

Designing a general abstract configuration format for Geoscience Modeling and Simulation

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1 Introduction

Ok so here my research starts, god saves the queen.

My goal is to find an abstract way to define a geoscience simulation modelling problem, where all implementations details are abstracted.

Therefore, I need to make a review on what kinds of problems geoscientists handle and how they describe them.

2 Geoscience Problems Review

More content here.

2.1 Reservoir Exploitation

Reservoir exploitation includes for example carbon sequestration or oil production.

Defining a reservoir simulation problem is all about listing fluid and reservoirs properties, including their relationship to pressure, temperature and composition. [1]

Reservoir properties

- fluid
 - yo

phase (*a*) region of space with uniform physical properties

fluid phase

liquid aqueuos phase (**w**)

liquid oleic phase (**o**)

gaseous phase (g)

microemulsions

supercritical fluids

rock phase rock matrix

component (k) unique chemical species, many components can be in one phase and a component can be in several phases

pseudocomponent a pseudocomponent represents similar components lumped together for computational purposes, simulation is often based on three to ten pseudocomponents

compositional model

black oil model (β) a special case of compositional model, with three pseudocomponents (water, oil and gas) in up to three fluid phases (aqueous, oleic and gaseous)

The oil pseudocomponent consists of all components present in a liquid hydrocarbon phase when brought to standard conditions. Likewise,

standard conditions (sc) $T_{sc} = 15.5\text{ }^{\circ}\text{C}$ $p_{sc} = 0.95\text{ bar}$

porosity (φ) pore volume divided by bulk volume

phase saturation (S_{α}) volume fraction of the void space occupied by a phase, phase saturations must sum to 1

density (ρ) mass divided by volume, usually refers to a phase but can also apply to a component. The density of a fluid is a function of pressure, temperature and composition.

2.2 Geothermal Energy

References

- [1] Matthew Balhoff. “Review of reservoir rock and fluid properties”. In: *Developments in Petroleum Science*. Vol. 75. Elsevier, 2022. Chap. 1. DOI: <https://doi.org/10.1016/B978-0-323-99235-0.00010-5>.