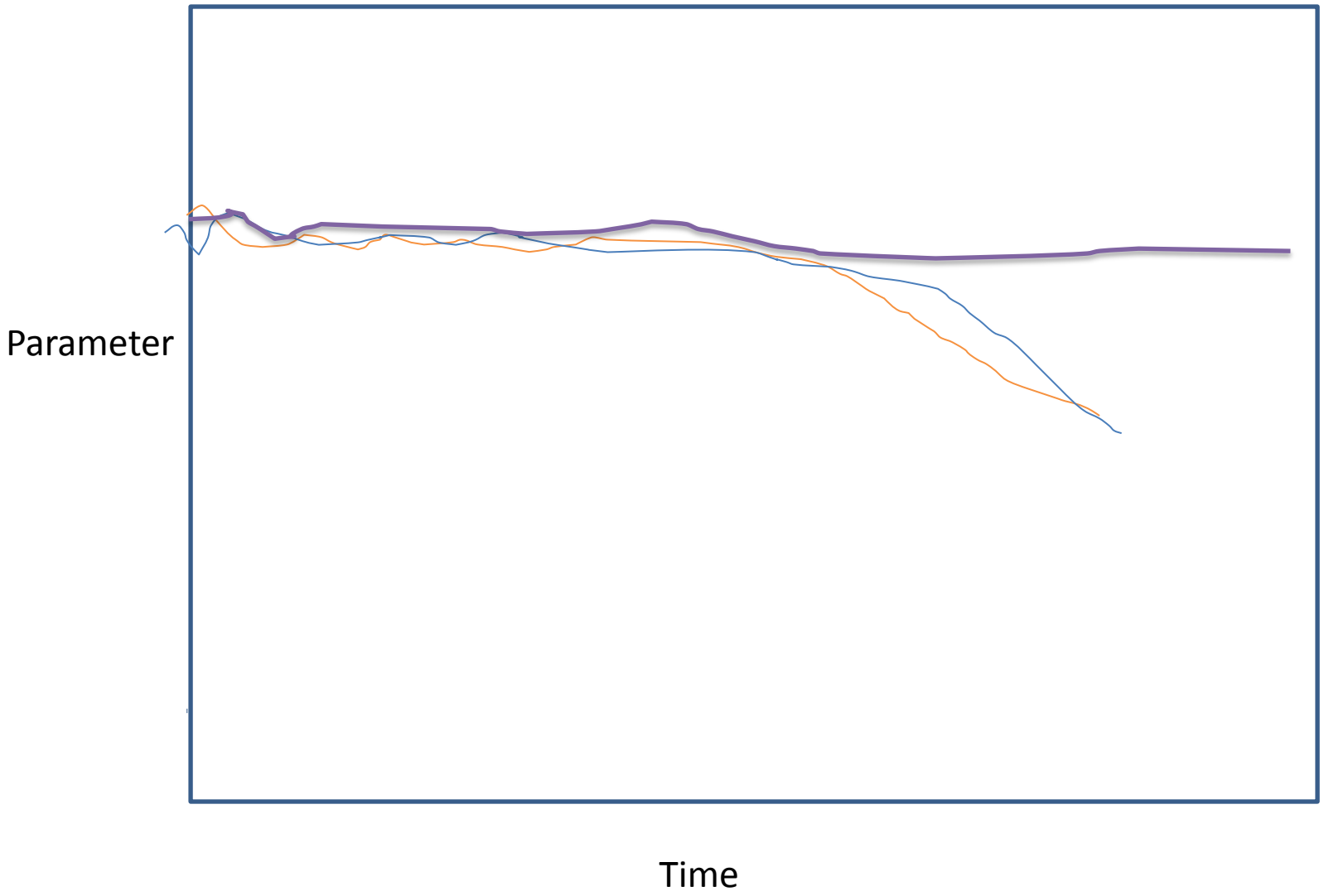


Smart Tracer Technology
Field Scale

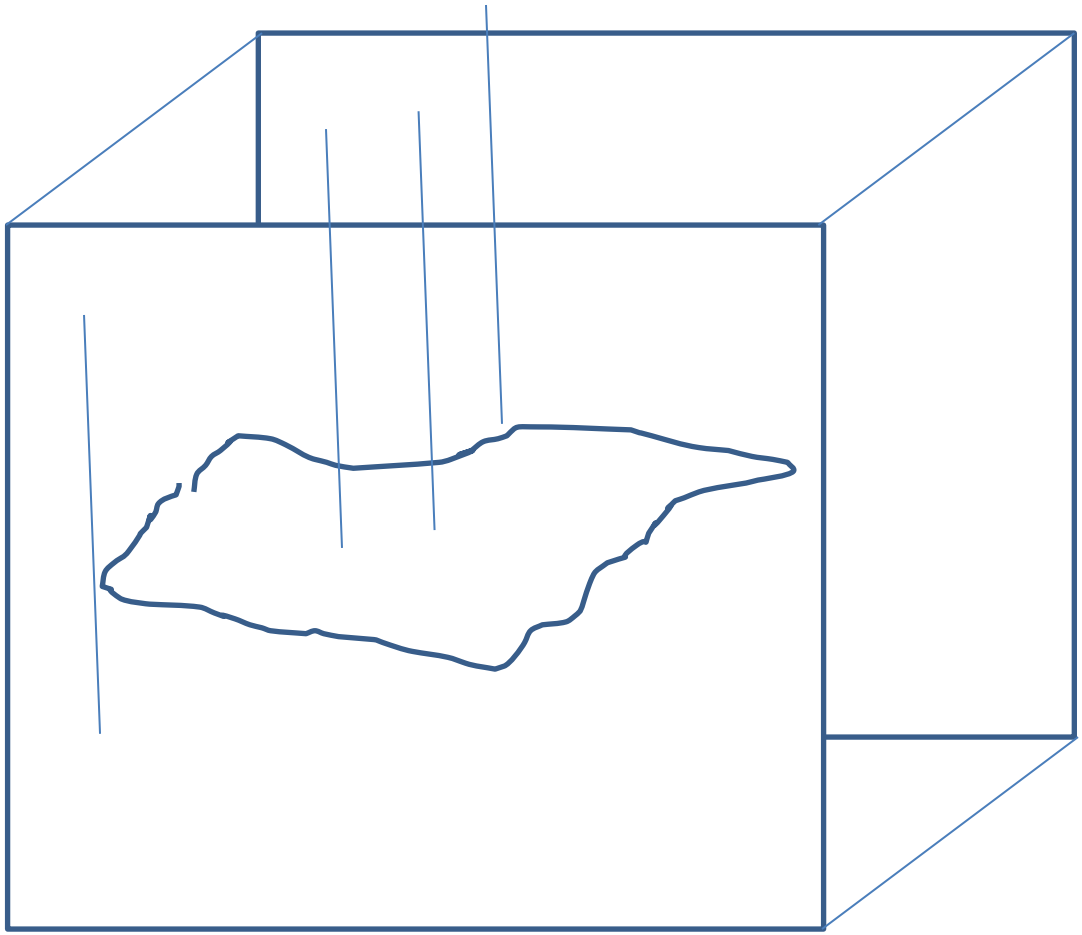




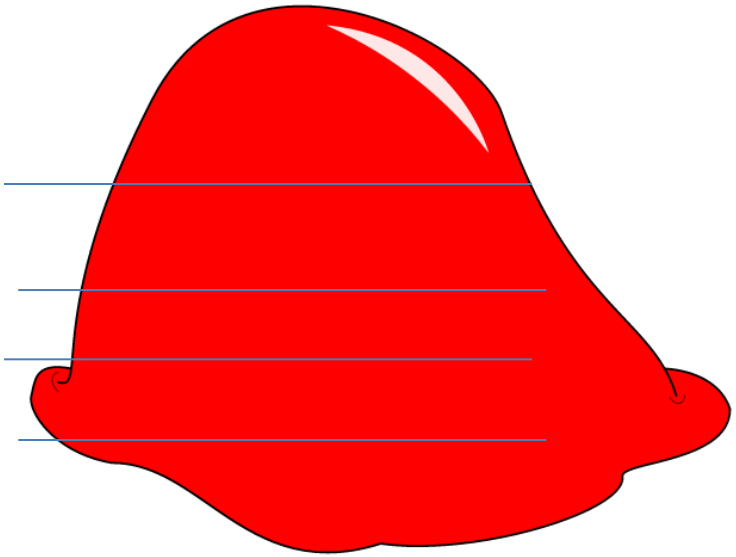
Smart Tracer Technology
Data Response & Interpretation



Smart Tracer Technology
Data Response & Interpretation



Blob- EOR/IOR 3D Geomodel from Tracer Technology



Developing a method to generate the 3D image of a tracer blob

assumptions :

