

TM-6011 : Modul 1: Pendahuluan

Advanced Reservoir Simulation

Introduction to Reservoir Simulation

What Is Reservoir Simulation?

- Reservoir simulation is the representation of petroleum reservoir performance using a model.

Types of Reservoir Simulation Models

- Analog models
- Physical models
- Mathematical models
- Numerical models
- Computer models

Why Do We Need Reservoir Simulation?

- Accurately predict reservoir performance under operating conditions
- Assess and minimize risk associated with reservoir development plans
 - Rock property variations
 - Fluid property variations
 - Recovery mechanism complexities
- Limitations of other predictive methods

When You Should Use Reservoir Simulation?

- When the problem cannot be solved any other way.
- When reservoir simulation is faster, cheaper, or more reliable than other methods.
- GENERAL RULE: Problems should be solved using the simplest and least costly method that will yield an answer consistent with the objectives of your study and the available data.

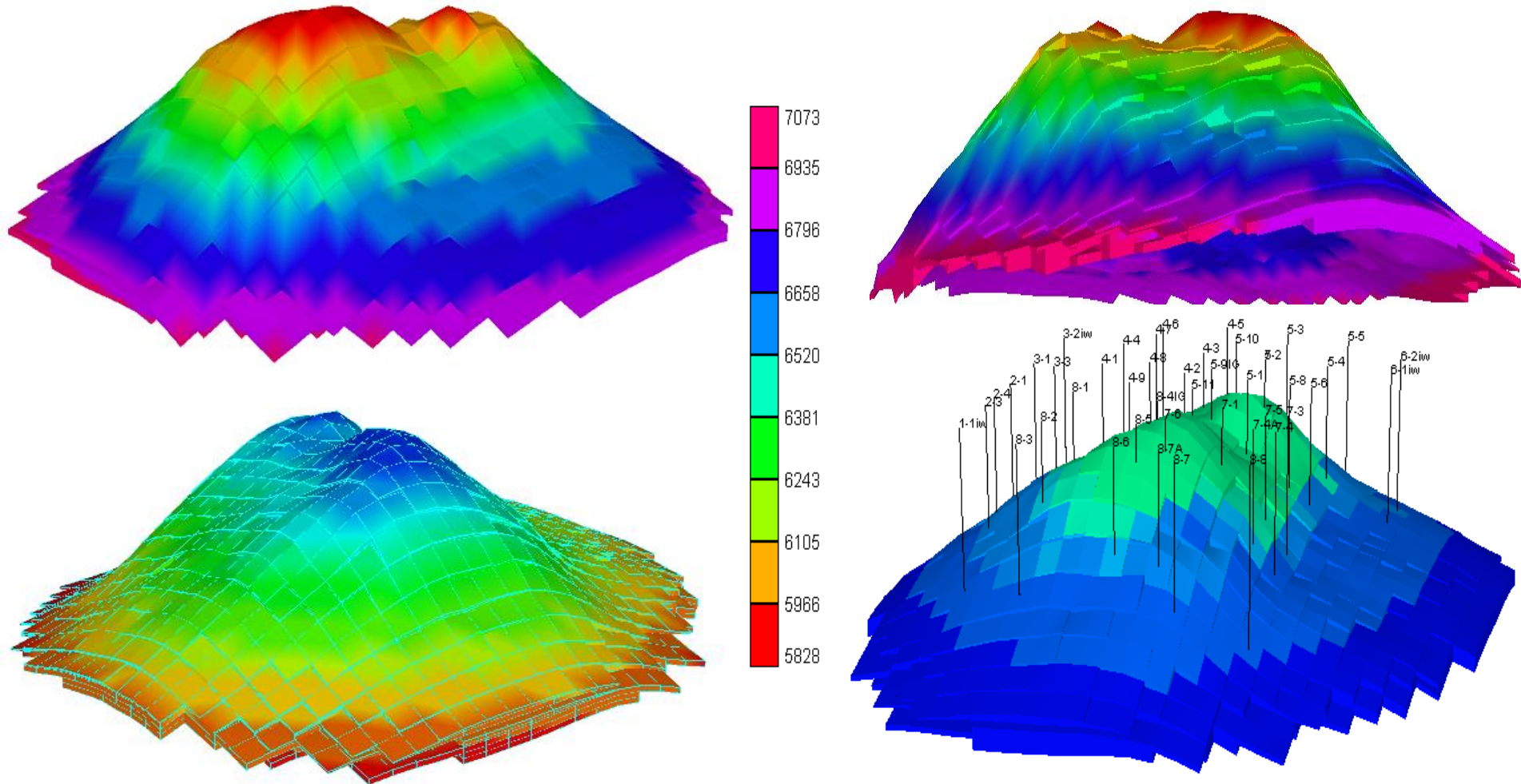
Applications of Reservoir Simulation

1. Determine the performance of an oil reservoir under natural depletion, water injection or gas injection.
2. Compare flank waterflooding to pattern waterflooding.
3. Determine the effects of well location, spacing and producing rate on recovery.
4. Determine the working gas and peak-day deliverability for a gas storage field.
5. Estimate lease-line drainage in heterogeneous oil or gas fields.

