Computational Environments for Integration of Geophysics and Reservoir Simulation

An overview of the NSF/ITR projects:

The Data Intense Challenge: The Instrumented Oil Field of the Future (2001-2005)


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Computational Environments for Integration of Geophysics and Reservoir Simulation
The Instrumented Oil Field

Assimilate data & reservoir properties into the evolving reservoir model

Detect and track changes in reservoir changes during production

Model Driven

Data Driven
DYNAMIC DATA DRIVEN SUBSURFACE SYSTEMS

Complex Geosystem Management

- Uncertainty Assessment
- Sensor Data Management
- Characterization & Imaging
- Sensor Placement
- Optimization and Control
- Multiscale Simulation
- Data Management
- 3D Visualization & Interpretation
- Geophysical Interpretation
- Petrophysical Interpretation
- Multiphysics Simulation

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Accomplishments

Models

Simulation

Optimization

Data

Multiphysics

Instrumented Landfill

Underground Pollution

Deep GeoM

Multialgorithmic

Fully Implicit

IMPES

IMPES

IMPES

IMPES

Multiphysics

Chemistry

Compositional

Black-oil

Thermal

Multiscale

Optimization

Optimal Scheduling

Optimal Well Placement

History Matching

Seismic data

Visualization

Flow data

Flow data Management

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Accomplishment: Grid-enabled Production and Reservoir Management

Seismic Data Simulation Tools

Reservoir Performance

Data Analysis

Grid-based Data Management and Manipulation Tools: DataCutter

Datasets from Simulations and Field Measurements

Reservoir Characterization

Oil Reservoir Simulation Tools

Data Analysis

Visualization Tools

Production Forecasting

Discover: Web, Steering, Collaborative Portals

Reservoir Monitoring Field Measurements

Datasets from Simulations and Field Measurements

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Accomplishment:
Sensitivity Analysis of Flow and Simulation
DDDAS: Integration of Data, Models, and IT

**DYNAMIC DATA COLLECTION**
- Remote sensing
- Monitoring
- Data assimilation

**REDUCTION OF UNCERTAINTY**

**COMPUTATIONAL SCIENCE**
- CS tools
- Numerical algorithms

**E-Fields, Seismic Surveys, Well Logging, Smart Wells**

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Publications and Invited Presentations:

- SEG, SPE, AGU, EAGE, SIAM, IEEE, ACM, Supercomputing

Workshops at

- DARPA, NASA, DOE, DOD, NSF

Academic, Industrial and Governmental colloquia and meetings