Complex heterogeneous reservoir

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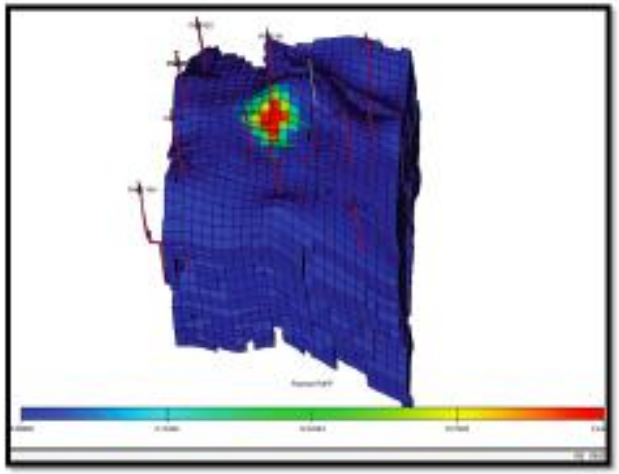
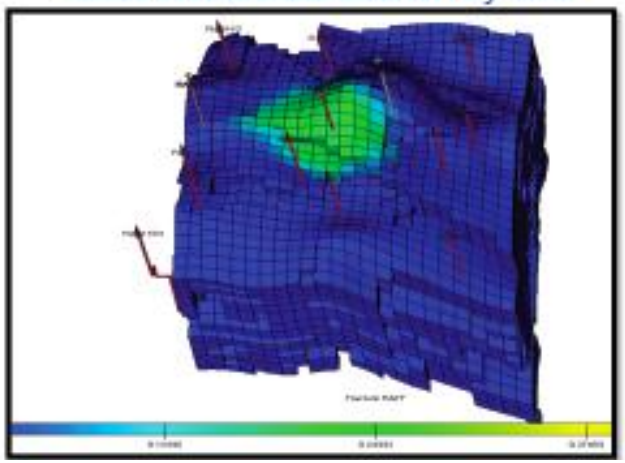
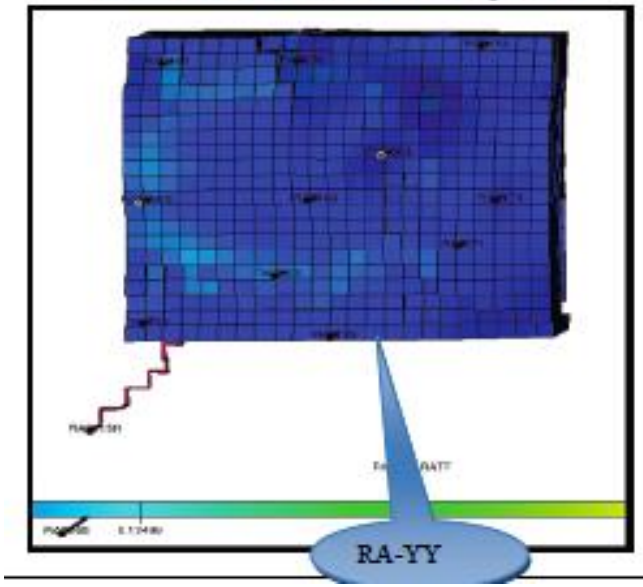
Tracer Concentration as of 1st Mar 2008

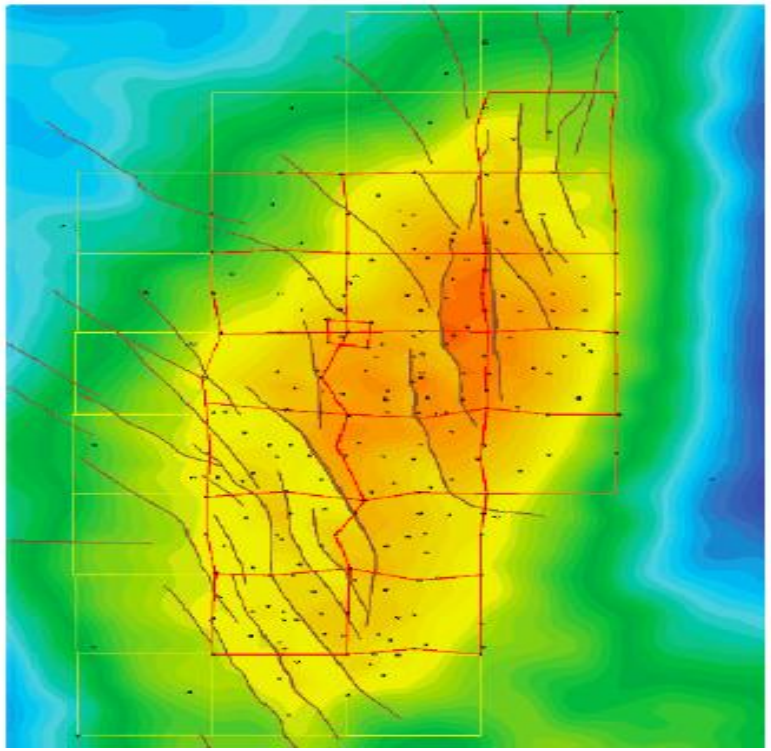


Tracer Concentration as of 1st May 2008



Tracer Concentration as of 1st Apr 2010





Method

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Tracer Test Design/ Candidate Selection :

- A commonly used environmentally safe tracer candidate can be used that is detectable by downhole sensors
- Definition of Interwell tracer objectives and aim of tracer testing.

- Definition of relevant tracer properties and select tracer candidate based on these.

- Definition and design of tracer test strategy (location, duration etc)

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Method

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Dynamic Tracer Simulation:

- Model The novel approach will utilize downhole sensors to sense the tracers.
- A **dynamic simulation model** will be generated based on the real-time information attained at the well
- The information will allow an iterative model for inverse modeling and history matching to obtain optimal results based on various modelling scenerios

Conclusions

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- Kuwait Oil Company is looking into implementing EOR in its mature fields
- Past implementation of Interwell tracers has shown much success , however approaches were traditional and did not address all challenges
- A novel approach using **downhole sensing** and **dynamic simulation** is now being developed to address these challenges and aid in the identification of pathways, improve sweep efficiency and indicate Sor.