Steps In A Reservoir Simulation Study

- Problem definition
- Data review
- Data acquisition
- Selection of approach
- Reservoir description and model design
- Programming support
- History matching
- Prediction
- Editing and analysis
- Reporting

3D – Structure Development

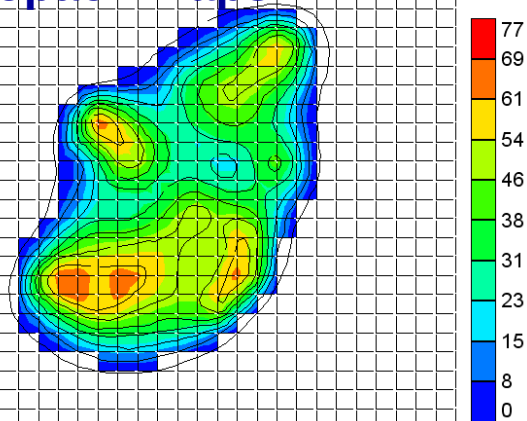


Simulation Model

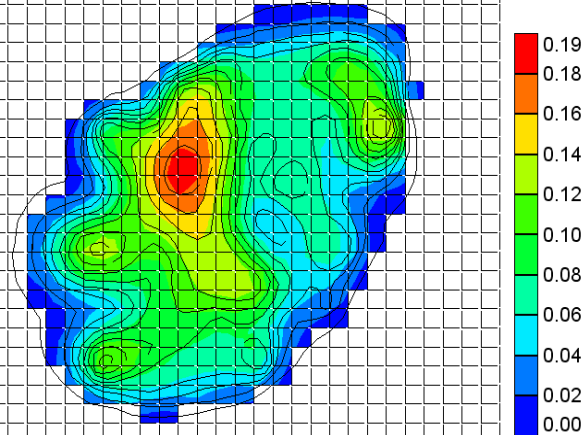
Input Data

Gross Thickness

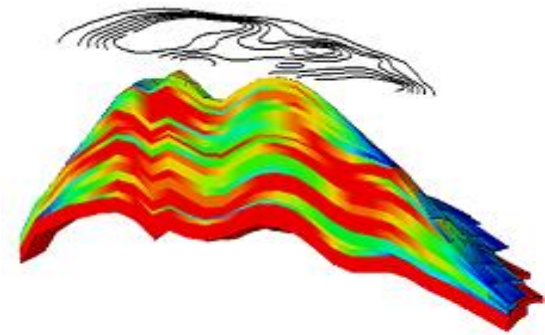
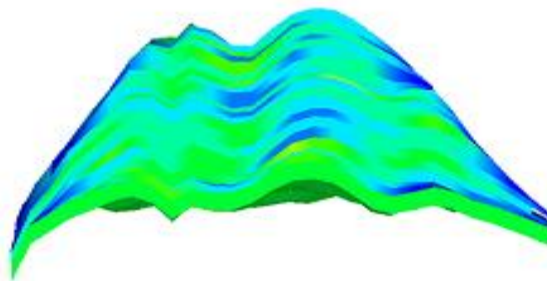
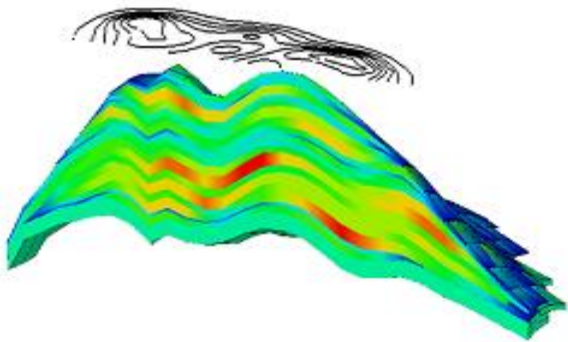
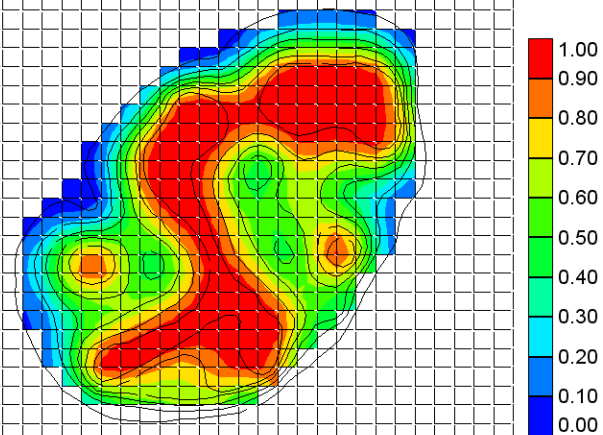
Isopach Maps



Porosity

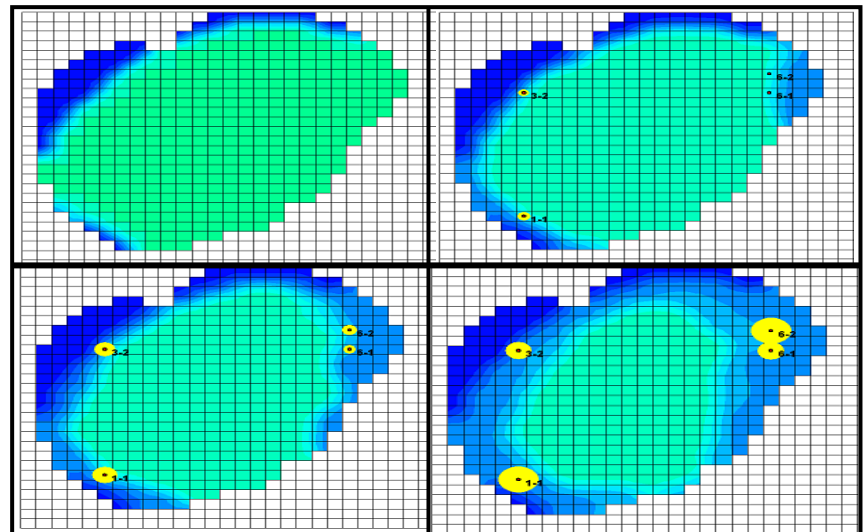
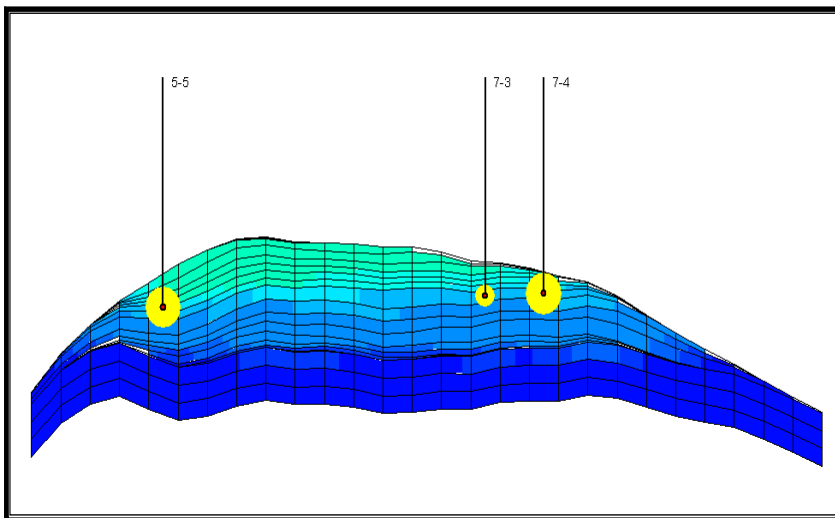
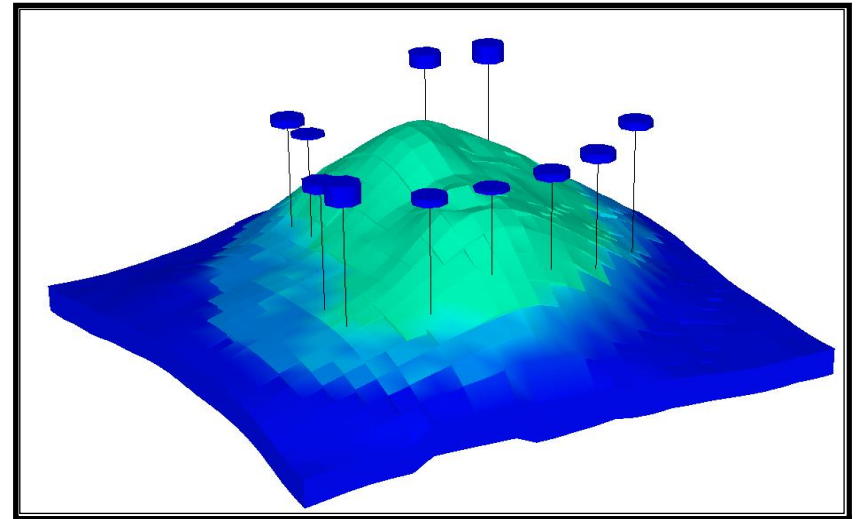
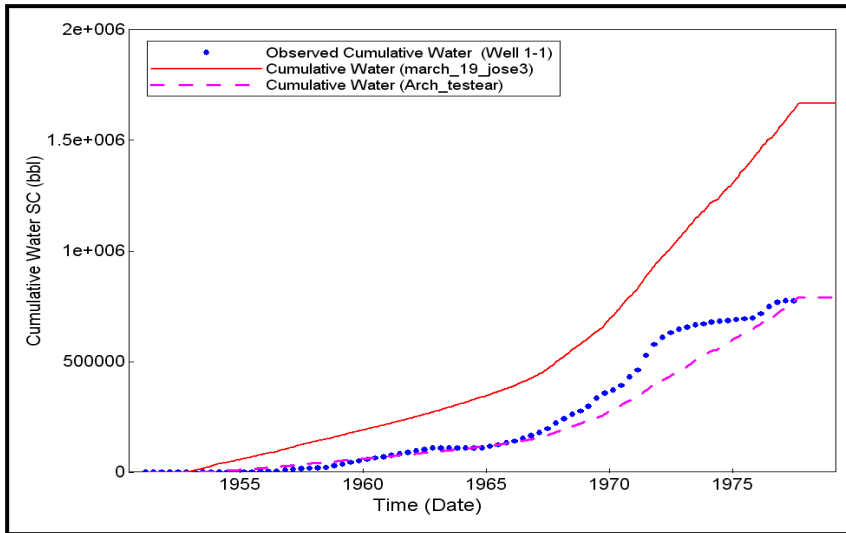


Net to Gross Ratio

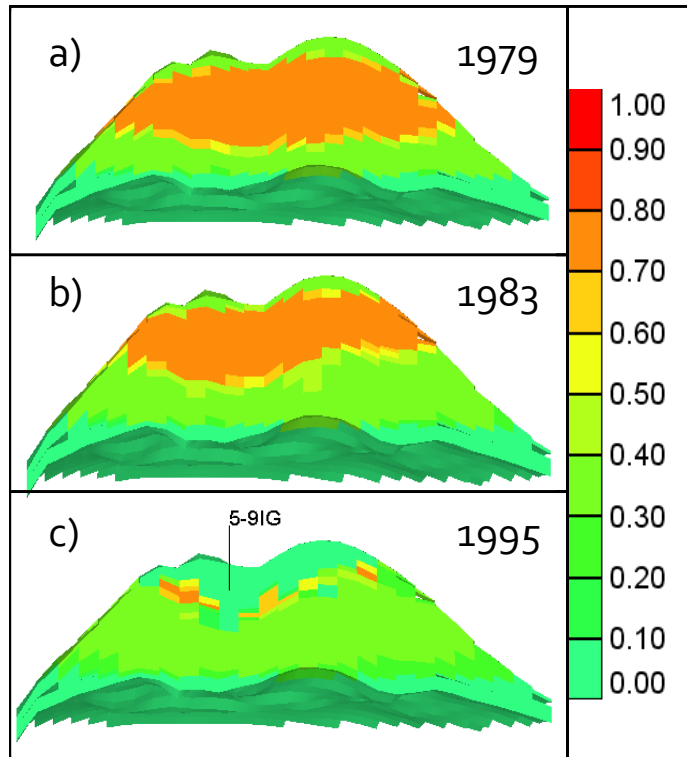


Results: Primary Depletion

Diagnosis



Results: CO₂ Injection Chronological Oil Saturation Distribution



a) Primary depletion

b) Waterflooding

c) CO₂ miscible flooding
Oil saturation considered overestimated due to the excess of oil production

References

1. Coats, K. H.: "Use and Misuse of Reservoir Simulation Models," *JPT* (Nov. 1969) 1391-1398.
2. Mattax, C. C. and Dalton, R. L.: *Reservoir Simulation*, Monograph Series, SPE, Richardson, TX (1990) 13.